

**Abstinence from compulsive sexual behavior and
problematic pornography use:
Phenomenological experiences and short-term effects**

David Paul Fernandez

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Statement of Contribution of Others

Where the work presented in this thesis was the product of collaborative efforts, I declare that my contribution was substantial and prominent, involving the development of original ideas, as well as the definition and implementation of subsequent work. Detailed information about my contribution to collaborative work in this thesis is outlined in Appendix A.

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Table of Contents

Abstract.....	1
PART I: GENERAL INTRODUCTION.....	3
Chapter 1.....	3
1.1 Background.....	3
1.2 Significance of the present thesis	4
1.3 Theoretical framework	8
1.4 Structure of the present thesis.....	9
PART II: SYSTEMATIC REVIEWS.....	12
Chapter 2.....	12
Psychometric instruments for problematic pornography use: A systematic review ...	12
2.1 Introduction	12
2.1.1 Previous reviews of psychometric instruments assessing problematic sexual behavior.....	14
2.2 Method.....	16
2.2.1 Instrument evaluation.....	17
2.3 Results	21
2.3.1 Theoretical models and conceptualizations of problematic pornography use	21
2.3.2 Components of addiction	29
2.3.3 Psychometric properties.....	30
2.3.4 Summary of instruments for problematic pornography use	31
2.4 Discussion.....	60
2.4.1 Conceptualizations of problematic pornography use.....	60
2.4.2 Assessment of addiction components	62
2.4.3 Contextual factors potentially affecting assessment of addiction components ...	65
2.4.4 Psychometric properties and sample characteristics.....	69
2.4.5 Recommendations for researchers and clinicians	70
2.4.6 Limitations	71
2.4.7 Conclusion	71
Chapter 3.....	72
Short-term abstinence effects across potential behavioral addictions: A systematic review.....	72
3.1 Introduction	72
3.1.1 Abstinence as a methodological tool in the assessment of addiction symptomatology.....	72

3.1.2	Abstinence as a potential intervention for problematic behaviors	74
3.1.3	The present study	76
3.2	Method.....	78
3.3	Results	80
3.3.1	Exercise.....	87
3.3.2	Gambling.....	88
3.3.3	Gaming.....	88
3.3.4	Mobile phone use	89
3.3.5	Pornography use.....	91
3.3.6	Social media use	91
3.4	Discussion.....	92
3.4.1	Withdrawal and craving	93
3.4.2	Relapse.....	96
3.4.3	Benefits and counterproductive consequences of abstinence	97
3.4.4	Methodological considerations and recommendations for future research	99
3.4.5	Limitations	102
3.4.6	Conclusion	102
PART III:	EMPIRICAL STUDIES	104
Chapter 4.....	104
The pornography ‘rebooting’ experience: A qualitative analysis of abstinence journals on a pornography abstinence forum	104
4.1	Introduction	104
4.1.1	Problematic pornography use	104
4.1.2	Abstinence from pornography as an intervention for PPU	106
4.1.3	The ‘rebooting’ movement	107
4.1.4	The present study	110
4.2	Method.....	110
4.2.1	Data collection and sample	110
4.2.2	Data analysis	115
4.2.3	Ethical considerations	116
4.3	Results	116
4.3.1	Abstinence is the solution to pornography-related problems	119
4.3.2	Sometimes abstinence seems impossible.....	123
4.3.3	Abstinence is achievable with the right resources	128
4.3.4	Abstinence is rewarding if persisted with.....	130

4.4 Discussion.....	132
4.4.1 Motivations for ‘rebooting’.....	132
4.4.2 The ‘rebooting’ experience.....	134
4.4.3 Abstinence as an intervention for PPU.....	137
4.4.4 Study strengths and limitations.....	140
4.4.5 Conclusion.....	140
Chapter 5.....	142
Lived experiences of recovery from compulsive sexual behavior among members of Sex and Love Addicts Anonymous: A qualitative thematic analysis	142
5.1 Introduction.....	142
5.1.1 The 12-step program.....	143
5.1.2 12-step groups for CSB – ‘S’ groups.....	144
5.1.3 The present study.....	148
5.2 Method.....	148
5.2.1 Participants.....	148
5.2.2 Data collection.....	150
5.2.3 Data analysis.....	152
5.2.4 Ethical considerations.....	153
5.3 Results and Preliminary Discussion.....	153
5.3.1 Theme 1: Unmanageability of life as impetus for change.....	153
5.3.2 Theme 2: Addiction as a symptom of a deeper problem.....	156
5.3.3 Theme 3: Recovery is more than just abstinence.....	160
5.3.4 Theme 4: Maintaining a new lifestyle and ongoing work on the self.....	163
5.3.5 Theme 5: The gifts of recovery.....	170
5.4 General Discussion.....	172
5.4.1 Study limitations.....	174
5.4.2 Conclusion.....	175
Chapter 6.....	176
Effects of a seven-day pornography abstinence period on withdrawal-related symptoms in regular pornography users: A randomized controlled study	176
6.1 Introduction.....	176
6.1.1 Problematic pornography use (PPU).....	176
6.1.2 The assessment of withdrawal in relation to PPU.....	178
6.1.3 Methodological limitations of PPU withdrawal studies.....	180
6.1.4 The present study.....	181

6.2 Method.....	184
6.2.1 Participants.....	184
6.2.2 Procedure	190
6.2.3 Daily measures.....	191
6.2.4 Baseline measures.....	194
6.2.5 Attention check measures	196
6.2.6 Data analysis	196
6.3 Results	199
6.3.1 Manipulation check analyses	199
6.3.2 Confirmatory analyses	200
6.3.3 Exploratory analyses.....	203
6.4 Discussion.....	206
6.4.1 Confirmatory analyses	206
6.4.2 Exploratory analyses.....	208
6.4.3 Implications.....	210
6.4.4 Limitations and directions for future research.....	211
6.4.5 Conclusion	212
PART IV: GENERAL DISCUSSION.....	214
Chapter 7.....	214
7.1 Summary and synthesis of findings.....	214
7.1.1 Phenomenological experiences of abstinence-based recovery from CSB and PPU	216
7.1.2 Short-term effects of abstinence from pornography on withdrawal-related symptoms	220
7.2 Implications	222
7.2.1 Abstinence-based interventions from CSB and PPU.....	222
7.2.2 The potential manifestation of withdrawal in relation to PPU	226
7.3 Unique contributions to knowledge.....	229
7.4 Methodology.....	231
7.4.1 Pragmatism as an overarching research paradigm.....	231
7.4.2 Strengths and limitations of qualitative methods used	232
7.4.3 Strengths and limitations of quantitative methods used	234
7.4.4 Strengths and limitations of mixed methods used	235
7.5 Limitations and directions for future research.....	236
7.6 Final remarks	238

References	239
Appendix A	300
Appendix B	301
Appendix C	317
Appendix D	320
Appendix E	321
Appendix F	322
Appendix G	323
Appendix H	324
Appendix I	326
Appendix J	328
Appendix K	329
Appendix L	331
Appendix M	332
Appendix N	334
Appendix O	335
Appendix P	337
Appendix Q	338

List of tables

Table 2.1 <i>Characteristics of psychometric instruments for problematic pornography use</i>	23
Table 2.2 <i>Components of addiction assessed by psychometric instruments for problematic pornography use</i>	33
Table 3.1 <i>Summary of abstinence effects across behaviors</i>	83
Table 4.1 <i>Sample characteristics</i>	113
Table 4.2 <i>Characteristics of abstinence attempts</i>	117
Table 4.3 <i>Themes derived from thematic analysis of the dataset</i>	120
Table 5.1 <i>Key participant characteristics</i>	151
Table 6.1 <i>Baseline characteristics of the sample</i>	187
Table 6.2 <i>Means and standard deviations of all outcome variables in confirmatory analyses</i>	201
Table 6.3 <i>Multilevel model results for all outcome variables in confirmatory analyses</i>	202
Table 6.4 <i>Multilevel model results for exploratory craving model</i>	204

List of figures

Figure 2.1. PRISMA flow diagram depicting the systematic search process for identifying instruments assessing problematic pornography use	19
Figure 3.1. PRISMA flow diagram depicting the systematic search process.	81
Figure 6.1. CONSORT flow diagram.	186
Figure 6.2. Timeline of the eight-day study period.....	190
Figure 6.3. Effect of group on craving by PPU level (± 1 SD) at all six levels of past four-week FPU.....	205

Abstract

The investigation of abstinence from compulsive sexual behavior (CSB) and problematic pornography use (PPU) is important for filling gaps in current knowledge about their assessment and intervention. These gaps include: (i) abstinence-based interventions for CSB and PPU being common yet little understood, and (ii) uncertainty about whether withdrawal-related symptomatology manifest when regular pornography users with varying levels of self-reported PPU attempt to abstain from pornography.

The first part of the present thesis comprised two systematic reviews that were conducted to review the state of the evidence in the following two areas: the theoretical conceptualization and psychometric assessment of PPU (Systematic Review 1) and short-term abstinence effects across multiple potential behavioral addictions (Systematic Review 2). Findings of Systematic Review 1 indicated a lack of consensus in the field about the theoretical conceptualization and operationalization of CSB and PPU and highlighted a need for further empirical research into less agreed-upon components of addiction (e.g., withdrawal). Findings of Systematic Review 2 showed that negative abstinence effects (potentially reflective of withdrawal-related symptoms) and/or positive abstinence effects (potentially reflective of benefits of abstinence as an intervention) manifested to varying extents across six potential behavioral addictions (exercise, gambling, gaming, mobile phone use, pornography use and social media use). Importantly, the review highlighted that no prospective study had examined the effects of short-term abstinence from pornography specifically on the manifestation of withdrawal-related symptoms.

The second part of the present thesis comprised three empirical studies that contributed to filling the aforementioned gaps in the literature by achieving two aims. First, qualitative

analyses of phenomenological experiences of abstinence-based recovery were conducted on abstinence journals of members of a pornography ‘rebooting’ forum (Empirical Study 1; $N = 104$) and in-depth semi-structured interviews with members of a 12-step group for CSB (Empirical Study 2; $N = 14$). Descriptions and sense-making of abstinence-based recovery experiences across both communities revealed commonalities (e.g., the importance of lifestyle changes and social support from the group in achieving successful abstinence), but also notable dissimilarities (e.g., nuances in etiological conceptualization of the problematic behavior leading to differences in sense-making about the meaning of abstinence). Second, a randomized controlled design was used to examine whether there were any effects of a seven-day pornography abstinence period on withdrawal-related symptoms (and whether abstinence effects were moderated by self-reported PPU) in a sample of regular pornography users (Empirical Study 3; $N = 176$). Contrary to confirmatory hypotheses, no evidence of abstinence effects on withdrawal-related symptoms was found, and this was not dependent on level of PPU (but with the caveat that the sample was 64.2% female and had relatively low levels of PPU). However, because exploratory analyses found an abstinence effect on craving when PPU was high and past four-week frequency of pornography use (FPU) crossed the threshold of daily use, the possibility that withdrawal-related symptoms may manifest only at high levels of FPU and PPU needs to be investigated in future prospective studies. Overall, the present thesis provides novel insights into abstinence-based interventions for CSB and PPU and contributes to current theorizing about whether withdrawal-related symptomatology manifests in relation to PPU.

PART I: GENERAL INTRODUCTION

Chapter 1

1.1 Background

Compulsive sexual behavior (CSB) and problematic pornography use (PPU)

While the clinical phenomenon of compulsive sexual behavior (CSB; also conceptualized by some scholars as ‘sex addiction’, ‘hypersexuality’, ‘sexual impulsivity’, or ‘out-of-control-sexual behavior’) has been described and theorized about in the literature for decades (Barth & Kinder, 1987; Carnes, 1983; Coleman, 1991; Goodman, 1992; Grubbs et al., 2020; Kafka, 2010), there has been a long history of controversy surrounding its diagnostic classification and legitimacy as a clinical disorder (Reid & Kafka, 2014). In 2013, the American Psychiatric Association [APA] rejected the proposal for the inclusion of hypersexual disorder (HD) into the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5; Kafka, 2014). Insufficient scientific evidence and potential misuse of the diagnosis in forensic settings were cited as the main reasons for its rejection (Hartmann, 2013; Kafka, 2014). However, more recently, the World Health Organization (WHO) included the diagnosis of compulsive sexual behavior disorder (CSBD) as an impulse control disorder in the *International Classification of Diseases 11th Revision* (ICD-11; Kraus et al., 2018; Reed et al., 2019; WHO, 2019), which afforded CSB a formal diagnosis within clinical settings for the first time. A conservative approach was taken for the ICD-11 in categorizing it as an impulse control disorder rather than an addictive disorder because there is (to date) insufficient clinical evidence to determine whether the processes involved in the development and maintenance of the disorder are equivalent to other recognized forms of addiction (Kraus et al., 2018).

The ICD-11 characterizes CSBD as “*a persistent pattern of failure to control intense, repetitive sexual impulses or urges, resulting in repetitive sexual behavior... over an*

extended period (e.g., six months or more) and causes marked distress or significant impairment in personal, family, social, educational, occupational or other important areas of functioning” (World Health Organization, 2019, p. 1). CSB encompasses various types of sexual behaviors such as pornography use and/or masturbation, cybersex, casual sex with multiple partners, use of escort services and sex workers, or frequenting of strip clubs (Karila et al., 2014; Reid, et al., 2009). Compulsive pornography use (also known as *problematic pornography use* [PPU] in the empirical literature) is the most common manifestation of CSB with more than 80% of individuals seeking treatment for CSB reporting compulsive pornography use (Reid, Carpenter, et al., 2012).

A recent systematic review of CSB research over the past 25 years (Grubbs et al., 2020) had two important conclusions that emphasize the need for high-quality research on CSB assessment and treatment. The first conclusion was that the field has been characterized by inconsistent conceptualization and assessment of CSB. While the current ICD-11 diagnosis is a good starting point for unified assessment of CSB, further empirical research on its precise phenomenological presentation is needed to inform theorizing about its conceptualization and classification (Griffiths, 2022; Kraus et al., 2016, 2018; Sassover & Weinstein, 2022). The second conclusion was that there has been a longstanding history of CSB treatment delivery with little empirical evaluation of these treatments. While various interventions with varying degrees of empirical support have been adopted by treatment providers and mutual-help groups over the years (Dhuffar & Griffiths, 2015a; Efrati & Gola, 2018b; Garcia et al., 2016; Mandalain et al., 2020; Miles et al., 2016), continued empirical research on these interventions is crucial for the field to understand and evaluate their utility.

1.2 Significance of the present thesis

The present thesis posits that investigating abstinence from CSB and PPU is important for filling gaps in current knowledge about CSB and PPU assessment and intervention.

Abstinence is broadly defined in this thesis as ‘a state of voluntary or involuntary non-engagement in a behavior’. More specifically, it is argued that (i) exploring phenomenological experiences of abstinence-based recovery can provide insights into abstinence-based interventions for CSB and PPU, and (ii) examining short-term effects of abstinence from pornography can advance current theorizing about whether withdrawal-related symptomatology manifests in relation to PPU.

Exploring phenomenological experiences of abstinence-based recovery can provide insights into abstinence-based interventions for CSB and PPU

Many individuals with CSB and PPU choose to attempt abstinence from their problematic sexual behaviors as a short-term or long-term goal in their recovery. Within clinical settings, abstinence is frequently chosen as an intervention goal alongside reduction/controlled use goals in PPU interventions (e.g., Sniewski & Farvid, 2019; Twohig & Crosby, 2010). Some clinicians treating CSB suggest temporary ‘celibacy contracts’ of complete abstinence from any sexual behavior in early phases of treatment (Carnes, 1989). 12-step groups for CSB (known as ‘S’ groups), which are mutual-help support groups based on the Alcoholics Anonymous (AA) model, emphasize abstinence from the problematic sexual behavior as a means of recovery from CSB (Efrati & Gola, 2018a). Online communities part of the growing pornography ‘rebooting’ movement (such as *NoFap* or *Reboot Nation*) advocate abstaining from pornography (sometimes accompanied by abstaining from masturbation and/or having an orgasm for a period of time) as a means of recovery from PPU (Deem 2014b, NoFap.com, nd).

Despite abstinence-based recovery from CSB and PPU being common, little is known about the phenomenological experiences of individuals engaged in abstinence-based recovery and the intricacies of these abstinence-based interventions. The first aim of the present thesis is to fill this gap in the literature by conducting inductive qualitative analyses of

phenomenological experiences of members of two abstinence-based recovery communities, an online pornography ‘rebooting’ forum (*Reboot Nation*; Empirical Study 1) and an ‘S’ group (i.e., Sex and Love Addicts Anonymous [SLAA]; Empirical Study 2). Both qualitative analyses are guided by the following three broad research questions: (i) What are members’ motivations for engaging in abstinence-based recovery? (ii) What is the abstinence-based recovery experience like for members?; and (iii) How do they make sense of their experiences?

Analyzing phenomenological experiences of abstinence-based recovery will provide unique insights into: (i) what abstinence-based recovery from CSB and PPU is like (i.e., primary motivations, key challenges, effective/ineffective strategies, perceived effects) from the perspectives of individuals with lived experiences, and (ii) abstinence as an intervention goal in recovery from CSB and PPU. A secondary aim of Empirical Study 1 is that if withdrawal-like symptoms are self-reported by members of the ‘rebooting’ forum, the nature of these symptoms would be useful for informing the specific withdrawal-related symptoms that need to be assessed quantitatively in Empirical Study 3 (described in the next section).

Examining short-term effects of abstinence from pornography can advance current theorizing about whether withdrawal-related symptomatology manifests in relation to PPU

Sassover and Weinstein (2022) have proposed that to properly assess the phenomenology of CSB, a comprehensive examination of all six components of Griffiths’ (2005) components model of addiction (i.e., salience, mood modification, conflict, withdrawal, tolerance and relapse) is needed. One addiction component that is still debated as being part of CSBD and PPU is withdrawal. Withdrawal can be defined as the unpleasant affective states and/or physical reactions that occur when a substance or behavior is abruptly ceased or reduced (Griffiths, 2005). Some conceptualizations of CSBD and PPU include withdrawal (e.g., Andreassen et al., 2018; Böthe et al., 2018), while others, including the

ICD-11 diagnostic criteria, do not (e.g., Bóthe, Potenza, et al., 2020; Kor et al., 2014). The present thesis focuses on the potential manifestation of the withdrawal component specifically in relation to PPU.

The possible existence of a pornography withdrawal syndrome warrants investigation because recent studies show that it is not uncommon for pornography users to self-report that they experience withdrawal-like symptoms when they attempt to abstain from pornography (Bóthe et al., 2018; Dwulit & Rzymiski, 2019a). However, these studies have methodological limitations that prevent conclusions from being drawn about whether genuine withdrawal symptoms manifest during pornography abstinence. Retrospective self-reports of perceived withdrawal-like symptoms upon cessation as reported in cross-sectional surveys (e.g., Dwulit & Rzymiski, 2019a) are subject to recall bias, and PPU self-report instruments that have included items assessing withdrawal (e.g., “*I became agitated when I was unable to watch porn*” in the Problematic Pornography Consumption Scale [PPCS]; Bóthe et al., 2018) are inherently limited if respondents do not engage in periods of abstinence because withdrawal symptoms, by definition, only arise under abstinence conditions.

The second aim of the thesis is to fill this gap in the literature by using a randomized controlled design to prospectively examine effects of a seven-day pornography abstinence period on withdrawal-related symptoms in regular pornography users (Empirical Study 3). More specifically, the study seeks to answer two research questions: (i) Do negative abstinence effects potentially indicative of withdrawal-related symptoms manifest when regular pornography users try to abstain from pornography for seven days? (ii) Do these negative abstinence effects only manifest (or manifest more strongly) for those with higher levels of self-reported PPU?

Determining whether withdrawal-related symptoms manifest during pornography abstinence has two primary implications. First, the presence or absence of withdrawal

symptoms is useful for informing debates about whether PPU should be classified as an addictive disorder (Reid, 2016). Second, even if negative abstinence effects are not interpreted within an addiction framework as withdrawal symptoms, observing the presence and nature of these symptoms, if they do manifest, is useful for understanding the phenomenological presentation of PPU. These symptoms can then become potential treatment targets in PPU interventions (Böthe, Lonza, et al., 2020).

1.3 Theoretical framework

CSB (and by extension, PPU) have had varying theoretical conceptualizations over the years, including sexual addiction (Carnes, 1983), sexual impulsivity (Barth & Kinder, 1987), compulsive sexual behavior (Coleman, 1991), hypersexual disorder (HD; Kafka, 2010), and most recently as an impulse-control disorder known as compulsive sexual behavior disorder (CSBD; WHO, 2019). In this thesis, addiction is used as the theoretical framework because addiction symptomatology shares significant commonalities with symptomatology of related theoretical models, for instance accounting for impulsivity in impulse control disorder models and compulsivity in compulsive behavior models (Cuzen & Stein, 2014; Kingston & Firestone, 2008). Also, although having etiological dissimilarities with addiction, HD and CSBD diagnostic criteria can be interpreted using an addiction framework.

Addiction has been conceptualized in various ways by researchers within the addiction field. For example, Griffiths (2005) conceptualized addiction as having six core components: (i) salience, (ii) mood modification, (iii) conflict, (iv) withdrawal, (v) tolerance, and (vi) relapse. Potenza (2006) conceptualized addiction as having three core elements: (i) a craving state prior to behavioral engagement, (ii) impaired control over behavioral engagement, and (iii) continued engagement despite adverse consequences. Sussman and Sussman (2011) conceptualized addiction as involving five distinct components: (i)

engagement in the behavior to achieve appetitive effects, (ii) preoccupation with the behavior, (iii) temporary satiation, (iv) loss of control, and (v) suffering negative consequences.

Griffiths' (2005) components model of addiction was used as the overarching model of addiction for the present thesis, for two main reasons. First, the withdrawal component is a key focus of the present thesis and Griffiths' model explicitly conceptualizes withdrawal as being a necessary component of addiction. While Sussman and Sussman (2011) also make reference to withdrawal, they conceptualize withdrawal (along with tolerance and craving) as being a manifestation of the preoccupation component. Second, Griffiths' model has been influential in the behavioral addiction field and has been widely used as the framework for many psychometric instruments assessing various problematic behaviors (Griffiths, 2019), including PPU (i.e., PPCS; Bóthe et al., 2018). Therefore, the PPCS could be used as a measure of PPU in Empirical Study 3.

1.4 Structure of the present thesis

This thesis is divided into four parts: (i) general introduction (Chapter 1), (ii) systematic reviews (Chapters 2–3), (iii) empirical studies (Chapters 4–6), and (iv) general discussion (Chapter 7).

Part 1: General introduction

This first chapter (Chapter 1) provides an introduction to CSB and PPU, highlights gaps in CSB and PPU assessment and treatment research, and outlines how the present thesis aims to address these gaps.

Part 2: Systematic reviews

Two systematic reviews were conducted to review the state of the evidence and highlight gaps in the following two areas: theoretical conceptualization and psychometric

assessment of PPU (Chapter 2) and short-term abstinence effects across multiple potential behavioral addictions (Chapter 3).

Chapter 2: Psychometric instruments for problematic pornography use: A systematic review. Systematic Review 1 aimed to review psychometric instruments assessing PPU in terms of their theoretical conceptualization, psychometric properties, strengths and limitations, and ability to assess various core components of addiction, including withdrawal.

Chapter 3: Short-term abstinence effects across potential behavioral addictions: A systematic review. Systematic Review 2 aimed to synthesize existing research evidence on short-term abstinence effects across multiple potential behavioral addictions in light of (i) manifestations of withdrawal, craving and relapse to provide insights into assessment of these addiction-related symptoms in behavioral addictions, and (ii) positive or counterproductive effects of abstinence to shed light on short-term abstinence as a potential intervention for behavioral addictions. A secondary aim of this review was to inform the methodological design of Empirical Study 3.

Part 3: Empirical studies

Chapter 4: The pornography ‘rebooting’ experience: A qualitative analysis of abstinence journals on a pornography abstinence forum. Empirical Study 1 aimed to explore phenomenological experiences of abstinence among members of an online ‘rebooting’ forum, *Reboot Nation*.

Chapter 5: Lived experiences of recovery from compulsive sexual behavior among members of Sex and Love Addicts Anonymous: A qualitative thematic analysis. Empirical Study 2 aimed to explore phenomenological experiences of recovery among members of an ‘S’ group, *Sex and Love Addicts Anonymous (SLAA)*.

Chapter 6: Effects of a seven-day pornography abstinence period on withdrawal-related symptoms in regular pornography users: A randomized controlled study.

Empirical Study 3 aimed to examine the effects of a seven-day pornography abstinence period on withdrawal-related symptoms in a sample of regular pornography users.

Part 4: General discussion

The final chapter (Chapter 7) summarizes and synthesizes findings of the systematic reviews and empirical studies. Methodological considerations, limitations, future research directions and overall implications of the findings of the present thesis are discussed.

PART II: SYSTEMATIC REVIEWS

Chapter 2

Psychometric instruments for problematic pornography use: A systematic review¹

2.1 Introduction

Pornography use has become increasingly prevalent worldwide (Hald et al., 2013; Hald & Mulya, 2013; Wright, 2013), which can be explained in part to the advent of the internet and increased internet access (Buzzell, 2005). Two decades ago, Cooper (1998) had predicted the impact that the internet would have on sexuality moving into the 21st century, proposing the Triple A Engine of access, affordability and anonymity – factors the internet possess that make accessing pornography online particularly convenient. Recently, *PornHub* (the largest pornography site on the internet) reported in their annual review that they received 28.5 billion visits in 2017, with a daily average of 81 million visits a day (Pornhub.com, 2018).

Pornography use has therefore been the subject of much scientific attention, with researchers especially interested in investigating the psychological effects of viewing pornography. Research on self-perceived effects of pornography consumption has shown that pornography users report positive effects such as increasing their sexual knowledge and improving their sex life, but also negative effects such as having unrealistic sexual expectations, relationship problems, and addiction (Hald & Malamuth, 2008; al Mamun et al., 2018; McKee, 2007). However, at present there is still ongoing disagreement within the scientific community about the negative effects of pornography, primarily about the possibility of being genuinely addicted to pornography. Proponents of the pornography addiction model have argued that pornography is addictive due to it being a particularly novel

¹ This chapter has been published in a peer-reviewed academic journal: Fernandez, D. P., & Griffiths, M. D. (2021). Psychometric instruments for problematic pornography use: A systematic review. *Evaluation and the Health Professions*, 44(2), 111-141. <https://doi.org/10.1177/0163278719861688>

and ‘supranormal’ stimulus (Hilton Jr., 2013), and that symptoms of excessive pornography use fit neatly within an addiction framework, sharing similar neurobiological mechanisms with substance addictions and other behavioral addictions (Gola et al., 2017; Love et al., 2015). Opponents of the model on the other hand have challenged the credibility and very existence of the notion in the first place (Voros, 2009), and have suggested that supposed ‘addictive’ use of pornography can be explained by non-pathological factors including high libido, tendency towards sensation-seeking, and religious values that conflict with personal sexual desires (Ley et al., 2014).

The controversy surrounding pornography addiction is part of a larger debate about whether sexual addiction more generally should be officially recognized as a clinical disorder. To date, sexual addiction has never received formal recognition as a disorder, despite clinical evidence documenting many individuals seeking treatment for problematic excessive sexual behaviors (Kraus et al., 2016; Reid, Garos, et al., 2012). Various theoretical models conceptualizing problematic excessive sexual behavior in different ways have arisen over the years, including sexual addiction (Carnes, 1983; Goodman, 1992), sexual impulsivity (Barth & Kinder, 1987), compulsive sexual behavior (Coleman, 1991), and more recently Hypersexual Disorder (HD; Kafka, 2010). However, in 2013 the American Psychiatric Association rejected the proposal for the inclusion of HD into the DSM-5 (Reid & Kafka, 2014), under which pornography dependence would have been subsumed as a specifier. Inadequate empirical evidence and lack of expert consensus on the conceptualization of the disorder was cited as the main reason for its rejection (Hartmann, 2013). However, more recently, the World Health Organization (WHO) included the diagnosis of compulsive sexual behavior disorder (CSBD) as an impulse-control disorder in the ICD-11 (Kraus et al., 2018; Reed et al., 2019; World Health Organization [WHO], 2019), under which compulsive use of pornography would be subsumed. This would for the first

time give compulsive pornography use a formal diagnosis within clinical settings. It is important to note that CSBD is not being ruled out as a behavioral addiction, but that for ICD-11, a conservative approach has been taken in categorizing it as an impulse-control disorder because there is insufficient evidence to determine whether the disorder is similar to other recognized forms of addiction including substance use disorders, gambling, and gaming (Kraus et al., 2016; Kraus et al., 2018).

Nonetheless, whether or not pornography addiction should be recognized as a disorder, scientific investigation of the phenomenon is still ongoing. Psychometric instruments have been developed over the years to assess various aspects of problematic pornography use. In the absence of official diagnostic criteria conceptualizing compulsive and/or addictive use of pornography, the construct has been explored from multiple angles, using different conceptualizations and theoretical frameworks. As a result, the term ‘problematic’ has often been used in lieu of the term ‘addiction’ or ‘compulsion’ in the literature. The term ‘problematic pornography use’ is therefore used in the present review because it covers any theoretical conceptualization of the concept. The variety of approaches to conceptualization has led to conclusions being drawn about problematic pornography use without a clear consensus in the field about agreed upon operational definitions and assessment of the construct, which will ultimately influence the understanding, assessment, and treatment of the problem. Hence, there is a need for systematic evaluation of psychometric instruments that have been developed to assess various aspects of problematic pornography use.

2.1.1 Previous reviews of psychometric instruments assessing problematic sexual behavior

Sexual addiction/hypersexual disorder. There have been relatively recent reviews pertaining to psychometric instruments for sexual addiction/hypersexual disorder in general. For example, Hook et al. (2010) evaluated psychometric properties of psychometric tools for

sexual addiction, while Womack et al. (2013) evaluated the ability of psychometric tools for HD in assessing diagnostic criteria of HD. More recently, Montgomery-Graham (2017) conducted an updated psychometric evaluation of the most researched HD instruments. However, these reviews did not include instruments that had been developed to specifically assess problematic pornography use.

Problematic pornography use. There have also been recent reviews more specifically focused on conceptualization and assessment of problematic pornography use. For example, Eleuteri et al. (2014) reviewed the strengths and weaknesses of psychometric tools for online sexual activities from 2004-2014, including instruments for problematic pornography use. Wéry and Billieux (2017) reviewed the conceptualization, assessment, and treatment of problematic cybersex, and provided a brief overview of instruments for the assessment of problematic cybersex, most of which could be applied to problematic pornography use. Duffy et al. (2016) reviewed the different definitions of ‘self-perceived pornography addiction’ in the literature and its reported impact. A recent review of the state of evidence for online pornography addiction (de Alarcón et al., 2019) briefly touched on the most widely used assessment tools for problematic pornography use.

However, to date, there has been no review evaluating psychometric instruments for problematic pornography use in terms of their diagnostic features. A major aim of the present review is therefore to compare different psychometric instruments for problematic pornography use on their ability to assess common components of addiction. The addiction model is used as a framework for this evaluation because addiction symptoms share significant commonalities with symptoms of related theoretical models, for instance accounting for impulsivity in impulse control disorder models and compulsivity in compulsive behavior models (Cuzen & Stein, 2014; Kingston & Firestone, 2008). Although having etiological dissimilarities with addiction, the symptoms proposed in diagnostic criteria

for HD and CSBD can be interpreted using an addiction framework. Some conceptualizations of addiction may also include tolerance and withdrawal (Griffiths, 2005), symptoms which are unique to addiction but not present in impulsivity or compulsivity models. Comparing psychometric instruments on their capacity to assess common components of addiction has been conducted for other problematic behaviors such as pathological gaming (King et al., 2013) but has yet to be applied to problematic pornography use. The aims of this systematic review are therefore to: (i) identify psychometric tools that have been developed to assess problematic pornography use; (ii) summarize key characteristics, psychometric properties, and strengths and limitations of instruments for problematic pornography use; (iii) compare the instruments' theoretical conceptualizations of problematic pornography use; (iv) evaluate each instrument on their ability to assess various core components of addiction.

2.2 Method

Papers were identified via electronic database searches of Scopus, Web of Science, PubMed, PsycArticles, PsycInfo and PsycTests. In order to identify literature related to psychometric tools assessing problematic pornography use, the following search terms were used: (problem* OR addict* OR compulsiv* OR dependen*) AND pornography AND (assessment OR scale OR instrument OR measurement). The search terms yielded 5,873 results in total.

Studies were first screened for relevance by reviewing titles and abstracts. Full-text papers were then assessed for eligibility based on the following inclusion criteria: (i) published in English; (ii) published in a peer-reviewed journal; (iii) describes the development, adaptation, or initial use of an original self-report psychometric tool that assesses at least one aspect of problematic pornography use on at least one subscale of the instrument. Papers were excluded if (i) the psychometric tool described was not a self-report instrument, and (ii) if the purpose of the psychometric tool described was not to specifically

assess aspects of pornography use even if the instrument could be used for such a purpose. For example, there are scales that have been developed to assess HD that could be directly applicable to problematic pornography use – the Hypersexual Behavior Inventory (HBI, Reid, Garos, et al., 2011), the Hypersexual Behavior Consequences Scale (HBCS; Reid, Garos, et al., 2012), and the Hypersexual Disorder Screening Inventory (HDSI; Parsons et al., 2013) were excluded on the basis that they assess HD more broadly (despite the authors explicitly stating that the instruments could be used to assess problematic pornography use). While problematic pornography use has been argued to be a subset of HD (Kafka, 2010), a review of HD instruments falls outside the scope of the present study. However, psychometric tools assessing ‘cybersex’ or ‘internet sex’ were included if some items on the instrument could be directly applied to online pornography use. Although such instruments were not designed to target pornography use specifically, many of these tests refer to ‘cybersex’ or ‘online sexual activities’ that could be reasonably argued to be a proxy for online pornography use. Reference lists of included studies were also searched to identify further relevant papers. Figure 2.1 depicts the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram summarizing the systematic search process.

2.2.1 Instrument evaluation

Instrument characteristics and psychometric properties

For each instrument, information pertaining to general instrument characteristics (i.e., item content, item sensitivity, factor structure, and original validation sample), theoretical conceptualizations of problematic pornography use, and psychometric properties (i.e., reliability and validity) was extracted. Reliability was evaluated in terms of internal consistency and test-retest reliability of the instruments and their subscales. Rules of thumb for evaluating internal consistency provided by Cicchetti (1994) were used, whereby below

.70 is below an acceptable threshold, between .70 and .79 is 'fair', between .80 and .89 is 'good', and .90 and above is 'excellent'. Rules of thumb for evaluating test-retest reliability provided by Hunsley and Mash (2008) were used, whereby test-retest correlations of at least .70, if over a period of several days to several weeks is 'adequate', if over a period of several months is 'good', and if over a period of a year or longer is 'excellent'. Validity was evaluated in terms of convergent and discriminant validity, criterion-related validity (i.e., concurrent or predictive validity), and whether the factor structure of the test was derived from factor analytic techniques. Criterion-related validity was operationally defined in the present review as the scores on the instrument having a correlation with behavioral indicators of pornography use (i.e., pornography consumption in terms of frequency or duration), or to an established existing measure of problematic pornography use in the field.

Components of addiction

Based on similar methodology used in King et al. (2013), the psychometric instruments were compared on their ability to assess different components of addiction. A total of 17 components of addiction were included in the comparison. Griffiths' (2005) six core components of addiction – salience, mood modification, withdrawal, tolerance, relapse, and conflict – were also included. *Salience* refers to an activity becoming the most important thing in the person's life, dominating their thinking and behavior. *Mood modification* refers to the use of the behavior to produce shifts in a person's mood state or to 'self-medicate' negative feelings. *Withdrawal* refers to the unpleasant emotional states that are experienced when the behavior is suddenly stopped. *Tolerance* refers to the person needing to increase frequency and/or amount of time spent on the behavior in order to achieve previous similar effects. With problematic sexual behaviors, this may also involve increased risk-taking or increased variety of stimuli or behaviors to achieve the same effect. *Relapse* refers to the person reverting to earlier patterns of behavior after periods of abstinence or control. Conflict

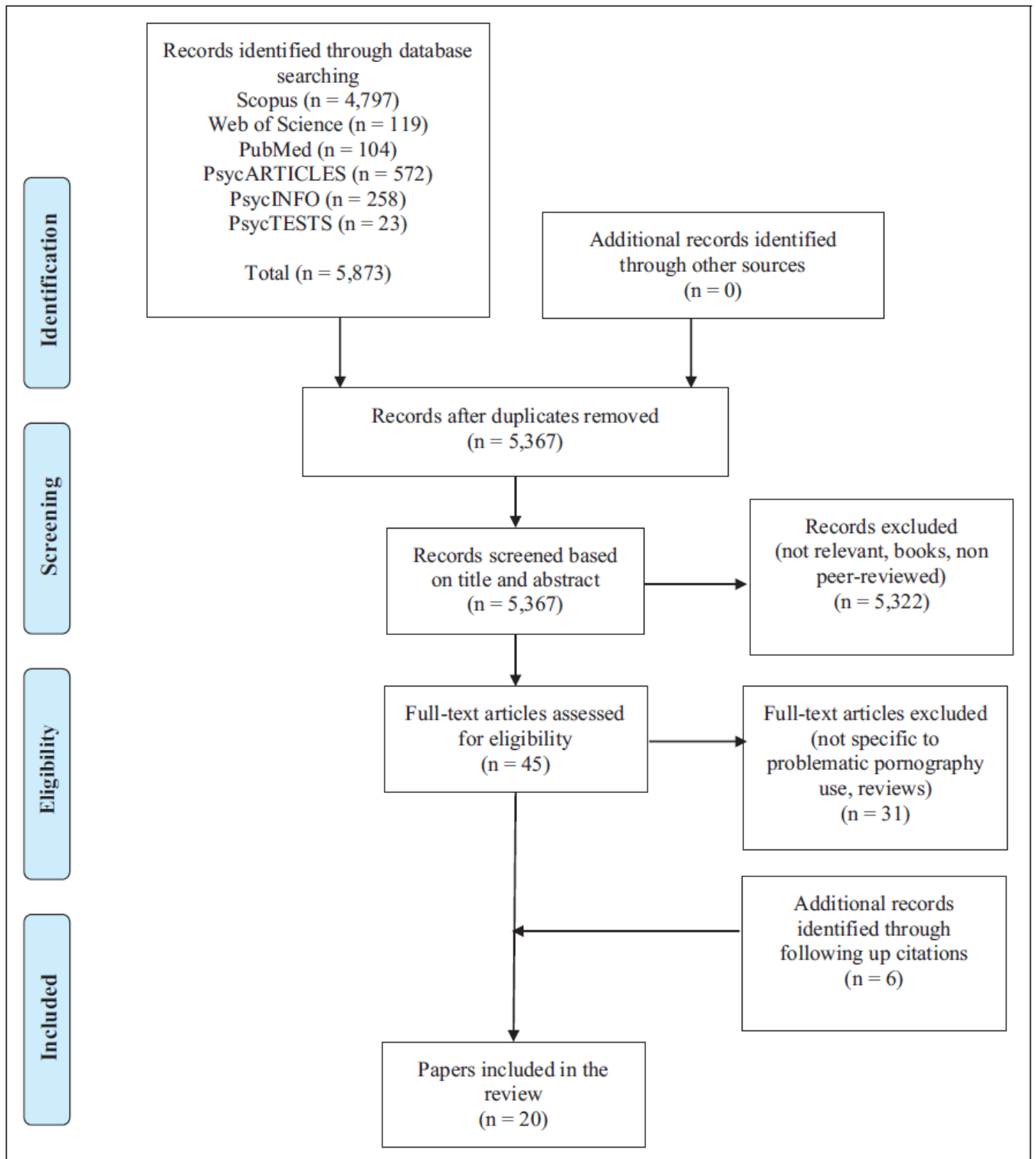


Figure 2.1. PRISMA flow diagram depicting the systematic search process for identifying instruments assessing problematic pornography use

refers to harmful consequences arising from the addictive behavior. The *conflict* component in the present review was further broken down across nine domains. First, *interpersonal conflict* refers to problems arising in interpersonal relationships, including a disruption of the person's social functioning (e.g., isolating, getting into arguments with significant others, etc.). Second, *intrapsychic conflict* refers to a subjective struggle experienced within the individual as a result of the behavior, which includes any psychological distress experienced. Third, *educational/occupational conflict* refers to problems in academic and/or job functioning. Fourth, *financial conflict* refers to financial problems experienced as a result of the addiction – for example, accumulating debt in order to continue engaging in the behavior. Fifth, *sleep conflict* refers to the person losing sleep to engage in the behavior. Sixth, *general life conflict* refers to any negative consequences experienced that affects the person's life more generally. Seventh, *household/hobby conflict* refers to the behavior interfering with household duties or leisure activities. Eighth, *negative attitude conflict* refers to any negative attitudes that are experienced as a result of engagement in the behavior. Finally, ninth, *sex life conflict* refers to the engagement in the activity having a detrimental effect on the person's sex life. Other core components of addiction not explicitly covered by Griffiths' model were also included and comprised impaired control, craving, use despite harm, and deception (American Psychiatric Association [APA], 2013; Maddux & Desmond, 2000; Shaffer, 1999). *Impaired control* refers to the person having diminished control over the behavior as evidenced by engaging in the behavior even when they do not want to, or engaging in the behavior more frequently or for a longer duration than intended. *Craving* refers to the subjective experience of intense desire to engage in the behavior. *Use despite harm* refers to continued engagement in the behavior despite experiencing negative consequences. *Deception* refers to hiding, being secretive, or lying about the behavior. This was included

because it is listed as a diagnostic criterion for gambling disorder in the DSM-5 (APA, 2013), and therefore could be an indicator of addiction for other problematic behaviors as well.

Individual items on each instrument were reviewed to determine which components of addiction, if any, they assessed. Where items appeared to be assessing more than one addiction component simultaneously, it was coded as such. Both authors of the present review coded the items independently and reached a consensus on any discrepancies in coding. For purpose of comparison, the proposed diagnostic criteria for HD and CSBD were also included in the evaluation. HD criteria and CSBD criteria correspond to ten and nine addiction components respectively. All nine addiction components captured by CSBD criteria (salience, impaired control, relapse, craving, interpersonal conflict, intrapsychic conflict, educational/occupational conflict, general life conflict, and use despite harm) were also assessed by HD criteria – the only difference being that HD criteria assess mood modification, while CSBD criteria do not.

2.3 Results

A total of 20 papers describing 22 psychometric instruments were found and included in the present review. Table 2.1 summarizes characteristics of each psychometric tool.

2.3.1 Theoretical models and conceptualizations of problematic pornography use

Although all the instruments assess some aspect of problematic pornography use, there are notable variations in their conceptualizations of problematic pornography use and intended purpose of use. These are outlined below.

Addiction

Out of the 22 instruments, 13 used an addiction framework in conceptualizing problematic pornography use. Of these, four were based on two existing measures of internet addiction that were adapted to online sexual behavior including pornography use (i.e., Compulsive Internet Use Scale adapted to Sexually Explicit Media [CIUS-Adapted] and

Compulsive Use of Sexually Explicit Internet Material were based on the Compulsive Internet Use Scale [CIUS; Meerkerk et al., 2009], and the Internet Addiction Test-Sex [IAT-Sex] and Short Internet Addiction Test adapted to Online Sexual Activities [s-IAT-Sex] were based on the Internet Addiction Test [IAT; Young, 1998]), and one instrument (i.e., Internet Sex Screening Test [ISST]) assesses internet sex addiction more generally but includes items concerning online sexual behavior that could be applied to problematic pornography use. The most common theoretical model of addiction used was Griffiths' (2005) components model of addiction, with three scales (CIUS-Adapted, Compulsive Use of Sexually Explicit Internet Material, and the Problematic Pornography Consumption Scale [PPCS]) incorporating it as part of their theoretical framework.

Compulsive behavior

Two instruments (i.e., Compulsive Pornography Consumption [CPC] Scale and Cyberporn Compulsivity Scale [CCS]) conceptualized problematic pornography use within models of compulsive behavior. The CPC is based on DSM-5 definitions of obsessive-compulsive disorders, while the CCS is based on Kalichman and Rompa's (1995) Sexual Compulsivity Scale which was itself based on conceptualizations of problematic sexual behavior as compulsions.

Hypersexual behavior

One instrument, the Pornography Consumption Inventory (PCI), was designed to assess motivations for pornography use among hypersexual men. The instrument was designed taking into consideration empirical and clinical findings on the proposed HD diagnosis (Kafka, 2010). Therefore, problematic pornography use is conceptualized as a hypersexual behavior.

Table 2.1
Characteristics of psychometric instruments for problematic pornography use

Instrument	Conceptualization of problematic pornography use	Factors	Items + item sensitivity	Sample	Validity			Reliability	
					Factor evidence	Convergent/discriminant	Criterion-related (concurrent/ predictive)	Internal consistency	Test-retest
Compulsive Internet Use Scale adapted to Sexually Explicit Media (Downing et al., 2014)	Addiction	Single factor	13 items, 5-point	Men who have sex with men (N=265)	Principal components analysis, exploratory and confirmatory factor analyses	Convergent: -Positively correlated with sexual sensation seeking, frequency of sexual fantasies similar to sexual activities viewed online, boredom, sexual frustration	- Positively correlated with time spent viewing Internet sexually explicit media	Full scale ($\alpha=.92$)	NR
Compulsive Pornography Consumption Scale (Noor et al., 2014)	Compulsive behavior	2: Preoccupation; Compulsivity	5 items, 7-point	Study 1 (test-retest sample): Men who have sex with men (N=240) Study 2: Men who have sex with men (N=1165)	Exploratory and confirmatory factor analyses	Convergent: -Positively correlated with negative affect, compulsive sexual behavior, internalized homonegativity - Negatively correlated with positive affect, social desirability and sexual self-esteem - Participants with heavy alcohol use and multiple sex partners had higher scores	- Participants who reported viewing more than 7 hours of sexually explicit media on average a week had higher scores compared to participants who reported viewing less than 1 hour of sexually explicit media	Full scale ($\alpha=.85$) Preoccupation ($\alpha=.74$) Compulsivity ($\alpha=.78-.79$)	Multigroup models used for 7-day test-retest sample
Compulsive Use of Sexually Explicit Internet Material (Doornwaard et al., 2016)	Addiction	Single factor	6 items, 6-point	Male adolescents (N=331)	NR	Convergent: -Positively correlated with depression, excessive sexual interest, affective psychopathy -Negatively correlated with global self-esteem	NR	Full scale ($\alpha=.83-.85$)	NR
Cyberporn Compulsivity Scale (Abell et al., 2006)	Compulsive behavior	Single factor	4 items, 4-point	Male college students (N=125)	NR	NR	NR	Full scale ($\alpha=.80$)	NR
Cyber Pornography Addiction Test (Cacioppo et al., 2018)	Addiction	Single factor	11 items, 5-point	Study 1: Male and female adults (N=372) Study 2: Males and females including adults, high school students and college students (N=201)	Exploratory and confirmatory factor analyses	Convergent: -Correlated with Twenty-Item Toronto Alexithymia Scale (TAS-20), factors of Family Adaptability and Cohesion Evaluation Scale (FACES-IV)	-Correlated with the Cyber Pornography Use Inventory (CPUI)	Full scale ($\alpha=.96$)	NR

Cyber Pornography Use Inventory (Grubbs et al., 2010)	Addiction	3: Addictive patterns; Guilt regarding online pornography use; Online sexual behavior-social	31 items, 5-point/7-point	Male and female college students (N=145)	Principal components analysis	NR	NR	Full scale (NR) Addictive patterns ($\alpha=.89$) Guilt regarding online pornography use ($\alpha=.83$) Online sexual behavior-social ($\alpha=.84$).	NR
Cyber-Pornography Use Inventory-9 (Grubbs et al., 2015)	Addiction	3: Perceived compulsivity; Access efforts; Emotional distress	9 items, 7-point	Study 1: Male and female college students (N=269) Study 2: Male and female adult sample (N=214) Study 3: Clinical sample of male and female students (N=152)	Exploratory and confirmatory factor analyses	Convergent: -Full scale and all subscales correlated with Kalichman Sexual Compulsivity Scale - Perceived Compulsivity and Emotional Distress related to neuroticism - Full scale and all subscales negatively correlated with self-control - Emotional Distress subscale correlated with depression - Full scale and all subscales except Access Efforts related to perceived stress - Full scale and Emotional Distress subscale related to state anxiety - Full scale and subscales related to measures of psychological distress	-Full scale, Access Efforts and Perceived Compulsivity subscales correlated with amount of time spent viewing pornography	Full scale ($\alpha=.75-.89$) Perceived compulsivity ($\alpha=.74-.83$) Access efforts ($\alpha=.75-.81$) Emotional distress ($\alpha=.81-.89$)	NR
Deficient Self-Regulation Scale (Sirianni & Vishwanath, 2016)	Self-regulation deficits from social cognitive perspective	Single factor	7 items, 5-point	Male and female college students (N=340)	Structural equation modeling	Convergent: -Average variance extracted exceeds 0.50 -Related to negative consequences -Related to habitual use of pornography Discriminant: Diagonal values are significantly higher than the off-diagonal values in the corresponding rows and columns	NR	Full scale ($\alpha=.92$)	NR
Habit Strength Scale (Sirianni & Vishwanath, 2016)	Self-regulation deficits from social cognitive perspective	Single factor	5 items, 5-point	Male and female college students (N=340)	Structural equation modeling	Convergent: -Average variance extracted exceeds 0.50 -Related to deficient self-regulation Discriminant: -Diagonal values are significantly higher than the off-diagonal values in the corresponding rows and columns	-Related to time spent viewing online pornography	Full scale ($\alpha=.88$)	NR
Internet Addiction Test – Sex (Brand et al., 2011)	Addiction	6: Saliency; Excessive use; Neglect work; Anticipation; Lack of control; Neglect social life	20 items, 5-point	Heterosexual men (N=89)	NR	Convergent: -Positively correlated with obsessive-compulsiveness, interpersonal sensitivity, depression, anxiety, phobic anxiety, paranoid ideation, psychoticism, and global severity index on SCL-90-R	NR	Full scale ($\alpha=.84$)	NR

-Predicted by sexual arousal rating, usage of internet sex applications
 -Highly correlated with Internet Addiction Test

Internet Sex Screening Test (Delmonico & Miller, 2003)	Addiction	5: Online sexual compulsivity; Online sexual behavior – social; Online sexual behavior – isolated; Online sexual spending; Interest in online sexual behavior	25 items, Yes/no	Men and women (N= 6088)	NR	NR	-All subscales significantly higher for sexually compulsive participants (as measured by Sexual Addiction Screening Test-Abbreviated)	Full scale (NR) Online sexual compulsivity ($\alpha=.86$) Online sexual behavior – social ($\alpha=.78$) Online sexual behavior – isolated ($\alpha=.73$) Online sexual spending ($\alpha=.61$) Interest in online sexual behavior ($\alpha=.51$)	NR
Negative consequences scale (Sirianni & Vishwanath, 2016)	Self-regulation deficits from social cognitive perspective	Single factor	7 items, 5-point	Male and female college students (N=340)	Structural equation modeling	Convergent: -Average variance extracted exceeds 0.50 -Related to deficient self-regulation Discriminant: -Diagonal values are significantly higher than the off-diagonal values in the corresponding rows and columns	NR	Full scale ($\alpha=.94$)	NR
Passion Scale – Pornography (Rosenberg & Kraus, 2014)	Addiction	2: Harmonious passion; Obsessive passion	14 items, 7-point	Male college students (N=221)	NR	Convergent: -Both subscales moderately correlated with sexual compulsivity, craving for pornography, compulsive internet use Discriminant: -No relationship with non-sexual sensation seeking or social desirability	-Most frequent users of pornography reported significantly higher mean scores on both subscales compared to those who used less pornography each week	Full scale (NR) Harmonious passion subscale ($\alpha=.78$) Obsessive passion subscale ($\alpha=.79$)	Harmonious passion ($r=.76$) Obsessive passion ($r=.86$) (one-week interval)
Pornography Consumption Effects Scale (Hald & Malamuth, 2008)	Atheoretical	9: Positive effects: Sex life; Attitudes towards sex; Sexual knowledge; Perception and attitudes towards opposite gender; Life in general Negative effects: sex life; attitudes towards sex; perception of and attitudes towards	47 items, 7-point	Male and female young adults (N=688)	Principal axis factor analysis	Convergent: -Subscales correlated with subscales from the same dimension Discriminant: -Negative effect dimension not correlated with positive effect dimension	- Negative effect dimension correlated with pornography consumption, although positive effect dimension had much higher correlation with pornography consumption	Positive effect dimension ($\alpha=.91$) SL ($\alpha=.91$) SK ($\alpha=.90$) ATS ($\alpha=.90$) DL ($\alpha=.87$) PATOG ($\alpha=.73$) Negative effect dimension ($\alpha=.82$) DL ($\alpha=.83$) ATS ($\alpha=.81$) SL ($\alpha=.79$) PATOG ($\alpha=.72$)	NR

			opposite gender; life in general						
Pornography Consumption Effects Scale – Revised (Hald et al., 2012)	Atheoretical	Single factor	7 items, 5-point	Study 1 (test-retest sample): Men who have sex with men (N=361) Study 2: Men who have sex with men (N=1,333)	Exploratory and confirmatory factor analyses	Convergent: -Positively correlated with positive affect and sexual self-esteem -Negatively correlated with internalized homonegativity Discriminant: -Not related to negative affect, social desirability, compulsive sexual behavior	NR	Full scale ($\alpha=.80$)	Multigroup models used for 7-day test-retest sample
Pornography Consumption Effects Scale Short Form (Miller et al., 2019)	Atheoretical	9: Positive effects: Sex life; Attitudes towards sex; Sexual knowledge; Perception and attitudes towards opposite gender; Life in general Negative effects: sex life; attitudes towards sex; perception of and attitudes towards opposite gender; life in general	14 items, 7-point	Heterosexual men (N=312)	Confirmatory factor analyses	Convergent: -Positively correlated with long-form PCES Discriminant: -No relationship with social desirability	NR	Positive effect dimension ($\alpha=.91$) Negative effect dimension ($\alpha=.91$) Spearman-Brown coefficient for subscales ranged from .79 to 86	NR
Pornography Consumption Inventory Disorder (HD) (Reid, Li, et al., 2011)	Hypersexual	4: Sexual curiosity; Emotional avoidance; Excitement seeking; Sexual pleasure	15 items, 5-point	Study 1: Men who self-identify as addicted to pornography (N=105) Study 2: Men seeking treatment for hypersexual behavior (N =107)	Exploratory and confirmatory factor analyses	Convergent: - Emotional avoidance subscale positively correlated with excitement seeking and sexual pleasure subscales - Emotional avoidance positively related to loneliness, anxiety, depression, impulsiveness, vulnerability, and fantasy, and negatively related to positive emotions of NEO-PI-R -Sexual curiosity subscale positively related to impulsiveness and fantasy subscales of NEO-PI-R Discriminant: - Emotional avoidance subscale not related to sexual curiosity subscale - Emotional avoidance subscale negatively related to Positive Emotions subscale of NEO-PI-R - Sexual curiosity subscale unrelated to loneliness, anxiety, depression, vulnerability, positive emotions and self-discipline subscales of NEO-PI-R	-Participants who report spending more than 1 hr viewing pornography score higher on Emotional Avoidance than participants who report spending less than 1 hr viewing pornography -Frequency of pornography use correlated with emotional avoidance and sexual pleasure - Full scale and subscales related to Hypersexual Behavior Inventory	Full scale ($\alpha=.83-.93$) Emotional avoidance ($\alpha=.85-.95$) Sexual curiosity ($\alpha=.87$) Excitement seeking ($\alpha=.73 -.85$) Sexual pleasure ($\alpha=.71 -.90$)	Full scale ($r=.86$) (2-week interval)

- Sexual pleasure subscale unrelated to loneliness, and positive emotions subscale of NEO-PI-R

Pornography Craving Questionnaire (Kraus & Rosenberg, 2014)	Addiction	Single factor	12 items, 7-point	Study 1 : Male college students(N=109) Study 2: Male college students (N=221) Study 3: Male college students (N=44)	Principal components analysis	Convergent: -Positive correlated with passionate attachment for pornography - Positively correlated with sexual compulsivity - Positively correlated with compulsive internet use scores Discriminant: - Not correlated with non-sexual sensation-seeking	- Related to frequency of weekly pornography use - Predicted frequency of pornography use in the following week	Full scale ($\alpha=.91$)	Full scale ($r=.82$) (one-week interval)
Pornography Use Scale (Szymanski & Stewart-Richardson, 2014)	Addiction	2: Frequency of use; Problematic pornography use	14 items, 5/6-point	Male heterosexuals including college students (N=373)	Exploratory and confirmatory factor analyses	Convergent: -Problematic use related to greater gender role conflict, avoidant attachment styles, anxious attachment styles, poorer relationship quality, and less sexual satisfaction -Problematic use subscale related to ISST online sexual compulsivity subscale Discriminant: -Negatively related to relationship length, not related to social desirability	-Problematic use subscale related to frequency of use subscale	Full scale (NR) Frequency of use ($\alpha=.88$) Problematic use ($\alpha=.91$)	NR
Problematic Pornography Consumption Scale (Bóthe et al., 2018)	Addiction	6: Salience; Mood modification; Conflict; Tolerance; Withdrawal; Relapse	18 items, 7-point	Men and women (N=772)	Confirmatory factor analysis	Convergent: -Correlated with frequency of masturbation, and negatively correlated with satisfaction with sexual life	-Correlated with time spent viewing pornography per occasion, frequency of reading online pornographic stories, online pornography picture viewing, online pornography video viewing, frequency of pornography consumption during masturbation	Full scale ($\alpha=.93$) Salience ($\alpha=.77$) Mood modification ($\alpha=.84$) Conflict ($\alpha=.71$) Tolerance ($\alpha=.78$) Withdrawal ($\alpha=.86$) Relapse ($\alpha=.86$)	NR
Problematic Pornography Use Scale (Kor et al., 2014)	Addiction	4: Distress and functional problems; Excessive use; Control difficulties; Use for escape/avoid negative emotions	12 items, 6-point	Study 1: Males and females including college students (N=333) Study 2: Males and females including college students (N=300) Study 3: Males and females including college students	Principal components analysis, confirmatory factor analysis	Convergent: - Positively correlated with CPUI - Positively correlated to PCI four motivations (sexual curiosity, emotional avoidance, sensation seeking, sexual pleasure) for pornography use - Related to poorer self-esteem, sexual behavior consequences, attachment insecurities, hypersexual disorder, internet addiction, and traumatic events Discriminant: -Lower correlations with internet addiction and gambling addiction compared to hypersexual disorder	-Correlated with frequency of pornography use	Study 2: Full scale ($\alpha=.92$) Distress and functional problems ($\alpha=.91$) Excessive use ($\alpha=.86$) Control difficulties ($\alpha=.75$) Use for escape ($\alpha=.93$) Study 3: Full scale ($\alpha=.93$) Subscales ($\alpha=.79 - .92$)	NR

(N=1720)

Short Internet Addiction Test adapted to Online Sexual Activities (Wéry et al., 2016)	Addiction	2: Loss of control/time management; Craving/social problems	12 items, 5- point	Men (N=401)	Confirmatory factor analysis	- Positively correlated with PATHOS global scores	-Positively correlated with time spent online for online sexual activities	Full scale ($\alpha=.88$) Loss of control/time management ($\alpha=.87$) Craving/social problems ($\alpha=.76$)	NR
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Note: NR = Not/none reported; SCL-90-R = Symptom Checklist-90-Revised; CPUI = Cyber Pornography Use Inventory; HD = hypersexual disorder; ISST = Internet Sex Screening Test; PCES = Pornography Consumption Effects Scale; NEO-PI-R = NEO Personality Inventory–Revised; PCI = Pornography Consumption Inventory.

Deficient self-regulation

Three instruments (i.e., Habit Strength Scale, Deficient Self-Regulation Scale, and Negative Consequences Scale) – forming part of a hypothesized model investigating different elements of unregulated media usage – were conceptualized based on a social-cognitive theory of dysregulated media use, and clearly differentiate their model from addiction models. These instruments were intended to assess problematic pornography use that exists on a spectrum of dysregulated media usage, from mild dysregulation with the absence of serious negative life consequences, to severe dysregulation that may fall within the realms of addiction. Therefore, the authors suggest that these instruments assess issues with self-regulation rather than addiction.

Negative effects

Three instruments – the Pornography Consumption Effects Scale (PCES), PCES Short-Form (PCES-SF), and PCES-Revised (PCES-R) examine the effects of pornography consumption (both positive and negative), with negative effects being directly applicable to problematic pornography use. These scales are atheoretical and approach pornography consumption from a neutral perspective based on sexuality and pornography research.

2.3.2 Components of addiction

The psychometric instruments were compared on their ability to assess different components of addiction (see Table 2.2). In terms of breadth of coverage, the instruments that were designed as comprehensive measures of addiction are able to assess more components of addiction. Among these tests, the scales that had the widest coverage of addiction components were the Cyber Pornography Use Inventory (CPUI; $n=11$), the s-IAT-Sex ($n=10$), the IAT-Sex ($n=10$), and the ISST ($n=10$). On the other hand, some scales only assess specific components of addiction (e.g., Pornography Consumption Questionnaire [PCQ] for

craving or the PCES, the PCES-R and the PCES-SF for various negative consequences) providing more depth examining a specific component.

The most frequently assessed components of addiction across the instruments were, in descending order: impaired control ($n=16$), salience ($n=14$), mood modification ($n=13$), interpersonal conflict ($n=11$) and general life conflict ($n=11$). Both interpersonal conflict and general life conflict emerged as the most frequently assessed types of conflict, with intrapsychic conflict ($n=7$), sex life conflict ($n=7$) educational/occupational conflict ($n=6$), assessed slightly less frequently. In contrast, conflict with sleep ($n=4$), negative attitudes ($n=3$), household and hobbies ($n=3$), finance ($n=2$) were the most infrequently assessed. Withdrawal ($n=9$) was much more frequently assessed than tolerance ($n=3$). Of the three scales that assessed tolerance, two of the scales (ISST and CPUI) used the same item “I have increased the risks I take online (give out name and phone number, meet people offline, etc.)” that do not refer to pornography use but rather social behavior online with a sexual purpose, and only loosely assesses tolerance. The PPCS was the only instrument that explicitly assessed tolerance. Relapse ($n=7$) was infrequently explicitly assessed compared to impaired control ($n=15$), although whenever relapse was assessed, impaired control was arguably also implicitly assessed. Craving ($n=6$), deception ($n=4$), and use despite harm ($n=2$) were also assessed less frequently.

2.3.3 Psychometric properties

Reliability

Cronbach’s alpha coefficients for all the instruments met a minimum threshold of .70, except for two subscales of the ISST (online sexual spending [.61] and interest in online sexual behavior [.51]). Test-retest reliability coefficients were reported for only three instruments (PCI, PCQ and Passion Scale), all of which demonstrated evidence of adequate temporal stability.

Validity

As part of their development, most instruments demonstrated evidence for convergent and/or discriminant validity except the CCS, CPUI and ISST. Fourteen out of 22 instruments demonstrated evidence of criterion-related validity except the CCS, CPUI, Compulsive Use of Sexually Explicit Internet Material, Deficient Self-Regulation scale, Negative Consequences scale, IAT-Sex, PCES-R, and PCES-SF. Seventeen out of the 22 instruments used factor analytic techniques to evaluate test dimensionality. The structure of the CCS, Compulsive Use of Sexually Explicit Internet Material Scale, the IAT-Sex, ISST, and Passion Scale-Pornography were not supported by factor analysis.

2.3.4 Summary of instruments for problematic pornography use

Each of the 22 instruments included in the present review are summarized in detail below, along with a summary of their most salient characteristics and respective strengths and limitations.

Adaptations of the Compulsive Internet Use Scale (CIUS)

Two instruments are adaptations of the Compulsive Internet Use Scale (CIUS; Meerkerk et al., 2009), a scale that was originally designed to assess the severity of compulsive internet use. The CIUS is based on Griffiths' (1999) six criteria for addiction, along with DSM-IV criteria for substance dependence and pathological gambling, and uses an addiction theoretical framework.

Compulsive Internet Use Scale adapted to Sexually Explicit Media. The Compulsive Internet Use Scale adapted to Sexually Explicit Media (CIUS-Adapted; Downing et al, 2014) is a 13-item scale that assesses “compulsive use of internet sexually explicit material” (Downing et al., p.1127). The scale has a single factor, with sample items such as “How often do you find it difficult to stop accessing these websites when you are online?”, “How often do you neglect your daily obligations (work, school or family life) because you prefer to

access these websites?” and “How often do you access these websites when you are feeling down?”, rated on a 5-point scale, from ‘never’ to ‘very often’. The scale assesses nine addiction components including salience, impaired control, withdrawal, relapse, mood modification, interpersonal conflict, intrapsychic conflict, educational/occupational conflict and sleep conflict. No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The CIUS-adapted was validated on a sample of men who have sex with men.

Reliability. The CIUS-Adapted has excellent internal consistency ($\alpha=.92$), but temporal stability of the instrument was not reported.

Validity. The scale’s single-factor structure was derived from principal components analysis. The scale demonstrated evidence of convergent validity, being positively correlated with sexual sensation seeking (Kalichman & Rompa, 1995), frequency of sexual fantasies similar to sexual fantasies viewed online, boredom, and sexual frustration. The scale has evidence for criterion-related validity, being correlated with time spent viewing online sexually explicit media.

Strengths and limitations. Overall, the CIUS-adapted has robust psychometric properties and a broad coverage of addiction components ($n=9$). However, the scale was validated in a sample of men who have sex with men, and therefore its generalizability beyond this subset of pornography users is unknown. Additionally, the way the items have been rephrased and adapted from the CIUS to focus mainly on accessing and using ‘these websites’ to watch pornography may not account for other ways pornography users may access online pornography without needing to spend time on specific websites (e.g., downloading pornography from peer-to-peer networks).

Table 2.2

Components of addiction assessed by psychometric instruments for problematic pornography use

Instrument	Salience	Impaired control	Withdrawal	Tolerance	Relapse	Mood modification	Craving	Interpersonal conflict	Intrapsychic conflict	Financial conflict	Educational/occupational conflict	Sleep conflict	Household/hobby conflict	General life conflict	Negative attitudes conflict	Sex life conflict	Deception	Use despite harm	
Compulsive Sexual Behavior Disorder ICD-11 criteria*	●	●	○	○	●	○	●	●	●	○	●	○	○	●	○	○	○	○	●
Hypersexual Disorder DSM-5 proposed criteria*	●	●	○	○	●	●	●	●	●	○	●	○	○	●	○	○	○	○	●
Compulsive Internet Use Scale adapted to Sexually Explicit Media	●	●	●	○	●	●	○	●	●	○	●	●	○	○	○	○	○	○	○
Compulsive Pornography Consumption Scale	●	●	○	○	○	●	○	○	●	○	○	○	○	○	○	○	●	○	○
Compulsive Use of Sexually Explicit Internet Material	●	●	●	○	○	●	○	●	○	○	○	●	○	○	○	○	○	○	○
Cyberporn Compulsivity Scale	○	○	○	○	○	○	●	●	○	○	○	○	○	●	○	○	○	○	○
Cyber Pornography Addiction Test	●	●	○	○	●	●	○	●	○	○	○	○	○	●	○	●	○	○	●
Cyber Pornography Use Inventory	●	●	●	●	○	○	●	●	●	○	●	●	○	●	○	○	●	○	○
Cyber-Pornography Use Inventory-9	●	●	○	○	○	○	●	●	●	○	○	○	○	●	○	○	○	○	○
Deficient Self-Regulation Scale	●	●	●	○	●	●	●	○	●	○	○	○	○	○	○	○	○	○	○
Habit Strength Scale	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Internet Addiction Test – Sex	●	●	●	○	●	●	○	●	○	○	●	●	●	○	○	○	●	○	○

Internet Sex Screening Test	●	●	●	●	○	●	○	○	●	●	○	●	○	●	○	○	●	○	
Negative Consequences Scale	○	○	○	○	○	○	○	●	○	●	●	○	○	●	○	○	○	○	
Passion Scale – Pornography	●	●	○	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	
Pornography Consumption Effects Scale	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○
Pornography Consumption Effects Scale Revised	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	○	○
Pornography Consumption Effects Scale Short-Form	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	○	○
Pornography Consumption Inventory	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○
Pornography Craving Questionnaire	●	●	○	○	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○
Pornography Use Scale	○	●	○	○	○	○	○	●	●	○	○	○	○	○	●	○	○	○	○
Problematic Pornography Consumption Scale	●	●	●	●	●	●	○	○	○	○	○	○	○	●	●	○	●	○	○
Problematic Pornography Use Scale	●	●	○	○	●	●	○	●	○	○	●	○	○	●	○	●	○	○	●
Short Internet Addiction Test adapted to Online Sexual Activities	●	●	●	○	●	●	○	●	○	○	●	●	●	○	○	○	●	○	

Note: ● assessed; ○ not assessed. *Diagnostic criteria included for purpose of comparison

Compulsive Use of Sexually Explicit Internet Material Scale. The Compulsive Use of Sexually Explicit Internet Material Scale (Doornwaard et al., 2016) is a six-item scale that assesses “symptoms of compulsive searching for/viewing of pornography on the internet” (p.76). The scale has a single factor and sample items include: “How often do you find it difficult to stop searching for/viewing porn on the internet?” and “How often do you look forward to the next time you can search for/view porn on the internet?” The scale assesses six components of addiction (i.e., salience, impaired control, withdrawal, mood modification, interpersonal conflict and sleep conflict). No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The scale was adapted for use with a sample of male adolescents.

Reliability. The scale has good internal consistency ($\alpha=.83-.85$), but temporal stability of the scale was not reported.

Validity. Factor analysis was not used to validate the factor structure of the scale. Positive correlations between the scale and depression (Kandel & Davies, 1982), excessive sexual interest (Snell & Papini, 1989), affective psychopathy as assessed by the callous-unemotional dimension of the Youth Psychopathic Traits Inventory-Short Version (van Baardewijk et al., 2010), and negative correlations between the scale and global self-esteem, as assessed by an adapted version of the Global Self-Worth subscale of the Self-Perception Profile for Adolescents (Wichstrøm, 1995), demonstrated evidence of convergent validity. Evidence of criterion-related validity was not reported.

Strengths and limitations. The scale is brief in its selection of items because each item assesses a different component of addiction. As the scale was adapted for use in a sample of Dutch male adolescents, its generalizability to other samples is unknown. Because validity of the instrument was only implicitly assessed, further psychometric validation would be necessary before being able to draw any conclusions about its robustness and utility.

Compulsive Pornography Consumption (CPC) scale

The Compulsive Pornography Consumption (CPC; Noor et al., 2014) scale is a five-item scale that assesses “compulsive pornography consumption” (p.245). The items on the CPC are based on definitions of obsessive-compulsive disorder in the DSM-5, and have two factors: preoccupation and compulsivity. Sample items include: “I thought of pornography when I was trying to focus on other things” (preoccupation component) and “I watched pornography even though I did not want to” (compulsivity component), rated on a 7-point scale, from ‘never’ to ‘very frequently’. The CPC assesses five addiction components including salience, impaired control, mood modification, intrapsychic conflict, and sex life conflict. No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The CPC was validated on a sample of men who have sex with men.

Reliability. The CPC full scale has good internal consistency ($\alpha=.85$), while both subscales have fair internal consistency: preoccupation ($\alpha=.74$) and compulsivity ($\alpha=.78-.79$). Although test-retest reliability coefficients were not reported, multigroup models were used for the test-retest sample to strengthen conclusions about the replicability of the measure.

Validity. The factor structure of the CPC was derived from exploratory and confirmatory factor analyses. The CPC demonstrated evidence of convergent validity, being positively correlated with negative affect as assessed by a short form of the Positive and Negative Affect Schedule (PANAS; Thompson, 2007), the Compulsive Sexual Behavior Inventory (CSBI; Coleman et al., 2001) and internalized homonegativity (Smolenski et al., 2010), while being negatively correlated with positive affect as assessed by the short form of the PANAS (Thompson), social desirability (Strahan & Gerbasi, 1972), and sexual self-esteem as assessed by the sexual confidence and sexual satisfaction subscales of the Multidimensional Sexuality Questionnaire (Snell et al., 1993). Also, participants with heavy

alcohol use and multiple sex partners had higher CPC scores, providing further evidence of convergent validity. Evidence of criterion-related validity of the CPC was demonstrated by the finding that participants who reported viewing on average more than 7 hours of sexually explicit material a week had higher CPC scores compared to participants who reported less than one hour of viewing sexually explicit material a week.

Strengths and limitations. The CPC is brief and easy to administer and has robust psychometric properties. Nonetheless, a disadvantage of being brief is that it has a narrower coverage of addiction components (n=5). One item on the CPC, “I could only have an orgasm when watching pornography” stands out as being ambiguous, as it does not primarily assess ‘compulsivity’ though it falls under the compulsivity subscale. Rather, it appears to assess negative effects on sex life brought about through dependence on pornography for sexual arousal. Also, the CPC was validated in a sample of men who have sex with men and needs to be validated in more diverse samples.

Cyberporn Compulsivity Scale (CCS)

The Cyberporn Compulsivity Scale (CCS; Abell et al., 2006) is a 4-item scale that assesses “sexual behaviors relating to internet-based pornography” (p.167). The items on the CCS are based on the Sexual Compulsivity Scale (Kalichman & Rompa, 1995), which defines sexual compulsivity as an “insistent, repetitive, intrusive and unwanted urge to perform specific acts often in ritualized or routinized fashions” (p.587). The CCS has a single factor, with sample items including “my sexual appetite for cyberporn has gotten in the way of my relationships” and “because of cyberporn, my sexual thoughts and behaviors are causing problems in my life”, rated on a 4-point scale, from ‘not at all like me’ to ‘very much like me’. The CCS assesses three addiction components, namely craving, interpersonal conflict, and general life conflict. No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The CCS was adapted for use with a sample of male college students.

Reliability. Internal consistency of the full scale was good ($\alpha=.0.80$), but temporal stability of the scale was not reported.

Validity. Validation of the instrument was not described in the study.

Strengths and limitations. The CCS is brief and easy to administer but has a narrow coverage of addiction components ($n=3$). Also, the CCS needs more comprehensive psychometric validation before any conclusions can be drawn about its psychometric robustness and utility.

Cyber Pornography Addiction Test (CYPAT)

The Cyber Pornography Addiction Test (CYPAT; Caccioppo et al., 2018) is an 11-item scale that was designed to screen for internet pornography addiction. The items on the CYPAT were based on various models of addiction. The CYPAT has a single factor and sample items include “sometimes, I feel unable to control the watching of porn sites” and “porn sites make me feel less alone”, rated on a 5-point scale, from ‘never’ to ‘always’. The CYPAT assesses eight addiction components, namely salience, impaired control, relapse, mood modification, interpersonal conflict, general life conflict, sex life conflict, and use despite harm. No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The CYPAT was validated on samples of men and women.

Reliability. The CYPAT has excellent internal consistency ($\alpha=.96$). However, temporal stability of the instrument was not reported.

Validity. The single-factor structure of the CYPAT was derived from exploratory and confirmatory factor analyses. The scale demonstrated evidence of convergent validity, being positively correlated with Twenty-Item Toronto Alexithymia Scale (TAS-20; Bagby, Taylor et al., 1994 ; Bagby, Parker et al., 1994), and several factors of the Family Adaptability and

Cohesion Evaluation Scale (FACES-IV; Olson, 2011). Also, the CYPAT has a strong correlation with the CPUI (Grubbs et al., 2010), providing evidence for criterion-related validity.

Strengths and limitations. The CYPAT is a brief scale with robust psychometric properties. A major strength of the CYPAT is that it has a wide breadth of coverage of addiction components (n=8). It is one of only two scales in this review that assesses the ‘use despite harm’ component, which is a component that is assessed by both HD and CSBD criteria. The CYPAT needs further validation in clinical samples before the extent of its utility can be known.

The Cyber Pornography Use Inventory (CPUI) and Cyber Pornography Use Inventory-9 (CPUI-9)

The Cyber Pornography Use Inventory (CPUI; Grubbs et al., 2010) and the Cyber Pornography Use Inventory-9 (CPUI-9; Grubbs et al., 2015) are variations of the same instrument. The CPUI-9 is intended to be a refined version of the original CPUI. The CPUI was modelled on the Internet Sex Screening Test (ISST; Delmonico & Miller, 2003), which was itself based on Schneider’s (1994) model of addictive behavior, and therefore the CPUI-9 is built on a similar theoretical framework.

CPUI. The CPUI is a 31-item scale that was designed to assess online pornography addiction. The CPUI has three factors: addictive patterns, guilt regarding online pornography use, and online sexual behavior-social. Sample items include: “at times I try to arrange my schedule so that I will be able to be alone in my room to view pornography” (addictive patterns factor), “I feel ashamed after viewing pornography online” (guilt regarding online pornography use), and “I have increased the risks I take online (give out name and phone number, meet people offline, etc.) (online sexual behavior-social factor), rated on a 5-point scale, from ‘never’ to ‘always’, or a 7-point scale, ‘strongly disagree’ to ‘strongly agree’.

The CPUI assesses eleven addiction components, namely salience, impaired control, withdrawal, tolerance, craving, interpersonal conflict, intrapsychic conflict, educational/occupational conflict, sleep conflict, general life conflict and deception. No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The CPUI was validated on students at a Christian university.

Reliability. The three subscales of the CPUI have good internal consistency – addictive patterns ($\alpha=.89$), guilt regarding online pornography use ($\alpha=.83$) and online sexual behavior-social ($\alpha=.84$). Internal consistency for the full scale, and temporal stability for the scale was not reported.

Validity. The factor structure of the CPUI was derived from principal components analysis. Convergent/discriminant validity or criterion-related validity was not reported.

Strengths and limitations. A major strength of the CPUI is that it assesses a very broad range of addiction components ($n=11$), but its length at 31 items is its main limitation. Also, the CPUI was designed to “make allowances for the effect that religiosity might have on an individual’s self-perceived levels of addiction” (p.111), with particular interest in guilt that religious individuals may feel as a result of their pornography use. As the developers had clinical implications in mind (with religious populations in particular) when designing the instrument (in particular the Guilt subscale), the suitability of using the CPUI with non-religious populations needs further exploration.

CPUI-9. The CPUI-9 is a 9-item scale that was designed to assess “problematic pornography use and perceived addiction to internet pornography” (p.21). The CPUI-9 has three factors: perceived compulsivity, access efforts, and emotional distress. Sample items include “I feel unable to stop my use of online pornography” (perceived compulsivity subscale), “I have put off important priorities to view pornography” (access efforts subscale), and “I feel ashamed after viewing pornography online” (emotional distress subscale), rated

on a 7-point scale, from ‘not at all’ to ‘extremely’. The CPUI-9 assesses six addiction components, including salience, impaired control, craving, interpersonal conflict, conflict: intrapersonal, and general life conflict. No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The CPUI-9 was validated in more diverse samples compared to the CPUI – with samples of male and female college students and a clinical sample.

Reliability. The internal consistency of the CPUI-9 ranges from fair to good – full scale ($\alpha=.75-.89$), perceived compulsivity ($\alpha=.74-.83$), access efforts ($\alpha=.75-.81$), and emotional distress ($\alpha=.81-.89$).

Validity. The factor structure of the CPUI-9 was derived with exploratory and confirmatory factor analyses. The CPUI-9 demonstrated evidence for convergent validity. The CPUI full scale has positive correlations with the Sexual Compulsivity Scale (Kalichman & Rompa, 1995), perceived stress (Cohen et al., 1983), state anxiety (Spielberger et al., 1983), and an aggregated measure of psychological distress. The CPUI full scale also demonstrates evidence of criterion-related validity, being positively correlated to amount of time spent viewing pornography.

Strengths and limitations. The CPUI-9 has robust psychometric properties and has a more diverse validation sample compared to the CPUI. It is brief which facilitates ease of administration, but breadth of coverage of addiction components ($n=6$) is reduced compared to the CPUI. Some items from the ‘Guilt’ subscale of the CPUI were retained to form the Emotional Distress subscale of the CPUI-9, but with an intended focus on “negative affect associated with pornography use rather than feelings of guilt or shame directly” (Grubbs et al., 2015, p. 9). It is important to highlight that questions surrounding the Emotional Distress subscale have nonetheless been raised in the literature, mainly about the possibility of the subscale inflating full scale scores of individuals who morally disapprove of pornography

(Brand et al., 2018; Fernandez et al., 2017), which the lead author of the CPUI-9 has since responded to at length (see Grubbs, Perry, et al., 2019b).

Deficient Self-Regulation Scale, Habit Strength Scale, and Negative Consequences Scale

The Deficient Self-Regulation Scale, Habit Strength Scale, and Negative Consequences Scale (Sirianni & Vishwanath, 2016) are scales that were developed as part of the same study, to test a model of problematic pornography use from a socio-cognitive perspective. The instruments are based on LaRose's (2003) social cognitive model of unregulated media behavior and LaRose and colleagues' (2010) socio-cognitive model of problematic internet use and defines problematic pornography use from a deficient self-regulation perspective as opposed to an addiction perspective.

Deficient Self-Regulation Scale. The Deficient Self-Regulation Scale is a seven-item scale that was designed to assess deficient self-regulation related to pornography use. The scale has a single factor, with sample items such as "I struggle to control my desire to view online pornography", rated on a 5-point scale from 'strongly disagree' to 'strongly agree'. The scale assesses seven addiction components, including salience, impaired control, withdrawal, relapse, mood modification, craving and intrapsychic conflict.

Habit Strength Scale. The Habit Strength Scale is a five-item scale that was designed to assess habit strength related to pornography use. The scale has a single factor, with sample items such as "Viewing pornography is part of my usual routine", rated on a 5-point scale from 'strongly disagree' to 'strongly agree'. The scale assesses two addiction components (i.e., impaired control and withdrawal).

Negative Consequences Scale. The Negative Consequences Scale is a seven-item scale that was designed to assess negative consequences resulting from pornography use. The scale has a single factor, with sample items such as "The online pornography that I view has negatively affected my school and/or job", rated on a 5-point scale from 'strongly disagree'

to ‘strongly agree’. The scale assesses four addiction components related to conflict from different dimensions (i.e., interpersonal conflict, financial conflict, educational/occupational conflict, and general life conflict).

Sample. All three scales were validated on samples of male and female college students.

Reliability. The scales have good to excellent internal consistency – Deficient Self-Regulation Scale ($\alpha=.92$), Habit Strength scale ($\alpha=.88$), and Negative Consequences scale ($\alpha=.94$). Temporal stability for all three scales were not reported.

Validity. Structural equation modeling was used to test the model of problematic pornography use, of which these three scales make up construct measures. Factor loadings showed that all items loaded on their respective construct. Evidence for convergent and discriminant validity for all three scales were provided by demonstrating that the average variance extracted for each scale exceeds 0.50, and that the diagonal values are significantly higher than the off-diagonal values in the corresponding rows and columns. Further evidence of convergent validity was demonstrated by correlations between the three scales.

Strengths and limitations. Further validation of these scales was not provided, as they were adapted for the purpose of testing their hypothesized model. However, if validated more comprehensively, these scales may be useful in that they conceptualize problematic pornography use from a social-cognitive perspective, and therefore provide a unique conceptualization of problematic pornography use. This may have useful applications especially to individuals at the sub-clinical end of the spectrum struggling with aspects of their pornography use without necessarily facing serious negative life consequences.

Adaptations of the Internet Addiction Test

The Internet Addiction Test-Sex (IAT-Sex; Brand et al., 2011) and the Short Internet Addiction Test adapted to Online Sexual Activities (s-IAT-Sex; Wéry et al., 2016) are both

variations of the same test. The s-IAT-Sex is intended to be a shortened version of the IAT-Sex. Both instruments were adapted from the original Internet Addiction Test (Young, 1998; Widyanto & McMurrin, 2004), and based on Young's (1998) model of internet addiction applied to online sexual behavior.

Internet Addiction Test-Sex (IAT-sex). The IAT-Sex is a 20-item scale that was adapted to assess "subjective complaints in everyday life due to online sexual activities and potential symptoms of cybersex addiction" (p.373). The IAT-Sex has six factors (i.e., salience, excessive use, neglecting work, anticipation, lack of control, and neglecting social life). The IAT-Sex assesses ten addiction components, including salience, impaired control, withdrawal, relapse, mood modification, interpersonal conflict, educational/occupational conflict, sleep conflict, household/hobby conflict, and deception. No cutoff score to differentiate between problematic users was provided.

Sample. The IAT-Sex was adapted for use with a sample of heterosexual men.

Reliability. The scale demonstrated good internal consistency ($\alpha=.84$), but temporal stability was not reported.

Validity. The factor structure of the IAT-Sex was not confirmed with factor analysis. Evidence of convergent validity of the IAT-Sex was provided by demonstrating positive correlations with obsessive-compulsiveness, interpersonal sensitivity, depression, anxiety, phobic anxiety, paranoid ideation, psychoticism, and the global severity index on the Symptom Check List (SCL-90-R; Franke, 2002), and with the IAT. Further evidence of convergent validity was provided by demonstrating that scores on the IAT-Sex were predicted by sexual arousal ratings and usage of online sex applications. No evidence of criterion-related validity was demonstrated.

Strengths and limitations. A major strength of the IAT-Sex is that it has a very broad coverage of addiction components ($n=10$). However, because the items were adapted from an

the Internet Addiction Test, the way the items have been phrased are restricted by its original manner of phrasing. The factor structure of the IAT-Sex was not validated using factor analysis and therefore needs further validation in future studies.

Short Internet Addiction Test adapted to Online Sexual Activities (s-IAT-Sex).

The French version of the s-IAT-sex is a 12-item scale that assesses “subjective complaints in everyday life due to online sexual activities and potential symptoms of problematic online sexual activities” (p.3). There are two factors: loss of control/time management, and craving/social problems. Sample items include: “How often do you find that you stay on internet sex sites longer than you intended?” and “How often do you choose to spend more time on internet sex sites over going out with others?”, rated on a five-point scale, from ‘never’ to ‘always’. The s-IAT-sex assesses ten addiction components: salience, impaired control, withdrawal, relapse, mood modification, conflict: relationships, educational/occupational conflict, sleep conflict, household/hobby conflict, and deception. No cutoff score to differentiate between problematic or non-problematic users was provided.

Sample. The s-IAT-sex was validated on a sample of French-speaking men.

Reliability. The scale demonstrated fair to good internal consistency – full scale ($\alpha=.88$), loss of control/time management ($\alpha=.87$) and craving/social problems ($\alpha=.76$). Temporal stability of the instrument was not reported.

Validity. The two-factor structure of the scale was derived using confirmatory factor analysis. Evidence of convergent validity was demonstrated by the s-IAT-sex having positive correlations with PATHOS (Carnes et al., 2012), a brief screening instrument for sexual addiction. Also, evidence for criterion-related validity was demonstrated by correlations with time spent online for online sexual activities and frequency of online sexual activities.

Strengths and limitations. An advantage of the s-IAT-sex is its brevity, and despite being short, it has decent breadth of coverage of addiction components ($n=10$). Being an

adapted test, the way the items have been rephrased to focus on 'internet sex sites' may not account for other ways pornography users may access online pornography without needing to spend time on specific websites (e.g., downloading pornography from peer-to-peer networks).

Internet Sex Screening Test (ISST)

The Internet Sex Screening Test (ISST; Delmonico & Miller, 2003) is a 25-item scale that was designed to "help individuals determine if their internet sexual behavior has become clinically problematic" (p.262). The ISST is based on Schneider's (1994) model of addictive behavior. The ISST has five factors: online sexual compulsivity, online sexual behavior-social, online sexual behavior-isolated, online sexual spending, and interest in online sexual behavior. Sample items include: "Internet sex has sometimes interfered with certain aspects of my life" (online sexual compulsivity), "I have participated in sexually related chats" (online sexual behavior-social), "I have masturbated while on the internet" (online sexual behavior-isolated), "I have purchased sexual products online" (online sexual spending), and "I have some sexual sites bookmarked" (interest in online sexual behavior), answered on a dichotomous 'yes'/'no' scale. The ISST assesses ten addiction components, including salience, impaired control, withdrawal, tolerance, mood modification, intrapsychic conflict, financial conflict, general life conflict, sleep conflict, and deception. No cutoff score to differentiate between problematic or non-problematic users was provided.

Reliability. The internal consistency of the subscales of the ISST range from below an acceptable threshold to good. The Online Sexual Compulsivity subscale has good internal consistency ($\alpha=.86$), the Online Sexual Behavior-Social ($\alpha=.78$) and Online Sexual Behavior-Isolated ($\alpha=.73$) subscales have fair internal consistency, while internal consistency for the Online Sexual Spending subscale ($\alpha=.61$), and the Interest in Online Sexual Behavior subscale ($\alpha=.51$) were below the acceptable threshold of .70. Temporal stability was not reported.

Validity. Validation of the factor structure of the scale with factor analysis was not reported. Evidence for convergent/discriminant validity was not provided. Criterion-related validity was demonstrated by all subscale scores of the ISST being significantly higher for sexually compulsive participants (as measured by the Sexual Addiction Screening Test-Abbreviated adapted from the Sexual Addiction Screening Test [SAST; Carnes, 1989]) compared to non-sexually compulsive participants.

Strengths and limitations. A strength of the ISST is that it was validated on a large sample of men and women ($N=6088$) and has a fairly wide coverage of addiction components ($n=10$). However, two subscales of the ISST (Online Sexual Spending and Interest in Online Sexual Behavior) have issues with its reliability. Furthermore, in reviewing each item, it was determined that 15 out of 25 items on the ISST simply assess the incidence of different sexual behaviors while not necessarily assessing problematic aspects of these behaviors. For example, items such as “I have masturbated while on the internet”, “I have searched for sexual material through an internet search tool” and “I have purchased sexual products online” refer to sexual behaviors that may not be problematic at all for many individuals. As such, content validity of the ISST is questionable when taking into account its purpose of assessing clinically problematic online sexual behavior. Overall, the ISST needs further psychometric validation before its utility can be determined.

Passion Scale-Pornography

The Passion Scale-Pornography (Rosenberg & Kraus, 2014) is a 14-item scale that was adapted from the original Passion Scale (Vallerand, 2003), which was itself based on Vallerand’s (2003) model of harmonious versus obsessive passion for liked activities. The instrument assesses “passionate attachment” for pornography. The scale has two factors: harmonious passion, and obsessive passion. The ‘harmonious passion’ subscale assesses the extent to which the activity is an important and well-integrated part of an individual’s life,

while the ‘obsessive passion’ subscale assesses potentially addictive patterns of behavior. Sample items on the obsessive passion subscale include “My mood depends on me being able to use porn”, “I almost feel obsessed with using porn” and “When the urge is so strong, I cannot help myself from using porn”, rated on a 7-point scale, from ‘disagree completely’ to ‘agree completely’. The obsessive passion subscale assesses four addiction components including salience, impaired control, mood modification, and craving. No cutoff score to differentiate problematic from non-problematic users of pornography was provided.

Sample. The Passion Scale-Pornography was validated on a sample of male college students.

Reliability. Both subscales have fair internal consistency: Harmonious passion ($\alpha=.78$) and Obsessive passion ($\alpha=.79$). Internal consistency for the full scale was not provided. Test-retest reliability at a one-week interval was reported for both subscales: Harmonious passion ($r=.76$), and Obsessive passion ($r=.86$), indicating adequate temporal stability.

Validity. Confirmation of the factor structure of the scale using factor analysis was not reported. Evidence for convergent validity was demonstrated by both subscales being correlated with measures of sexual compulsivity (Kalichman & Rompa, 1995), craving for pornography (Kraus & Rosenberg, 2014), and compulsive internet use (Meerkerk et al., 2009). Evidence for discriminant validity was demonstrated by both scales not having a relationship with measures of non-sexual sensation seeking (Hoyle et al., 2002) or social desirability (Stöber, 2001). Evidence for criterion-related validity was demonstrated by the finding that most frequent users of pornography reported significantly higher mean scores on both subscales compared to those who used less pornography each week.

Strengths and limitations. The Passion Scale-Pornography is useful in that it recognizes the need to differentiate between healthy and unhealthy ‘passionate attachment’ to

pornography and in doing so refrains from pathologizing harmonious interest and passion for an activity such as viewing pornography. Additionally, it is able to determine when an individual's pornography use is starting to become problematic – if their scores on the 'obsessive passion' subscale are high. Overall, the scale has robust psychometric properties. However, it is limited in assessing addiction comprehensively because it has a narrow coverage of addiction components ($n=4$).

Pornography Consumption Effects Scale, Pornography Consumption Effects Scale-Revised, and Pornography Consumption Effects Scale Short-Form

The Pornography Consumption Effects Scale (PCES; Hald & Malamuth, 2008), the Pornography Consumption Effects Scale-Revised (PCES-R; Hald et al., 2012) and the Pornography Consumption Effects Scale-Short-Form (PCES-SF; Miller et al., 2019) are variations of the same scale. The PCES is the original scale and the PCES-R and PCES-SF are its derivatives. The PCES itself was the fourth section of the 139-item Pornography Consumption Questionnaire, which initially comprised 64 items, but was later reduced to 47 items. The PCES is largely atheoretical in the manner that it approaches pornography use, and is based on sexuality and pornography use research. Consequently, it does not approach pornography use from a 'problematic' or 'addiction' perspective. Its goal is to explore the effects of pornography consumption, both positive and negative. The negative effects of pornography assessed by these scales arguably assess aspects of problematic pornography use.

PCES. The PCES has 47 items comprising nine factors. It assesses "self-perceived effects of hardcore pornography consumption on participants' sexual behaviors or sex life, attitudes towards sex, sexual knowledge, life in general, and attitudes towards and perceptions of the opposite gender" (p.616). Five of these factors (sex life, attitudes towards sex, sexual knowledge, perception and attitudes towards opposite gender and life in general)

form a 'positive effects dimension'; while four of these factors (sex life, attitudes towards sex, perception and attitudes towards opposite gender, and life in general) form a 'negative effects dimension'. Sample items on the PCES include: "To what extent do you believe that your consumption of pornography has taught you new sexual techniques" (positive effects dimension) and "To what extent do you believe that your consumption of pornography has adversely affected your outlook on sex?" (negative effects dimension). The PCES assesses three addiction components: general life conflict, negative attitudes conflict, and sex life conflict.

Sample. The PCES was validated on a sample of male and female young adults.

Reliability. The internal consistency of its subscales range from fair to excellent ($\alpha=.72-.91$). Temporal stability of the scale was not reported.

Validity. The factor structure of the PCES was validated using principal axis factor analysis. Evidence for convergent validity of the PCES was demonstrated by the subscales within the positive effect dimension being correlated with each other, and the subscales within the negative effect dimension being correlated with each other. Evidence for discriminant validity of the PCES is demonstrated by the negative effect dimension not being correlated with the positive effect dimension. In terms of criterion-related validity, the negative effect dimension was correlated with pornography consumption. However, it is interesting to note that the correlation between the positive effect dimension and pornography consumption is much stronger than the correlation between the negative effect dimension and pornography consumption, suggesting that overall, participants in the sample found pornography consumption having more positive effects than negative effects. The authors suggest the possibility that this could be accounted for by the generally liberal mindset of their young Danish sample, although this needs to be validated and confirmed across more diverse samples.

PCES-Revised. The PCES-R is a seven-item scale that assesses “cognitive, affective and behavioral effects of pornography” (p.759). The PCES-R was reduced from the original 47 PCES items to seven items and is scored differently. The seven items are rated on two separate five-point scales: the first concerning the valence of the effect from 1=very bad, to 5=very good, and the second concerning the magnitude of the effect from 1=decreased to 5=increased. A single index is derived from scores, with -2 being a strong, negative effect, and 2 being a strong positive effect, with 0 indicating a neither positive nor negative effect. Sample content of the items included knowledge of sex acts, attitude towards sex, and interest in trying new sexual positions. The PCES-R assesses two addiction components (i.e., sex life conflict and negative attitudes conflict).

Sample. The PCES-R was validated on samples of men who have sex with men.

Reliability. The PCES-R demonstrated good internal consistency ($\alpha=.80$). Although test-retest reliability coefficients were not reported, multigroup models were used for the test-retest sample to strengthen conclusions about the replicability of the measure.

Validity. The single-factor structure of the scale was derived using exploratory and confirmatory factor analyses. Evidence of convergent validity was demonstrated by the instrument being positively correlated to positive affect as assessed by the short form of the PANAS (Thompson, 2007) and sexual self-esteem as assessed by the sexual confidence and sexual satisfaction subscales of the Multidimensional Sexuality Questionnaire (Snell et al., 1993). Evidence for discriminant validity was demonstrated by scores on the instrument being unrelated to negative affect as assessed by the short form of the PANAS (Thompson), social desirability (Strahan & Gerbasi, 1972), and compulsive sexual behavior (Coleman et al., 2001). Temporal validity and criterion-related validity for the scale were not reported. As the validation sample was limited to men who have sex with men, generalizability beyond this population is unknown.

PCES-Short-Form. The PCES-SF is a 14-item scale and is a shortened version of the PCES. The PCES-SF has the same nine factors like the original PCES. The PCES-SF assesses three addiction components: negative attitudes conflict, sex life conflict, and general life conflict.

Sample. The PCES-SF was validated in a sample of heterosexual men.

Reliability. The PCES-SF demonstrated excellent internal consistency for both the positive effect dimension ($\alpha=.91$) and negative effect dimension ($\alpha=.91$), while Spearman Brown coefficients for all subscales ranged from .79 to .86.

Validity. The factor structure of the PCES-SF was confirmed using confirmatory factor analysis. Evidence for convergent validity of the scale was demonstrated by being positively correlated with the long-form version of the PCES. Evidence for discriminant validity was provided by the scale showing no relationship with a measure of social desirability.

Strengths and limitations. Overall, the PCES and its derivatives have robust psychometric properties. There is an advantage in approaching pornography use from a neutral perspective in preventing participants from being primed with the idea that their pornography use may be problematic if items only include negative components of pornography use. There are benefits of accumulating additional raw data from participants to investigate that even if participants are experiencing negative effects in their pornography use, whether they are also experiencing positive effects. However, these scales are limited in their ability to assess more addiction components beyond negative effects on life in general, attitudes, and sex life. As such the scales have limited utility for participants with addictive or compulsive pornography use.

Pornography Consumption Inventory

The Pornography Consumption Inventory (PCI; Reid, Li, et al., 2011) is a 15-item scale that assesses “motivations for pornography use among hypersexual men” (p.359). Conceptually, the PCI is based on empirical and clinical findings of HD (Kafka, 2010). There are four factors: sexual curiosity, emotional avoidance, excitement-seeking, and sexual pleasure. Of particular relevance to problematic pornography use is the emotional avoidance subscale, with sample items such as “I turn to [pornography] when I’m feeling down, sad or lonely” and “I use [pornography] to avoid feeling uncomfortable or unpleasant emotions”, rated on a 5-point scale, from ‘never like me’ to ‘very often like me’. The other three subscales of the PCI arguably explore more neutral and non-problematic motivations for pornography, although Item 5 (pertaining to the excitement seeking subscale; “I use [pornography] to escape into a fantasy world”) could be argued to be assessing the ‘mood modification’ component of addiction. Overall, the PCI only assesses the mood modification component. Nonetheless, the entire PCI was constructed with a specific population in mind – hypersexual men – and as such, results from all four subscales have the potential to be of interest to researchers and clinicians.

Sample. The PCI was validated on samples of men who self-identified as addicted to pornography, and men seeking treatment for hypersexual behavior.

Reliability. The PCI demonstrates fair to excellent internal consistency for the full scale ($\alpha=.83-.93$) and its subscales: emotional avoidance ($\alpha=.85-.95$), sexual curiosity ($\alpha=.87-.89$), excitement-seeking ($\alpha=.73-.85$), and sexual pleasure ($\alpha=.71-.90$). The PCI full scale had evidence of adequate temporal stability, demonstrating test-retest correlations of $r=.86$ at a two-week interval.

Validity. The factor structure of the PCI was derived using exploratory and confirmatory factor analyses. Evidence of convergent validity was demonstrated through the

emotional avoidance subscale being positively correlated to excitement-seeking and sexual pleasure subscales of the PCI, to the loneliness, anxiety, depression, impulsiveness, vulnerability, and fantasy subscales of the NEO Personality Inventory-Revised (NEO-PI-R; Costa & McCrae, 1992) while being negatively correlated to positive emotions subscale of the NEO-PI-R. Also, the sexual curiosity subscale was shown to be positively correlated to impulsiveness and fantasy subscales of the NEO-PI-R.

Evidence of discriminant validity was demonstrated by the emotional avoidance subscale being unrelated to the sexual curiosity subscale of the PCI, and being negatively related to Positive Emotions subscale of the NEO-PI-R. Discriminant validity was also demonstrated by the sexual curiosity subscale being unrelated to the loneliness, anxiety, depression, vulnerability, positive emotions, and self-discipline subscales of the NEO-PI-R. Finally, the sexual pleasure subscale was unrelated to loneliness and positive emotions subscales of the NEO-PI-R.

In terms of criterion-related validity, frequency of pornography use was correlated with emotional avoidance and sexual pleasure subscales. Additionally, the full scale and subscales of the PCI were correlated with the HBI (Reid, Garos, et al., 2011). Finally, participants who reported spending more than one hour viewing pornography per week scored higher on Emotional Avoidance compared to participants who reported spending less than one hour per week viewing pornography.

Strengths and limitations. The PCI is the only instrument in the present review that specifically examines motivations for pornography use and is a potential source of rich information about participants. However, only one component of addiction (mood modification) is assessed and as such cannot be used for a comprehensive assessment of addiction symptoms. While the PCI has good psychometric properties, it was validated on

samples of men with hypersexual disorder, therefore, generalizability to non-clinical samples is unknown.

Pornography Craving Questionnaire (PCQ)

The Pornography Craving Questionnaire (PCQ; Kraus & Rosenberg, 2014) is a 12-item scale that assesses craving for pornography. The PCQ is theoretically based on models of addiction of which craving is an element. The PCQ has a single factor (i.e., subjective craving for pornography). Sample items include “I have an urge to watch porn right now” and “If I watched porn now I would have difficulty stopping”, rated on a 7-point scale from ‘disagree completely’ to ‘agree completely’. Although described as a craving questionnaire, the PCQ assesses four addiction components: salience, impaired control, craving, and mood modification. No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The PCQ was validated on samples of male college students.

Reliability. The PCQ demonstrated excellent internal consistency ($\alpha=.91$). A test-retest coefficient of .82 at one-week follow-up was reported, indicating adequate temporal stability.

Validity. The single-factor structure of the PCQ was derived with principal components analysis. Evidence of convergent validity was demonstrated by the PCQ being positively correlated to passionate attachment for pornography (Rosenberg & Kraus, 2014), sexual compulsivity (Kalichman & Rompa, 1995), and compulsive internet use (Meerkerk et al., 2009). Evidence for discriminant validity was demonstrated by the PCQ being unrelated to non-sexual sensation-seeking (Hoyle et al., 2002). Evidence for criterion-related validity was provided by the PCQ being related to frequency of weekly pornography use and predicting frequency of pornography use in the following week.

Strengths and limitations. Overall, the PCQ appears to have good psychometric properties. It has promising utility for providing greater depth of information regarding one specific addiction component (i.e., craving), but at the cost of sacrificing breadth of coverage of addiction components ($n=4$).

Pornography Use Scale (PUS)

The Pornography Use Scale (PUS; Szymanski & Stewart-Richardson, 2014) is a 14-item scale that assesses men's pornography use in terms of frequency of use and problematic pornography use. The PUS has an addiction theoretical framework and is based on research on sexual and substance addictions. The scale has two factors: frequency of use and problematic pornography use. Sample items include, "How frequently do you view sexual (sic) explicit materials/pornography on the internet" (frequency of use subscale) rated on 4-point/5-point scales depending on the item, and "My use of sexually explicit materials/pornography is a problem in my romantic relationship currently" (problematic pornography subscale), rated on a 5-point scale, from 'strongly agree' to 'strongly disagree'. The PUS assesses four addiction components: impaired control, interpersonal conflict, intrapsychic conflict, and general life conflict. No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The PUS was validated on a sample of male heterosexuals which included college-age students.

Reliability. The PUS demonstrated good to excellent internal consistency for its subscales – frequency of use ($\alpha=.88$), and problematic use ($\alpha=.91$). Temporal stability was not reported.

Validity. The factor structure of the PUS was derived from exploratory and confirmatory factor analyses. Evidence of convergent validity was demonstrated by the problematic use subscale being related to greater gender role conflict (O'Neil et al., 1986),

avoidant and anxious attachment styles (Brennan et al., 1998), poorer relationship quality (Spanier, 1976), and less sexual satisfaction (Snell et al., 1993). Also, the problematic use subscale was related to the online sexual compulsivity subscale of the ISST (Delmonico & Miller, 2003). Evidence for discriminant validity was demonstrated by the full scale being negatively related to relationship length, while being unrelated to social desirability (Reynolds, 1982). In terms of criterion-related validity, the problematic use subscale was related to frequency of pornography use, as measured by the frequency of pornography use subscale.

Strengths and limitations. The PUS has good psychometric properties. The main contribution of the PUS is that it provides a good measure for investigating frequency of pornography use in a standardized fashion with its frequency of use subscale. However, the PUS is limited in its ability to assess a broad range of addiction components, assessing only four components.

Problematic Pornography Consumption Scale (PPCS)

The Problematic Pornography Consumption Scale (PPCS; Bóthe et al., 2018) is an 18-item scale that assesses “problematic online pornography use” (p.1) and has Griffiths’ (2005) components model of addiction as its theoretical framework, where items were developed for each component. Corresponding to the six components, there are six factors: salience, mood modification, conflict, tolerance, withdrawal and relapse. Sample items include “I felt that porn is an important part of my life” (salience), “Watching porn got rid of my negative feelings” (mood modification) and “I felt that I had to watch more and more porn for satisfaction” (tolerance), rated on a 7-point scale from ‘never’ to ‘all the time’. The PPCS assesses nine components of addiction, namely salience, tolerance, withdrawal, mood modification, relapse, household/hobby conflict, general life conflict, and sex life conflict.

The authors provided an optimal cutoff of 76 (out of 126) to be classified as a problematic pornography user.

Sample. The PPCS was validated on a sample of men and women.

Reliability. The PPCS has range of fair to excellent internal consistency – full scale ($\alpha=.93$), salience ($\alpha=.77$), mood modification ($\alpha=.84$), conflict ($\alpha=.71$), tolerance ($\alpha=.78$), withdrawal ($\alpha=.86$) and relapse ($\alpha=.86$). Temporal stability for the instrument was not reported.

Validity. Factor structure of the PPCS was confirmed using confirmatory factor analysis. Evidence of convergent validity was demonstrated by the PPCS being correlated with frequency of masturbation, and negatively correlated with satisfaction with sexual life. Criterion-related validity was demonstrated by the PPCS being correlated with time spent viewing pornography per occasion, frequency of reading online pornographic stories, online pornography picture viewing, online pornography video viewing, and frequency of pornography consumption during masturbation.

Strengths and limitations. A strength of the PPCS is that it has a clear theoretical framework to guide its construction, with factor analyses confirming the factors corresponding to the six addiction components. Furthermore, this is the only instrument in the present review that explicitly assesses the ‘tolerance’ component and therefore may be useful to researchers or clinicians who wish to obtain specific information related to tolerance in respondents. However, as comprehensive as the PPCS aims to be, it suffers from a lack of breadth of coverage of important dimensions of conflict. For the three items assessing conflict, only sex life conflict, and conflict in terms of hobbies/leisure activities are assessed. However, conflict in terms of interpersonal relationships and conflict in terms of education/occupation, both major indicators of conflict in addiction, are not assessed. Therefore, potentially useful information may not be captured by the scale in its current form.

Nonetheless, a strength of the PPCS is that it is the only instrument in the present review to provide a validated cutoff score to differentiate between problematic and non-problematic users of pornography.

Problematic Pornography Use Scale (PPUS)

The Problematic Pornography Use Scale (PPUS; Kor et al., 2014) is a 12-item scale that assesses problematic pornography use and is based on models describing core features of addiction. The PPUS has four factors: distress and functional problems, excessive use, control difficulties, and use for escape/avoid negative emotions. Sample items include “Using pornography has created significant problems in my personal relationships with other people, in social situations, at work or in other important aspects of my life” (distress and functional problems subscale) and “I have been unsuccessful in my efforts to reduce or control the frequency I use pornography in my life” (control difficulties), rated on a 6-point scale, from ‘never true’ to ‘almost always true’. The PPUS assesses nine addiction components, including salience, impaired control, relapse, mood modification, interpersonal conflict, educational/occupational conflict, general life conflict, sex life conflict, and use despite harm. No cut-off score was provided to differentiate problematic from non-problematic pornography users.

Sample. The PPUS was validated on samples of male and female college students.

Reliability. The PPUS has internal consistency ranging from fair to excellent for full scale and subscales ($\alpha=.75-.93$). Temporal stability of the instrument was not reported.

Validity. Factor structure of the PPUS was supported by principal components analysis and confirmatory factor analysis. Evidence for convergent validity was demonstrated by the scale being related to the CPUI (Grubbs et al., 2010), subscales of the PCI (Reid, Li, et al., 2011), poorer self-esteem (Rosenberg, 1965), sexual behavior consequences as assessed by the HBCS (Reid et al., 2012), attachment insecurities (Brennan et al., 1998), hypersexual

disorder (Reid, Garos, et al., 2012; Reid, Carpenter, et al., 2012), internet addiction (Young, 1998), and traumatic events (Nijenhuis et al., 1999). Evidence for discriminant validity was demonstrated through the finding that the PPUS has weaker correlations with internet addiction and gambling addiction (Winters et al., 1993) compared to hypersexual disorder. In terms of criterion-related validity, the PPUS was positively correlated with frequency of pornography use.

Strengths and limitations. The PPUS has robust psychometric properties. However, some of the items on the PPUS are lengthy and might need further clarification from the respondent to provide more information (e.g., Item 1: “Using pornography has created significant problems in my personal relationships with other people, in social situations, at work, or in other important areas of my life”). While this manner of constructing the item allows for an exhaustive exploration of possible life areas that have been affected by pornography, the item itself does not provide clear information about which area of life has been affected. Nonetheless, the PPUS has excellent coverage of addiction components (n=9) and is one of only two instruments in the present review to assess the ‘use despite harm’ component, which is an addiction component assessed by both HD and CSBD diagnostic criteria.

2.4 Discussion

The aim of the present study was to conduct a systematic review on psychometric instruments assessing problematic pornography use. Twenty-two psychometric instruments assessing at least some aspect of problematic pornography use were reviewed.

2.4.1 Conceptualizations of problematic pornography use

The instruments reviewed had different theoretical conceptualizations of problematic pornography use, ostensibly due to the lack of consensus at present in the field about how best to operationalize problematic sexual behavior. Other than an addiction framework, the

instruments approached problematic pornography use from varying perspectives – three from a social-cognitive perspective, three from an atheoretical and neutral perspective, two from a compulsive behavior perspective, and one from a hypersexual behavior perspective. Nonetheless, addiction still emerged as the most influential theoretical model in conceptualizing problematic pornography use, as reflected in the finding that more than half of the instruments in this review were built on an addiction framework (13 out of 22). In the case of two scales (PPUS and PPCS) where the term ‘problematic’ was explicitly used to describe the construct, addiction was still the theoretical model guiding the content of the scales. It appears that in the literature, the term ‘problematic’ is arguably a placeholder for the term ‘addiction’ because researchers appear to be reluctant to use the term ‘pornography addiction’ in the absence of formal recognition of its validity as a disorder. Of the 12 instruments using addiction as their theoretical framework, it is interesting to note that only three scales used the term ‘addiction’ in their scale title. Two of these were adaptations based on scales for internet addiction (IAT-Sex and s-IAT-Sex), and only one was developed specifically for the purpose of assessing pornography addiction (CYPAT).

It should also be noted that some authors in their scale development (i.e., the CPUI-9; Grubbs et al., 2015) use the term ‘perceived addiction to pornography’ as opposed to “addiction to pornography” in defining the construct being assessed. This implies that there might sometimes be a disparity between an individual’s self-perception of addiction and the actual reality. The potential for overpathologizing sexual behaviors has indeed been recognized to be a major concern when assessing problematic sexual behaviors in general, as reflected in the diagnostic guidelines for CSBD proposed for ICD-11 (Kraus et al., 2018). Kraus et al. suggest that individuals who identify as being ‘sex addicts’ or ‘porn addicts’ might not necessarily “exhibit clinical characteristics of the disorder” (p.109), although they may perceive themselves as such. Kraus et al. list other factors that might lead to false

positives in diagnosis (e.g., high levels of sex drive or interest without evidence of impaired control, or distress related to moral judgments about sexual impulses, urges, or behaviors). Therefore, a practical implication for problematic pornography use assessment would be that, taking into account the possibility of specific individuals overpathologizing their own behavior, items focusing on objective behavior patterns (e.g., “I have had many unsuccessful attempts to reduce my pornography use”) would likely have greater validity compared to items focusing on belief or perception (e.g., “I believe I am addicted to pornography”).

2.4.2 Assessment of addiction components

Despite the varying theoretical orientations, the instruments had significant overlaps in components of addiction they assessed. The most frequently assessed components of addiction were impaired control, salience, mood modification, interpersonal conflict, and general life conflict. If taking a majority consensus view across all the instruments included in the present review, these five symptoms appear to represent the ‘core’ criteria for problematic pornography use. This finding is unsurprising because these symptoms are core features of addiction models (Griffiths, 2005; Shaffer, 1999) and HD and CSBD diagnostic criteria.

Other common components of addiction had significantly less inclusion by the instruments: educational/occupational conflict, intrapsychic conflict, withdrawal, tolerance, craving, and use despite harm. Educational/occupational conflict and intrapsychic conflict, while not infrequently assessed, were not as commonly assessed as the top five components. This finding is surprising, when taking into account that ‘distress’ and ‘impairment in educational or occupational functioning’ are typically listed as part of diagnostic criteria for disorders, HD and CSBD included.

Furthermore, while withdrawal and tolerance form key parts of addiction models (Griffiths, 2005), they were not assessed as frequently by the instruments relative to the other

core criteria. This might be due to withdrawal and tolerance not being universally accepted in the field as necessary components of behavioral addictions (e.g., Starcevic, 2016). It is also worth noting that HD and CSBD diagnostic criteria do not include withdrawal and tolerance as they are not based on an addiction framework. Nonetheless, an interesting finding was that tolerance was assessed much less frequently than withdrawal by the instruments – only one scale explicitly assessed tolerance with regards to pornography use. This is not necessarily reflective of the extant empirical research on both these components in relation to pornography use. While withdrawal has been explored relatively substantially with other problematic behaviors (e.g., gambling – Blaszczynski et al., 2008; Cunningham-Williams et al., 2009; gaming – Kaptis et al., 2016a, 2016b), to the best of the present authors' knowledge, studies focusing on investigating withdrawal symptoms in relation to pornography use (apart from studies utilizing the self-report instruments in the present review) have rarely been reported in the literature, with the exception of recent qualitative research that found evidence of symptoms potentially resembling withdrawal in individuals who self-identify as being addicted to pornography (Ševčíková et al., 2018). In contrast, there has been neuroscientific evidence documenting that continued use of pornography over time might lead to effects resembling tolerance (e.g., Kühn and Gallinat, 2014). However, the difficulty of conceptualizing tolerance when applied to behavioral addictions in general (Billieux et al., 2015) could be another reason for the lack of inclusion by the instruments. Nonetheless, in their assessment, Bóthe et al. (2018) did account for both quantitative aspects of tolerance (“I felt I had to watch more and more porn for satisfaction”) and qualitative aspects of tolerance (“I gradually explored more ‘extreme’ porn, because the porn I watched was less satisfying”). Overall, more empirical research examining the nature of tolerance and withdrawal specifically with regards to pornography use is needed in order to better assess these components.

Craving has also been proposed to be a central component of addiction (Shaffer, 1999), and over the past few years there has been growing empirical support for the role of craving in the development and maintenance of addictive pornography use (Brand et al., 2016; Laier et al., 2013; Snagowski et al., 2015). However, only six scales assessed craving in some way. One scale (PCQ) is dedicated exclusively to the assessment of subjective craving for pornography and therefore has excellent research and clinical utility. Use despite harm was only assessed by two scales (PPUS and CYPAT) although this symptom has been described by addiction models as being central to the definition of addiction (Shaffer, 1999), as the disorder might be argued to be more about the individual's disregarding of the negative consequences rather than the presence of negative consequences itself. Scales assessing problematic pornography use could benefit from assessing craving and use despite harm, as both HD and CSBD criteria also refer to explicitly to sexual urges and continued use despite negative consequences or harm.

The more arguably 'peripheral' components of addiction (e.g., financial conflict, sleep conflict, household/hobby conflict, negative attitudes conflict, sex life conflict, and deception) were unsurprisingly less frequently assessed by the instruments, as they appear to act as secondary indicators of addictive use of pornography rather than primary indicators *per se*. However, it is interesting to note that of these 'peripheral' components, sex life conflict was the most frequently assessed, along with sleep conflict. Four out of the six instruments that assessed sleep conflict were based on adaptations of scales assessing internet addiction, of which sleep loss appears to be a significant manifestation, and does not appear to be a unique feature of problematic pornography use. However, what was unique to the assessment of problematic pornography use was conflict in terms of negative effects on sex life. In addition to questions concerning negative effects on sex life in general, specific negative effects explored were performance anxiety during sex (PCES), only having an orgasm when

watching pornography (CPC), and only getting sexually aroused when watching pornography (CYPAT). Over the past couple of years, there have been clinical reports (Park et al., 2016; Porto, 2016) indicating that specific sexual dysfunctions such as erectile dysfunction and anorgasmia may result from chronic pornography use in some individuals, although empirical examination of this in the literature appears to be limited. Research to date has focused mainly on a possible association between pornography use and erectile dysfunction, although evidence for this association has generally been inconclusive (Berger et al., 2019; Grubbs & Gola, 2019; Isenberg, 2015; Klein et al., 2015; Landripet & Štulhofer, 2015; Prause & Pfaus, 2015). Therefore, no conclusion can be drawn about the extent to which these dysfunctions reflect pornography dependence or otherwise, but remains a promising avenue for future research.

2.4.3 Contextual factors potentially affecting assessment of addiction components

Several contextual factors that may affect the assessment of addiction components in relation to pornography use need to be highlighted. First, the affordability of pornography use has the ability to affect the assessment of financial conflict. Pornography today can more often than not be accessed for free via the internet, therefore the need to spend increasing amounts of money to purchase access to pornography may not manifest when compared to other problematic behaviors which may cost a significant amount of money. Novel measures such as the Pornography Purchase Task (PPT; Mulhauser et al., 2018) based on a behavioral economics paradigm, which ask participants using a hypothetical scenario how much money they would be willing to spend on pornography given different price points, may be able to account for this contextual characteristic of pornography use. The use of the hypothetical scenario would allow for the assessment continued engagement in the behavior despite significantly increasing financial costs – which would not be possible otherwise. Nonetheless, the specific extent to which responses on these kinds of measures would correspond to real-

world scenarios where pornography use was expensive, is at present unknown but warrants further investigation.

Second, the manner in which pornography consumption behavior takes place needs to be considered. In comparison with other problematic behaviors, such as gambling and gaming, pornography use, even when problematic, tends – in general – to take up less time. For instance, a non-clinical sample recently reported an average of 16-30 minutes per occasion viewing pornography (Bóthe et al., 2018) while 95% of a clinical sample of problematic pornography viewers viewed less than three hours of pornography a week (Reid, Li, et al., 2011), which is at most an average of 25 minutes a day. Even if Cooper et al.'s (1999) cutoff of 11 hours per week as problematic were to be used, this would amount to an average of approximately 1.5 hours a day. When compared to duration spent on online gaming (average of 25 hours per week and up to 70 hours per week in extreme cases; Griffiths et al., 2004), the total amount of time spent viewing pornography is comparatively little. A possible explanation for the shorter duration of typical pornography use is that pornography use is more often than not accompanied by masturbation (Kraus & Rosenberg, 2014; Reid, Carpenter et al., 2012), and sexual stamina may become a factor, even during pornography binges (Wordecha et al., 2018). Therefore, if pornography use, even when it is problematic, does not take up a lot of time because it is limited by sexual stamina, then it may have less of a negative effect on areas of life such as sleep, and other leisure activities. However, this does not mean that other components of addiction may not be present (e.g., salience, impaired control, etc.) – but that the manner in which these manifest may not be reflected in time spent due to the sexual nature of the activity. At the same time, is important to note also that frequency of use or amount of use in and of itself is not a sufficient condition for addiction, because it is possible for frequency and/or amount of use to be high but for the behavior to not be problematic (Griffiths, 2010).

Third, the fact that pornography use (when compared to other potentially problematic behaviors) is sexual in nature may potentially influence the assessment of the craving component. There has been some debate within the field about whether high-frequency sexual behaviors represent a pathological manifestation of underlying hypersexuality/compulsive sexual behavior, or simply a (non-pathological) manifestation of high sexual desire, and about possible overlaps between the two constructs (e.g., Carvalho et al., 2015; Hilton, 2014; Kraus et al., 2016; Steele et al., 2013; Winters et al., 2010). It is plausible that the craving component in particular (when it comes to sexual behavior, including viewing pornography), might differ from craving for other problematic behaviors in that it may (in part) involve manifestations of general sexual desire (Kraus & Rosenberg, 2014). Craving for other problematic behaviors (e.g., ingesting substances, gambling, and gaming), unlike sexual urges, arguably do not involve the attempted fulfillment of an innate biological drive. Therefore, it might be helpful to account for general sexual desire in some way when assessing craving for pornography. By extension, the presence and frequency of accompanying sexual behaviors (e.g., masturbation and/or sexual intercourse, with and without pornography) may need to be accounted for as well when assessing problematic pornography use.

Fourth, as already has been acknowledged in the literature (Duffy et al., 2016; Humphreys, 2018), the morally-loaded and value-laden nature of pornography use and sexual behaviors in general are a significant contextual factor to consider in problematic pornography use assessment. Perceptions of pornography use as immoral, or as being out of line with one's values, have the potential to affect the assessment of the following addiction components: intrapsychic conflict, interpersonal conflict, and deception. In terms of intrapsychic conflict, a whole body of work (see Grubbs, Perry, et al., 2019a for a review) has suggested that for some individuals (especially religious individuals), using pornography

while morally disapproving of pornography use may lead to emotional distress and shame resulting from moral incongruence. The ICD-11 diagnosis of CSBD (Kraus et al., 2018) acknowledges the potential confounding effects of moralistic judgments about sexual behavior and states that “distress that is entirely related to moral judgments and disapproval about sexual impulses, urges or behaviors is not sufficient to meet this requirement [for diagnosis]” (WHO, 2019, p. 1). Therefore, it is important in the assessment of problematic pornography use, for researchers and clinicians to differentiate between intrapsychic distress related to moral judgments of pornography use, as opposed to intrapsychic distress arising from a genuine addictive pattern, although the two are not mutually exclusive (Kraus & Sweeney, 2019). It will be helpful for the field to develop validated measures of moral perceptions or values surrounding pornography use to help account for this factor. In addition, moral interpretations of pornography use also have the ability to influence the assessment of interpersonal conflict. As Vaillancourt-Morel and Bergeron (2019) have pointed out, it is important to consider the interpersonal contexts in which pornography use takes place, especially romantic relationships. For example, recent research showed that in a sample of 1755 mixed-sex couple pairs, only 14% had identical levels of acceptance of pornography (Willoughby et al., 2016), suggesting that most couples may have some sort of discrepancy in their values surrounding pornography use in the context of a relationship. Also, because research has shown that men have more positive attitudes towards pornography than women (Johansson & Hammarén, 2007), and frequent pornography consumption appears to be more common in men as opposed to women (e.g., Levin et al., 2012; Twohig et al., 2009) – there is a high likelihood of interpersonal conflict taking place within romantic relationships based on moral values, as opposed to the behavior itself necessarily being addictive or compulsive. Therefore, it is important when assessing the interpersonal conflict component that potential moral disapproval of significant others be taken into account. By

extension, this interpersonal context also has the ability to affect the assessment of the deception component, as the perception of social acceptability or unacceptability by the individual may impact the perceived need to keep the behavior secret. For example, where there may be incongruence in values towards pornography use of partners within a relationship, the pornography user may choose to hide or lie to their partner about their pornography use – not because they are addicted to the behavior, but to avoid conflict in the relationship. It is therefore important to ensure that deception due to covering up addictive behavior is differentiated from deception due to covering up behavior due to perceived social unacceptability of the behavior.

2.4.4 Psychometric properties and sample characteristics

In general, most of the instruments reviewed had robust psychometric properties demonstrating basic evidence of reliability and validity. However, five scales (Compulsive Use of Sexually Explicit Material, CCS, Habit Strength Scale, Deficient Self-Regulation Scale, and Negative Consequences Scale) did not undergo extensive psychometric evaluation. The ISST in particular had psychometric weaknesses, with two subscales having below acceptable levels of internal consistency, and with content validity issues. Therefore, use of these scales needs further validation before its use can be recommended.

It is also important to note that most of the instruments in the present review were validated using very specific samples (e.g., adolescents, men who have sex with men, heterosexual men, men in general, etc.) which limits the generalizability of the findings across different samples. While female participants were sampled in a handful of studies, in general, participants across the studies were predominantly male. In addition, primarily non-clinical and Western samples were used in a large majority of the studies. Hence, more research is needed to validate these instruments across more diverse participant samples

including clinical/treatment-seeking populations and across gender, age group, and sexual orientation.

2.4.5 Recommendations for researchers and clinicians

Overall, based on the findings of the present review, two instruments can be recommended for researchers and clinicians who wish to assess problematic pornography use based on their coverage of specific addiction components. The first instrument, the PPUS, although its coverage of addiction components was not the widest, assesses the most central components of addiction. Notably, the PPUS is the instrument that comes closest to assessing the same components assessed by HD criteria (8/10) and CSBD (7/9) – the missing components of which are craving and intrapsychic conflict, which the PPUS does not directly assess. The second instrument, the PPCS, is the only instrument that assessed all six of Griffiths' (2005) components, including explicitly assessing withdrawal and tolerance, which may be of particular research and/or clinical interest. The PPCS also provides a validated cutoff score to differentiate problematic from non-problematic pornography users which adds to its research and clinical utility. However, the assessment of the 'conflict' component on the PPCS is limited by its inclusion of the more 'peripheral' aspects of conflict (e.g., negative effects on sex life) and exclusion of the more central aspects of conflict (e.g., interpersonal conflict). However, wherever possible, the present authors recommend combining the use of different instruments included in this review depending on the type of information needed.

It is also important for researchers and clinicians to take into account variables that have the potential to confound problematic pornography use assessment, as has been discussed above. Caution needs to be exercised especially within treatment settings before reaching conclusions about clients being addicted to pornography not only because addiction cannot be assessed using self-report data alone, but because current understanding of the etiology of problematic pornography use is still in its infancy.

2.4.6 Limitations

The present review is not without its limitations. The review only covered self-report scales. Scales that assess problematic pornography use from a different person's perspective (e.g., partner's perspective in Perceived Partner's Pornography Use Scale; Stewart & Szymanski, 2012) though useful, fell outside the scope of the present review. Additionally, the synthesis presented here included instruments that were not designed to strictly assess addiction symptoms (e.g., PCES and its derivatives), and as a result may have skewed observed trends of included addiction components. Finally, the present review only examined papers that described the initial use, development, or validation of an instrument – follow-up studies that used these instruments were not included and therefore limit any further information provided in the literature about psychometric properties of the instrument beyond the original validation sample.

2.4.7 Conclusion

Overall, while addiction has been the primary theoretical model by which problematic pornography use has been conceptualized in the literature, the lack of consensus among researchers about how to operationalize the condition poses a significant problem for the field. The newly included diagnostic criteria for CSBD in the ICD-11 looks to be a promising resource in guiding future research endeavors in providing a unified framework for standardizing the conceptualization and assessment of problematic pornography use.

Chapter 3

Short-term abstinence effects across potential behavioral addictions: A systematic review²

3.1 Introduction

Although defined in various ways within the addiction literature (see Hughes, 2007c), abstinence broadly refers to a state of voluntary or involuntary non-engagement in a behavior³. The psychological effects of abstinence from potential behavioral addictions have important implications for the assessment and treatment of behavioral addictions.

3.1.1 Abstinence as a methodological tool in the assessment of addiction symptomatology

In the assessment of addiction, it is not simply an individual's psychological state while actively engaged in a behavior that is taken into account, but also how they react to situations where they are prevented, whether voluntarily or involuntarily, from engaging in a behavior. Three out of the six components in the 'components model of addiction' (Griffiths, 2005) refer in some way to symptomatology that presuppose (attempted) abstinence situations. First, *withdrawal symptoms* refer to unpleasant emotional states that are experienced when a behavior is abruptly ceased. If an individual is regularly or habitually engaging in a behavior without restriction, it is possible that any latent withdrawal symptoms which might otherwise arise under abstinence conditions might be masked. For withdrawal symptoms to manifest, a period of abstinence is required. Second, *relapse* refers to an individual losing control over a behavior and reverting to earlier patterns of behavior after a

² This chapter has been published in a peer-reviewed academic journal: Fernandez, D. P., Kuss, D. J., & Griffiths, M. D. (2020). Short-term abstinence effects across potential behavioral addictions: A systematic review. *Clinical Psychology Review*, 76, 101828. <https://doi.org/10.1016/j.cpr.2020.101828>

³ There are generally two ways by which abstinence may occur. First, through attempted self-restraint while still having immediate access to the behavior (e.g., a gamer internally committing to not play games while still having access to their electronic devices). Second, through physical separation from the behavior, where immediate access to the behavior is removed. Separation can be voluntary (e.g., the gamer surrendering their electronic devices to a friend) or involuntary, due to circumstances out of one's control (e.g., disrupted internet access forcing a state of abstinence from gaming).

period of abstinence. If an individual does not try to abstain from the behavior in the first place, relapse, by definition, cannot be observed. Third, *salience* refers to a behavior dominating an individual's thinking and feelings. Although in most cases salience can be observed in the absence of abstinence, Griffiths (2005) has argued that for behaviors such as smoking, where an individual has practically unrestricted access to the behavior under usual circumstances, salience (and the experience of craving that accompanies salience), may not manifest until the person is prevented from engaging in the behavior (e.g., on a 24-hour plane flight).

Accordingly, because some addiction-related symptoms (i.e., withdrawal, relapse, and salience/craving) only manifest (or manifest more strongly) under abstinence conditions, it is possible that they might be masked under non-abstinence conditions. In behavioral addiction research, retrospective and cross-sectional self-report questionnaires asking individuals whether they experience withdrawal symptoms, craving, or relapse are inherently limited if individuals generally do not engage in significant periods of abstinence in the first place. Instead, prospective studies of abstinence situations are particularly useful in allowing observation of these psychological phenomena as they may arise over an abstinence period. Naturally occurring periods of abstinence (e.g., intrinsically motivated cessation attempts) are useful for researchers to systematically observe where they do occur but may be rare depending on the behavior of interest. In their absence, abstinence can be experimentally manipulated in order to examine its effects. Prospective studies examining cognitive, affective, physical, and behavioral reactions to abstinence can be a useful methodological tool in systematically investigating addiction-related symptomatology, especially withdrawal, craving, and relapse (i.e., do these symptoms manifest, and if so, for whom, how, and why?).

3.1.2 Abstinence as a potential intervention for problematic behaviors

Beyond its use as a methodological tool, the possibility of abstinence also being a potentially useful intervention for problematic behaviors needs to be given due consideration within behavioral addiction treatment research. If a behavior is causing problems, abstaining from the behavior appears (at face value) to be a logical solution. For instance, 12-step groups based on the original Alcoholics Anonymous (AA) model advocate an abstinence approach to compulsive behaviors, although abstinence goals across these groups may not always be absolute and may be more nuanced, depending on the behavior involved (Browne, 1991; Efrati & Gola, 2018a). Some clinicians treating problematic sexual behavior have even suggested temporary (e.g., 90 days) ‘celibacy contracts’ of complete abstinence from any sexual behavior in early phases of treatment (Carnes, 1989). Historically, abstinence has also been the dominant long-term treatment goal within treatment settings for gambling disorder (Ladouceur et al., 2009).

However, there appears to be some consensus within the behavioral addiction field that controlled use, rather than complete abstinence should be the recommended long-term treatment goal for many behavioral addictions⁴, including gaming (King & Delfabbro, 2014), internet use (Young, 2007), SNS use (Andreassen, 2015), exercise (Berczik et al., 2014), shopping (Kellest & Bolton, 2009), work (Holland, 2007), and eating (Yau et al., 2014). For gambling disorder, controlled gambling is increasingly being advocated as a viable goal alongside traditional abstinence treatment goals (e.g., Stea et al., 2015). Commonly cited reasons for advocating controlled use over abstinence as a long-term goal include behaviors being (or becoming) an integral part of life and therefore not possible or unrealistic to go without (e.g., buying – Kellest & Bolton, 2009; technology use – Kuss & Griffiths, 2017;

⁴ It is worth noting that ‘relapse’ has different meanings depending on the intended goal (i.e., abstinence or controlled use). In the case of abstinence, any re-engagement in the behavior is typically regarded as relapse. For controlled use, relapse is usually defined as a violation of predetermined moderation goals – for example, gaming more frequently or for longer durations than previously agreed upon (see Rosenberg & Feder, 2014 for further discussion).

Young, 2007; work – Holland, 2007), or having health benefits that would be lost through abstinence (e.g., exercise – Berczik et al., 2014) .

Abstinence as a temporary intervention, on the other hand, has not received as much attention within the empirical literature. Concerns about the viability of abstinence as a long-term goal does not preclude the possibility that short-term periods of abstinence could be beneficial, depending on the behavior in question. The crucial difference is that with short-term abstinence the goal in many cases would be to return to controlled use following the abstinence period. Temporarily disentangling from continued, unrestrained engagement in a behavior could, theoretically, undo to a specific extent negative effects caused by excessive engagement in the behavior (e.g., Wilson, 2016) or enhance self-awareness or insight into the behavior. Abstinence tasks also require practicing self-control, which might increase capacity for self-control strength (Muraven & Baumeister, 2000), and successful abstinence attempts might increase abstinence/avoidance self-efficacy (e.g., Hodgins et al., 2004; Kraus et al., 2017). These potential benefits remain speculative, but are certainly worth empirical scrutiny. All in all, short-term abstinence as a temporary intervention need not be conflated with long-term abstinence as an indefinite treatment goal and can be regarded as separate interventions.

Nonetheless, attempted periods of short-term abstinence, while plausibly having benefits, may also have adverse or counterproductive consequences. For example, individuals who attempt quitting a behavior ‘cold turkey’ may lack effective coping skills in dealing with withdrawal symptoms and engage in harmful behavior as a result. A recent report indicated that gamers might engage in compensatory behaviors (e.g., searching for gaming-related pornography) during periods of ‘forced abstinence’ from gaming (Castro-Calvo et al., 2018). It is entirely possible that across different behaviors, individuals respond to the unpleasant experience of withdrawal by engaging in compensatory behaviors that might sometimes cause equal or more harm (e.g., binge drinking to cope with gambling cravings). Not

knowing how to deal adaptively with lapses or slips during periods of abstinence might also lead to counterproductive consequences – for example, the phenomenon of the abstinence violation effect (Marlatt & Gordon, 1985) might cause a lapse to progress to a full-blown relapse (e.g., Sharma & Anand, 2019). Consequently, it may be possible that abstinence on its own, when it is not part of an intervention that teaches effective coping skills for dealing with withdrawal, cravings, or lapses, might cause more harm than good. It is also worth noting that there have been concerns raised by food addiction and sex addiction researchers that the goal of abstinence in and of itself (in relation to these specific behaviors) may have harmful effects – abstinence from specific foods potentially leading to patterns of disordered eating (Schulte et al., 2016), or even temporary sexual celibacy contracts potentially leading to negative attitudes towards sexuality (Coleman, 1990; Kingston & Firestone, 2008). Therefore, understanding potential adverse effects of these abstinence periods, and even abstinence as an approach in and of itself, irrespective of time frame, is vital before its viability as a potential intervention can be properly weighed.

3.1.3 The present study

Taken together, because psychological reactions to abstinence might be indicative of addiction symptomatology (i.e., withdrawal, relapse, and salience/craving), and abstinence in the short-term may be a potentially useful intervention for problematic behaviors, there is a need to systematically review the psychological effects of abstinence and evaluate the extent to which these effects might inform behavioral addiction assessment and treatment.

There have been numerous reviews on the effects of abstinence from exercise over the years (e.g., Antunes et al., 2011; Hausenblas & Downs, 2002; Morgan et al., 2018; Szabo, 1995; Weinstein et al., 2017). However, to date, there has been no systematic review of the effects of abstinence across multiple potential behavioral addictions. The present review sought to address this gap by reviewing the current state of knowledge on the effects of

abstinence from behaviors most commonly investigated within behavioral addiction research. While having significant implications for behavioral addiction treatment research, the effects of long-term abstinence falls outside the scope of the present review. The present review instead focuses on short-term abstinence (hereafter termed ‘abstinence’ unless otherwise specified). Short-term abstinence, for the purposes of the present review, refers to two kinds of abstinence periods. The first refers to the first four weeks of a non-temporary, indefinite abstinence period (i.e., a genuine cessation attempt). This may be regarded as ‘short-term’ because while participants are intending to quit the behavior completely, the focus here is on the experience of early abstinence. A four-week period was chosen on the basis that the time course of acute withdrawal symptoms for substance addictions generally does not last beyond this period (Hughes et al., 1994). Consequently, it can be reasonably extrapolated that acute withdrawal symptoms for behavioral addictions (if any do manifest) would also not persist beyond a four-week period. The second refers to any temporary abstinence period, irrespective of time frame, which may also be regarded as ‘short-term’ because participants are only trying to quit a behavior temporarily. This includes studies that experimentally manipulate abstinence, since participants are only instructed to abstain from the behavior for a predetermined amount of time. Studies that have examined abstinence as a temporary goal, even if the time frame exceeds the initial four-week acute withdrawal stage (e.g., a 90-day celibacy contract), are also of interest because they would be especially useful for evaluating temporary abstinence as a potential clinical intervention.

Abstinence effects across different addictive substances, while useful for comparison with behavioral addictions, are beyond the scope of the present review. The extant literature reviewing abstinence effects in relation to withdrawal and relapse for substances is substantial, particularly in relation to tobacco (e.g., Hughes, 2007a, b). Withdrawal syndromes for most addictive substances are also well-established (for comparisons across

substances, see Hughes et al., 1994; Shmulewitz et al., 2015; West & Gossop, 1994). The relationships between withdrawal, craving and relapse in substance use are complex and have been reviewed and discussed extensively elsewhere (e.g., Patten & Martin, 1996a; Piasecki, 2006; Serre et al., 2015; Wray et al., 2013). However, it is important to bear in mind for this review that the term ‘withdrawal’ may have a somewhat different meaning for behavioral addictions when compared with substance addictions. Unlike substance addictions, behavioral addictions do not involve direct contact with brain synapses through the introduction of an exogenous ligand, but instead alter endogenous ligand functions. Neurotransmitter release may become dependent on repeated engagement in the behavior, which may lead to ‘withdrawal-like’ symptoms when the behavior is ceased (see Sussman, 2017 for further discussion of this issue).

The aims of the present review can therefore be summarized as follows: (i) review the existing literature examining effects of abstinence from potential behavioral addictions (namely gambling, gaming, technology use, sex, pornography use, exercise, work, eating, and buying); (ii) evaluate these effects in relation to addiction symptomatology (i.e., withdrawal, relapse, and salience/craving), along with potential benefits or counterproductive consequences; and (iii) discuss implications of these findings for behavioral addiction assessment and treatment.

3.2 Method

Papers were identified via electronic database searches of *Scopus*, *Web of Science*, *PubMed*, *PsycArticles* and *PsycInfo*. In order to identify papers examining abstinence from behaviors commonly investigated within behavioral addiction research (i.e., gambling, gaming, technology use, sex, pornography use, exercise, work, buying, and eating) while excluding substance addiction literature, we used the following search terms: (patholog* OR problem* OR addict* OR compulsiv* OR dependen* OR disorder) AND (gambling OR

gaming OR internet OR technolog* OR sex* OR pornography OR exercise OR work OR shopping OR buying OR food) AND (abstinen* OR abstain) NOT (drug* OR substance OR alcohol* OR nicotine OR smok* OR opioid OR opiate OR heroin OR cocaine OR cannabis OR marijuana OR amphetamine). The search terms yielded 1,991 results in total.

Studies were first screened for relevance by reviewing titles and abstracts. Full-text papers were then assessed for eligibility based on the following inclusion criteria: (i) published in English; (ii) published in a peer-reviewed journal; (iii) examined psychological effects of short-term abstinence (whether through self-restraint or separation) from gambling, gaming, internet use, sex, pornography use, exercise, work, shopping (buying), or eating – either through employing abstinence as an independent variable in order to isolate its effects, or by examining abstinence-induced effects, i.e., psychological phenomena that occur under abstinence conditions; and (iv) utilized a prospective design in examining either experimentally manipulated or naturally occurring abstinence.

Papers were excluded if (i) abstinence was examined in the context of a specific non-addiction psychopathology (e.g., masturbation prohibition examined in the context of pedophilia – Brown et al., 1996); (ii) abstinence effects resulting from an attempt to quit the behavior completely were not assessed within the first four weeks (e.g., Kushnir et al., 2018) because they do not fall within the operational definition of ‘short-term abstinence’ used for this review; (iii) abstinence was examined as an outcome variable or dependent variable, where the focus was not on abstinence effects, but on a different independent variable (e.g., number of days abstinent as an outcome variable, as an indicator of CBT vs. 12-step treatment effectiveness – Toneatto & Dragonetti, 2008); (iv) abstinence was employed as part of a larger treatment intervention consisting of multiple therapeutic components (e.g., Kim et al., 2012; Sakuma et al., 2017; Uhls et al., 2014) on the basis that any effects observed cannot be directly attributed to abstinence; (v) abstinence effects were examined through

retrospective or cross-sectional designs. For example, in terms of gambling, studies using retrospective surveys typically report a range of negative abstinence effects generally characterized by restlessness, irritability and mood disturbances (e.g., Blaszczynski et al., 2008; Cunningham-Williams et al., 2009; Rosenthal & Lesieur, 1992; Wray & Dickerson, 1981). Studies using cross-sectional designs might attempt to infer possible abstinence effects by comparing differences in various outcomes between abstinent individuals and non-abstinent individuals. However, retrospective designs are subject to several types of bias, and cross-sectional designs limit conclusive inferences about abstinence effects (for a discussion of the limitations of non-prospective designs, see Hughes, 2007c). Therefore, studies employing these designs were excluded from the present review.

Reference lists of included papers and exercise deprivation systematic reviews (Antunes et al., 2011; Hausenblas & Downs, 2002; Morgan et al., 2018; Szabo, 1995; Weinstein et al., 2017) were also searched to identify further relevant studies. Figure 3.1 depicts the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram summarizing the systematic search process.

3.3 Results

A total of 46 papers comprising 47 studies met the inclusion criteria and were included in the present review. A large majority of studies examined abstinence effects in relation to exercise ($n = 22$), followed by electronic media (i.e., mobile phone or social media) use ($n = 13$), gaming or gambling ($n = 9$), and pornography use ($n = 3$). The systematic search strategy used did not identify any papers examining abstinence from sex, work, shopping (buying), or food. The terms ‘abstinence’, ‘deprivation’ and ‘restriction’ appeared to be used interchangeably across studies to describe similar protocols where the goal was ensuring participants did not engage in the behavior. A total of 39 studies employed a self-restraint protocol (where there was still immediate access to the behavior), six

employed a separation protocol (where immediate access to the behavior was removed), and two employed a combination of self-restraint and separation protocols across different

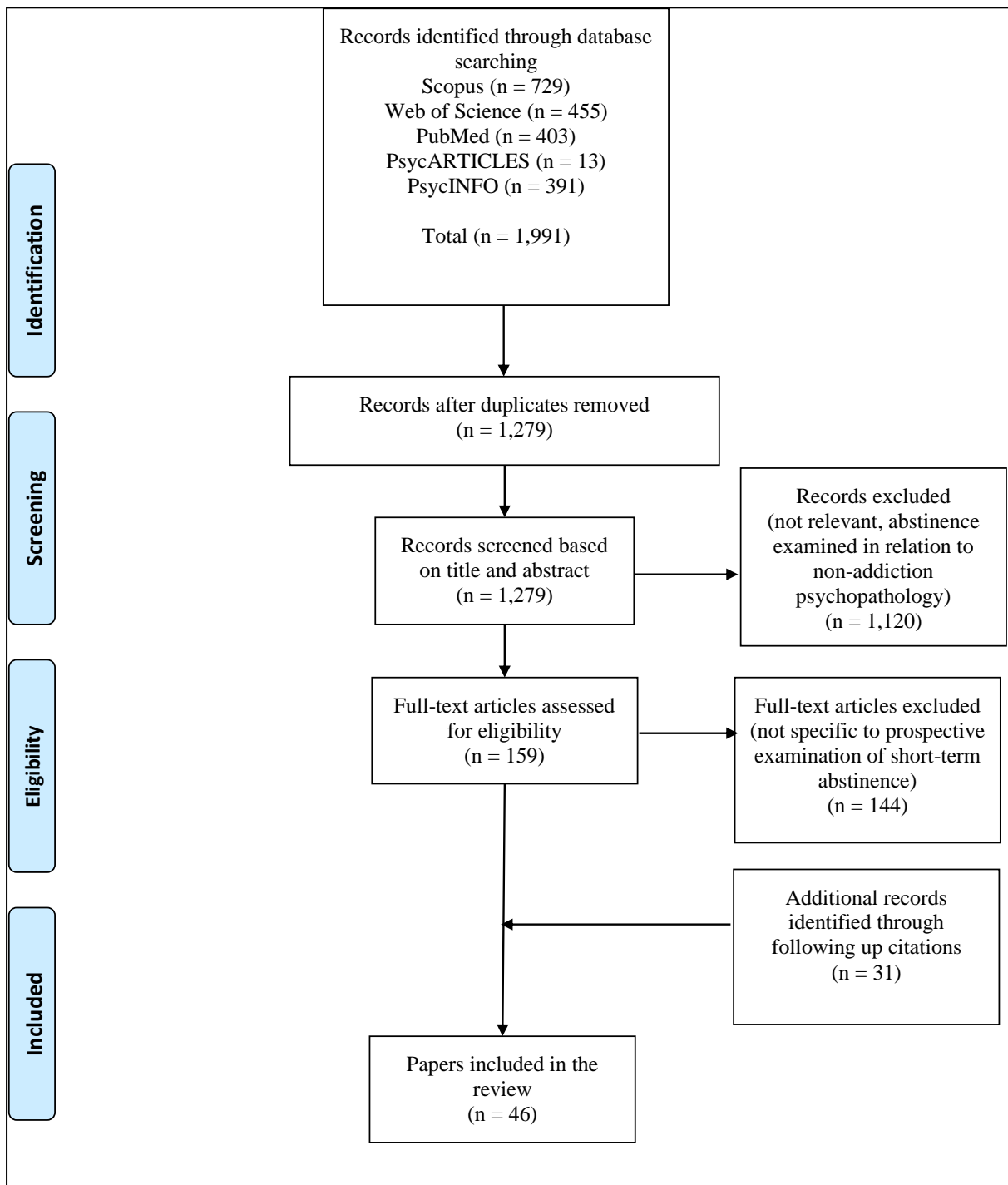


Figure 3.1. PRISMA flow diagram depicting the systematic search process.

experimental conditions. Most of the studies ($n = 41$) experimentally manipulated abstinence in some way, while six studies prospectively examined naturally occurring abstinence. Forty-

five studies examined temporary abstinence, while two studies examined abstinence effects within the first three weeks of an indefinite cessation attempt. Duration of abstinence ranged from four minutes to 99 days. All studies used participant samples who were presumed to be at least regularly engaged in the behavior.

Table 3.1 summarizes abstinence effects across all six behaviors (see Appendix B for detailed methodological characteristics and findings of each study). Most of the studies ($n = 43$) examined abstinence effects potentially indicative of withdrawal (i.e., negative cognitive-affective/physical reactions to abstinence). However, less than half of these ($n = 21$) conceptualized these effects in their studies explicitly as ‘withdrawal symptoms’. Four studies examined abstinence-induced craving but did not explicitly conceptualize craving as a withdrawal symptom, while five studies explicitly conceptualized craving as a withdrawal symptom. Only two studies directly assessed relapse. Nonetheless, even if studies did not set out to directly assess relapse, abstinence non-compliance rates (where reported) are noted among the relevant findings as an indicator of potential relapses. ‘Relapse’ is defined as any engagement in the behavior during the abstinence period. Most of the studies ($n = 33$) considered an addiction framework in their interpretation of abstinence effects, while the remaining studies ($n = 14$) utilized a non-addiction perspective, never explicitly mentioning addiction-related concepts.

Table 3.1
 Summary of abstinence effects across behaviors

	Abstinence protocols (duration, type)	Negative cognitive-affective/physical effects	Negative behavioral effects	Positive effects	Theoretical interpretations of effects
<i>Exercise</i> (<i>n</i> = 22)	24 hrs ^{2,41} 26-30hrs ¹⁰ 2-5 days ⁹ 3 days ^{20,29,32} 5 days ¹⁰ 7 days ^{18, 19,26, 38,39,46} 7-14 days ³ 10 days ¹ 2 wks ^{6,25,30,33,45} 1 month ⁴ SR(all)	↑Depression ^{2,6,9,25,29,30,39,41,45} ↑Total mood disturbance (POMS) ^{6,9,25,29,33,39,45} ↑Fatigue ^{1,2,6,9,19,25,45} ↑Tension ^{2,9,29, 39} ↑Anxiety ^{4,29,30} ↑Anger ^{2,9,39} ↑Confusion ^{2,9,29} ↑Somatic symptoms ^{18,30} ↑Psychological distress ³³ ↑Need to be with others ⁴ ↑Tense arousal ³² ↑Sexual tension ⁴ ↑Galvanic skin response ⁴¹ ↑Body dissatisfaction ³² ↑Heart rate ³⁹ ↑Insomnia ³⁰ ↑Pain ¹⁹ ↑Non-articular tenderness ⁴⁶ ↑Strained feelings ³⁰ ↓Vigor ^{2,9, 29, 39} ↓Appetite ⁴ ↓Sleep quality ⁴ ↓Hedonic tone, energetic arousal ³² ↓Quality of life ⁴⁶ ↓Positive affect ³⁹	<u>Abstinence non-compliance rates:</u> 0% ^{30,32,39} , 7.5% ²⁰	<u>Moderating/interaction effects</u> <ul style="list-style-type: none"> Females, lower competition levels ↑positive moods¹⁰ High-dependence/high-commitment runners ↓mood disturbances⁹ ‘True’ deprivation days ↑positive engagement and revitalization (compared to ‘non-exercise’ days)²⁰ Low dependence ↑positive engagement, revitalization, tranquility²⁰ 	<u>Negative effects</u> Addiction-related withdrawal ^{2,3,9,10,26,30, 39,41} Non-addiction-related ‘withdrawal’ ^{20,29} Negative health outcomes ^{1,6,32} Biological determinants ^{3,19,25,33,45,46} Beneficial effects of exercise lost ³⁰ <u>Positive effects</u> Relief from fatigue ¹⁰ Relief from obligation ²⁰
		<u>Moderating/interaction effects</u> <ul style="list-style-type: none"> Males, higher competition levels ↑negative moods¹⁰ Low commitment-high dependence runners ↑mood disturbances⁹ 			

- Hypoactive biological stress response system ↑fatigue, ↑pain, ↑mood disturbances¹⁹
- Exercise addiction ↑anxiety²⁶, ↑tension², ↑anger^{2,3}, ↑depression^{2,3,26}, ↑heart rate², ↑sympathetic activity²⁶, ↑confusion^{2,3}, ↑fatigue³, ↓bioelectrical activity²⁶, ↓vigor³

Trajectory of effects

- By Day 3, anxiety, tension, depression and total mood disturbance decreased²⁹
- Somatic symptoms (wk 1) preceded onset of cognitive-affective symptoms (wk 2)^{6,30}

<i>Gambling</i> (n = 2)	5 – 21 days ^{12,40} SR ^{12,40}	Gambling craving more severe than alcohol craving ^{12,40} , dependent on external factors ¹² , related to unpleasant arousing state ¹² and depression ⁴⁰	NR	NR	<u>Negative effects</u> Addiction-related craving ^{12,40}
<i>Gaming</i> (n = 7)	4 mins ¹⁴ 84 hrs ^{16, 21,22,23} IVSP ^{13,14} SR ^{16,21,22,23}	↑Boredom ^{16, 22} ↑Drive for mental stimulation ²² ↑Craving ²² <u>Moderating/interaction effects</u> <ul style="list-style-type: none"> • IGD group ↑lentiform activation¹³, ↑withdrawal symptoms²¹ • Females ↑RGU-IGD differences in craving-related functional connectivity¹⁴ <u>Trajectory of effects</u> <ul style="list-style-type: none"> • Withdrawal symptoms declined over time in both abstinence and control groups¹⁶ • Withdrawal symptoms declined over time in both IGD and non-IGD groups²¹ 	<u>Abstinence non-compliance rates:</u> 0% ^{21, 22, 23} , 83% ²⁴ Use of action shooting games, endorsement of IGD withdrawal criterion at baseline ↑abstinence non-adherence ²⁴	↑Insight/attitude shifts towards gaming ^{16, 22} ↑Positive changes to gaming post-abstinence ^{16, 22, 23} ↑Free time for other activities ^{16, 22} ↓IGD symptoms ²³ ↓Maladaptive gaming cognitions ²³	<u>Negative effects</u> Addiction-related withdrawal ^{16, 21, 22, 24} Addiction-related craving ^{13,14} Structural characteristics of games ²⁴ <u>Positive effects</u> Abstinence useful intervention ^{16, 22, 23} Potential role of self-monitoring ^{16, 23}

<p><i>Mobile phone use</i> ($n = 6$)</p> <p>3-5 mins³⁴ 5 mins⁸ 60 mins^{7,11} 72 hrs¹⁵ 3/5 days³⁶</p> <p>SR³⁶ VSP^{11,15} IVSP⁸ SR/VSP^{7,34}</p>		<p>↑Anxiety^{7, 8, 36} ↑Unpleasantness⁸ ↑Withdrawal symptoms¹⁵ ↑FoMO¹⁵ ↓Cognitive performance⁸ ↓Extended self⁸</p> <p><u>Moderating/interaction effects</u></p> <ul style="list-style-type: none"> • High text users ↑thoughts of texting³⁶ • When phone in sight ↑anxiety³⁴ • Heavy daily users ↑anxiety; moderate daily users ↑anxiety only for VSP condition⁷ <p><u>Trajectory of effects</u></p> <ul style="list-style-type: none"> • Withdrawal symptoms and FoMO reduced over time for abstinence and control groups¹⁵ 	<p>NR</p>	<p>↑Attainment of study goals¹¹</p>	<p><u>Negative effects</u> Addiction-related withdrawal¹⁵ Separation anxiety⁷ FoMO⁷ Phone as extension of self^{8, 15} 'Attachment' to phone³⁴ Non-pathological reliance on technology for communication³⁶</p> <p><u>Positive effects</u> Alleviation of negative effects attributed to mobile phone use¹¹</p>
<p><i>Pornography use</i> ($n = 3$)</p> <p>14 days¹⁷ 3 weeks^{27,31}</p> <p>SR^{17,27,31}</p>		<p>↑Perceived compulsivity¹⁷</p>	<p><u>Frequency of use during abstinence:</u> $M = 2.50, SD = 2.92$¹⁷ $M = 1.42, SD = .67$²⁷ $M = 1.53, SD = .83$³¹</p> <p>Self-reported compulsivity predicted by number of relapses when abstinence effort high¹⁷</p>	<p>↑Relationship commitment²⁷ ↑Perceived compulsivity – may reflect insight into actual compulsivity in one's own behavior¹⁷ ↓Delay discounting³¹</p>	<p><u>Negative effects</u> Addiction-related craving, relapse¹⁷</p> <p><u>Positive effects</u> Alleviation of negative effects attributed to pornography use^{27,31} Abstinence useful behavioral experiment¹⁷</p>
<p><i>Social media use</i> ($n = 7$)</p> <p>48 hrs³⁵ 7 days^{37, 42, 43, 44} 14 days²⁸ 99 days⁵</p>		<p>↑Subjective feelings of 'withdrawal'⁵ ↑Boredom³⁷ ↑Craving³⁷ ↑Social pressure to use social media³⁷ ↑Time distortion⁴³</p>	<p><u>Abstinence non-compliance rates:</u> 13%⁴², 23%³⁵, 31%⁵, 36.4%⁴³, 38.2%⁴⁴, 59%³⁷</p>	<p>↑Life satisfaction⁴² ↑Affective well-being⁴² ↓Perceived stress⁴⁴</p> <p><u>Moderating/interaction effects</u></p>	<p><u>Negative effects</u> Addiction-related withdrawal^{5, 37}, homeostasis violation⁴³ FoMO³⁷</p>

SR^{5, 35, 37, 42, 43, 44}
VSP²⁸

↓Sense of connection³⁵

Moderating/interaction effects

- Users at-risk for social media addiction
↑post-abstinence time distortion⁴³

Greater disconnection during abstinence ↑usage post-abstinence³⁵

Baseline frequency of use, negative moods during abstinence, addiction-related feelings ↑likelihood of reversion⁵

Facebook switching-stress during abstinence
↓intentions to discontinue use²⁸

Excessive use⁴⁴, higher stress during abstinence⁴⁴, increase in time distortion during abstinence⁴³
↓abstinence length

- Heavy users, passive users, users who envy others ↑life satisfaction, ↑affective well-being⁴²
- Excessive users
↓perceived stress⁴⁴

Use motivated by negative affect^{5,28,35,44}

Positive effects

Alleviation of negative effects attributed to social media use^{42, 44}

Note:

↑ indicates significant increase compared to baseline/significantly greater compared to comparison group/significant positive association/perceived abstinence-induced increase; ↓ indicates significant decrease compared to baseline/significantly lower compared to comparison group/significant negative association/perceived abstinence-induced reduction; FoMO: fear of missing out; IGD: Internet Gaming Disorder; IVSP: involuntary separation; NR: not/none reported; POMS: Profile of Mood States; RGU: recreational game use; SR: self-restraint; VSP: voluntary separation.

Studies: 1: Ablin et al. (2013); 2: Aidman & Woollard (2003); 3: Antunes et al. (2016); 4: Baekeland (1970); 5: Baumer et al. (2015); 6: Berlin et al. (2006); 7: Cheever et al. (2014); 8: Clayton et al. (2015); 9: Conboy (1994); 10: Crossman et al. (1987); 11: Cutino & Nees (2017); 12: de Castro et al. (2007); 13: Dong et al. (2019a); 14: Dong et al. (2019b); 15: Eide et al. (2018); 16: Evans et al. (2018); 17: Fernandez et al. (2017); 18: Gauvin & Szabo (1992); 19: Glass et al. (2004); 20: Hausenblas et al. (2008); 21: Kaptis et al. (2016a); 22: King et al. (2016); 23: King et al. (2017); 24: King et al. (2018); 25: Kop et al. (2008); 26: Krivoschekov & Lushnikov (2017); 27: Lambert et al. (2012); 28: Maier et al. (2015); 29: Mondin et al. (1996); 30: Morris et al. (1990); 31: Negash et al. (2015); 32: Niven et al. (2008); 33: Poole et al. (2011); 34: Sapacz et al. (2016); 35: Sheldon et al. (2011); 36: Skierkowski & Wood (2012); 37: Stieger & Lewetz (2018); 38: Szabo & Gauvin (1992); 39: Szabo and Parkin (2001); 40: Tavares et al. (2005); 41: Thaxton (1982); 42: Tromholt (2016); 43: Turel & Cavagnaro (2018); 44: Turel et al. (2018); 45: Weinstein et al. (2007); 46: Zeller et al. (2011)

3.3.1 Exercise

Apart from being the most extensively studied across the different behaviors in terms of total number of studies ($n = 22$), exercise abstinence was also studied the earliest, with the first study conducted almost 50 years ago (Baekeland, 1970). Overall, findings across the exercise studies showed a consistent pattern of negative cognitive-affective or physical effects due to abstinence. A total of 20 out of 22 studies reported withdrawal-like effects, with depression and/or mood disturbances ($n = 10$) followed by fatigue ($n = 7$) being the most commonly reported effects. Duration of abstinence did not appear to make a difference – negative effects were observed even after as few as 24 hours in two samples (Aidman & Woolard, 2003; Thaxton, 1982) and did not abate even over a two-week period across another two samples (Berlin et al., 2006; Morris et al., 1990). While a significant number of studies ($n = 11$) investigated these negative effects as potential withdrawal symptoms within an addiction framework, the remainder did not. Notable theoretical perspectives included interpreting these effects in light of potential biological determinants (e.g., Antunes et al., 2016; Glass et al., 2004; Kop et al., 2008; Poole et al., 2011; Weinstein et al., 2007; Zeller et al., 2011), or as negative non-addiction-related health outcomes resulting from not exercising (Ablin et al., 2013; Berlin et al., 2006; Niven et al., 2008). Across all behaviors examined in the present review, only negative abstinence effects from exercise have been interpreted from a biological perspective. Notably, benefits of abstinence related to positive affective shifts were reported across only two studies (Crossman et al., 1987; Hausenblas et al., 2008).

Craving and relapse were never directly examined by any of the studies, even in studies investigating exercise addiction. However, in one study (Hausenblas et al., 2008), although only non-exercise-dependent participants were included in the sample, 7.5% of participants did not fully comply with the abstinence protocol, suggesting that some may have relapsed.

3.3.2 Gambling

Given that gambling is the most extensively researched behavioral addiction, it is arguably surprising that only two studies (i.e., de Castro et al., 2007; Tavares et al., 2005) were identified that met the present review's inclusion criteria. Both studies found that the gamblers had higher craving scores compared to the alcohol-dependent participants during early abstinence (5–21-day period). An important implication found across both studies was that the nature of gambling craving differs from alcohol craving during early abstinence.

3.3.3 Gaming

Four of the seven gaming studies used a similar 84-hour self-restraint protocol (Evans et al., 2018; Kaptsis et al., 2016a; King et al., 2016; King et al., 2017), the findings of which have important implications for understanding the nature and trajectory of gaming withdrawal, and short-term abstinence as a potential clinical intervention. It should be noted that three of these studies (i.e., King et al., 2016; Kaptsis et al., 2016; King et al., 2017) used the same sample. In one sample (King et al., 2016), the nature of qualitatively reported withdrawal symptoms (i.e., craving, boredom, and drive for mental stimulation) were inconsistent with DSM-5 conceptualizations of withdrawal (i.e., sadness, irritability, anxiety). Across two samples (Kaptsis et al., 2016a; Evans et al., 2018), withdrawal-related symptomatology declined over time, regardless of IGD status (Kaptsis et al., 2016a), or whether assigned to the abstinence or control group (Evans et al., 2018). This suggests that withdrawal-related symptomatology (i.e., craving) may paradoxically manifest more strongly during periods of intensive gaming compared to abstinence, potentially due to reinforcers during game-playing which maintain craving to keep playing (Kaptsis et al., 2016a). The finding that withdrawal symptoms declined in the control group as well is somewhat counterintuitive, and was attributed to either self-monitoring playing a role, or defensive responding (Evans et al., 2018). Importantly, positive abstinence effects were reported across

both samples, including an increase in attitudinal shifts towards gaming, positive behavioral changes to gaming post-abstinence and free time for other activities (King et al., 2016; Evans et al., 2018), along with a decrease in maladaptive gaming cognitions and IGD symptoms (King et al., 2017). Notably, two of these gaming studies (Evans et al., 2018; King et al., 2017) were the only studies in the present review to directly investigate the possibility of using short-term abstinence as an intervention for a problematic behavior (i.e., gaming). Complete compliance with the abstinence protocol was reported in both samples, which means that even IGD participants did not relapse. This was in contrast with another study that reported that up to 83% of an IGD sample did not adhere to their intention to abstain for a seven-day period (King et al., 2018). Non-abstainers in this sample were more likely than successful abstainers to endorse the IGD withdrawal criterion at baseline, suggesting that abstinence non-adherence was possibly influenced by the experience of withdrawal.

Another two studies (Dong et al. 2019a, 2019b) using similar protocols both examined abstinence-induced craving-related processes in gamers using fMRI scans, immediately following involuntary separation from gaming. Findings across both studies suggest that examining craving-related processes in gaming, especially under deprivation conditions, is important for understanding the development and maintenance of IGD.

3.3.4 Mobile phone use

In general, abstinence durations for the mobile phone use studies were shortest compared to the other behaviors. Findings across most of the mobile phone use studies (5/6) were characterized by negative cognitive-affective reactions to abstinence. Withdrawal symptoms (assessed by an adapted cigarette withdrawal scale comprising dimensions relating to depression-anxiety, craving, irritability-impatience and difficulty concentrating) and FoMO were found in a 72-hour voluntary separation period (Eide et al., 2018). Withdrawal symptoms and FoMO reduced over the 72-hour period, but the finding that these symptoms

reduced over time for the control group as well suggest that a third variable (e.g., self-monitoring due to daily measures administered) may have played a role in influencing trajectories of symptoms. Importantly, the most common effect found across the studies was anxiety-related reactions. Apart from a single study that found a 60-minute voluntary self-restraint period increased attainment of study goals during a study period (a positive effect of abstinence) but had no effect on anxiety (Cutino & Nees, 2017), four studies found anxiety-related reactions to abstinence. Duration and type of abstinence did not appear to make a difference, with anxiety-related reactions reported over a 3- to 5-day self-restraint period (Skierkowski & Wood, 2012), but also within as little as a 3- to 5-minute self-restraint period (Sapacz et al., 2016), a 5-minute involuntary separation period (Clayton et al., 2015), and 60-minute voluntary separation and self-restraint periods (Cheever et al., 2014). The hypothesis that these anxiety reactions indicate addiction-related withdrawal symptoms was not endorsed by any of the authors due to various plausible theoretical explanations for these reactions. The authors proposed that abstinence-induced anxiety may be explained by a non-pathological reliance on text messaging for communication (Skierkowski & Wood et al., 2012), separation anxiety (Cheever et al., 2014), one's phone being an extension of self (Clayton et al., 2015) based on extended self-theory (Belk, 2013), or fear of missing out (FoMO; Przybylski et al., 2013).

Abstinence compliance rates were not reported across most studies. This is likely because separation protocols (e.g., Eide et al., 2018) render lapses highly unlikely, although still theoretically possible (e.g., using someone else's mobile phone), or where self-restraint conditions were employed, the duration of abstinence was short (e.g., 60 minutes [Cheever et al., 2014]; 3-5 minutes [Sapacz et al., 2016]). In one sample, there was no difference between high-texting and low-texting users on abstinence non-compliance rates (Skierkowski &

Wood, 2012), but the authors speculate that this could be due to participants being dishonest about possible lapses due to fear of losing full credit for study participation.

3.3.5 Pornography use

Studies investigating pornography abstinence were limited in number ($n = 3$) but provide evidence that there may be some benefits of short-term abstinence from pornography. Two studies using similar three-week self-restraint protocols found positive effects of abstaining from pornography namely greater relationship commitment (Lambert et al., 2012) and less delay discounting (Negash et al., 2015). These effects were interpreted as alleviation of negative effects attributed to pornography use. Not all participants in both studies complied fully with the abstinence protocol, suggesting that some may have relapsed. Notably, findings from the third study (Fernandez et al., 2017) suggest that a short-term self-restraint period could lead to insight about compulsivity in an individual's own patterns of behavior, through observing one's own reactions to abstinence (e.g., cravings/difficulty abstaining or relapses).

3.3.6 Social media use

Abstinence effects across the social media studies were mixed and inconsistent. Negative cognitive-affective reactions resembling withdrawal-like symptoms were found across four studies, including a decreased sense of connection (48-hour period – Sheldon et al., 2011), subjective feelings of withdrawal (99-day period – Baumer et al., 2015), accentuated time distortion, especially in participants 'at-risk' for social media addiction (7-day period – Turel & Cavagnaro, 2018), and boredom, craving and pressure to be on social media (7-day period – Stieger & Lewetz, 2018). Two studies found positive effects resulting from a seven-day abstinence period, resembling alleviation of negative effects attributed to social media use, including greater life satisfaction and affective wellbeing (Tromholt, 2016) and reductions in perceived stress (Turel et al., 2018). Notably, these effects were more

pronounced for heavy/problematic users suggesting that that instead of producing withdrawal symptoms among this subset of users, abstaining from *Facebook* may have a positive impact on affective states. Duration of abstinence did not appear to account for any differences in outcomes.

The high rates of non-compliance with the abstinence protocols across five studies, ranging from 13% to 59%, suggest a likely possibility that many regular social media users relapse when attempting to abstain from social media. There was some evidence that the likelihood of experiencing relapse was higher for individuals with frequent baseline use (Baumer et al., 2015) or problematic use (Turel et al., 2018). A significant pattern found across three studies was that relapse/reversion to social media appears to be motivated by the experience of negative affect during abstinence (Baumer et al., 2015; Maier et al., 2015; Sheldon et al., 2011). Notably, one study reported a finding resembling a ‘rebound effect’, whereby participants who experienced larger increases in disconnection during abstinence engaged in more usage post-abstinence, even when compared to their baseline usage (Sheldon et al., 2011).

3.4 Discussion

The aim of the present study was to systematically review the current state of knowledge regarding abstinence effects from potential behavioral addictions, and to interpret these findings in relation to addiction-related symptomatology, along with potential benefits and/or counterproductive consequences of abstinence. A total of 47 prospective studies examining short-term abstinence effects from six different potential behavioral addictions (i.e., exercise, gaming, gambling, mobile phone use, pornography use and social media use) were reviewed. In general, there is a paucity of studies prospectively examining abstinence effects across these behaviors, with the exception of exercise, which has gradually built up a relatively substantial body of research over the past 50 years. Therefore, any conclusions

drawn from the findings of the present review are necessarily tentative. Overall, both negative and positive consequences to abstinence were found across the studies, depending on the specific behavior being examined. Evaluation of the findings in relation to addiction symptomatology, along with potential benefits and counterproductive consequences are discussed below.

3.4.1 Withdrawal and craving

Negative cognitive-affective or physical reactions to abstinence possibly indicative of withdrawal symptoms were found to varying extents across five of the behaviors (i.e., exercise, gambling, social media use, mobile phone use and gaming) in participant samples who were generally considered to be at least regularly engaged in these behaviors. These negative effects were typically observed irrespective of total duration and type of abstinence (naturally occurring vs. experimentally manipulated, and voluntary/involuntary separation vs. self-restraint). Across all behaviors, exercise demonstrated the clearest and most consistent pattern of withdrawal-like symptoms, mainly related to depression and mood disturbances. While there have been alternative theoretical explanations for these effects within mental health frameworks (Morgan et al., 2018; Weinstein et al., 2017), findings that these effects were more pronounced for exercise addicted participants suggest that if a withdrawal syndrome were to exist for exercise addiction, depression and mood disturbances would likely be a key symptom.

Firm conclusions cannot be drawn about withdrawal symptomatology for the remaining behaviors because there was a limited number of studies. Even across these few studies, evidence of clear and reliable patterns of withdrawal-related symptoms during abstinence was generally lacking. For instance, in terms of social media, withdrawal-like effects were found in some studies (Baumer et al., 2015; Sheldon et al., 2011; Stieger & Lewetz, 2018; Turel & Cavagnaro, 2018) but not in others (Tromholt., 2016; Turel et al.,

2018). For mobile phone use negative abstinence effects were mainly characterized by anxiety-related reactions which might resemble withdrawal symptoms (Cheever et al., 2014; Clayton et al., 2015; Sapacz et al., 2016; Skierkowski & Wood, 2012), but which had different plausible non-addiction theoretical explanations. For gaming, qualitative responses to abstinence were inconsistent with DSM-5 conceptualizations of withdrawal (King et al., 2016), emphasizing the importance of bottom-up approaches in the study of withdrawal symptomatology. In terms of trajectories, while exercise withdrawal symptoms did not abate and even increased over a 2-week period (Morris et al., 1990; Berlin et al., 2006), gaming and mobile phone withdrawal symptoms, rather than increasing, declined over the first few days (Kaptsis et al., 2016a; Eide et al., 2018; Evans et al., 2018). These findings confirm that trajectories of withdrawal symptoms across different behaviors are not always homogenous. However, it is important to note that because withdrawal symptoms also decreased similarly for gaming and mobile phone use non-abstaining control groups (Eide et al., 2018; Evans et al., 2018), third-variable explanations for the decrease in symptoms (e.g., daily self-monitoring) need to be ruled out.

Notable overlaps in negative abstinence effects across the behaviors included boredom (social media use and gaming), anxiety (mobile phone use and exercise), and FoMO (mobile phone use and social media use). However, craving was, by a significant extent, the most common abstinence-induced addiction-related symptom across the studies – found to varying extents across gambling, gaming, mobile phone use, and social media use studies. Historically, there has been some debate within substance addiction research as to whether craving should constitute a withdrawal symptom or not. For example, the DSM-IV (American Psychiatric Association, 1994) removed craving as a nicotine withdrawal symptom partially because craving also manifests during non-abstinence situations (Shmulewitz et al., 2013) with craving having later been added to the DSM-5 tobacco use

disorder criteria as a separate criterion from withdrawal (American Psychiatric Association, 2013). However, smoking research demonstrates that craving tends to intensify during abstinence periods (Shiffman et al., 2004), suggesting that there is a difference between craving under non-abstinence conditions and abstinence conditions. Similarly, theoretical models of addiction have posited that there is a difference between ‘cue-elicited craving’, resulting from a conditioned response to cues, and ‘withdrawal craving’, resulting from an unconditioned response to abstinence (Drummond, 2000). This distinction suggests that while craving may be conceptualized separately from withdrawal, it also makes sense to conceptualize craving as a component of withdrawal. Given that craving is an often-reported withdrawal symptom across different substances including cannabis (Haney, 2005) and nicotine (Piper, 2015), it would be unsurprising if craving also emerged as a key withdrawal symptom across different behavioral addictions. Therefore, it is important that behavioral addiction researchers account for craving in future abstinence studies.

It is noteworthy that withdrawal-like symptoms appeared to be present across four behaviors (i.e., exercise, social media, mobile phone use, and gaming) even for regular users who had no apparent indication of problematic use or addiction. Although these effects were found to be more pronounced for both exercise and gaming among addicted participants, the finding that habitual engagement in these behaviors has the ability to produce withdrawal-like symptoms is significant because it raises the possibility that some regular users may have developed enough of a dependency on the behavior such that negative affective states occur once the behavior has ceased. While these reactions may indeed be indicative of a masked underlying pathological dependency on the behavior (i.e., addiction), there is also the possibility that withdrawal-like symptoms may also result from a non-pathological dependency on the behavior. For instance, dependency on mobile phone use might be the result of an increasing reliance on technology within society at large for day-to-day

communication (Kuss, 2017). Or, negative emotional reactions might be expected to result from not being able to engage in a valued healthy activity (e.g., exercise; Szabo, 1995). It could also be that an over-reliance on a single behavior (e.g., gaming or social media use) to achieve a specific mood-modifying function (e.g., entertainment) could naturally result in boredom during abstinence (e.g., King et al., 2016; Stieger & Lewetz, 2018). In short, the presence of withdrawal-like symptoms during abstinence may indicate that there is some level of dependency on the behavior, but this does not automatically mean that the dependency is pathological or indicative of an underlying addiction. Ultimately, withdrawal symptoms alone are insufficient to determine the presence of addiction – it would be necessary to investigate whether other addiction symptoms (e.g., relapse and continued engagement in the behavior despite negative consequences) are present as well.

3.4.2 Relapse

In contrast to withdrawal and craving, relapse was not directly examined by the majority of the studies reviewed. Only two studies set out to directly investigate relapse in relation to pornography use (Fernandez et al., 2017) and social media use (Stieger & Lewetz, 2018). Most studies reported compliance and non-compliance rates with the abstinence protocols and rarely interpreted them in relation to potential relapses, except four studies (King et al., 2018; Skierkowski & Wood, 2012; Turel & Cavagnaro, 2018; Turel et al., 2018). Most studies were primarily concerned with achieving abstinence compliance to isolate the effects of abstinence in order to observe withdrawal symptomatology. Consequently, investigating lapses or relapses over an abstinence period has been relatively neglected within behavioral addiction research. Possible relationships between withdrawal symptoms and relapse were also rarely investigated, apart from a few social media studies (Baumer et al., 2015; Maier et al., 2015; Sheldon et al., 2011; Turel et al., 2018) and one gaming study (King

et al., 2018) that provided some indication that relapse/reversion behaviors may be motivated, to some extent, by the relief of negative affective states during abstinence.

In the present review, non-compliance rates with the abstinence protocol were evaluated as an indicator of potential relapses. Abstinence non-compliance was found to varying extents across exercise, gaming, social media, mobile phone use, and pornography studies. Rates as high as 59% non-compliance with a seven-day protocol were reported in a non-clinical sample of social media users (Stieger & Lewetz, 2018). There are of course many reasons for non-compliance – perhaps due to participants not committing fully to the abstinence protocol for various reasons, such as not being intrinsically motivated to abstain in the first place. However, for some participants, non-compliance with abstinence might be indicative of genuine relapses, suggesting the presence of compulsivity even among regular users who have no apparent problematic use. Interestingly, perfect compliance with an 84-hour self-restraint protocol was reported even among gamers with IGD symptoms (King et al., 2016), but up to 83% of participants with IGD symptoms in a separate sample were unable to maintain abstinence for a seven-day period (King et al., 2018). These disparate findings could be reasonably attributed to the duration of the abstinence period, where individuals with compulsive use might be able to maintain abstinence for a specific time period, but relapse only once a specific time threshold is passed.

3.4.3 Benefits and counterproductive consequences of abstinence

Another aim of the review was to assess the extent to which short-term abstinence may have utility as a potential intervention for problematic behaviors. While largely preliminary, findings of the present review suggest that short-term abstinence might have specific benefits for specific problematic behaviors (gaming, social media use, mobile phone use, and pornography use). As a general caveat, it is important to note that positive effects were only observed in studies where abstinence was voluntary in nature. It is possible that

any benefits of abstinence may to some extent be contingent on the individual feeling self-directed and in control over the abstinence experience.

Evidence of three different kinds of positive effects was found to varying extent depending on the behavior. First, there is some indication that abstinence might alleviate negative effects attributed to habitual engagement in the behavior for social media use (Tromholt et al., 2016; Turel et al., 2018), mobile phone use (Cutino & Nees, 2017), pornography use (Lambert et al., 2012; Negash et al., 2015), and exercise (Crossman et al., 1987). Second, abstaining from the behavior might facilitate self-awareness and insight into an individual's relationship with the behavior, including how the behavior may have been causing problems (pornography use – Fernandez et al., 2017; gaming – Evans et al., 2018; King et al., 2017). Third, abstaining from the behavior may lead to positive behavioral changes, both in terms of increased engagement in other activities during abstinence, and reductions in the behavior post-abstinence (gaming – Evans et al., 2018; King et al., 2016). Preliminary findings from a gaming study (i.e., King et al., 2017) in particular are encouraging because the present study appears to be the first to formally propose short-term abstinence as a clinical intervention for gaming, demonstrating clinically significant improvements in IGD symptoms within an IGD sample. This finding suggests that short-term abstinence could be a potentially useful intervention for other problematic behaviors as well – a possibility which future research needs to validate.

Caution is nonetheless warranted with regards to potential benefits of an abstinence period. Thorough examination of adverse effects resulting from abstinence is necessary before any conclusions can be drawn about its utility as an intervention. Three kinds of potentially adverse effects should be highlighted for future research to explore further. First, research would need to account for potential 'rebound effects', which can be defined as an increase in post-abstinence engagement in the behavior compared to baseline (see e.g., Burish

et al., 1981, and Carey et al., 1988, for investigations of rebound effects in relation to temporary abstinence from alcohol). A ‘rebound effect’ was found in one sample in relation to social media use for a specific subset of users (Sheldon et al., 2011) and warrants further examination in future research across different behaviors. Second, compensatory behaviors that are engaged in to deal with unpleasant feelings during an abstinence period (cf., Castro-Calvo et al., 2018) would also need to be accounted for by future research, in case there is potential switching to harmful alternative behaviors. Third, it is possible that abstinence may be beneficial only for specific problematic behaviors but may be counterproductive for others. Exercise is a good example to illustrate this point – positive effects were minimal and negative effects were substantial across the studies. Exercise has many health benefits that would be lost through abstinence, and it is plausible that any supposed benefit of abstinence gained might not outweigh the negative health impacts resulting from not exercising at all. It is also uncertain as to whether the act of abstaining in and of itself from specific behaviors (especially behaviors that are linked to innate biological drives, such as food and sex) might lead to the development of dysfunctional attitudes towards the behavior themselves (Coleman, 1990; Kingston & Firestone, 2008; Schulte et al., 2016). These concerns do not appear to have been empirically examined so far in the literature and research is needed to investigate their validity. Hence, generalizations about benefits across behaviors cannot be assumed.

3.4.4 Methodological considerations and recommendations for future research

Findings from the present review suggest that the effects of abstinence from different potential behavioral addictions remains largely underexplored when compared to substance abuse research. Future behavioral addiction research would especially benefit from adapting methodologies used successfully within substance addiction research. Given that nicotine/tobacco is likely the most extensively studied substance in relation to abstinence

effects with good methodological rigor (Ferguson & Shiffman, 2011; West & Gossop, 1994), key examples of smoking studies are provided as reference for this section.

Determining the presence and nature of withdrawal symptomatology in relation to different potential behavioral addictions would be a logical first step. Instead of using a primarily deductive approach where withdrawal symptoms are assumed to be homogenous across behaviors – open-ended questions would be useful for theory-building and mapping out idiosyncrasies of the abstinence experience across different behaviors. Specific quantitative measures of withdrawal would then need to be developed according to the specific behavior. Investigating the natural history and trajectory of withdrawal would be the next step (e.g., Shiffman et al., 2006).

Many of the studies included in the present review administered outcome measures at the end of an abstinence period, which is not optimal because self-reports would likely be substantially influenced by recall bias. Wherever possible, it is recommended that ecological momentary assessment (EMA; Shiffman et al., 2008) or at least daily diaries be used to ensure accuracy of self-reports across the abstinence period. EMA is increasingly being used in substance abuse research, with its fine temporal resolution rendering it particularly useful for investigating withdrawal symptoms, craving, and lapses and the inter-relationships between these (Ferguson & Shiffman, 2011). EMA is especially useful for observing temporal sequences, such as the antecedents of a lapse (e.g., how negative affect may be intensified in hours leading up to a lapse; Shiffman & Waters, 2004). This has the potential to answer research questions about whether withdrawal symptoms are predictive of lapses, and if so, which components of withdrawal (e.g., Piper et al., 2011), whether lapses in turn increase withdrawal-related symptoms (e.g., Robinson et al., 2019), and how lapses might lead to relapses (e.g., Kirchner et al., 2012). Any potentially useful or counterproductive benefits may profit from open-ended exploration by asking participants about their

perceptions of positive and negative aspects of the abstinence period (e.g., Evans et al., 2018; King et al., 2016). Any compensatory behaviors engaged in during abstinence would also need to be accounted for, and a post-abstinence period may be important for observing any potential behavioral rebound effects.

In terms of participant samples, comparisons between regular non-problematic users, and problematic users may be of interest in determining whether withdrawal symptoms, craving, and/or relapse are also present in regular users. Accounting for intrinsic motivation in participants is also important because research has shown that there are important psychological differences between experimenter-induced abstinence and genuine quit attempts (Hughes, 2007c). However, as Kaptsis et al. (2016a) have acknowledged, using clinical samples without first adequately understanding possible adverse effects in non-clinical populations is premature and should be avoided. Nonetheless, the goal over time would be to adopt these protocols for clinical samples, as these would likely demonstrate the strongest addiction symptomatology, and would have the most to gain from such an intervention.

Abstinence duration employed would likely depend on the regularity of the behavior. For example, mobile phone use may require shorter abstinence periods when compared to exercise because ‘regular’ mobile phone use would generally be engaged in with greater frequency (e.g., in total a few hours daily) compared to ‘regular’ exercise (e.g., five times a week). Ultimately, optimal duration would also depend on allowing abstinence to be of sufficient length to allow for emergence of addiction-related symptomatology, but not too long that participant recruitment and/or attrition might become a problem (Szabo, 1998). It might also be worth experimenting with different variations of abstinence manipulations – for example, abstinence at a stretch over a specific period of time (e.g., one week) versus intermittent abstinence (e.g., every alternate day over a two-week period). Partial abstinence

from specific behaviors could also be explored in order to compare whether it might have similar or differing effects to complete abstinence (e.g., instead of complete abstinence, abstaining only from a specific game, specific SNS, or a specific form of gambling).

3.4.5 Limitations

Limitations of the present review need to be highlighted. In order to limit the search results to a manageable number, the initial search term used to identify studies related to abstinence was “abstinen*” and did not include terminology that has been used interchangeably within the literature to describe a state of non-engagement in the behavior, e.g., ‘restriction’ or ‘deprivation’. Studies that did use alternative terms were identified primarily through reference lists of included papers and systematic reviews, and as a result, some studies might have been missed (e.g., in terms of food/eating, studies might use the term ‘food deprivation’ or ‘fasting’ instead of ‘abstinence’). However, from a practical standpoint it was not feasible to account for all variations of synonymous terms. Therefore, the search strategy used is a limitation. The inclusion of only prospective studies (and the exclusion of retrospective or cross-sectional studies) might result in an incomplete picture of addiction symptomatology (as reported in the literature across these different kinds of studies) for the different behaviors. However, the present review was not meant to be an exhaustive review of withdrawal symptoms, craving, and relapse – but to evaluate these symptoms only as they present themselves prospectively over short-term abstinence periods.

3.4.6 Conclusion

Generally, findings of the present review demonstrated that there is a paucity of prospective studies investigating abstinence effects in relation to different potential behavioral addictions, except for exercise. Findings suggest that withdrawal-related symptomatology can be observed for exercise more reliably than the other behaviors. Craving appears to be a key abstinence-induced symptom that needs to be explored in greater depth

within future abstinence studies. Importantly, the examination of relapse under abstinence conditions has generally been underexplored within behavioral addiction research. Finally, some preliminary evidence suggests that short-term abstinence may have benefits and could be useful as a clinical intervention for specific problematic behaviors. However, more empirical research is needed to more clearly understand positive effects and potential mechanisms of change, along with potential counterproductive or adverse consequences before its utility as a clinical intervention can be adequately determined.

PART III: EMPIRICAL STUDIES

Chapter 4

The pornography ‘rebooting’ experience: A qualitative analysis of abstinence journals on a pornography abstinence forum⁵

4.1 Introduction

Pornography use is a common activity in the developed world, with nationally representative studies showing that 76% of men and 41% of women in Australia reported using pornography within the past year (Rissel et al., 2016), and that 47% of men and 16% of women in the United States reported using pornography at a monthly-or-greater frequency (Grubbs, Kraus, et al., 2019). *PornHub* (one of the largest pornography websites) reported in their annual review that they received 42 billion visits in 2019, with a daily average of 115 million visits a day (Pornhub.com, 2019).

4.1.1 Problematic pornography use

Given the prevalence of pornography use, the potential negative psychological effects of pornography use have been the subject of increasing scientific attention in recent years. The available evidence generally indicates that although the majority of individuals who use pornography may do so without experiencing significant negative consequences, a subset of users may develop problems related to their pornography use (e.g., Bóthe, Tóth-Király, et al., 2020; Vaillancourt-Morel et al., 2017).

One primary self-perceived problem related to pornography use concerns addiction-related symptomatology. These symptoms generally include impaired control, preoccupation, craving, use as a dysfunctional coping mechanism, withdrawal, tolerance, distress about use,

⁵ This chapter has been published in a peer-reviewed academic journal: Fernandez, D. P., Kuss, D. J., & Griffiths, M. D. (2021a). The pornography “rebooting” experience: A qualitative analysis of abstinence journals on an online pornography abstinence forum. *Archives of Sexual Behavior*, 50(2), 711-728. <https://doi.org/10.1007/s10508-020-01858-w>

functional impairment, and continued use despite negative consequences (e.g., Bóthe et al., 2018; Kor et al., 2014). Problematic pornography use (PPU) is most often conceptualized in the literature as a behavioral addiction despite ‘pornography addiction’ not being formally recognized as a disorder (Fernandez & Griffiths, 2021). Nonetheless, the World Health Organization (WHO) recently included the diagnosis of compulsive sexual behavior disorder (CSBD) as an impulse control disorder in the eleventh revision of the *International Classification of Diseases* (ICD-11; World Health Organization, 2019), under which compulsive use of pornography might be subsumed. At the same time, it is important to note that research (Grubbs & Perry, 2019; Grubbs, Perry et al., 2019a) has shown that self-perceptions of being addicted to pornography might not necessarily reflect an actual addictive or compulsive pattern of pornography use. A model explaining pornography-related problems (Grubbs, Perry et al., 2019a) has suggested that although some individuals may experience a genuine pattern of impaired control in relation to their pornography use, other individuals may perceive themselves to be addicted to pornography due to moral incongruence (in the absence of a genuine pattern of impaired control). Moral incongruence occurs when an individual morally disapproves of pornography and yet engages in pornography use, resulting in a misalignment between their behavior and values (Grubbs & Perry, 2019). This incongruence might then lead to the pathologizing of their pornography use (Grubbs, Perry, et al., et al., 2019). However, it should also be noted that this model does not rule out the possibility that both moral incongruence and genuine impaired control may be present simultaneously (Grubbs, Perry, et al., 2019; Kraus & Sweeney, 2019).

Research has also indicated that some pornography users might find their pornography use problematic due to perceived negative consequences attributed to their pornography use (Twohig et al., 2009). PPU has also been referred to in the literature as any use of pornography that creates interpersonal, vocational, or personal difficulties for the

individual (Grubbs et al., 2015). Research on self-perceived adverse effects of pornography consumption has shown that some individuals report experiencing depression, emotional problems, decreased productivity, and damaged relationships as a result of their pornography use (Schneider, 2000). Although potential associations between pornography use and sexual dysfunctions are generally inconclusive (see Dwulit & Rzymiski, 2019b), self-perceived negative effects on sexual functioning have also been reported by some pornography users, including erectile difficulties, decreased desire for partnered sexual activity, decreased sexual satisfaction, and reliance on pornographic fantasies during sex with a partner (e.g., Dwulit & Rzymiski, 2019a; Kohut et al., 2017; Sniewski & Farvid, 2020). Some researchers have used terms such as ‘pornography-induced erectile dysfunction’ (PIED) and ‘pornography-induced abnormally low libido’ to describe specific sexual difficulties attributed to excessive pornography use (Park et al., 2016).

4.1.2 Abstinence from pornography as an intervention for PPU

One common approach to addressing PPU involves attempting to completely abstain from viewing pornography. Most 12-step groups adapted for problematic sexual behaviors tend to advocate an abstinence approach to the specific type of sexual behavior that is problematic for the individual, including pornography use (Efrati & Gola, 2018a). Within clinical interventions for PPU, abstinence is chosen by some pornography users as an intervention goal as an alternative to reduction/controlled use goals (e.g., Sniewski & Farvid, 2019; Twohig & Crosby, 2010).

Some limited prior research has suggested that there may be benefits to abstaining from pornography. Three studies that experimentally manipulated abstinence from pornography in non-clinical samples indicate that there may be some positive effects to short-term (2-3 weeks) abstinence from pornography (Fernandez et al., 2020), including greater relationship commitment (Lambert et al., 2012), less delay discounting (i.e., showing

preference for smaller and more immediate rewards rather than attaining larger but later rewards; Negash et al., 2016), and insight into compulsive patterns in one's own behavior (Fernandez et al., 2017). There have also been a handful of clinical reports where pornography users were asked to abstain from pornography for relief of sexual dysfunctions attributed to their pornography use, including low sexual desire during partnered sex (Bronner & Ben-Zion, 2014), erectile dysfunction (Park et al., 2016; Porto, 2016), and difficulty achieving orgasm during partnered sex (Porto, 2016). In most of these cases, abstaining from pornography provided relief from their sexual dysfunction. Collectively, these findings provide some preliminary evidence that abstinence could potentially be a beneficial intervention for PPU.

4.1.3 The 'rebooting' movement

Notably, over the past decade, there has been a growing movement of pornography users utilizing online forums (e.g., *NoFap.com*, *r/NoFap*⁶, *Reboot Nation*) attempting to abstain from pornography due to problems attributed to excessive pornography use (Wilson, 2014, 2016). 'Rebooting' is a colloquial term used by these communities that refers to the process of abstaining from pornography (sometimes accompanied by abstaining from masturbation and/or having an orgasm for a period of time) in order to recover from the negative effects of pornography (Deem, 2014b; NoFap.com, n.d.). This process is called 'rebooting' to connote imagery of the brain being restored to its original 'factory settings' (i.e., before the negative effects of pornography; Deem, 2014b; NoFap.com, n.d.). Online forums dedicated to 'rebooting' were founded as early as 2011 (e.g., *r/NoFap*, 2020) and membership on these forums have been growing rapidly since. For example, one of the largest English-language 'rebooting' forums, the subreddit *r/NoFap*, had approximately 116,000 members in 2014 (Wilson, 2014), and this number has grown to more than 500,000

⁶ Forums that have an 'r/' prefix are known as 'subreddits', online communities on the social media website Reddit that are dedicated to a specific topic.

members as of 2020 (r/NoFap, 2020). However, what has yet to be adequately addressed within the empirical literature is what specific problems are driving an increasing number of pornography users on these forums to abstain from pornography in the first place, and what the pornography ‘rebooting’ experience is like for these individuals.

Previous studies utilizing a diverse range of samples might provide some insight into the motivations and experiences of individuals who attempt abstinence from pornography and/or masturbation. In terms of motivations for abstinence, abstinence from pornography was shown to be driven by a desire for sexual purity in a qualitative study of Christian men (i.e., Diefendorf, 2015), while a qualitative study of Italian men on an online ‘pornography dependence’ recovery forum showed that abstinence from pornography was motivated by perceptions of addiction and significant negative consequences attributed to pornography use, including impairment in social, occupational, and sexual functioning (Cavaglioni, 2009). In terms of meanings associated with abstinence, a recent qualitative analysis of narratives of religious men’s pornography addiction recovery showed that they made use of both religion and science to make sense of their perceived addiction to pornography, and that abstinence from pornography for these men could be interpreted as an act of “redemptive masculinity” (Burke & Haltom, 2020, p. 26). In relation to coping strategies for maintaining abstinence from pornography, findings from three qualitative studies of men from different recovery contexts, the aforementioned Italian online forum members (Cavaglioni, 2008), members of 12-step groups (Ševčíková et al., 2018) and Christian men (Perry, 2019), demonstrate that apart from making use of practical strategies, these individuals typically perceived that providing mutual support to each other within their respective support groups was instrumental to their ability to remain abstinent. A recent quantitative study of men from the subreddit r/EveryManShouldKnow (Zimmer & Imhoff, 2020) found that motivation to abstain from masturbation was positively predicted by perceived social impact of

masturbation, perception of masturbation as unhealthy, decreased genital sensitivity, and one aspect of hypersexual behavior (i.e., dyscontrol). While useful, the findings from these studies are limited in their transferability to pornography users abstaining from pornography today as part of the ‘rebooting’ movement because they are over a decade old, before the emergence of the movement (i.e., Cavalgion, 2008, 2009), because they were contextualized specifically within a 12-step recovery milieu (Ševčíková et al., 2018) or religious context (Burke & Haltom, 2020; Diefendorf, 2015; Perry, 2019), or because participants were recruited from a non-‘rebooting’ forum (Zimmer & Imhoff, 2020; see also Imhoff & Zimmer, 2020; Osadchiy et al., 2020).

There has been little systematic investigation of abstinence motivations and experiences among pornography users on online ‘rebooting’ forums, apart from two recent studies. The first study (Vanmali et al., 2020) used natural language processing methods to compare posts on the r/NoFap subreddit (a ‘rebooting’ forum) that contained text related to PIED ($n = 753$) to posts that did not ($n = 21,966$). The authors found that although both PIED and non-PIED discussions featured themes related to various aspects of relationships, intimacy and motivation, only PIED discussions emphasized themes of anxiety and libido. Also, PIED posts contained fewer ‘discrepancy words’, suggesting “a more assured writing style” (Vanmali et al., 2020, p.1). The findings of the present study suggest that the anxieties and concerns of individuals on ‘rebooting’ forums are unique depending on the specific self-perceived pornography-related problem, and that further research is needed to better understand the different motivations of individuals who use these forums. Second, Taylor and Jackson (2018) conducted a qualitative analysis of posts by members of the r/NoFap subreddit. However, their study’s aim was not to focus on members’ phenomenological experiences of abstinence, but to apply a critical lens using discourse analysis, to illustrate how some members employed “idealized discourses of innate masculinity and the need for

‘real sex’ to justify their resistance to pornography use and masturbation” (Taylor & Jackson, 2018, p. 621). While such critical analyses provide useful insights into the underlying attitudes of some members of the forum, experiential qualitative analyses of members’ experiences that ‘give voice’ to their own perspectives and meanings are also needed (Braun & Clarke, 2013).

4.1.4 The present study

Accordingly, the present study sought to fill this gap in the literature by conducting a qualitative analysis of phenomenological experiences of abstinence among members of an online ‘rebooting’ forum. A total of 104 abstinence journals by male members of a ‘rebooting’ forum was analyzed using thematic analysis, using three broad research questions to guide our analysis: (i) what are members’ motivations for abstaining from pornography? and (ii) what is the abstinence experience like for members? and (iii) how do they make sense of their experiences? Findings of the present study will be useful for researchers and clinicians to obtain a deeper understanding of (i) the specific problems which are driving an increasing number of members on ‘rebooting’ forums to abstain from pornography, which can inform clinical conceptualization of PPU; and (ii) what the ‘rebooting’ experience is like for members, which can guide development of effective treatments for PPU and inform understanding of abstinence as an intervention for PPU.

4.2 Method

4.2.1 Data collection and sample

Data were collected from an online ‘rebooting’ forum, *Reboot Nation* (Reboot Nation, 2020). *Reboot Nation* was founded in 2014, and at the time of data collection (July 2019), the forum had over 15,000 registered members. On the *Reboot Nation* homepage there are links to informational videos and articles describing negative effects of pornography and recovery from these effects through ‘rebooting’. To become a registered member of the *Reboot Nation*

forum, an individual needs to create a username and password and provide a valid email address. Registered members can then immediately start posting on the forum. The forum provides a platform for members to connect with each other and discuss recovery from pornography-related problems (e.g., sharing helpful information and strategies for ‘rebooting’, or asking for support). There are five sections on the forum categorized by topic: ‘porn addiction’, ‘porn induced erectile dysfunction/delayed ejaculation’, ‘partners of rebooters and addicts’ (where partners of people with PPU can ask questions or share their experiences), ‘success stories’ (where individuals who have successfully achieved long-term abstinence can share their journey retrospectively), and ‘journals’ (which allows members to document their ‘rebooting’ experiences using journals in real time).

Before beginning data collection, the first author engaged in a preliminary exploration of the ‘journals’ section by reading posts from the first half of the year 2019 to become familiar with the structure and content of journals on the forum. Members start journals by creating a new thread and typically use their first post to talk about their background and abstinence goals. This thread then becomes their personal journal, which other members are free to view and comment on to provide encouragement and support. These journals are a source of rich and detailed accounts of members’ abstinence experiences, and how they perceive and make sense of their experiences. An advantage of collecting data in this unobtrusive way (i.e., using existing journals as data as opposed to actively approaching members on the forum to participate in a study) allowed for observation of members’ experiences naturalistically, without researcher influence (Holtz et al., 2012). To avoid excessive heterogeneity in our sample (Braun & Clarke, 2013), analysis was restricted

to male forum members aged 18 years and above⁷. Based on initial exploration of the journals, two inclusion criteria were determined for journals to be selected for analysis. First, the content of the journal would need to be sufficiently rich and descriptive to be subject to qualitative analysis. Journals that elaborated on motivations for initiating abstinence and described in detail the range of their experiences (i.e., thoughts, perceptions, feelings and behavior) during the abstinence attempt fulfilled this criterion. Second, the duration of the abstinence attempt described in the journal would need to last at least seven days, but no longer than 12 months. This period was decided on to account for both early abstinence experiences (<3 months; Fernandez et al., 2020) and experiences following periods of sustained longer-term abstinence (>3 months).⁸

At the time of data collection, there was a total of 6939 threads in the male journal section. The forum categorizes journals by age range (i.e., teens, 20s, 30s, 40s, and above). Since the primary aim was to identify common patterns of the abstinence experience, irrespective of age group, the present authors set out to collect a similar number of journals across three age groups (18–29 years, 30–39 years, and ≥ 40 years). The first author selected journals from the years 2016-2018 at random and perused the content of the journal. If it met the two inclusion criteria, it was selected. Throughout this selection process, it was ensured that there was always a balanced number of journals from each age group. Whenever an individual journal was selected, it was read in full by the first author as part of the process of

⁷ Although there is a dedicated section on the forum for female forum members, the large majority of journals were by male forum members. This disproportion in the ratio of male to female journals mirrors previous research showing that men report much higher rates of pornography use (e.g., Hald, 2006; Kvaalem et al., 2014; Regnerus et al., 2016), PPU (e.g., Grubbs, Kraus, et al, 2019; Kor et al., 2014) and treatment-seeking for PPU (Lewczuk et al., 2017) compared to women. Given past research reporting notable gender differences in predictors of treatment-seeking for PPU (e.g., amount of pornography use and religiousness were significant predictors of treatment-seeking for women, but not for men – Gola et al., 2016; Lewczuk et al., 2017), there may likewise be important differences in abstinence motivations and experiences between males and females on ‘rebooting’ forums.

⁸ A 12-month cut-off point was chosen as it can be reasonably expected that most perceived effects of ‘rebooting’ would be observable within the first year of the abstinence attempt. Journals describing very long-term abstinence attempts (>12 months), due to how long and detailed they are, would require a separate investigation analyzing a smaller total number of journals, ideally with an idiographic approach to data analysis.

data familiarization (described later in the ‘data analysis’ section). This process was continued systematically until it was determined that data saturation had been reached. The data collection phase was ended at this saturation point. A total of 326 threads were screened and 104 journals were selected that met the inclusion criteria (18-29 years [$N = 34$], 30-39 years [$N = 35$], and ≥ 40 years [$N = 35$]). The mean number of entries per journal was 16.67 ($SD = 12.672$), and the mean number of replies per journal was 9.50 ($SD = 8.41$).

Demographic information and pertinent information about members (i.e., self-perceived addiction to pornography or other substances/behaviors, sexual difficulties, and mental health difficulties) were extracted from their journals wherever reported. Sample characteristics are summarized in in Table 4.1. Of note, 80 members reported being addicted to pornography, while 49 members reported having some sexual difficulty. A total of 32 members reported both being addicted to pornography and having some sexual difficulty.

Table 4.1
Sample characteristics

	Frequency	%
Age group		
<i>18-29 years</i>	34	32.7
<i>30-39 years</i>	35	33.7
<i>40 years and above</i>	35	33.7
Marital status		
<i>Single</i>	11	10.6
<i>Dating/in a relationship</i>	10	9.6
<i>Married</i>	33	31.7
<i>Divorced</i>	1	1.0
<i>Did not specify</i>	49	47.1
Sexual orientation		
<i>Heterosexual/straight</i>	2	1.9
<i>Bisexual</i>	2	1.9
<i>Gay</i>	2	1.9

<i>Did not specify</i>	98	94.2
Religious affiliation		
<i>Christian/Catholic</i>	9	8.7
<i>Muslim</i>	1	1.0
<i>Atheist</i>	1	1.0
<i>Did not specify</i>	93	89.4
Self-perceived addiction to pornography		
<i>Yes</i>	80	76.9
<i>No</i>	4	3.8
<i>Did not specify</i>	20	19.2
Self-perceived sexual difficulty		
<i>Erectile difficulties</i>	42	40.4
<i>Low desire for partnered sex</i>	8	7.7
<i>Delayed ejaculation</i>	2	1.9
<i>Not/none reported</i>	55	52.9
Self-perceived addiction to pornography + sexual difficulty combinations		
<i>Addiction but not sexual difficulty</i>	48	46.1
<i>Sexual difficulty but not addiction</i>	17	16.3
<i>Addiction and sexual difficulty</i>	32	30.8
<i>Neither addiction nor sexual difficulty reported</i>	7	6.7
Other self-perceived addictions/problematic behaviors		
<i>Sex sexting/sex chats</i>	6	5.8
<i>Internet/mobile phone use</i>	2	2.0
<i>Nicotine/tobacco</i>	2	2.0
<i>Alcohol</i>	1	1.0
<i>Not/none reported</i>	93	89.4
Self-perceived mental health difficulties		
<i>Depression</i>	10	9.6
<i>Social anxiety</i>	5	4.8
<i>Generalized anxiety</i>	4	3.8
<i>Suicidality</i>	3	2.9
<i>Attention-deficit/hyperactivity disorder</i>	2	2.0

<i>Obsessive compulsive disorder</i>	2	2.0
<i>Not/none reported</i>	78	75.0

Note. N=104. Age range=18-63 years.

4.2.2 Data analysis

The data was analyzed using a phenomenologically informed thematic analysis (TA; Braun & Clarke, 2006, 2013). Thematic analysis is a theoretically flexible method which allows researchers to conduct a rich, detailed analysis of patterned meaning across a dataset. Given the phenomenological approach to data analysis, the goal was to “obtain detailed descriptions of an experience as understood by those who have that experience in order to discern its essence” (Coyle, 2015, p. 15) – in this case, the experience of ‘rebooting’ as understood by members of a ‘rebooting’ forum. The analysis was situated within a critical realist epistemological framework, which “affirms the existence of reality...but at the same time recognizes that its representations are characterized and mediated by culture, language, and political interests rooted in factors such as race, gender, or social class” (Ussher, 1999, p. 45). This means members’ accounts were taken at face value and were considered to be generally accurate representations of the reality of their experiences, while acknowledging possible influences of the sociocultural context in which they occur. Therefore, in the present analysis, themes were identified at the semantic level (Braun & Clarke, 2006), prioritizing members’ own meanings and perceptions.

NVivo 12 software was used throughout the entire data analysis process and followed the process of data analysis outlined in Braun and Clarke (2006). First, journals were read by the first author upon selection and then re-read for data familiarization. Next, the entire dataset was systematically coded by the first author, in consultation with the second and third authors. Codes were derived using a bottom-up process, meaning that preconceived coding categories were not imposed upon the data. Data were coded at a basic semantic level (Braun & Clarke, 2013), resulting in 890 unique data-derived codes. These codes were then merged

once patterns started emerging to form higher level categories. For example, the basic codes ‘honesty is liberating’ and ‘accountability makes abstinence possible’ were grouped into a new category, ‘accountability and honesty’, which was in turn grouped under ‘effective coping strategies and resources’. In addition, descriptive information from each journal pertaining to the abstinence attempt in general (i.e., goal of abstinence and inferred duration of the abstinence attempt) were also systematically extracted. Once the entire data set was coded, codes were reviewed, and then added or modified as necessary to ensure consistent coding across the data set. Candidate themes were then generated from the codes by the first author, guided by the research questions of the study. Themes were refined after review by the second and third authors and finalized once a consensus was reached by all three of the research team.

4.2.3 Ethical considerations

The ethics committee of the research team’s university approved the study. From an ethical standpoint, it was important to consider whether the data were collected from an online venue considered to be a ‘public’ space (British Psychological Society, 2017; Eysenbach & Till, 2001; Whitehead, 2007). The *Reboot Nation* forum is easily found using search engines, and posts on the forum are readily accessible for viewing to anyone without requiring registration or membership. Therefore, it was concluded that the forum was ‘public’ in nature (Whitehead, 2007), and informed consent from individual members was not required (as did the authors’ university ethics committee). Nonetheless, to further protect the privacy and confidentiality of members of the forum, all usernames reported in the results have been anonymized.

4.3 Results

To provide context for the analysis, a summary of abstinence attempt characteristics is provided in Table 4.2. In terms of abstinence goals, 43 members intended to abstain from

pornography, masturbation, and orgasm, 47 members intended to abstain from pornography and masturbation, and 14 members intended to abstain from pornography. This means that a sizeable proportion of the sample (at least 86.5%) were intending to abstain from masturbation in addition to abstaining from pornography. However, at the outset of their abstinence attempt, almost all members did not specify an exact time frame for their abstinence goals or indicate whether they were intending to quit any of these behaviors forever. Therefore, it was not possible to ascertain whether members were typically interested in abstaining temporarily or ceasing the behavior permanently. The total duration of abstinence attempt for each journal was inferred based on members' explicit statements (e.g., "on day 49 of the reboot"), or in the absence of explicit statements, through deduction based on dates of members' posts. The majority of inferred total durations of abstinence attempts were between seven and 30 days (52.0%), and the median inferred total duration of all abstinence attempts was 36.5 days. However, it is important to note that members did not necessarily stop attempting to abstain beyond these periods – these durations merely reflect the implied length of the abstinence attempt recorded in the journal. Members could have continued with the abstinence attempt, but stopped posting in their journals.

Table 4.2
Characteristics of abstinence attempts

	Frequency	%
Goal of abstinence (explicitly stated/implied)		
<i>Abstinence from pornography, masturbation and orgasm</i>	43	41.3
<i>Abstinence from pornography and masturbation (orgasm permitted/undecided/not mentioned)</i>	47	45.2
<i>Abstinence from pornography (masturbation and/or orgasm permitted/undecided/not mentioned)</i>	14	13.5

Inferred duration of abstinence attempt

7 days-30 days	54	52.0
1 month-3 months	22	21.2
3 months-6 months	13	12.5
6 months-1 year	15	14.4

Note. Median duration of abstinence attempts = 36.5 days

A total of four themes with nine subthemes were identified from the data analysis (see Table 4.3). In the analysis, frequency counts or terms denoting frequency are sometimes reported. The term ‘some’ refers to less than 50% of members, ‘many’ refers to between 50% and 75% of members, and ‘most’ refers to more than 75% of members⁹. As a supplementary step, the ‘crosstab’ function in NVivo12 was used to explore if there were any notable differences in frequency of abstinence experiences across the three age groups. These were subjected to chi-square analyses to determine if these differences were statistically significant (see Appendix D). Age-related differences are highlighted under their corresponding theme below.

To elucidate each theme, a selection of illustrative quotes is provided, with accompanying member code (001-104) and age. Nonsignificant spelling errors have been corrected to aid readability of the extracts. In order to make sense of some of the language used by members, a brief explanation of commonly used acronyms is necessary. The acronym ‘PMO’ (pornography/masturbation/orgasm) is often used by members to refer to the process of watching pornography while masturbating to orgasm (Deem, 2014a). Members

⁹ It is important to bear in mind that because members were not responding to a structured list of questions, it is not possible to determine whether the rest of the sample shared (or did not share) the same experience if they did not report it. Consequently, where frequency counts or terms denoting frequency are reported, they are best understood as the minimum proportion of members in the sample who reported an experience, but the actual number of individuals who had the experience could have been larger.

often group these three behaviors together because of how frequently their pornography use is accompanied by masturbating to orgasm. When discussing these behaviors separately, members often acronymize watching pornography as ‘P’, masturbating as ‘M’ and having an orgasm as ‘O’. Acronymizations of combinations of these behaviors are also common (e.g., ‘PM’ refers to watching pornography and masturbating but not to the point of orgasm, and ‘MO’ refers to masturbating to the point of orgasm without watching pornography). These acronyms are also sometimes used as a verb (e.g., “PMO-ing” or “MO-ing”).

4.3.1 Abstinence is the solution to pornography-related problems

Members’ initial decision to attempt ‘rebooting’ was founded on the belief that abstinence is the logical solution for addressing pornography-related problems. Abstinence was initiated because there was the belief that their pornography use was leading to serious negative consequences in their lives – therefore, removing pornography use would alleviate these effects through ‘rewiring’ the brain. Because of the perceived addictive nature of pornography use, a reduction/controlled use approach to the behavior was not viewed as a viable strategy for recovery.

Abstinence motivated by negative effects attributed to pornography use

Three main consequences attributed to excessive pornography use were cited by members as motivations for initiating abstinence. First, for many members ($n=73$), abstinence was motivated by a desire to overcome a perceived addictive pattern of pornography use (e.g., “*I’m 43 now and I’m addicted to porn. I think the moment to escape from this horrible addiction has arrived*” [098, 43 years]). Accounts of addiction were characterized by the experience of compulsivity and loss of control (e.g., “*I’m trying to stop but it is so hard I feel that there is something pushing me to porn*” 005, 18 years), desensitization and tolerance to the effects of pornography over time (e.g., “*I don’t really feel anything anymore when watching porn. It is sad that even porn has become so unexciting and unstimulating*” [045,

Table 4.3

Themes derived from thematic analysis of the dataset

Themes	Subthemes
Abstinence is the solution to pornography-related problems	<i>Abstinence motivated by negative effects attributed to pornography use</i> <i>Abstinence about 'rewiring' the brain</i> <i>Abstinence as the only feasible way to recover</i>
Sometimes abstinence seems impossible	<i>Navigating sexuality during the 'reboot'</i> <i>The inescapability of cues for pornography use</i> <i>The insidiousness of the relapse process</i>
Abstinence is achievable with the right resources	<i>External resources: Social support and barriers to pornography access</i> <i>Internal resources: An arsenal of cognitive-behavioral strategies</i>
Abstinence is rewarding if persisted with	<i>Regaining control</i> <i>An array of psychological, social and sexual benefits</i>

34 years]), and distressing feelings of frustration and disempowerment (*“I hate that I don’t have the strength to JUST STOP...I hate that I have been powerless against porn and I want to regain and assert my power”* (087, 42 years). Second, for some members ($n=44$), abstinence was motivated by a desire to relieve their sexual difficulties, based on the belief that these difficulties (erectile difficulties [$n=39$]; diminished desire for partnered sex [$n=8$]) were (possibly) pornography-induced. Some members believed that their problems with sexual functioning was a result of a conditioning of their sexual response predominantly to pornography-related content and activity (e.g., *“I notice how I lacked enthusiasm for the body of the other...I have conditioned myself to enjoy sex with the laptop”* [083, 45 years]). Of the 39 members who reported erectile difficulties as a reason for initiating abstinence, 31 were relatively certain that they were suffering from ‘pornography-induced erectile dysfunction’ (PIED). Others ($n=8$) were less certain of definitively labeling their erectile difficulties as being ‘pornography-induced’ due to wanting to rule out other possible explanations (e.g., performance anxiety, age-related factors, etc.), but decided to initiate abstinence in case they were indeed pornography-related.

Third, for some members ($n=31$), abstinence was motivated by a desire to alleviate perceived negative psychosocial consequences attributed to their pornography use. These perceived consequences included increased depression, anxiety and emotional numbness, and decreased energy, motivation, concentration, mental clarity, productivity and ability to feel pleasure (e.g., *“I know it has tremendous negative effects on my concentration, motivation, self-esteem, energy level”* [050, 33 years]). Some members also perceived negative impacts of their pornography use on their social functioning. Some described a sense of decreased connection with others (e.g., *“(PMO)...makes me less interested and friendly to people, more self-absorbed, gives me social anxiety and makes me just not care about anything really,*

other than staying home alone and jerking off to porn” (050, 33 years), while others reported a deterioration of specific relationships with significant others and family members, especially romantic partners.

Notably, a small proportion of members ($n=11$) reported that they morally disapproved of pornography in some way, but only a few of these ($n=4$) explicitly cited moral disapproval as a reason for initiating ‘rebooting’ (e.g., *“I am leaving porn because this shit is disgusting. Girls are being raped and tortured and used as fuck objects in this shit”* [008, 18 years]). However, for these members, moral incongruence was not listed as the only reason for initiating abstinence but was accompanied by one of the other three primary reasons for abstinence (i.e., perceived addiction, sexual difficulties, or negative psychosocial consequences).

Abstinence about ‘rewiring’ the brain

Abstinence was approached by some members based on an understanding of how their pornography use might have been negatively impacting their brains. Abstinence was viewed as the logical solution to reversing the negative effects of pornography, as a process that would ‘rewire’ the brain (e.g., *“I know I have to abstain in order to let my pathways heal and settle my brain”* (095, 40s). The concept of neuroplasticity in particular was a source of hope and encouragement for some members, which led them to believe that the negative effects of pornography may be reversible through abstinence (e.g., *“Brain plasticity is the real saving process that will re-wire our brain”* [036, 36 years]). Some members described learning about pornography’s negative effects and ‘rebooting’ through informational resources by influential figures respected by the ‘rebooting’ community, especially Gary Wilson, host of the website *yourbrainonporn.com*. Wilson’s (2014) book (e.g., *“The book Your Brain on Porn by Gary Wilson...introduced me to the idea of a reboot, this forum and really explained some things I did not know”* [061, 31 years]) and 2012 TEDx talk (TEDx

Talks, 2012; e.g., “*I watched THE GREAT PORN EXPERIMENT yesterday, very interesting and informative*” [104, 52 years]) were resources that were most frequently cited by members as being particularly influential in shaping their beliefs about pornography’s negative effects on the brain and ‘rebooting’ as the appropriate solution to reversing these effects.

Abstinence as the only feasible way to recover

For some members who reported being addicted to pornography, abstinence was seen as the only feasible way to recover, largely due to a belief that using any pornography during abstinence would likely trigger addiction-related circuitry in the brain and lead to craving and relapse. Consequently, trying to engage in moderation instead of abstaining completely was seen as an unviable strategy:

“I need to completely stop watching porn and any explicit material for that matter because whenever I watch any nsfw [not safe for work] content a pathway is created in my brain and when I get urges my brain automatically forces me to watch porn. Therefore, quitting p and m cold turkey is the only way to recover from this shit”
(008, 18 years).

4.3.2 Sometimes abstinence seems impossible

The second theme illustrates possibly the most striking feature of members’ ‘rebooting’ experiences – how difficult it was to actually successfully achieve and maintain abstinence. At times, abstinence was perceived to be so difficult that it seemed impossible to achieve, as described by one member:

“I am back on Struggle St., after a whole bunch of relapses. I am not sure how to successfully quit, sometimes it seems impossible.” (040, 30s)

Three main factors appeared to contribute to the difficulty in achieving abstinence: navigating sexuality during the ‘reboot’, the seeming inescapability of cues for pornography use, and the relapse process experienced as being cunning and insidious.

Navigating sexuality during the 'reboot'

A difficult decision that members had to make at the outset of the abstinence process was regarding acceptable sexual activity during the 'reboot': should masturbation without pornography and/or having an orgasm through partnered sexual activity be allowed in the short-term? For many members, the long-term goal was not to eliminate sexual activity altogether, but to redefine and learn a new "*healthy sexuality*" (033, 25 years) without pornography. This would likely mean incorporating partnered sex (e.g., "*What we want is healthy natural sex with our partner, right?*" [062, 37 years]) and/or masturbation without pornography (e.g., "*I am okay with old-fashioned MO. I think it is possible to manage that in a healthy way without the debilitating effects of porn addiction*" [061, 31 years]). However, what needed more consideration was whether allowing these behaviors in the short-term would help or hinder progress with their abstinence from pornography. On one hand, allowing these activities in the initial phases of abstinence was perceived by some members to be a potential threat to abstinence, primarily due to what they colloquially dubbed the 'chaser effect'. The 'chaser effect' refers to strong cravings to PMO that arise after sexual activity (Deem, 2014a). Some reported experiencing this effect after both masturbation (e.g., "*I find the more I MO the more I crave it and porn*" [050, 33 years]) and partnered sexual activity (e.g., "*I have noticed that after sex with wife the urges are stronger afterwards*" [043, 36 years]). For these members, this resulted in a decision to temporarily abstain from masturbation and/or partnered sex for a period. On the other hand, for other members, abstaining completely from sexual activity was reported to lead to a build-up of sexual desire and cravings for pornography. Therefore, for these members, having a sexual outlet during the 'reboot' did not impede progress, but in fact aided their ability to abstain from pornography (e.g., "*I am finding that if I knock one out when I feel especially horny, then I am less likely to start making up excuses to resort to porn*" [061, 36 years]).

It is interesting to note that paradoxically, close to one-third of members reported that instead of experiencing increased sexual desire, they experienced diminished sexual desire during abstinence, which they called the ‘flatline’. The ‘flatline’ is a term that members used to describe a significant decrease or loss of libido during abstinence (although some appeared to have a broader definition for this to also include accompanying low mood and a sense of disengagement in general: (e.g., *“I feel like I'm probably in a flatline right now as the desire to engage in any sort of sexual activity is almost nonexistent”* [056, 30s]. Not being certain about when sexual desire would return was disconcerting for some (e.g., *“Well, if I cannot have a regular orgasm when I feel like, what's the point in living?”* [089, 42 years]). The temptation for these members was to turn to PMO to ‘test’ whether they could still function sexually during a ‘flatline’ (e.g., *“Bad thing though is that I start to wonder whether everything is still working in the way it should in my pants”*[068, 35 years]).

The inescapability of cues for pornography use

What also made abstaining from pornography particularly challenging for many members was the seeming inescapability of cues that triggered thoughts of pornography and/or cravings to use pornography. First, there were seemingly ubiquitous external cues for pornography use. The most common source of external triggers was electronic media (e.g., *“Dating sites, Instagram, Facebook, movies/TV, YouTube, online ads all can trigger relapses for me”* [050, 33 years]). The unpredictability of sexually arousing content appearing in a television show or one’s social media feed meant that casual browsing of the internet could be risky. Seeing sexually attractive people in real life was also a trigger for some members (e.g., *“I also quit the gym I was going to today as there’s way too much to look at there via woman in them tight yoga pants”* [072, 57 years]), which meant that viewing anything sexually arousing, whether online or offline, could potentially be triggering. Also, the fact that members often accessed pornography while alone in their bedroom meant that their

default immediate environment was already a cue for pornography use (e.g., *“just lying in bed when I wake up and have nothing to do is a serious trigger”* [021, 24 years]).

Second, there were also numerous internal cues for pornography use (primarily negative affective states). Because members had previously often relied on pornography use to regulate negative affect, uncomfortable emotions appeared to have become a conditioned cue for pornography use. Some members reported that they experienced heightened negative affect during abstinence. Some interpreted these negative affective states during abstinence as being part of withdrawal. Negative affective or physical states that were interpreted as being (possible) ‘withdrawal symptoms’ included depression, mood swings, anxiety, ‘brain fog’, fatigue, headache, insomnia, restlessness, loneliness, frustration, irritability, stress, and decreased motivation. Other members did not automatically attribute negative affect to withdrawal but accounted for other possible causes for the negative feelings, such as negative life events (e.g., *“I find myself getting agitated very easily these past three days and I don’t know if it’s work frustration or withdrawal”* [046, 30s]). Some members speculated that because they had previously been using pornography to numb negative emotional states, these emotions were being felt more strongly during abstinence (e.g., *“Part of me wonders if these emotions are so strong because of the reboot”* [032, 28] years). Notably, those in the 18–29 years age range were more likely to report negative affect during abstinence compared to the other two age groups, and those 40 years and above were less likely to report ‘withdrawal-like’ symptoms during abstinence compared to the other two age groups. Regardless of the source of these negative emotions (i.e., withdrawal, negative life events, or heightened preexisting emotional states), it appeared to be very challenging for members to cope with negative affect during abstinence without resorting to pornography to self-medicate these negative feelings.

The insidiousness of the relapse process

More than half of the sample ($n=55$) reported at least one lapse during their abstinence attempt. More members in the 18–29 year age group reported at least one relapse ($n=27$) compared to the other two age groups: 30–39 years ($n=16$) and 40 years and above ($n=12$). Relapse typically resembled an insidious process that often caught members off guard and left them feeling distressed immediately after. There appeared to generally be two ways by which lapses tended to occur. The first was when craving to use pornography was triggered for various reasons. Although craving was sometimes manageable, at other times craving was so severe that it was experienced as overwhelming and uncontrollable. When craving was severe, some members reported that it was sometimes accompanied by cunning rationalizations for relapse, as if they were being tricked by the ‘addicted brain’ into relapse:

“I had incredible strong urges to watch porn, and I found myself arguing with my own brain on the tune of: ‘this could be last time...’, ‘come on, do you think that just a small peek would be so bad’, ‘just today, and from tomorrow I stop again’, ‘I have to stop this pain, and there is only one way how to do that’... so basically, in the afternoon I managed to work very little, and instead I fought the urges continuously” (089, 42 years).

The second way in which the insidiousness of the relapse process manifested was that, even in the absence of strong cravings, lapses sometimes seemed to ‘just happen’ on ‘autopilot’, to a point where it sometimes felt like relapse was happening *to them* (e.g., *“it’s like I’m in autopilot or somethin’. I just stood there watching myself from the outside, like I’m dead, like I have no control whatsoever”* [034, 22 years]). This automaticity was also sometimes observed when members found themselves subconsciously searching for sexually stimulating material online (e.g., sexually arousing videos on *YouTube*) that did not

technically qualify as ‘pornography’ (often referred to by members as ‘porn substitutes’). Browsing these ‘porn substitutes’ was often a gradual gateway to a lapse.

4.3.3 Abstinence is achievable with the right resources

Despite abstinence being difficult, many members found that abstinence was achievable with the right resources. A combination of external and internal resources appeared to be key in enabling members to successfully achieve and maintain abstinence.

External resources: Social support and barriers to pornography access

Social support was a key external resource for many members that was crucial for them in maintaining abstinence. Members described receiving helpful support from many different sources, including family, partners, friends, support groups (e.g., 12-step groups), and therapists. However, the online forum itself was the most commonly cited source of support for members. Reading other members’ journals (especially success stories) and receiving supportive messages on one’s own journal was a primary source of inspiration and encouragement for members (e.g., “*Seeing other journals and other posts motivate me and make me feel like I’m not alone*” [032, 28 years]). Some members solicited further support by requesting another forum member to be their accountability partner, although for other members, simply maintaining a journal on the forum was sufficient to feel an increased sense of accountability. Honest sharing and accountability were described by some members as being essential to their ability to maintain motivation to stay abstinent (e.g., “*The public oath and the public commitment is what is different now. Accountability. That was the element missing in the last 30 years*” [089, 42 years]).

Another common external resource employed by members during abstinence was barriers that acted as impediments to easy access of pornography use. Some members reported installing applications on their devices that blocked pornographic content. These applications were typically found to be limited because there were usually means of

circumventing them, but they were useful for creating one extra barrier that could intervene in a moment of vulnerability (e.g., *“I want to reinstall K9 web-blocker. I can bypass it, but it still serves as a reminder”* [100, 40 years]). Other strategies included using one’s electronic devices only in less triggering environments (e.g., never using their laptop in the bedroom, only using their laptop at work), or restricting their use of electronic devices altogether (e.g., temporarily leaving their smartphone with a friend, giving up their smartphone for a non-smartphone mobile phone). In general, external barriers were seen by members to be useful but not sufficient for maintaining abstinence because it was unrealistic to completely avoid any access to electronic devices, and also because internal resources were needed as well.

Internal resources: An arsenal of cognitive-behavioral strategies

Most members reported making use of various internal resources (i.e., cognitive and/or behavioral strategies) to aid their abstinence. Day-to-day behavioral strategies (e.g., exercising, meditating, socializing, keeping busy, going out more often, and having a healthier sleep routine) were incorporated as part of an overall lifestyle change to minimize the frequency of triggering situations and craving. Cognitive and/or behavioral strategies were amassed by members over the abstinence attempt, often through trial-and-error experimentation, to regulate emotional states that could potentially precipitate a lapse (i.e., momentary cravings and negative affect). A behavioral approach to emotion regulation involved engaging in an alternative non-harmful activity instead of giving in to the temptation to use pornography. Some members reported that taking a shower was particularly effective at combating cravings (e.g., *“Tonight I was feeling extremely horny. So I took a very cold shower at 10pm in very cold weather and boom! The urges are gone”* [008, 18 years]). Attempting to suppress thoughts of pornography was a common cognitive strategy used, but some members realized over time that thought suppression was counterproductive (e.g., *“I think I need to find a different strategy than, ‘don't think about PMO, don't think about PMO,*

don't think about PMO'. That makes me crazy and gets me to thinking about PMO" [099, 46 years]). Other common cognitive strategies used by members included mindfulness-related techniques (e.g., accepting and 'riding' the craving or negative emotion) and reframing their thinking. Writing in their journals as they were experiencing craving or immediately after a lapse appeared to provide a particularly useful avenue for members to engage in motivating self-talk and reframe unhelpful thinking.

4.3.4 Abstinence is rewarding if persisted with

Members who persisted with abstinence typically found it to be a rewarding experience, despite its difficulties. The pain of abstinence appeared to be worth it because of its perceived rewards, as described by one member: *"It has not been an easy ride, but it has been totally worth it"* (061, 31 years). Specific benefits described included an increased sense of control, as well as improvements in psychological, social, and sexual functioning.

Regaining control

A major perceived benefit of abstinence described by some members revolved around regaining a sense of control over their pornography use and/or their lives in general. After a period of abstinence, these members reported decreased salience, craving and/or compulsivity with regards to their pornography use:

"My porn desires are way down and it is way easier to fight my urges. I find I hardly think about it at all now. I am so pleased that this reboot has had the effect on me I wanted so badly" (061, 31 years).

Successfully abstaining from pornography for a period of time was also reported to result in an increased sense of self-control over pornography use and pornography abstinence self-efficacy (e.g., *"It seems I've developed good self-control to avoid pornographic material"* [004, 18 years]). Some members felt that as a result of exercising self-control over

their pornography use, this newfound sense of self-control extended to other areas of their lives as well.

An array of psychological, social and sexual benefits

Many members reported experiencing various positive cognitive-affective and/or physical effects that they attributed to abstinence. The most common positive effects related to improvements in day-to-day functioning, including improved mood, increased energy, mental clarity, focus, confidence, motivation, and productivity (e.g., *“No porn, no masturbation and I had more energy, more mental clarity, more happiness, less tiredness”* [024, 21 years]). Some members perceived that abstaining from pornography resulted in feeling less emotionally numb and in an ability to feel their emotions more intensely (e.g., *“I just ‘feel’ on a deeper level. with work, friends, past times, there have been waves of emotions, good & bad, but it’s a great thing”* [019, 26 years]). For some, this resulted in enhanced experiences and an increased ability to feel pleasure from ordinary day-to-day experiences (e.g., *“My brain can get so much more excited about little things and things that aren’t pure pleasure...like socializing or writing a paper or playing sports”* [024, 21 years]). Of note, more members in the 18 – 29 age group reported positive affective effects during abstinence ($n=16$) compared to the other two age groups, 30-39 ($n=7$) and ≥ 40 ($n=2$).

Perceived positive effects of abstinence on social relationships were also reported. Increased sociability was reported by some members, while others described improved relationship quality and an increased sense of connection with others (e.g., *“I am feeling closer to my wife than I have in a long time”* [069, 30s]). Another common benefit attributed to abstinence centered on perceived improvements in sexual functioning. Some members reported an increase in desire for partnered sex, which represented a welcome shift away from only being interested in masturbating to pornography (e.g., *“I was so horny but the good thing was that I was horny for sexual experience with another human being. Not*

interested in porn induced orgasm” [083, 45 years]). Increased sexual sensitivity and responsiveness were reported by some members. Of the 42 members who reported erectile difficulties at the outset of the abstinence attempt, half ($n=21$) reported at least some improvements in erectile function after abstaining for a period of time. Some members reported partial return of erectile function (e.g., *“It was only about a 60% erection, but what was important is that it was there”* [076, 52 years]), while others reported a complete return of erectile function (e.g., *“I had sex with my wife both Friday night and last night, and both times were 10/10 erections that lasted quite a long time”* [069, 30 years]). Some members also reported that sex was more pleasurable and satisfying than before (e.g., *“I had two times (Saturday and Wednesday) the best sex in four years”* (062, 37 years)).

4.4 Discussion

The present qualitative study explored phenomenological experiences of abstinence among members of an online pornography ‘rebooting’ forum. Thematic analysis of abstinence journals on the forum yielded four main themes (with nine subthemes): (i) ‘abstinence is the solution to pornography-related problems’, (ii) ‘sometimes abstinence seems impossible’, (iii) ‘abstinence is possible with the right resources’, and (iv) ‘abstinence is rewarding if persisted with’. The key contribution of this analysis is that it sheds light on why members of ‘rebooting’ forums engage in ‘rebooting’ in the first place, and what the ‘rebooting’ experience is like for members from their own perspectives.

4.4.1 Motivations for ‘rebooting’

First, the present analysis sheds light on what motivates individuals to initiate ‘rebooting’ in the first place. Abstaining from pornography was viewed as the logical solution to their problems (Theme 1) because it was perceived that their pornography use led to serious negative consequences in their lives. Three kinds of perceived negative consequences of pornography use were the most frequently cited reasons for ‘rebooting’: (i) perceived

addiction ($n=73$), (ii) sexual difficulties believed to be (possibly) pornography-induced ($n=44$), and (iii) negative psychological and social consequences attributed to pornography use ($n=31$). It is important to note that these motivations were not necessarily mutually exclusive. For instance, 32 members reported having both an addiction to pornography and a sexual difficulty. At the same time, this meant that there was a proportion of members ($n=17$) reporting possible pornography-induced sexual difficulties without necessarily reporting an addiction to pornography.

Members believed that abstaining from pornography use was able to reverse the negative effects of pornography use on the brain, and this belief was built upon an assimilation of neuroscientific concepts, such as neuroplasticity. Although the use of neuroscientific language to make sense of pornography-related struggles is not unique, as has been shown in previous qualitative analyses with religious samples (Burke & Haltom, 2020; Perry, 2019), it may be particularly characteristic of the ‘rebooting’ community, given a ‘rebooting’ culture that has likely developed from (and been shaped by) the recent proliferation of online sites disseminating information about supposed negative effects of pornography on the brain (Taylor, 2019, 2020) especially by influential figures respected by those in the ‘rebooting’ community (Hartmann, 2020). Therefore, members’ motivations to attempt a ‘reboot’ as a remedy for PPU is also likely influenced by ‘rebooting’ culture and norms that have developed as a result of a collective consciousness of (especially senior) fellow members’ experiences and views, and the influence of prominent figures who have impacted the ‘rebooting’ movement.

Of note, moral incongruence (Grubbs & Perry, 2019) was a less frequently cited reason for ‘rebooting’ in this sample ($n=4$), which suggests that (in general) members on ‘rebooting’ forums might have differing motivations for abstaining from pornography use compared to religious individuals who do so primarily for moral reasons (e.g., Diefendorf,

2015). Even so, the possibility that moral incongruence might influence decisions to abstain from pornography use cannot be ruled out without follow-up research explicitly asking members if they morally disapprove of pornography. Also, the present analysis suggests that some members on ‘rebooting’ forums may decide to abstain from masturbation (cf. Imhoff & Zimmer, 2020) primarily for the practical reason of helping themselves stay abstinent from pornography use (because they perceive that masturbating during a ‘reboot’ triggers pornography cravings), and not necessarily because of a belief in the intrinsic benefits of semen retention (e.g., ‘superpowers’ such as self-confidence and sexual magnetism), which some researchers have observed to be central to NoFap ideology (Hartmann, 2020; Taylor & Jackson, 2018).

4.4.2 The ‘rebooting’ experience

Second, the present analysis illustrates what the ‘rebooting’ experience is like from members’ own perspectives – successfully achieving and maintaining abstinence from pornography is very difficult (Theme 2), but it is achievable if an individual is able to make use of the right combination of resources (Theme 3). If abstinence is persisted with, it can be rewarding and worth the effort (Theme 4).

Abstaining from pornography was perceived to be difficult largely due to the interaction of situational and environmental factors, and the manifestation of addiction-like phenomena (i.e., withdrawal-like symptoms, craving, loss of control/relapse) during abstinence (Brand et al., 2019; Fernandez et al., 2020). More than half of members recorded at least one lapse during their abstinence attempt. Lapses were either the result of the force of habit (e.g., accessing pornography on ‘autopilot’), or were precipitated by intense cravings that felt overwhelming and difficult to resist. Three main factors contributed to the frequency and intensity of cravings experienced by members: (i) the ubiquity of external cues for pornography use (especially sexual visual cues or situational cues such as being alone in

one's room), (ii) internal cues for pornography use (especially negative affect, which pornography had previously been used to self-medicate prior to the 'reboot'), and (iii) the 'chaser effect' – cravings which were the result of any sexual activity engaged in during abstinence. More members in the youngest age group (18–29 years) reported experiencing negative affect and at least one lapse during abstinence compared to the other two age groups. One possible explanation for this finding is that because libido tends to be higher for this age group compared to the other two age groups (Beutel et al., 2007), it may be more difficult to refrain from using pornography as a sexual outlet. Another possible explanation is that abstaining from pornography use becomes more difficult the earlier an individual engages in habitual pornography viewing due to a greater dependency on the behavior developing. This explanation tallies with recent findings that age of first exposure to pornography was significantly associated with self-perceived addiction to pornography (Dwulit & Rzymiski, 2019b), although more research is required to delineate the possible association between age of first exposure to pornography and PPU.

Importantly, members' experiences showed that abstinence, although difficult, is achievable with the right combination of internal and external resources. Members were generally resourceful in experimenting with different coping strategies and resources to prevent relapse. For the most part, members built wide repertoires of effective internal resources (i.e., cognitive-behavioral strategies) over the abstinence period. An advantage of this trial-and-error approach was that members were able to customize, through trial-and-error, a program of recovery that worked for them. However, one downside of trial-and-error experimentation is that it sometimes led to the employment of ineffective relapse prevention strategies. For example, attempting to suppress thoughts of pornography was a common internal strategy used to deal with intrusive thoughts of pornography and cravings for pornography. Thought suppression has been demonstrated to be a counterproductive thought

control strategy because it leads to rebound effects, i.e., an increase of those suppressed thoughts (see Efrati, 2019; Wegner et al., 1987). The fact that this was a relatively common strategy suggests that many individuals attempting to abstain from pornography, especially outside of a professional treatment context, might unknowingly engage in ineffective strategies such as thought suppression, and would benefit from psychoeducation about how to effectively manage cravings during abstinence. This specific example (and the various challenges faced by members while ‘rebooting’) highlight the importance of empirically-supported interventions being developed, refined, and disseminated by the field to assist individuals with PPU in effectively regulating their pornography use. Interventions teaching mindfulness-based skills, for example, appear particularly suited to addressing many of the challenges experienced by members (Van Gordon et al., 2016). Learning to non-judgmentally accept the experience of craving with curiosity instead of suppressing it could be an effective means of dealing with craving (Twohig & Crosby, 2010; Witkiewitz et al., 2013). Cultivating dispositional mindfulness could help reduce automatic pilot behaviors that lead to lapses (Witkiewitz et al., 2014). Engaging in mindful sexual activity (Blycker & Potenza, 2018; Hall, 2019; Van Gordon et al., 2016) may allow for conditioning of the sexual response beyond pornography-related cues so that sexual activity can be enjoyed without dependence on pornography and pornography-related fantasy (e.g., masturbating without needing to fantasize to memories of pornography).

In terms of external resources, implementing barriers to pornography access, such as blocking applications, was described to be somewhat useful. However, social support and accountability appeared to be the external resources that were most instrumental to members’ ability to sustain abstinence. This finding is in line with previous qualitative analyses comprising diverse samples (Cavaglioni, 2008, Perry, 2019; Ševčíková et al., 2018) that have highlighted the crucial role of social support in aiding successful abstinence. The ‘rebooting’

forum itself was arguably the most important resource utilized by members that enabled them to successfully maintain abstinence. Honestly sharing their experiences in their journals, reading other members' journals, and receiving encouraging messages from other members appeared to provide a strong sense of social support and accountability despite the lack of face-to-face interaction. This suggests that authentic interaction on online forums could provide a potentially equally beneficial alternative to in-person support groups (e.g., 12-step groups). The anonymity afforded by these online forums may even be an advantage because it may be easier for individuals with stigmatizing or embarrassing problems to acknowledge their problems and receive support online as opposed to in-person (Putnam & Maheu, 2000). Constant accessibility of the forum ensured that members could post in their journals whenever the need arose. Ironically, the characteristics (accessibility, anonymity and affordability; Cooper, 1998) that contributed to members' problematic pornography use in the first place were the same characteristics that added to the therapeutic value of the forum and were now facilitating their recovery from these very problems (Griffiths, 2005b).

Members who persisted with abstinence typically found abstinence to be a rewarding experience and reported a range of perceived benefits which they attributed to abstaining from pornography. Perceived effects resembling pornography abstinence self-efficacy (Kraus et al., 2017) or an increased sense of self-control in general (Muraven, 2010) were described by some members after successful periods of abstinence. Perceived improvements in psychological and social functioning (e.g., improved mood, increased motivation, improved relationships) and sexual functioning (e.g., increased sexual sensitivity and improved erectile function) were also described.

4.4.3 Abstinence as an intervention for PPU

The wide range of reported positive effects of abstinence by members suggest that abstaining from pornography could potentially be a beneficial intervention for PPU.

However, whether each of these perceived benefits resulted specifically from the removal of pornography use itself cannot be clearly established without follow-up studies using prospective longitudinal and experimental designs. For example, other intervening factors during abstinence such as making positive lifestyle changes, receiving support on the forum, or exerting greater self-discipline in general could have contributed to positive psychological effects. Or, changes in psychological variables (e.g., reduction in depression or anxiety) and/or changes in sexual activity (e.g., reduction in masturbation frequency) during abstinence could have contributed to improvements in sexual functioning. Future randomized controlled studies isolating the effects of abstaining from pornography (Fernandez et al., 2020; Wilson, 2016) in particular are needed to validate whether each of these specific perceived benefits can be conclusively attributed to the removal of pornography use specifically, and to rule out possible third variable explanations for these perceived benefits. Also, the current study design allowed mainly for observation of perceived positive effects of abstinence, and less so for perceived negative effects. This is because it is likely that the sample overrepresents members who found abstinence and online forum interaction to be beneficial, and as such might have been more likely to persist with abstinence and continue posting in their journals. Members who found abstinence and/or online forum interaction to be unhelpful may have merely stopped posting in their journals instead of articulating their negative experiences and perceptions, and therefore may be underrepresented in our analysis. For abstinence (and ‘rebooting’) to be properly evaluated as an intervention for PPU, it is important to first examine whether there are any possible adverse or counterproductive consequences of abstinence as an intervention goal and/or approaching the abstinence goal in a specific way. For example, being overly preoccupied with the goal of avoiding pornography (or anything that could trigger thoughts and/or cravings for pornography) could paradoxically increase preoccupation with pornography (Borgogna & McDermott, 2019; Moss et al., 2015;

Perry, 2019; Wegner, 1994), or attempting abstinence without learning effective coping skills for dealing with withdrawal, craving or lapses, could potentially do more harm than good (Fernandez et al., 2020). Future research investigating abstinence as an approach to PPU should account for potential adverse effects in addition to potential positive effects.

Finally, the fact that abstinence was perceived to be so difficult raises an important question for researchers and clinicians to consider – is complete abstinence from pornography always necessary to address PPU? It is noteworthy that there appeared to be little consideration among members for a reduction/controlled use approach to recovery from pornography-related problems (in lieu of an abstinence approach) because of the belief that controlled use is unachievable due to the addictive nature of pornography – which is reminiscent of the 12-step approach to addictive/compulsive pornography use (Efrati & Gola, 2018a). It is worth noting that within clinical interventions for PPU, reduction/controlled use goals have been seen as a valid alternative to abstinence goals (e.g., Twohig & Crosby, 2010). Some researchers have recently raised concerns that abstinence might not be the most realistic intervention goal for some individuals with PPU, in part because of how arduous a task it may be perceived to be, and propose prioritizing goals such as self-acceptance and acceptance of pornography use over abstinence (see Sniewski & Farvid, 2019). The present findings do suggest that for individuals who are intrinsically motivated to stay completely abstinent from pornography, abstinence, although difficult, may be rewarding if persisted with. Furthermore, acceptance and abstinence need not be mutually exclusive goals – a pornography user can learn to be accepting of themselves and their situation while desiring to stay abstinent if a life without pornography is valued (Twohig & Crosby, 2010). However, if reduction/controlled use of pornography is achievable and able to produce similarly beneficial outcomes to abstinence, then abstinence might not be necessary in all cases. Future empirical research comparing abstinence versus reduction/controlled use intervention goals is

needed to clearly elucidate the advantages and/or disadvantages of either approach to recovery from PPU, and under what conditions one might be preferable over the other (e.g., abstinence might result in better outcomes for more severe cases of PPU).

4.4.4 Study strengths and limitations

Strengths of the present study included: (i) unobtrusive data collection that eliminated reactivity; (ii) analysis of journals instead of purely retrospective accounts of abstinence that minimized recall bias; and (iii) broad inclusion criteria including a range of age groups, abstinence attempt durations, and abstinence goals that allowed for mapping out of commonalities of the abstinence experience across these variables. However, the study also has limitations warrant acknowledgment. First, unobtrusive data collection meant that we could not ask members questions about their experiences; therefore, the present analysis was limited to content that members chose to write about in their journals. Second, subjective evaluation of symptoms without the use of standardized measures limits reliability of members' self-reports. For example, research has shown that answers to the question "Do you think you have erectile dysfunction?" do not always correspond to International Index of Erectile Function (IIEF-5; Rosen et al., 1999) scores (Wu et al., 2007).

4.4.5 Conclusion

The present study provides insights into the phenomenological experiences of pornography users part of the 'rebooting' movement who are attempting to abstain from pornography due to self-perceived pornography-related problems. Findings of the present study are useful for researchers and clinicians to obtain a deeper understanding of (i) the specific problems which are driving an increasing number of pornography users to abstain from pornography, which can inform clinical conceptualization of PPU, and (ii) what the 'rebooting' experience is like, which can guide development of effective interventions for PPU and inform understanding of abstinence as an intervention for PPU. However, any

conclusions from this analysis should be drawn with caution because of the inherent limitations in the study methodology (i.e., qualitative analysis of secondary sources). Follow-up studies that actively recruit members of the ‘rebooting’ community and employ structured survey/interview questions are needed to validate the findings of this analysis and to answer more specific research questions about the experience of abstaining from pornography as a means of recovery from PPU.

Chapter 5

Lived experiences of recovery from compulsive sexual behavior among members of Sex and Love Addicts Anonymous: A qualitative thematic analysis¹⁰

5.1 Introduction

Although the clinical phenomenon of compulsive sexual behavior (CSB; also conceptualized as ‘sex addiction’, ‘hypersexuality’, ‘sexual impulsivity’ or ‘out-of-control-sexual-behavior’) has been described and theorized about in the literature for decades (e.g., Barth & Kinder, 1987; Carnes, 1983; Coleman, 1991; Goodman, 1992; Grubbs et al., 2020; Kafka, 2010), it has only recently received formal recognition as a clinical disorder. In 2019, the World Health Organization (WHO) included the diagnosis of compulsive sexual behavior disorder (CSBD) as an impulse control disorder in the eleventh revision of the *International Classification of Diseases* (ICD-11; World Health Organization [WHO], 2019). A conservative approach was taken for the ICD-11 in categorizing it as an impulse control disorder instead of an addictive disorder because there is (to date) insufficient clinical evidence to determine whether the processes involved in the development and maintenance of the disorder are equivalent to other recognized forms of addiction (Kraus et al., 2018).

The prevalence of CSB in the adult population has been estimated to be between 3% and 8.6% (Bóthe, Tóth-Király, et al., 2020; Dickenson et al., 2018; Klein et al., 2014; Sussman et al., 2011). According to the ICD-11, CSBD is characterized by “*a persistent pattern of failure to control intense, repetitive sexual impulses or urges, resulting in repetitive sexual behavior... over an extended period (e.g., six months or more) and causes marked distress or significant impairment in personal, family, social, educational,*

¹⁰ This chapter has been published in a peer-reviewed academic journal: Fernandez, D. P., Kuss, D. J., & Griffiths, M. D. (2021b). Lived experiences of recovery from compulsive sexual behavior among members of sex and Love Addicts anonymous: A qualitative thematic analysis. *Sexual Health & Compulsivity*, 28(1-2), 47-80. <https://doi.org/10.1080/26929953.2021.1997842>

occupational or other important areas of functioning” (World Health Organization, 2019, p. 1). CSB encompasses various types of compulsive solo or relational sexual behaviors such as masturbation, pornography use, cybersex, casual sex with multiple partners, use of escort services and sex workers, or frequenting of strip clubs (Karila et al., 2014; Reid et al., 2009). Moreover, individuals with CSB may engage in more than one sexual behavior that is compulsive (Derbyshire et al., 2015). These compulsive behaviors lead to significant negative consequences for the individual, including (but not limited to) emotional distress, relationship difficulties (e.g., betrayal of trust in romantic relationships), diminished self-esteem and self-respect, unintended pregnancies, and risk of HIV and sexually transmitted infections (McBride et al., 2008; Muench et al., 2007; Reid, Garos, et al., 2012). While rigorous outcome studies on CSB treatments using gold-standard approaches such as randomized controlled trials are scarce, likely due to CSB only recently receiving formal recognition as a clinical disorder (Grubbs et al., 2020), various treatments have nonetheless been delivered to treatment-seekers over the years. Treatment approaches (for reviews, see Briken, 2020; Dhuffar & Griffiths, 2015a; Efrati & Gola, 2018b; Garcia et al., 2016; Malandain; 2020; Miles et al., 2016) include individual and/or group psychotherapies, pharmacotherapies, and mutual-help support groups such as 12-step groups, which is the focus of the present study.

5.1.1 The 12-step program

The 12-step program was originally pioneered by Alcoholics Anonymous (AA), which was founded in the 1930s (AA, 1939). The program has since been adapted for substance addictions (e.g., Narcotics Anonymous [NA], Cocaine Anonymous [CA]) and various other compulsive and addictive behaviors (e.g., Gamblers Anonymous [GA], Overeaters Anonymous [OA]). The 12-step recovery process consists of two elements: (i) fellowship and (ii) practice of the 12-step program (Tonigan et al., 1999). ‘Fellowship’ involves engaging in mutual support with other members through attending meetings,

keeping in touch outside of meetings, and sponsorship (a sponsor is an experienced member who guides newer members in their recovery). The 12-step program can be understood as program of change that facilitates the overcoming of addictive/compulsive behavior through the cultivation of spirituality¹¹ and a new way of living (Stein & Carnes, 2017), and members are encouraged to work on the 12 steps with a sponsor. The 12 steps can be summarized as follows: admitting ‘powerlessness’ (that one cannot control one’s addiction/compulsion) and deriving hope that a power greater than oneself can help overcome the addiction/compulsion (Steps 1-3), engaging in self-examination, disclosure and making amends to harmed individuals (Steps 4-9), maintaining a new way of living and helping other individuals who struggle with the addiction/compulsion (Steps 10-12; Parker & Guest, 1999; Tonigan et al., 1999). A central feature of 12-step ideology is its emphasis on abstinence from the problematic behavior as a means of recovery, which is an outcome of its adoption of the disease concept of addiction and the belief that the afflicted individual is powerless over the addiction/compulsion (Parker & Guest, 2002; Wallace, 1996).

5.1.2 12-step groups for CSB – ‘S’ groups

12-step groups adapted for CSB, known within the 12-step community as ‘S’ groups, include Sex and Love Addicts Anonymous (SLAA; founded in 1976), Sex Addicts Anonymous (SAA; founded in 1977), Sexaholics Anonymous (SA; founded in 1979), Sexual Compulsives Anonymous (SCA; founded in 1982) and Sexual Recovery Anonymous (SRA; founded in 1990) (see Salmon, 1995 for a history of the development of ‘S’ groups). ‘S’ groups follow the basic structure of AA, but differ in one important respect – while AA defines abstinence as complete abstinence from alcohol, ‘S’ groups do not define abstinence

¹¹ Although the 12-step program often refers to a ‘God’ or a ‘higher power’ of one’s own understanding, religious affiliation or belief in a personal God is not required for 12-step membership. Members are encouraged to establish a connection to a ‘power greater than oneself’ that can guide and provide inspiration for their recovery – for some this might be a personal God, but for others this may be trust in the 12-step fellowship, or connecting to a sense of one’s fullest potential, humanity or to the universe (Borman & Dixon, 1998; Parker & Guest, 2002; Ziff, 2019). Spirituality within the 12-step recovery process also consists of the practicing of ‘spiritual principles’ such as honesty, open-mindedness, and willingness (AA, 1939; Carroll, 1993).

as complete abstinence from sex. The various ‘S’ groups have differing definitions of ‘bottom-line’ behaviors, which refer to specific problematic behaviors that the individual would need to abstain from (Ziff, 2019). Some groups (SA and SRA) have fixed and predefined definitions of bottom-line behavior for all members. SA has the narrowest definition of bottom-line behavior of all the groups, which is any sexual activity outside of a heterosexual, monogamous marriage, while SRA broadens this definition slightly to include any sexual activity outside of a committed monogamous relationship. The other three groups (SLAA, SAA and SCA) allow members to define a unique set of bottom-line behaviors for themselves, typically in consultation with a sponsor (Ziff, 2019).

While there is currently no data on the estimated total worldwide membership of ‘S’ groups, it can be reasonably expected that a considerable number of individuals in recovery from CSB around the world are engaged in 12-step recovery in some capacity. For example, in terms of SLAA alone, there are currently hundreds of in-person meetings across 56 countries worldwide (Sex and Love Addicts Anonymous Fellowship-Wide Services [SLAA FWS], 2021). Furthermore, participation in ‘S’ groups has long been recommended as an adjunct to therapy by clinicians who specialize in treating CSB (e.g., Carnes, 2000; Parker & Guest, 2002; Rosenberg et al., 2014; Schneider & Irons, 2001; Weiss, 2015; Ziff, 2019), with some recommending integrating 12-step-related tasks and principles into therapy and treatment plans (e.g., Carnes, 2000; Stein & Carnes, 2017).

Some limited prior research has suggested that engagement in specific 12-step activities could be helpful in the CSB recovery process, although findings have been arguably inconclusive. Wright (2010), using a retrospective two-wave panel design, found that meeting attendance and sponsor work among members of an unspecified ‘S’ group ($N=97$) at T1 were associated with lower levels of sexual compulsivity at T2, suggesting that involvement in these 12-step activities could be responsible for the alleviation of CSB symptoms. However,

these activities at T1 did not explain significant variance in T2 sexual compulsivity after T1 levels of sexual compulsivity were accounted for, which weakens support for the efficacy of the 12 steps. Efrati and Gola (2018a) found that advancement in the 12-step program (operationalized by current step in the program) among SA members ($N=97$) significantly predicted beneficial outcomes including lower levels of CSB symptoms, sexually-related feelings of helplessness, avoidant help-seeking and sexual suppression, and higher levels of self-control and well-being, above and beyond the contribution of overall duration in the program and sociodemographic factors. However, the cross-sectional nature of the study meant that the reverse interpretation could also be true (i.e., that members who experience these benefits in their recovery may be more motivated to advance through the 12 steps).

Despite the prominence of 12-step recovery as an approach to addressing CSB worldwide, little is known about the phenomenological experiences of recovery from CSB among individuals who participate in ‘S’ groups, and how they make sense of their recovery experiences. In-depth qualitative research exploring the lived experience of recovery from CSB among these individuals is lacking within the empirical literature. To date, most qualitative studies examining experiences of recovery from CSB have utilized non-12-step samples (Burke & Haltom, 2020; Cavaglioni, 2008, 2009; Corley et al., 2013; Fernandez et al., 2021a; Perry, 2019; Sniewski & Farvid, 2019; Zitzman & Butler, 2005) or clinical samples where only a proportion of the sample attended ‘S’ meetings (Schneider & Schneider, 1996; Schneider et al., 1998). Additionally, these studies have either focused only on individual aspects of the recovery experience, including marital challenges during recovery (Schneider & Schneider, 1996), disclosure of infidelity and/or relapse to partners (Corley et al., 2013; Schneider et al., 1998) and experiences of progress through specific clinical interventions (Sniewski & Farvid, 2019; Zitzman & Butler, 2005), or have restricted their focus solely to recovery from problematic pornography use within religious

communities (Burke & Haltom, 2020; Perry, 2019) or online recovery forums (Cavaglion, 2008, 2009; Fernandez et al., 2021a).

To date, there have only been three qualitative studies exploring recovery experiences from CSB that have focused exclusively on individuals who participate in ‘S’ groups (i.e., Dhuffar & Griffiths, 2015b; Ševčíková et al., 2018; Yamamoto, 2020). However, these studies are also limited in that they focused only on very specific aspects of the recovery experience and/or had narrow inclusion criteria for participants. Dhuffar and Griffiths (2015b), analyzing recovery experiences of three SLAA members from the UK, restricted their sample to female-only participants. Ševčíková et al. (2018), analyzing recovery experiences of 18 Czech and Slovak members of SA and SAA, restricted their sample to members who were seeking help specifically for problematic online sexual activities. In addition, they used a deductive approach to data analysis to answer specific research questions about particular aspects of the recovery process (i.e., whether manifestations of the problematic behavior corresponded to behavioral addiction symptomatology and which coping strategies participants used to deal with these symptoms). Yamamoto (2020), analyzing recovery experiences of four heterosexual men from unspecified ‘S’ groups, restricted her sample to participants who had more than three-year concurrent engagement in weekly psychotherapy for CSB and regular 12-step program participation, plus more than two years of continuous abstinence from their problematic sexual behavior. Her aim was to examine a specific aspect of participants’ recovery, i.e., their experiences of combination treatment for CSB (which was psychotherapy plus 12-step participation) and their perceptions of its effectiveness. Taken together, while these analyses provide valuable insights into specific aspects of the recovery experience or about specific subsets of individuals within ‘S’ groups, qualitative studies that use a bottom-up approach to explore the

recovery experience as a whole among individuals who attend ‘S’ groups, with broader inclusion criteria for participants, are also needed.

5.1.3 The present study

The present study sought to fill the aforementioned gap within the empirical literature by conducting an inductive thematic analysis of phenomenological experiences of recovery from CSB among members of ‘S’ groups. Two broad, open-ended research questions were used to guide the analysis: (i) how do members of ‘S’ groups describe their experiences of recovery from CSB? and (ii) how do they make sense of their recovery experiences?

5.2 Method

5.2.1 Participants

Participants were recruited by means of purposive and snowball sampling through the first author’s professional network. A one-page study advertisement containing basic study information was forwarded to members of ‘S’ groups acquainted with the first author, who in turn forwarded the advertisement to other members through their respective networks. The advertisement invited members of ‘S’ groups to take part in one-on-one online interviews about their recovery from CSB. Eligibility criteria for participation listed on the advertisement included (i) being at least 18 years old, (ii) identifying as being in recovery from sex or pornography addiction¹², (iii) currently being an active member of an ‘S’ group, and (iv) having attended at least six ‘S’ group meetings before. This last criterion was to ensure that all participants considered themselves long-term members of an ‘S’ group, as most ‘S’ groups recommend that newcomers attend at least six meetings before deciding if they want to participate in the group long-term (SLAA FWS, 2004). Prospective participants

¹² Since ‘S’ groups primarily conceptualize their problematic sexual behavior using an addiction model, the terms ‘sex addiction’ or ‘pornography addiction’ were used instead of ‘compulsive sexual behavior’ when interacting with participants throughout the study. Language of addiction is also used throughout the data analysis to stay true to terminology used by participants in the interviews.

who were interested in participating contacted the research team directly. Before proceeding with the interview, participants were asked to sign an online consent form and fill out a short online survey containing questions pertaining to background information about themselves to provide context for the interview (i.e., demographic information, compulsive sexual behaviors, comorbid mental health conditions, current bottom-line behaviors, and ‘S’ group membership history). Key participant characteristics are summarized in Table 5.1.

The final study sample comprised 14 participants (13 males and one female; $M_{\text{age}} = 43.86$ years, $SD = 11.23$). The sample comprised individuals from eight nationalities including Dutch ($n=3$), British ($n=3$), American ($n=2$), Malaysian ($n=2$), French ($n=1$), Irish ($n=1$), Mexican ($n=1$), and Syrian ($n=1$). Some participants were living abroad and were attending ‘S’ meetings in their current country of residence. Countries of residence included Malaysia ($n=4$), Netherlands ($n=3$), Singapore ($n=2$), United Kingdom ($n=2$), China ($n=1$), Indonesia ($n = 1$) and the United States ($n=1$). To protect participants’ anonymity, participant nationality and country of residence are omitted from Table 5.1.

Although the study was open to members of any ‘S’ group, all 14 participants were members of SLAA. Of these, eleven attended SLAA exclusively, two also attended SA and SAA, while one also attended SAA. Therefore, the present analysis is best framed as an analysis of SLAA members specifically. Duration of active ‘S’ group membership ranged from seven months to ten years, with a median of approximately three years. Given participants’ membership in SLAA, whether or not they also identified as having love addiction¹³ was explored at some point during 12 of the 14 interviews. Eleven participants

¹³ SLAA is the only ‘S’ group that makes explicit reference to ‘love addiction’ in addition to (and in tandem with) sex addiction in their program (see SLAA FWS, 1990). Love addiction as a construct has not been clearly defined in the scientific and clinical literature. In existing conceptualizations of love addiction, what exactly someone is addicted to when addicted to ‘love’ has ranged anywhere from the feelings of romantic love present in the early phases of a new relationship, to a single object (or multiple objects) of desire, or to the romantic relationship itself (Costa et al., 2021; Hall, 2019; Redcay & Simonetti 2018; Sussman, 2010; Weiss, 2015). SLAA takes a broad view of love addiction – seeing it as manifesting in unhealthy emotional dependency on one or more love objects, preoccupation with romantic fantasies, having serial relationships, or any combination of these (Parker & Guest, 1999).

stated that they identify as also having love addiction, while one denied having love addiction. In terms of CSBs reported, visiting escorts ($n=12$) and pornography use ($n=12$) were the most common, followed by masturbation ($n=11$). Twelve participants reported a history of comorbid mental health difficulties and/or substance use disorders. All eight members with a history of substance use disorders reported currently being in recovery from substance use disorders and had either previously attended or were currently attending 12-step groups for substance use disorders (i.e., AA and/or NA).

5.2.2 Data collection

Interviews with all 14 participants were carried out between May and June of 2020 via *Zoom* video call (except for one participant who expressed preference for a *Zoom* audio call instead). All interviews were conducted by the first author, and ranged from approximately 60 to 100 minutes in length, with most being around 75 minutes. All interviews were semi-structured in nature, and the interview schedule (see Appendix E) consisted of open-ended questions pertaining to participants' CSB history, motivations for initiating recovery, goals in recovery, challenges in recovery, strategies used in recovery, and how life in recovery was different compared to the past. It should be noted that the interview schedule was merely used as a rough guide to provide a general structure for the interview, and its structure was not adhered to rigidly to ensure that the flow of the interview developed organically and dynamically depending on participants' responses to the open-ended questions. All interviews were audio recorded with participants' permission. The data collection process was concluded once it was determined that data saturation had been reached (Saunders et al., 2018).

Table 5.1
Key participant characteristics

Participant number/'S' group(s) attending	Age/gender	Sexual orientation	Relationship status	Sexual behaviors reported as compulsive	Self-identify as having love addiction?	Self-reported history of comorbid substance use disorders/mental health difficulties	Length of active membership in 'S' group(s)
P01/SLAA	38/M	H	Divorced	Visiting escorts, group sex, casual sex with multiple partners, pornography use, masturbation	Y	Methamphetamine, cocaine, and alcohol use	3 years 7 months
P02/SLAA	28/M	H	Single	Visiting escorts and strip clubs, cybersex, public sex, sex with strangers, pornography use, masturbation, telephone sex	Y	Cyclothymic disorder	1 year 10 months
P03/SLAA	41/M	H	Divorced	Visiting escorts, group sex, anonymous sex with strangers, cybersex, pornography use, masturbation	ND	Depression and anxiety	7 months
P04/SLAA	44/M	H	Married	Visiting escorts, pornography use, masturbation	Y	Bipolar disorder	5 years
P05/SLAA	22/M	H	Single	Pornography use, masturbation, stimulant-enhanced anal masturbation while watching pornography	Y	Alcohol, cannabis, steroid, nicotine, 3-MMC and MDMA use	10 months
P06/SLAA	40/F	B	In a relationship	Casual sex with multiple partners, group sex, swinging, cybersex	N	Cannabis and amphetamine use	1 year
P07/SLAA	57/M	G	Single	Public sex with strangers, visiting escorts, cybersex, pornography use, masturbation	Y	Alcohol, cannabis and nicotine use, anxiety, insomnia	2 years
P08/SLAA, SAA	52/M	H/P	Divorced, in relationships	Cuckolding, group sex, anonymous sex with strangers, swinging, pegging, underwear fetishism, bondage and submission, sexting, visiting escorts, pornography use, masturbation	Y	None	2 years 6 months
P09/SLAA, SA, SAA	49/M	H	Separated	Visiting escorts, casual sex with multiple partners	Y	Cocaine, cannabis and alcohol use, bipolar disorder	10 years
P10/SLAA	54/M	H	Married	Visiting escorts, massage parlors and strip clubs, pornography use, masturbation	Y	None	5 years
P11/SLAA	42/M	H	Divorced, in a relationship	Visiting escorts, pornography use, masturbation, telephone sex	Y	Post-traumatic stress disorder, anxiety	4 years
P12/SLAA	33/M	H	Married	Visiting escorts and massage parlors, cybersex, pornography use, masturbation, telephone sex	Y	Cannabis use, anxiety	4 years 9 months
P13/SLAA, SA, SAA	60/M	H	Divorced	Visiting escorts and strip clubs, pornography use, masturbation	ND	Alcohol, cannabis, amphetamine and cocaine use, attention-deficit/hyperactivity disorder	1 year 2 months
P14/SLAA	54/M	H	Divorced, married	Visiting escorts, pornography use	Y	Alcohol use	7 years 4 months

Note: 3-MMC: 3-Methylmethcathinone; F: female; G: gay; H: heterosexual; M: male; MDMA: 3,4-Methylenedioxymethamphetamine; N: no; ND: not discussed; P: pansexual; Y: yes

5.2.3 Data analysis

Data were analyzed using a phenomenologically informed thematic analysis (TA; Braun & Clarke, 2006, 2013). TA is a theoretically flexible method which allows researchers to conduct a rich, detailed analysis of patterned meaning across a data set. Given the phenomenological approach to data analysis, the goal of the analysis was to explore how individuals with the lived experience of a phenomenon describe and make sense of the phenomenon (Patton, 2014) – in this case, how individuals from ‘S’ groups describe and make sense of the experience of recovery from CSB. The present analysis was conducted within a critical realist epistemological framework, which “*assumes an ultimate reality, but claims that the way reality is experienced and interpreted is shaped by culture, language, and political interests*” (Braun & Clarke, 2013, p. 329). This means that participants’ accounts were taken at face value and were considered to be generally accurate representations of the reality of their experiences, while acknowledging possible influences of the sociocultural context in which they occur.

NVivo12 software was used throughout the entire data analysis process to organize the data and to facilitate ease of coding and thematic organization. The iterative process of data analysis outlined by Braun and Clarke (2006) was followed. After transcribing all the interviews verbatim, the first author read and re-read all transcripts while making initial notes for data familiarization. Next, the entire dataset was systematically coded by the first author, in consultation with the second and third authors. Given the inductive approach to data analysis, codes were derived using a bottom-up process and preconceived coding categories were not imposed upon the data. This allowed for a prioritization of participants’ own meanings and perceptions in the analysis. Data were coded at a semantic level (Braun & Clarke, 2013), resulting in 1154 unique data-derived codes. Codes were then merged to form higher-level categories (see Appendix F for an illustrative example of the progression of

coding from a basic code to a higher-level category). Candidate themes were then generated from the codes by the first author, guided by the research questions of the study. Themes were refined after review by the second and third authors and finalized once a consensus was reached by all three members of the research team.

5.2.4 Ethical considerations

The ethics committee of the research team's university approved the study. Before each interview was carried out, full informed consent was obtained from participants. Participants consented to the interviews being audio recorded and transcribed. All audio files and transcripts were fully anonymized and stored on a password-protected database. Any information that could potentially identify participants (e.g., names of individuals and places) have been anonymized in the findings.

5.3 Results and Preliminary Discussion

A total of five themes were identified from the data analysis: (i) unmanageability of life as impetus for change, (ii) addiction as a symptom of a deeper problem, (iii) recovery is more than just abstinence, (iv) maintaining a new lifestyle and ongoing work on the self, and (v) the gifts of recovery. To elucidate each theme, a selection of illustrative quotes is provided, with accompanying participant number (P01-P14). In the analysis, frequency counts or terms denoting frequency are sometimes reported. The term 'some' refers to six or fewer participants, 'many' refers to between seven and ten participants, and 'most' refers to between eleven and fourteen participants.

5.3.1 Theme 1: Unmanageability of life as impetus for change

Most participants described their initiation into recovery as being precipitated primarily by the negative consequences of their sexual behavior becoming so severe that life was no longer perceived to be manageable (e.g., "*yeah, my life was unmanageable...there was nothing left of my life*" [P06]). From a 12-step perspective, admission of 'powerlessness'

(i.e., loss of control over the addiction) and the ‘unmanageability’ of life (i.e., due to the severe negative consequences of the addiction) is the first step that begins the process of recovery. While participants described at length the experience of powerlessness over their behavior in the form of obsessive preoccupation with the behavior, repeated broken promises to stop the behavior and escalation of the behavior (in terms of increased amount of time spent on the behavior or progression to more extreme or stimulating behaviors to achieve the same desired effect), it is interesting to note that the experience of powerlessness alone did not appear to be sufficient to spur recovery initiation for most participants. Rather, the perception of some form of unmanageability in the form of negative consequences appeared to be a necessary condition for motivating change. As noted by one participant:

It's the consequences, one hundred percent. Yeah like I said if the consequences were not so dire, I would probably continue to try to get away with it. (P09)

The most commonly reported negative consequence was negative impact on marital or romantic relationships ($n=11$), which included causing emotional pain to partners, dissatisfaction with partners, a lack of trust in the relationship, and breakdown of the relationship or divorce. Other negative consequences reported included engaging in behavior that went against their moral values, such as engaging in infidelity ($n=9$), shame and regret ($n=8$), financial costs ($n=6$), self-loathing and loss of self-esteem ($n=4$), occupational impairment ($n=4$), negative impact on sex life with partner ($n=3$), contracting and/or spreading sexually-transmitted infections ($n=3$) and suicidal ideation ($n=2$).

Of note, for most participants ($n=11$) the turning point happened only once some kind of crisis hit – either an external crisis (precipitated by an external intervening event; $n=8$) or an internal crisis (having an emotional breakdown; $n=3$). The most common external intervening event was their secret sexual behavior being discovered by their partner ($n=4$).

One participant even described feeling relieved at being discovered by his wife, indicating a desire to change deep down but feeling helpless to do so without external intervention:

So, when my wife found out, it was basically... I don't know, maybe it was just a matter of...a cry for help. I don't know. So, when my wife found out she actually confronted me, it was actually quite a bit of relief actually. (P04)

All three participants who experienced an emotional breakdown (broadly defined as the experience of overwhelming emotional distress leading to a feeling of not being able to cope any longer with the present circumstances) attributed it to the incongruence and exhaustion felt at living a double life for so long. For example, one participant described feeling inexplicable panic attacks which he later realized was because of his double life:

I think it [the reason for the panic attacks] was uh...the fact that I could not cope with the deception, the lying, the constant lying to everybody...my body was telling me what my brain was trying to avoid...the body was saying no, this is not alright, this is not okay. (P14)

While shame (which involves evaluation of the self as a bad person) has been suggested to play a role in the maintenance of CSB, guilt (which involves evaluation of the behavior as wrong), in contrast, may play a functional role in effecting motivation to change the behavior (Gilliland et al., 2011). For all three participants the emotional breakdown appeared to be brought about by accumulated feelings of guilt about their double lives, and was followed by the decision to address the behavior and come clean about the behavior (e.g., “...and that was the point that I um... discovered that I cannot do this any longer...when I came home I told my wife about my secret life, about everything” [P03]).

Participants' experiences suggest that motivations for initiation into recovery are no different for individuals who attend 'S' groups when compared to individuals with substance use disorder and gambling disorder, as previous qualitative research has found that initiation

into recovery from these disorders is also often precipitated by an external or internal crisis (Stokes et al., 2018; Vasiliadis & Thomas, 2018). While ‘hitting rock bottom’ is not necessary for initiating recovery from substance use disorders (Chen, 2018) and likely for CSB as well, the perception of life as unmanageable, often precipitated by a crisis, appears to be a common pathway into recovery initiation from CSB for ‘S’ group members.

5.3.2 Theme 2: Addiction as a symptom of a deeper problem

Arguably the most prominent theme that emerged across participants’ reflections about their addiction was that their addiction was a symptom of a deeper problem. From the vantage point of recovery, they now saw their sexual acting out as a manifestation of unresolved underlying issues that would need to be addressed in recovery:

And that’s why I am trying to go deeper into the issues because [the addiction] is just a symptom of what the real problem is. (P03)

Their sexual acting out was believed to be, at least in part, a manifestation of one of three non-mutually exclusive issues: (i) unresolved developmental trauma, (ii) a disordered search for validation and attention, and (iii) a disordered search for intimacy and love.

Unresolved developmental trauma

First, many participants ($n=9$) viewed their addiction developing as a consequence of unresolved developmental trauma (e.g., “*Addiction, where it comes from... I can say that I have identified that the origin is in trauma*” [P14]), a perception that is consistent with findings from studies suggesting that early life trauma could be a contributing factor in the development of CSB (Chatzittofis et al., 2017; Efrati & Gola, 2019; McPherson et al., 2013). The nine participants reported a range of early adverse experiences including witnessing domestic violence, being bullied, being sexually abused, and having parents who were addicted to psychoactive substances, but most common ($n=5$) was the experience of abandonment or neglect from early caregivers (e.g., “*Um, had a sense of abandonment from*

like my father leaving and uh... yeah there's just a lot of dysfunction in the home...it certainly affected me" [P09]).

Some participants inferred that these early adverse experiences contributed to the development of CSB through learning from an early age that sexual behavior could provide effective (albeit short-term) relief from distressing emotions resulting from these experiences (e.g., *"I was being bullied at school a lot, and I used to come home from school and masturbate immediately right, very fast right, right after. It would calm me down" [P11]).* Over time, the sexual behavior became the primary coping mechanism for dealing with distressing emotions, as described by one participant:

I used to use [pornography] as an escape because at home it wasn't always very pleasant and my dad was then also drinking a lot and was always fighting and screaming and beating my mother up and stuff... That time it felt like my savior...I found something that's gonna fix my life again. (P05)

This explanation makes sense in light of previous research suggesting that because individuals with unresolved traumatic experiences tend to experience chronically elevated levels of anxiety and emotion dysregulation throughout their lives, CSB may develop if sexual behavior is continually used as a primary regulatory mechanism (Katchakis, 2009; Lew-Starowicz, 2020). It is also plausible that using sexual behavior as a primary emotion regulation strategy could have been similarly responsible for the development of CSB among participants who reported having comorbid mood and/or anxiety disorders (whether trauma-related or otherwise), although this hypothesis was not explicitly explored by participants during the interviews.

Disordered search for validation and attention

Second, many participants ($n=7$) saw their sexual acting out as resulting from a disordered search for validation and attention:

I think it was a degree of validation...In terms of sort of like I felt I was recognized, I felt I was being listened to. I felt that someone was attracted to me, even if I knew it was fake, I felt that that was at least happening. (P12).

Some participants even saw themselves as being more addicted to attention from objects of desire than to the sex itself (e.g., “when I was in rehab, I said oh yeah maybe I’m addicted to attention, you know...it’s not so much the sex, it’s the attention” [P14]), with one participant describing the attention as giving him even more of a high than sex (i.e., “in fact, attention is more important for me than sex. If I get attention from a beautiful woman, I think that is more of a high than the sex” [P11]).

Seeking validation and attention through these interactions was generally seen as stemming from feelings of inadequacy and low self-worth: (e.g., “it was all to do with low self-esteem, low self-worth, no self-respect” [P06]), which aligns with previous qualitative findings showing that some individuals with CSB see their sexual acting out as compensating for feelings of low self-esteem (Giugliano, 2006).

Disordered search for intimacy and love

Third, many participants ($n=7$) understood their sexual acting out to be a manifestation of a disordered search for intimacy and love. As described by one participant:

I knew my acting out occurred via sex but I think what I desperately wanted even through that extensive sexual acting out... was love and affection. I just didn’t know how to attain it in a healthy way. Yes, it came out sexually but really what I was after was love. (P12)

This description of sex as a disordered search for love and intimacy is echoed in findings from previous qualitative research showing that some individuals with CSB attribute their sexual behavior to a desire for connection, where the feeling of connection with another human being during sexual acting out, however fleeting and illusory, acts as a substitute for

real intimacy (Giugliano, 2006; Turner-Shults, 2002). Crocker (2015) postulates that individuals with CSB often act out their emotional needs sexually because it allows them to attempt to meet their need for connection without the risk of vulnerability that is needed in the context of real intimacy. Some authors have called CSB an ‘intimacy disorder’ (e.g., Adams & Robinson, 2001; Schwartz & Southern, 2017), proposing that a defining characteristic of individuals with CSB is an impairment in capacity for real intimacy that results from early traumatic experiences and insecure attachment, although other authors have argued that this may not be the case for all individuals with CSB (Hall, 2013; Riemersma & Systema, 2013). Notably, two of the seven participants spoke at length about a history of avoidance of intimacy in relationships. While one participant cited fear of vulnerability as the primary reason for his avoidance of intimacy (i.e., “*when it comes to the real stuff, when I’m about to be emotional or vulnerable, I stay away*” [P01]), the other participant made explicit use of attachment theory (Bowlby, 1982) to explain how a sense of abandonment in his childhood led to attachment issues and an avoidance of intimate relationships, which in turn contributed to the development of his addiction:

Addiction is, you know, an attachment disorder...It is trying to fill in the spaces where there hasn’t been proper attachment. (P07)

Of note, all seven participants who attributed their sexual acting out to a disordered search for love and intimacy reported identifying as having love addiction, with four mentioning that they identify more with love addiction than sex addiction. Interestingly, four of these seven participants (including the three who identified more with love addiction) saw their sex addiction as being a manifestation of love addiction (e.g., “[*Love addiction*] manifests itself through sexual ways, you see. I act out sexually just to feel loved. Just to either feel loved or to overcompensate for the lack of love, you know” [P01]).

Participants did not provide clear definitions of their love addiction, but from their descriptions it appeared that they referred broadly to any engagement in interactions that went beyond just sexual pleasure, that either elicited feelings of affection and/or attraction, or had an emotional connection component to them (e.g., “...*love addiction...even with escorts, it wasn't really always just the sex. It was having some emotional connection with that person...shared experiences, shared mutual satisfaction and maybe some attraction*” [P10]). However, the extent to which these participants actually experienced compulsive patterns of romance or emotional dependency was unclear. It is possible that due to exposure to the love addiction concept in SLAA, some SLAA members may more readily use the ‘love addiction’ label to explain their desire for intimacy, or be more sensitive to any tendency in themselves to search for intimacy in disordered ways beyond sex. Further qualitative research is needed to better understand what having ‘love addiction’ means to members of SLAA who identify with this label, whether they believe that their sex addiction and love addiction are related, and if so, how.

5.3.3 Theme 3: Recovery is more than just abstinence

Many participants reported that when first beginning their recovery journey, their goal was simply to stop the problematic behavior (e.g., “*I suppose initially I just wanted to stop acting out*” [P12]). However, over time in recovery, participants’ goals evolved to include goals beyond abstinence because they gradually came to believe that while abstinence from bottom-line behavior (called ‘sobriety’ within SLAA; see SLAA FWS, 2012) is foundational to recovery, recovery is more than just abstinence. The primary way that participants appeared to be led to this belief was through learning from experience that paradoxically, in order to achieve lasting abstinence, what was needed was not so much focusing attention on stopping the behavior, but on getting one’s life in order, because lasting abstinence is achieved as a byproduct of improving one’s life as a whole:

What I learned after a year or so at SLAA is it's not fighting the addiction, it's just getting your life in order that's important...And over time, the obsession for sex or needing that closeness or that love relationship dissipates. (P10)

We're not talking about fixing that... hey you stop watching pornography. It's not about that. It's about fixing all the amazing things that I can have in my life... And that helps me to stay away from pornography. (P02)

Yeah, first was more just to stop the behavior.... But I must say at some point it also more shifted like... That I was more working on creating a life I didn't want to escape from anymore. So, it was also more about not doing something but more about... yeah, working on all the other parts of my life. (P03)

Specific recovery goals beyond abstinence articulated by participants included increasing self-acceptance and/or loving/liking oneself more ($n=5$), working on trauma-related issues ($n=4$), developing or improving one's connection with a higher power ($n=3$), loving or having an increased connection with other individuals ($n=2$), learning to have a healthy relationship with sex and love based on intimacy ($n=2$), living in peace and serenity ($n=2$), making amends to loved ones ($n=1$), restoring dignity of the self ($n=1$), and achieving personal growth ($n=1$). Of note, some of these goals (i.e., increasing self-acceptance, trauma work, and learning intimacy-related skills) directly address the underlying issues mentioned by participants in Theme 2, while other goals (e.g., restoring dignity of the self and living in peace and serenity) appear to represent attempts to undo negative consequences of the addiction. These goals illustrate how recovery takes on a broader and deeper meaning beyond just abstaining from the behavior because recovery now also becomes about working on the self to achieve personal growth and regaining what has been lost as a consequence of the addiction.

Overall, this theme of recovery being more than just abstinence is mirrored in findings from previous qualitative research investigating meanings of recovery among individuals with substance use disorders who are engaged in abstinence-based recovery (Costello et al., 2018; Laudet, 2007), which suggests that the overarching meaning of recovery is likely to be similar regardless of the addictive or compulsive behavior an individual is trying to overcome. Participants' narratives within this theme also corroborate Helm's (2019) observation that while abstinence is as an important component of recovery in all 12-step programs, 12-step members across various 12-step groups tend to emphasize the quality of their recovery as a whole (which manifests in 'emotional and mental sobriety' – Helm, 2019, p. 29) as being more central to the meaning of recovery over just a physical state of being abstinent. An important implication of this is that someone could be abstinent from the behavior at a given moment, and yet be regressing in recovery and at risk of relapse if not vigilant about maintaining the quality of their recovery. In line with this, one participant who reported successfully achieving long-term abstinence from bottom-line behaviors for the past few years stated that he still has to be cautious in maintaining the quality of his recovery, or risk relapse (i.e., "*No, I mean like I said I still have to be careful... [the addiction's] still always in the long grass*" [P12]). In this sense, recovery was also seen as a lifestyle that must be nurtured and maintained for the long-term, even lifelong, because there is always a risk of relapse:

It's not a quick fix. It's something I need to work on regularly. Like someone said it's like keeping a garden. Keeping a garden, you have to consistently water, cut things and everything. (P05).

I haven't been to the stage in recovery where [the addiction] just goes away... I don't think that ever happens, I think it's just we spend the rest of our lives just trying to manage it, and managing it, and that. (P09).

5.3.4 Theme 4: Maintaining a new lifestyle and ongoing work on the self

Since achievement of long-term abstinence was believed to be contingent upon maintenance of quality of recovery, the key task for participants was to develop and execute a strategy that offered them the best chance of continuing to maintain the quality of their recovery for the long-term. Participants' descriptions of what helped them maintain the quality of their recovery can be best summarized as a combination of maintaining a new lifestyle and engaging in ongoing work on the self.

Maintaining a new lifestyle

Two aspects of the SLAA recovery process provided participants with a structure from which to build a new lifestyle that could be maintained throughout their recovery: (i) the three circles framework, and (ii) regular connection with the fellowship.

The three circles framework. The 'three circles' framework (International Service Organization of SAA, 2016) was originally developed and popularized by SAA, but appeared to be informally adopted by many participants even within SLAA. Within this framework, behaviors are allocated into three concentric circles typically in consultation with a sponsor. Behaviors within the inner circle (also known as 'bottom line' behaviors within SLAA) are behaviors that members want to abstain from, and engaging in these behaviors would be considered a slip or relapse. Example behaviors allocated to this circle by participants included visiting escorts, watching pornography, and having sex outside of a committed relationship. Behaviors within the middle circle are behaviors that are triggering or 'slippery' such that if engaged in, might lead back to inner circle behaviors. Example behaviors allocated to this circle by participants included watching videos with sexually arousing content, not engaging in proper self-care, and dishonesty. Behaviors within the outer circle (also known as 'top line' behaviors within SLAA) are healthy behaviors that enhance recovery. Example behaviors allocated to this circle by participants included exercising,

meditating, praying, maintaining a healthy sleep routine, investing time in new hobbies, attending ‘S’ group meetings regularly, and making regular phone calls to other members.

The three circles framework appeared to provide a sense of clarity to participants about how to structure their lives behaviorally on a day-to-day basis – in essence, avoid inner circle and middle circle behaviors, and focus on practicing outer circle behaviors. Notably, sexual boundary plans using this same framework have been recommended for CSB treatment by clinicians who treat CSB (e.g., Carnes, 2007; Hall, 2019; Weiss, 2015). Weiss (2015) argues that unambiguous definitions of behaviors within inner and middle circles is necessary to avoid impulsive decisions being made during moments of vulnerability about whether certain behaviors are acceptable or not within one’s recovery. It should be noted that lists of inner and middle circle behaviors were not inflexible once set – many participants reported modifying and refining these lists over time, in consultation with their sponsors. For example, some participants removed masturbation from their inner circle when it was determined that they were ready to integrate it back into their sexual lives in a healthy way:

Masturbation was like a complete ‘no’ at the beginning...And then over time...I got to relax the masturbation because I was single for most of the time...what I found myself is like once a week is a pretty healthy frequency. (P14).

Importantly, the middle circle concept was cited by some participants as being particularly instrumental to their recovery, because slipping into middle circle behaviors was a visible warning sign that the individual was backsliding in recovery. As described by one participant, slips could often be traced back to not being vigilant about avoiding middle circle behaviors:

And these middle circles are just bringing me down, and I acted out or I masturbated or I’m watching porn because of these middle circles. (P02).

It is worth noting that while many participants appeared to benefit from the three circles framework, two participants reported some uneasiness specifically about the process

of deciding on their bottom-line behaviors because they perceived that their sponsors' opinions of what should be included as bottom-line behaviors were overly restrictive. For example, one participant described feeling imposed upon by her sponsor to include pornography use and masturbation as bottom-line behaviors although she did not feel these behaviors were a problem in her own life:

I don't know if it's SLAA or it's just my sponsor, like... But I thought the bottom lines is for every person it's different. And if like me, I think I don't have a problem right now with porn or masturbating, so I don't want to put it on my bottom lines... But like my sponsor, he really disagrees...that is something that I find quite difficult. (P06).

This indicates that although some 'S' groups (e.g., SLAA) ostensibly allow for autonomy and flexibility in definition of personal bottom-line behaviors, in practice some attendees might feel pressure to conform to specific norms in definitions of bottom-line behaviors (e.g., pornography use always being included as a bottom-line behavior) that may have developed as a result of the idiosyncratic beliefs and culture of specific groups (since each local group is autonomous and is made up of a unique composition of individuals at any given time – Salmon, 1995). These members might feel reluctant to freely explore what healthy sexuality means to them personally for fear of the group not being supportive of atypical definitions of bottom-line behaviors.

Regular connection with the fellowship. The second aspect of the SLAA recovery process that contributed to a new lifestyle was ensuring that regular contact with the SLAA fellowship was built into the individual's weekly routine. This was achieved through regular meeting attendance (typically once to three times weekly) and phone calls with sponsors and other members. Some members described being part of *WhatsApp* groups with other 'S' group members, which allowed them to set up immediate phone calls with members who happened to be available at the time (e.g., *"The [WhatsApp] group helped a lot because you*

know since it's distributed and there's so many people, I knew there'll always be someone to help" [P13]). Phone calls acted either as a coping strategy, to seek support while feeling an urge to act out on bottom line behaviors and/or while experiencing challenging situations or emotions, or as a recovery maintenance strategy, where calls were built into one's daily routine to 'check in' with other members (called 'outreach calls'). Some members reported that engaging in multiple outreach calls as part of their daily routine was particularly helpful (e.g., *"the regular outreach calls, I was doing three calls a day, every day...that just really helped keep me focused and straight [P08]"*).

Regular meetings and phone calls provided avenues for participants to share openly and honestly about themselves and their lives, but also to listen to other members' stories and learn from their experiences:

I do believe SLAA works on multiple levels of improvement...One of them is sharing about yourself, creating a level of honesty and being less afraid to voice out exactly what's going on in your life. I spent so many times smothering up and keeping hidden what was going on for fear of further shame and further criticism, so yeah. Learning to talk about me. Hearing from the other stories from others and practical advice from others about dealing with their obsessions. (P10).

Other benefits of regular interaction with other members commonly described by participants included a sense of identification and belonging (e.g., *"I find people with the same problem...I had a feeling that I was not crazy anymore, and I was not alone"* [P03]) and sustaining motivation in one's recovery through feeling inspired by other (usually senior) members (e.g., *"...how I stayed sober yeah...like those people that are multiple years clean. It's like they really motivate me, and when I see them it's just...I want what they have"* [P05]). Clinicians who treat CSB have suggested that authentic interaction with other recovering individuals within a group setting can be particularly therapeutic for individuals

with CSB, because it gives them an opportunity to learn to build intimate relationships with other individuals in a healthy way (Benfield, 2018; Coleman et al., 2018). In line with this, some participants in the present study felt that connection with the fellowship provided a sense of intimacy and connection that they were looking for through their sexual acting out. As described by one participant:

I guess it's the same kind of warmth that I was looking for when I was going high I guess...Because yeah you go there now, familiar faces... And it's nice to know each other and help each other and whenever I have problems or when I feel anxious now or whenever I feel something I can do things. I can call someone. I can reach out. (P05).

Importantly, staying connected to the fellowship through meetings and phone calls was perceived to be so essential to recovery that some participants directly attributed their lapses to not staying sufficiently connected to the fellowship:

But like when I was slipping the most, is when I was way more lenient on it. These last few months I've been way more diligent with it, like I've only missed a handful of days where I didn't make all those things, three calls a day, call my sponsor, three meetings a week. (P09).

I haven't used reaching out so much where I've felt in a slippery place. I haven't used a sponsor in the way I should have, and there are probably two reasons why I haven't had a length a sobriety. (P10)

Participants' experiences generally align with those of SA and SAA members from a previous qualitative study (Ševčíková et al., 2018) who described the three circles framework and phone calls to other members as being particularly effective for dealing with addiction-related symptomatology (e.g., salience, mood modification, and relapse – Griffiths, 2005) during abstinence. Of note, participants in the present study described these tools as useful

not just for dealing with these addiction symptoms, but for minimizing the occurrence of these symptoms in the first place through the maintenance of a new lifestyle.

Ongoing work on the self

Many participants reported that in parallel to maintaining a new lifestyle, engaging in ongoing work on the self was key to their recovery. The two main ways by which participants described engaging in ongoing work on the self was through (i) 12-step work, and (ii) psychotherapy.

12-step work. The primary way by which participants reported working on the self was through working the 12 steps with a sponsor. While some participants emphasized 12-step work as being about connection with a higher power (e.g., “*There's 12 steps, right, and the end result, the 12th step, is we had a spiritual awakening. It's all about connecting with a higher power*” [P09]”), other participants also described 12-step work as being about the facilitation of self-examination in order to achieve personal growth and self-improvement (e.g., “*you need to make some steps in the program, what they suggest...within lies personal growth*” [P05]). This is consistent with the idea that cultivation of spirituality within the 12-step recovery process is not only about connecting with a higher power, but also about spiritual growth and character-building (Carroll, 1993). Participants typically highlighted working Steps 4–9 as being particularly transformative, as the process of letting go of their resentment and fears, being aware of their personal weaknesses, and making amends to individuals in their lives that they had harmed was deeply therapeutic and effective for building character. For example, one participant described Step 6 work (where personal weaknesses are explored) as facilitating insight into a major trigger for his sexual acting out:

Getting to you know the sort of Step 5 and Step 6 work of getting to know your flaws, your weaknesses, your character defects, I found particularly important because...some real core defects were driving me to what I did and get me into those

negative mindset situations which ultimately led to me seeking relief through acting out. (P10)

Psychotherapy. Apart from 12-step work, most participants also reported engaging in work on the self by receiving psychotherapy for their CSB and underlying issues. Thirteen of the 14 participants reported receiving therapy for CSB at some point in their recovery. Of these, two participants explicitly stated that they received therapy from clinicians who specialized in treating CSB. One of these participants felt that seeing a specialist clinician was particularly crucial to his recovery:

Therapy was massive for me, I mean I'm very grateful for the 12 steps, but I think a lot of my big work was done in seeing a specialist sex addiction counselor. I think that was massive for me. Having a professional ear to listen to my issues and help me work my emotions through them... Helping me to look at my family of origin and the patterns that they had since childhood, and how I was repeating these patterns as an adult... They were massive things for me. (P12).

Although some participants felt that 12-step work was sufficiently therapeutic for addressing their underlying issues and therefore stopped receiving therapy (e.g., “*Now that now I'm no longer in the [therapy] program, I actually don't believe I need more because basically in Step 4 you also go back in the past and talk about it*” [P05]), other participants felt that the 12 steps could not adequately address their underlying issues, especially unresolved trauma:

So, psychotherapy. Because trauma is not so well addressed you know in the 12 steps... It's not a direct approach to trauma where we need more strategies to deal with the trauma. It's good to have other tools to be able to cope with that while we work the steps. (P14).

This perception aligns with those of ‘S’ group members from a recent qualitative study who perceived therapy as being able to address underlying issues that the 12 steps were not able to (Yamamoto, 2020). Notably, five of seven participants in the present study who reported at the time of the interview that they were still receiving ongoing therapy on a weekly basis described working primarily on trauma-related issues in therapy. For these participants, a combination of 12-step work and professional psychological treatment formed the basis for ongoing work on the self that was a key component of their recovery.

5.3.5 Theme 5: The gifts of recovery

All participants noted significant positive changes in their lives, or ‘gifts of recovery’ (DeLucia et al., 2015) after being in recovery for some time. Most of these positive changes can be framed as gifts because these were changes that were not pursued directly, but appeared to manifest in their lives as an effect of their continued practice of their program of recovery. Many participants ($n=9$) described regaining a sense of control over their sexual behavior as a key change. Some participants highlighted that their compulsion to engage in bottom-line behaviors had largely diminished (e.g., “*those kind of worse behaviors from my acting out have abated. I don’t have the compulsion towards them*” [P12]), while others emphasized a sense of self-efficacy in being able to deal with urges even if they were to arise (e.g., “*I mean sometimes I get urges to act out...but I also know that okay, fine, these urges will come and go if I don’t act on them*” [P11]).

Importantly, many participants described undergoing profound personal transformation that went beyond just being able to abstain from their bottom-line behaviors. One participant felt that he was even a better version of himself than before the onset of his addiction:

I have to say I'm grateful for my addiction because I believe I'm a better version of myself before I even picked up my first drug or acted out. (P01).

Positive changes relating to increased strength of character and resilience ($n=6$), greater emotional stability ($n=5$), increased sense of gratitude ($n=5$), increased self-acceptance ($n=4$) and increased sense of meaning ($n=1$) were described by participants. However, the most frequently cited change was an increase in other-centeredness and love ($n=10$), which might be an outcome of the emphasis on the overcoming of self-centeredness as a key aspect of spiritual growth within the 12-step program (Tonigan et al., 1999). This was described by one participant:

So as long as I'm in my addiction, I'm thinking about myself. You know, I'm worried about what's happening to me, what can I get for myself. But when I'm in recovery, I start thinking about other people, what can I do, how can I contribute... How can I help this other person, how can I become a better father, better husband, better friend. (P09).

Some participants ($n=6$) also reported that the overall quality of their lives had improved, where increase in life satisfaction, increase in positive emotions, improvement in occupational functioning, and a sense of life flourishing (Keyes, 2002) were described. For instance, one participant described that the extent to which his whole life was different now compared to the past was previously beyond his “wildest dreams”:

But I'd say right now I have a life beyond my wildest dreams. I'm married, I love my wife, um I enjoy her company. I express my feelings and my emotions to her. And God willing, we'll have a baby boy in three months' time... These are things I couldn't have imagined. (P12).

Collectively, the positive changes in participants' lives appeared to not only be about the alleviation of CSB symptoms. Because a holistic plan of recovery (that focused on maintenance of a new lifestyle and ongoing work on the self) was needed in the first place, the outcome appeared to be holistic transformation of themselves, and by extension, their

lives. For some participants, these positive changes were somewhat reminiscent of the “better than well” phenomenon (Best & Aston, 2015, p. 177; Hibbert & Best, 2011) previously observed among individuals recovering from substance use disorders, where the recovery process appears to lead the individual not merely back to a ‘normal’ state, but to a quality of life that may even transcend that of the general population. Finally, it also appeared that because these positive changes were so rewarding, they served to further reinforce participants’ motivation to sustain commitment to their recovery and abstinence from bottom-line behaviors.

5.4 General Discussion

The present qualitative study used inductive thematic analysis to explore how members of an ‘S’ group (i.e., SLAA), describe and make sense of their experiences of recovery from CSB. A key contribution of the present study is that an open-ended, bottom-up approach to data collection and analysis was used in exploring the CSB recovery experience as a whole among SLAA members. One advantage of this approach was that it was possible to observe how participants made sense of the entirety of their recovery experience without feeling restricted to speak about it only within a narrow context (e.g., a 12-step context). Since all participants were active long-term members of SLAA, it is unsurprising that they made sense of their recovery experiences primarily from a 12-step lens. At the same time, it is noteworthy that most participants appeared to have sophisticated views of recovery that drew upon not only 12-step spiritual concepts, but psychological concepts likely assimilated through their experiences in therapy (e.g., CSB developing as a result of underlying psychological problems such as unresolved developmental trauma or insecure attachment). This observation makes sense in light of the fact that almost all participants reported undergoing some kind of psychological treatment for CSB either in the past or present. Participants tended to emphasize the holistic and multidimensional nature of their recovery

(Costello et al., 2018; Dodge et al., 2010), which involved change across cognitive, affective, behavioral, social, and spiritual dimensions. Data on ‘S’ group membership are scarce, but a recent membership survey of SAA ($N = 2,190$) found that 67% of members had undergone therapy before attending SAA, and 81% were still undergoing therapy while attending SAA (International Service Organization of SAA, 2019). Taken together, this suggests that many ‘S’ group members do not take a purely 12-step perspective of recovery, but use the 12-step program as one tool among many in their recovery.

Nonetheless, with regards to the 12-step recovery process itself, regular connection with the fellowship was emphasized by most participants as being particularly instrumental in their recovery, in line with previous qualitative studies that have shown that individuals recovering from CSB across various recovery communities (e.g., religious communities – Perry, 2019; online recovery forums – Cavaglion, 2008; Fernandez et al., 2021; individuals receiving group treatment for CSB – Hall & Larkin, 2020) tend to highlight receiving ongoing support from other recovering individuals as being crucial to their recovery. Beyond meeting attendance, frequent (sometimes daily) phone calls with other ‘S’ group members appeared to play an important role in the SLAA recovery process. The present analysis suggests that social support received from other members in the fellowship, especially in between meetings, could be an important mechanism of change in ‘S’ groups beyond 12-step work (cf. Efrati & Gola, 2018a), and warrants further exploration in future quantitative studies of ‘S’ groups.

Overall, the present analysis indicates that ‘S’ groups such as SLAA appear to be an invaluable resource for individuals recovering from CSB, particularly due to the virtually constant social support available to members by other members. At the same time, it is important to note that the present analysis also suggests that ‘S’ group participation might not be suitable for all individuals with CSB. While all 14 participants appeared to benefit from

the 12-step recovery process overall, two participants expressed difficulties with one aspect of the SLAA program in particular – the subjectivity of the process of defining bottom-line behaviors with a sponsor (i.e., both felt that their sponsor’s opinion on what should be considered acceptable behavior in recovery was overly restrictive). This suggests that some ‘S’ group attendees could feel pressure to conform to specific norms in definitions of bottom-line behaviors that may have developed as a result of the idiosyncratic beliefs and culture within individual ‘S’ groups. Therefore, individuals who wish to explore atypical definitions of bottom-line behaviors or non-abstinence goals (e.g., moderation in lieu of complete abstinence from problematic sexual behaviors) might not feel comfortable participating in a specific ‘S’ group if they perceive that these goals will not be supported by other members. In addition, because the present sample was self-selected and comprised individuals who were long-term, active ‘S’ group members, the present analysis is likely to emphasize positive experiences over negative experiences within ‘S’ groups. As such, there may be other potential deterrents to ‘S’ group participation that have not been captured by the analysis. Qualitative research that purposively samples members who have had predominantly negative experiences within ‘S’ groups (see, for example, Glassman et al., 2020) is needed to more fully understand further potential limitations and/or harms of ‘S’ groups.

5.4.1 Study limitations

The present study has some limitations that warrant acknowledgement. First, although all participants self-identified as being in recovery from ‘sex addiction’ or CSBD, no clinical interview was conducted to verify whether participants did indeed meet CSBD criteria as outlined in the ICD-11. Second, the sample comprised primarily heterosexual male members of a specific ‘S’ group (i.e., SLAA) who identified as having ‘love addiction’ in addition to ‘sex addiction’ or CSBD, many of whom also had a history of co-occurring mental health conditions and/or substance use disorders. Recent research has shown that the majority

(91.2%) of individuals with CSBD report a history of comorbid Axis I clinical conditions, while a smaller proportion (16.2-22.1%) report a history of substance use disorders specifically (Ballester-Arnal et al., 2020). This suggests that while having co-occurring mental health conditions is generally representative of the typical individual with CSBD, there may be an overrepresentation of individuals with a history of co-occurring substance use disorders in the sample. Therefore, the present findings may be limited in their transferability to 'S' group members who do not match these aforementioned sample characteristics. Finally, the present study's focus on mapping out patterned meaning across the dataset meant that individual differences in various aspects of the recovery experience could not adequately be accounted for in the analysis. Future qualitative studies employing idiographic methods (e.g., interpretative phenomenological analysis) with smaller sample sizes are needed to address this specific limitation.

5.4.2 Conclusion

Although many individuals recovering from compulsive sexual behavior (CSB) worldwide participate in 'S' groups, there has been a paucity of empirical research on 'S' groups when compared with 12-step groups for substance use (e.g., AA and NA). The present qualitative study contributes to this gap in the literature by analyzing the lived experiences of CSB among members of a specific 'S' group (i.e., SLAA) using a bottom-up approach, and provides insights into how SLAA members describe and make sense of their recovery journeys. Moving forward, more qualitative and quantitative research on 'S' groups in general is needed to continue to build a deeper and more complete understanding of the recovery experiences of 'S' group members and the specific 'S' group processes that contribute to successful CSB recovery.

Chapter 6

Effects of a seven-day pornography abstinence period on withdrawal-related symptoms in regular pornography users: A randomized controlled study¹⁴

6.1 Introduction

6.1.1 Problematic pornography use (PPU)

Pornography use is a common activity in the developed world, with nationally representative studies showing that 76% of men and 41% of women in Australia reported using pornography within the past year (Rissel et al., 2017), and that 47% of men and 16% of women in the U.S. reported using pornography at a monthly or greater frequency (Grubbs, Kraus, et al 2019). Given the increasing prevalence of pornography use, the potential negative psychological effects of pornography use (particularly in relation to its problematic or addiction potential) have been the subject of growing empirical attention in recent years (de Alarcón et al., 2019; Grubbs et al., 2020; Grubbs & Kraus, 2021). Research to date has generally indicated that while the majority of individuals who use pornography report doing so in a non-problematic way (Bóthe, Tóth-Király, et al., 2020), a subset of users report addiction-like symptoms such as impaired control over their pornography use (Bóthe et al., 2018; Kor et al., 2014) and self-identify as being ‘addicted’ to pornography (Grubbs et al., 2018).

Despite these self-reports, researchers still disagree about whether habitual pornography users can develop genuine addictions to pornography and manifest addiction-related symptomatology akin to substance addictions. Some authors have argued that pornography is inherently addictive due to it being a particularly novel and rewarding

¹⁴ This chapter has been submitted for publication in a peer-reviewed academic journal: Fernandez, D. P., Kuss, D. J., Justice, L. V., Fernandez, E. F., & Griffiths, M. D. (2022). *Effects of a seven-day pornography abstinence period on withdrawal-related symptoms in regular pornography users: A randomized controlled study* [Manuscript submitted for publication]. Department of Psychology, Nottingham Trent University.

stimulus (Hilton Jr., 2013) and that symptoms of dysregulated pornography use fit within an addiction framework, sharing similar neurobiological mechanisms with substance addictions and other behavioral addictions (Gola et al., 2017; Love et al., 2015), while others hold the view that pornography addiction is not a valid clinical entity and can instead be explained by non-pathological learning (Ley et al., 2014). One model (Grubbs, Perry, et al., 2019) has posited that while some users may experience genuine dysregulation in their pornography use, other users may inaccurately pathologize their use even in the absence of genuine dysregulation due to moral incongruence about their use – suggesting that self-diagnoses of ‘pornography addiction’ should be regarded with caution.

The lack of consensus concerning how best to conceptualize dysregulated use of pornography has also been in large part due to ongoing debates in the field about how to conceptualize out-of-control sexual behaviors more broadly (Fernandez & Griffiths, 2021). There have been numerous theoretical conceptualizations of out-of-control sexual behaviors over the years, including sexual addiction (Carnes, 1983), sexual impulsivity (Barth & Kinder, 1987), compulsive sexual behavior (Coleman, 1991) and hypersexual disorder (Kafka, 2010). As a result of the varying theoretical frameworks, the term *problematic pornography use* (PPU) has typically been used in the literature likely because it is the most theoretically neutral term that encompasses any conceptualization of the phenomenon and includes problematic use at the subclinical end of the spectrum (Fernandez & Griffiths, 2021). Most recently (in 2019), the World Health Organization (WHO) included the diagnosis of compulsive sexual behavior disorder (CSBD) as an impulse control disorder in the eleventh revision of the International Classification of Diseases (ICD-11; WHO, 2019), under which PPU may be subsumed. A conservative approach was taken for the ICD-11 in classifying CSBD as an impulse control disorder instead of an addictive disorder because there is (to date) insufficient evidence to determine whether the processes involved in the

development and maintenance of the disorder are equivalent to other recognized forms of addiction (Kraus et al., 2018).

While the current ICD-11 CSBD diagnosis is a good starting point for unified assessment of the disorder, more research on its precise phenomenology and neurobiological underpinnings is needed to determine whether it should be re-classified as an addictive disorder in future iterations of diagnostic manuals (Griffiths, 2022; Kraus et al., 2016, 2018; Sassover & Weinstein, 2022). Determining whether CSBD (and by extension, PPU) is best conceptualized as an addictive disorder is important to ensure that appropriate pharmacological and psychological treatments are delivered depending on the specific neurobiological mechanisms and clinical features involved (Bóthe et al., 2022; Briken & Turner, 2022; Lew-Starowicz & Coleman, 2022; Potenza et al., 2017; Kingston, 2015; Kor et al., 2013). While debated (Castro-Calvo et al., 2022; Rumpf & Montag, 2022), some authors (Sassover & Weinstein, 2022) have proposed that to properly assess the phenomenology of CSBD, a comprehensive examination of all six components of Griffiths' (2005) components model of addiction (i.e., salience, mood modification, conflict, withdrawal, tolerance and relapse) is needed. The present study focuses on the potential manifestation of the withdrawal component specifically in relation to PPU.

6.1.2 The assessment of withdrawal in relation to PPU

Withdrawal can be defined as the unpleasant affective states and/or physical reactions that occur when a substance or behavior is abruptly ceased or reduced (Griffiths, 2005). It is important to investigate withdrawal-related symptoms in relation to PPU for a few reasons. First, the presence or absence of withdrawal-related symptoms may help inform debates on whether PPU should be classified as an addictive disorder. While some authors (e.g., Starcevic, 2016) have argued against including withdrawal in the conceptualization of

behavioral addictions¹⁵, withdrawal remains an important part of key existing nosological and theoretical conceptualizations of behavioral addictions, CSBD and PPU in the field.

Withdrawal is listed as a diagnostic criterion in the *Diagnostic and Statistical Manual for Mental Disorders, Fifth Edition* (DSM-5) for two other behavioral addictions, Gambling Disorder and Internet Gaming Disorder (American Psychiatric Association, 2013). In Griffiths' (2005) aforementioned components model of addiction, withdrawal is one of six components that need to be present before a behavior can be diagnosed as an addiction. Some CSBD researchers (e.g., Reid, 2016) have argued that while withdrawal may not be strictly necessary for a diagnosis of addiction, the presence of withdrawal symptoms may provide further support in characterizing CSBD as an addictive disorder. In a recent systematic review of psychometric instruments assessing PPU, items assessing withdrawal were included in nine of 22 instruments reviewed (Fernandez & Griffiths, 2021). One of these instruments, the Problematic Pornography Consumption Scale (PPCS; Bóthe et al., 2018, Bóthe, Tóth-Király, Demetrovics, et al., 2021) was constructed based on Griffiths' (2005) framework and has become a widely used measure in PPU research. Recent studies on the PPCS using network analysis have found withdrawal to be one of the central symptoms of PPU in an online sample of Hungarian men (Bóthe, Lonza, et al., 2020) and the most crucial symptom of PPU among three separate samples (i.e., two community samples of Hungarian and Chinese men, and a subclinical sample of Chinese men – Chen et al., 2021).

Second, some limited empirical research has indicated that self-perceptions of withdrawal-like symptoms are not uncommon among individuals who have attempted to abstain from pornography. A cross-sectional survey of Polish students who were current

¹⁵ Primary reasons cited include: (i) withdrawal not being necessary for the diagnosis of addiction more broadly (as the cessation of some substances does not produce a withdrawal syndrome – Starcevic, 2016), and (ii) methodological weaknesses in the assessment of withdrawal in behavioral addictions (e.g., relying on individuals' subjective complaints of feeling irritable instead of psychophysiological measurement) has meant that the evidence base supporting the existence of behavioral addiction withdrawal syndromes has been claimed as weak (Kardefelt-Winther et al., 2017, Pies, 2009; van Rooij & Prause, 2014).

pornography users ($N = 4260$) found that among those who had at least one past pornography abstinence attempt ($n = 2169$), 72.2% recalled experiencing at least one withdrawal-like symptom upon cessation (Dwulit & Rzymiski, 2019a). The most commonly endorsed symptoms were erotic dreams (53.5%), irritability (26.4%), and attention disturbance (26.0%). Moreover, a recent qualitative study that analyzed abstinence journals of male members of an online pornography abstinence forum found that some members reported heightened negative affective states during abstinence, which some interpreted to possibly be withdrawal symptoms (Fernandez et al., 2021a). The most commonly self-perceived withdrawal-like symptoms included depression, mood swings, anxiety, ‘brain fog’, fatigue, headache, insomnia, restlessness, loneliness, frustration, irritability, stress and decreased motivation. These reports suggest the possible existence of a pornography withdrawal syndrome and warrant further investigation.

Finally, even if negative psychological effects of abstinence are not necessarily interpreted within an addiction framework as withdrawal symptoms (e.g., heightened negative affect during abstinence could instead reflect previous overreliance on pornography use for negative affect regulation or even normal psychological reactions to sexual deprivation – Castro-Calvo et al., 2022), observing the presence and nature of these symptoms, if they manifest, is still useful for understanding the phenomenological presentation of PPU (Fernandez et al., 2020, 2021a). These symptoms can then become potential treatment targets in PPU interventions (Bóthe, Lonza, et al., 2020).

6.1.3 Methodological limitations of PPU withdrawal studies

To date, studies investigating withdrawal in PPU have methodological limitations that make them less than ideal for determining whether actual withdrawal symptoms manifest during periods of abstinence. Retrospective reports of negative abstinence effects during prior abstinence attempts as reported in cross-sectional surveys (e.g., Dwulit & Rzymiski, 2019a)

are subject to recall bias (Hughes, 2007c). Self-perceived negative abstinence effects as reported in qualitative studies (e.g., Fernandez et al., 2021a) cannot be automatically assumed to be genuine abstinence effects due to the absence of psychometric measures and lack of comparison of scores to baseline and/or a non-abstaining control group. PPU self-report instruments that have included withdrawal items (e.g., “*I became agitated when I was unable to watch porn*” in the PPCS; Bõthe et al., 2018) are inherently limited if respondents typically have unrestricted access to pornography and/or never try to abstain from pornography because withdrawal symptoms, by definition, only arise under abstinence conditions (Fernandez et al., 2020; Kaptsis et al., 2016b).

Therefore, in order to properly investigate the potential manifestation of withdrawal, prospective studies of abstinence effects, preferably using intensive longitudinal methods such as ecological momentary assessment or daily diaries, are needed (Fernandez et al., 2020). Apart from observing naturally occurring abstinence situations (e.g., intrinsic quit attempts), abstinence from pornography can be experimentally manipulated to examine its effects. To date, three studies have experimentally manipulated pornography abstinence, but these have focused on its effects on relationship commitment (Lambert et al., 2012), delay discounting (Negash et al., 2016) and perceived compulsivity (Fernandez et al., 2017) rather than withdrawal-related symptoms.

6.1.4 The present study

To address the aforementioned gaps in the literature, the present study used a randomized controlled trial (RCT) design to examine effects of a seven-day experimentally manipulated pornography abstinence period on withdrawal-related symptoms among regular pornography users. Participants were randomly assigned to one of two conditions: (i) an abstinence group, where they were given instructions to try their best to abstain from pornography for seven days, or (ii) a control group, where they were told that they are free to

use pornography as usual. Outcome measures were assessed at baseline the night before the start of the experimental period (retrospectively about the past seven days) and each night of the experimental period using end-of-day online surveys.

Three potential manifestations of withdrawal-related symptoms were examined in the present study. First, *craving for pornography* was examined in light of findings from a recent systematic review that craving was the most common abstinence effect across multiple behaviors including gambling, gaming, mobile phone use, and social media use (Fernandez et al., 2020). Therefore, it would be logical to examine whether craving is also an abstinence effect for pornography use. Second, *positive and negative affect* were examined because affective disturbances are common self-perceived withdrawal-like symptoms reported by pornography users (Dwulit & Rzymiski, 2019a; Fernandez et al., 2021a). Increased negative affect and/or decreased positive affect may be a possible manifestation of withdrawal, in line with previous prospective studies of abstinence from substances such as nicotine (e.g., Hughes, 2007b; Klemperer et al., 2021) and behaviors such as exercise (Fernandez et al., 2020). Third, *withdrawal symptoms* as assessed by an adaptation of the Wisconsin Smoking Withdrawal Scale (Welsch et al., 1999) for pornography use were examined because retrospective survey and qualitative research has shown that the more commonly self-reported withdrawal-like symptoms by pornography users (i.e., depressed mood, irritability/frustration, anxiety and difficulty concentrating – Dwulit & Rzymiski, 2019a; Fernandez et al., 2021a) overlap to a considerable extent with symptoms of cigarette-smoking withdrawal (Hughes, 2007b).

A non-clinical sample of regular pornography users was used instead of a clinical sample (e.g., treatment-seeking individuals) because withdrawal-like symptoms have been shown to manifest during abstinence from other behaviors (i.e., exercise, social media use, mobile phone use, and gaming) even for regular users who have no apparent indication of

problematic use (Fernandez et al., 2020). Several authors (e.g., Fernandez et al., 2020; Kaptsis et al., 2016a) have also recommended against using clinical samples in abstinence studies until any possible negative abstinence effects are first understood in less complex populations. Nonetheless, within a non-clinical sample of regular users, it would be expected that those with higher self-reported levels of PPU would experience more pronounced negative abstinence effects, if any.

Taken together, the present study sought to answer the following two broad research questions: (i) do negative abstinence effects (potentially indicative of withdrawal-related symptoms) manifest when regular pornography users try to abstain from pornography for a seven-day period? and (ii) do these negative abstinence effects only manifest (or manifest more strongly) for those with higher levels of PPU? If a pornography withdrawal syndrome were assumed to exist, the following hypotheses would be expected to be supported:

H₁: There will be significant main effects of group (abstinence vs. control) on craving, positive affect, negative affect and withdrawal symptoms, controlling for baseline scores.

More specifically, compared to the control group, the abstinence group will score significantly higher on craving, negative affect and withdrawal symptoms, and significantly lower on positive affect.

H₂: There will be a significant group \times PPU interaction on craving, positive affect, negative affect and withdrawal symptoms, controlling for baseline scores. More specifically, it is predicted that abstinence effects will either (a) only manifest for those with higher PPU and not for those with lower PPU, or (b) manifest more strongly for those with higher PPU compared to those with lower PPU.

6.2 Method

6.2.1 Participants

Participants were psychology undergraduate students at a university in Malaysia. An *a priori* power analysis using the *pwr.f2.test* function in R determined that to detect an effect size of $f^2=0.06$ (Cohen's $d = 0.5$), assuming $\alpha = 0.05$, power = 0.8, and numerator degrees of freedom = 2, a sample size of 164 participants was required. Cohen's $d = 0.5$ was set as the smallest effect size of interest (Lakens, 2022) for the present study because it has been specified in the literature to be the smallest difference individuals are able to detect in health-related quality of life outcomes (Norman et al., 2003).

Eligibility criteria for participation included: (i) being at least 18 years old, and (ii) being a regular pornography user, operationally defined here as having watched pornography at least three times a week in the four weeks leading up to the study start date. A custom definition of pornography adapted and modified from definitions found in past literature (Grubbs, Kraus, et al., 2019; McKee et al., 2020) was provided for participants as follows: 'any sexually explicit films, video clips or pictures which intend to sexually arouse the viewer; this may be seen on the internet, in a magazine, in a book, or on television'. There was no gender restriction for participating in the present study.

A total of 184 students signed up for the study and were assessed for eligibility through their responses to questions on the baseline survey. Eight participants were excluded at this stage because they did not meet the requirement of being a regular pornography user. A total of 176 participants were randomized, resulting in 86 participants allocated to the abstinence group and 90 participants allocated to the control group. No participants failed to complete any daily survey post-randomization (144 completed all seven surveys, 23 completed six surveys, six completed five surveys, two completed four surveys, and one completed three surveys). Daily survey completion rate across the seven days ranged from

92.2% to 100.0%. An intention-to-treat strategy (Gupta, 2011) to the analysis was applied. Therefore, all randomized participants were retained for data analysis. The final sample comprised 176 participants (64.2% female, 34.7% male, 1.1% agender, $M_{age} = 21.38$ years, $SD = 1.50$). Fig. 6.1 depicts a Consolidated Standards of Reporting Trials (CONSORT) flow chart detailing the flow of participants through each stage of the study.

Baseline characteristics of the sample are presented in Table 6.1. At baseline, 48.9% of participants reported desire to reduce but not completely quit their pornography use, 40.9% of participants reported no desire to reduce nor quit their pornography use, and 10.2% reported desire to completely quit their pornography use. In line with CONSORT best practice recommendations for RCTs (Altman et al., 2001), significance tests of baseline differences between the groups were not conducted as due to the randomization procedure, any potential observed baseline differences would be attributable to chance (de Boer et al., 2015; Harvey, 2018).

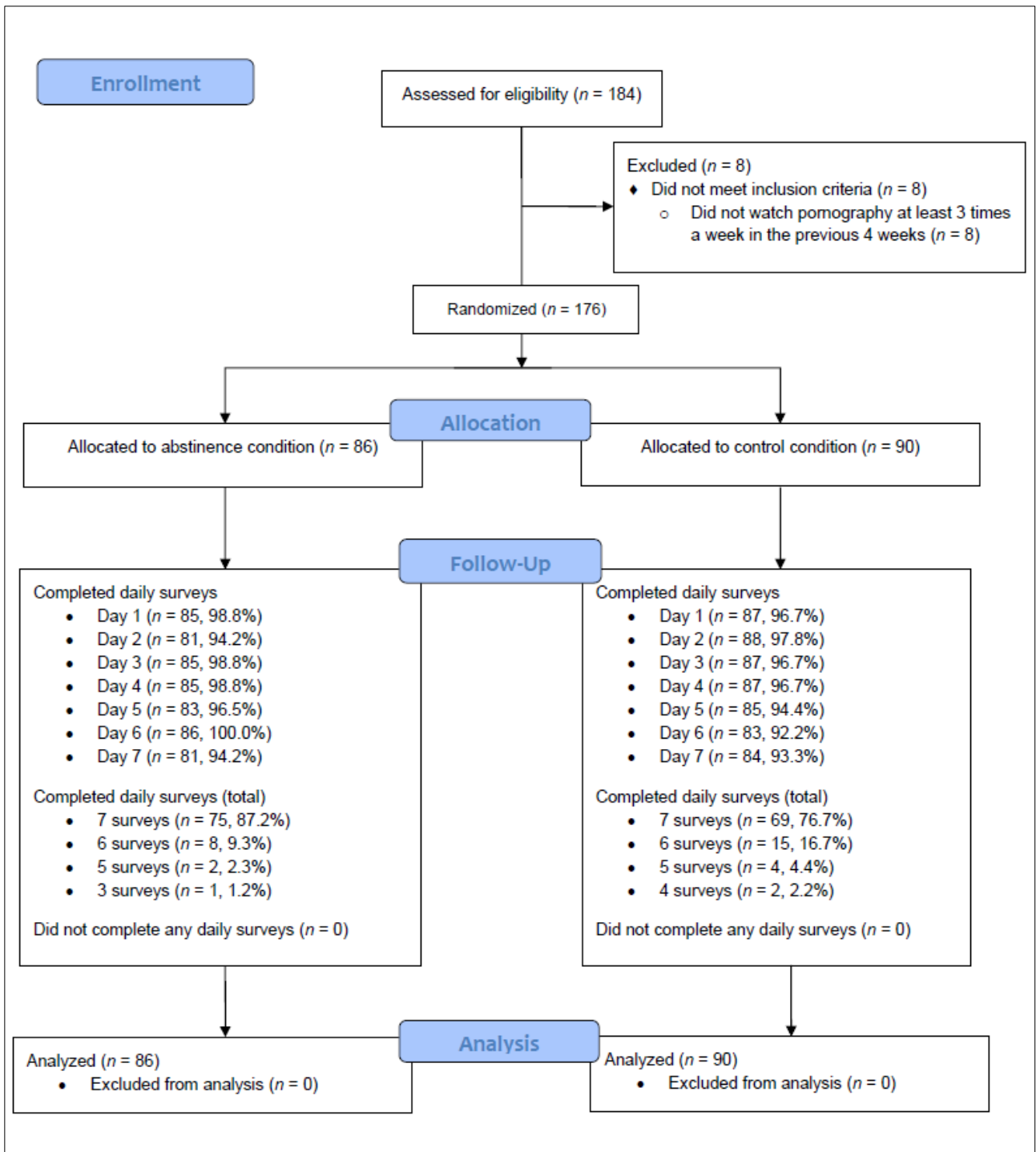


Figure 6.1. CONSORT flow diagram.

Table 6.1
Baseline characteristics of the sample

Characteristic	Abstinence group (<i>n</i> = 86)	Control group (<i>n</i> = 90)	Total (<i>N</i> = 176)
<i>Age, M (SD)</i>	21.17 (1.26)	21.57 (1.69)	21.38 (1.50)
<i>Gender, n (%)</i>			
Male	30 (34.88)	31 (34.44)	61 (34.66)
Female	55 (63.95)	58 (64.44)	113 (64.20)
Agender	1 (1.16)	1 (1.11)	2 (1.14)
<i>Sexual orientation, n (%)</i>			
Heterosexual	67 (77.9)	69 (76.67)	136 (77.27)
Homosexual	3 (3.49)	5 (5.56)	8 (4.55)
Bisexual	11 (12.79)	11 (12.22)	22 (12.50)
Other (combined ^a)	5 (5.81)	5 (5.56)	10 (5.68)
<i>Relationship status, n (%)</i>			
Single, not in a committed relationship	45 (52.33)	47 (52.22)	92 (52.27)
In a committed relationship	40 (46.51)	43 (47.78)	83 (47.16)
Married	1 (1.16)	0 (0.00)	1 (0.57)
<i>Nationality, n (%)</i>			
Malaysian	82 (95.35)	81 (90.00)	163 (92.61)
Indonesian	2 (2.33)	4 (4.44)	6 (3.41)
Other (combined ^b)	2 (2.33)	5 (5.56)	7 (3.98)
<i>Past four-week frequency of pornography use, n (%)</i>			
3 times a week on average	29 (33.72)	33 (36.67)	62 (35.23)
4 times a week on average	23 (26.74)	23 (25.56)	46 (26.14)
5 times a week on average	13 (15.12)	6 (6.67)	19 (10.80)
6 times a week on average	6 (6.98)	9 (10.00)	15 (8.52)
Once a day on average	12 (13.95)	11 (12.22)	23 (13.07)
More than once a day on average	3 (3.49)	8 (8.89)	11 (6.25)

Past four-week average duration of pornography use per session, n (%)

5 minutes or less	7 (8.14)	6 (6.67)	13 (7.39)
6 to 10 minutes	23 (26.74)	20 (22.22)	43 (24.43)
11 to 20 minutes	22 (25.58)	27 (30.00)	49 (27.84)
21 to 30 minutes	17 (19.77)	18 (20.00)	35 (19.89)
31 to 45 minutes	8 (9.30)	13 (14.44)	21 (11.93)
46 to 60 minutes	5 (5.81)	3 (3.33)	8 (4.55)
1 to 1.5 hours	3 (3.49)	3 (3.33)	6 (3.41)
1.5 to 2 hours	1 (1.16)	0 (0.00)	1 (0.57)

Past four-week frequency of masturbation without pornography, n (%)

Never	40 (46.51)	39 (43.33)	79 (44.89)
3 times or less in total	27 (31.40)	30 (33.33)	57 (32.39)
Once a week on average	12 (13.95)	6 (6.67)	18 (10.23)
2-3 times a week on average	7 (8.14)	7 (7.78)	14 (7.95)
4-6 times a week on average	0 (0.00)	5 (5.56)	5 (2.84)
7 or more times a week on average	0 (0.00)	3 (3.33)	3 (1.70)

Past four-week percentage of pornography sessions accompanied by masturbation (range 0-100), M (SD)

70.81 (32.09)	67.80 (34.65)	69.27 (33.36)
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Past seven-day total frequency of pornography use, M (SD)

5.93 (4.49)	5.42 (2.96)	5.67 (3.78)
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Past seven-day frequency of pornography use without masturbation, M (SD)

1.56 (3.77)	1.69 (2.37)	1.62 (3.12)
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Past seven-day frequency of pornography use with masturbation, M (SD)

4.37 (3.63)	3.73 (3.02)	4.05 (3.34)
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Past seven-day duration of pornography use in minutes, M (SD)

108.88 (100.71)	110.60 (109.75)	109.76 (105.13)
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Problematic pornography use (range 18-126), M (SD)

57.69 (20.00)	51.88 (1.68)	54.72 (18.60)
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PPCS score < 76 (clinical cutoff), n (%)

69 (80.23)	80 (88.89)	149 (84.66)
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PPCS score ≥ 76 (clinical cutoff), n (%)

17 (19.77)	10 (11.11)	27 (15.34)
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Moral disapproval of pornography (range 1-7), M (SD)

2.83 (1.68)	2.68 (1.51)	2.75 (1.59)
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<i>Intrinsic desire to quit or reduce pornography use, n (%)</i>			
Reduce	37 (43.02)	49 (54.44)	86 (48.86)
Quit	11 (12.79)	7 (7.78)	18 (10.23)
No desire to reduce or quit	38 (44.19)	34 (37.78)	72 (40.91)
<i>Abstinence effort (range 0-10), M (SD)</i>	1.06 (2.48)	1.19 (2.51)	1.13 (2.49)
<i>Craving (range 0-24), M (SD)</i>	12.55 (3.40)	11.51 (3.93)	12.02 (3.70)
<i>Negative affect (range 5-25), M (SD)</i>	12.50 (4.14)	12.24 (4.40)	12.37 (4.26)
<i>Positive affect (range 5-25), M (SD)</i>	14.41 (3.47)	14.39 (4.00)	14.40 (3.74)
<i>Withdrawal symptoms (range 0-4), M (SD)</i>	2.15 (0.66)	2.13 (0.74)	2.14 (0.70)

Note. ^aPansexual, asexual, other, prefer not to say; ^bBruneian, Chinese, Iranian, Maldivian. *M* = mean, *SD* = standard deviation.

6.2.2 Procedure

The study was advertised to prospective participants as ‘The pornography abstinence experiment: An eight-day daily diary study of regular pornography users’. Participants were informed that the purpose of the study would be to track the daily experiences of regular pornography users who will be randomly assigned either to an ‘abstinence’ group or a ‘no abstinence’ group¹⁶. Three separate eight-day sessions of the study were conducted over the course of two months (February and March, 2021). All three sessions began on a Monday and ended on the following Monday (see Figure 6.2). Participants were required to complete a daily survey each night during the eight-day period (including the baseline survey on the first Monday). At 8.00 pm each night of the eight-day period, online *Qualtrics* survey links were emailed to participants. Participants were asked to complete the surveys at the end of their day, as close as possible before they went to bed. The survey links expired at 5.00 am the next morning to ensure that participants did not complete the surveys after waking.

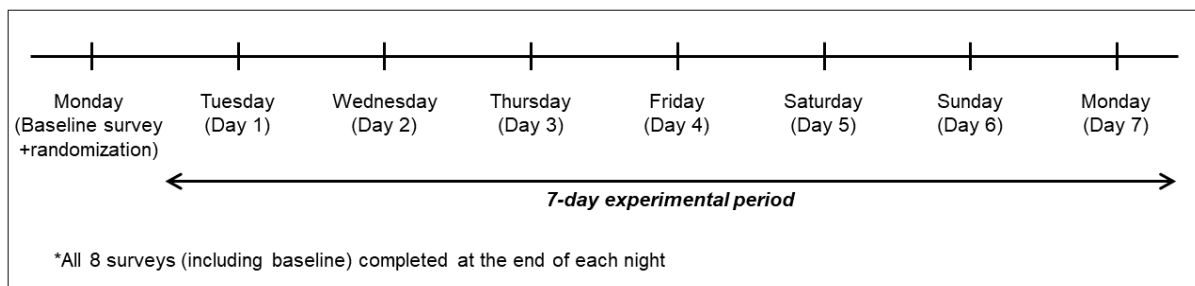


Figure 6.2. Timeline of the eight-day study period

After completing the baseline survey, participants were randomly allocated to the abstinence and control groups by the *Qualtrics* randomizer function, which was set to assign an equal number of participants to each condition. Participants in the abstinence group received instructions to try their best to abstain from pornography for the next seven days,

¹⁶ Prospective participants were informed about the nature of the random assignment from the outset because a willingness to attempt abstinence from pornography if assigned to the abstinence group was necessary for participation. While this may have led to demand characteristics, it was deemed unethical to withhold this information from prospective participants.

starting from 5.00 am the next morning (Tuesday) to 5.00 am the following Tuesday morning (exactly seven days). Participants were told that if they did watch pornography during this period, to report it honestly during the daily surveys, and that it would not have an effect on any compensation they were entitled to receive. They were also told that they were allowed to masturbate without pornography or engage in any other non-pornography-related sexual activity during this period. The control group were told that they were free to watch pornography as usual for the next seven days (see Appendix G for full instructions provided to the abstinence and control groups).

As compensation, participants received course credit if they completed at least six of the seven surveys during the experimental period, and in addition received a gift voucher worth MYR 30.00 (approximately 7.00 USD) if they completed all seven surveys. Informed consent was obtained from all participants, and all study procedures were approved by the research team's university ethics committees.

6.2.3 Daily measures

Daily frequency and/or duration of sexual behavior. During each daily survey, five items asked about the frequency and/or duration of sexual behaviors participants engaged in during two separate time windows: (i) after completing last night's survey and before going to bed, and (ii) since waking up that day. This was to ensure that any sexual behavior engaged in after each nightly survey was also accounted for. For all five items, daily totals were computed by summing the frequency/duration reported about both time frames that made up one full day: (i) since waking up that day, and (ii) after completing that night's survey and before going to bed (reported on the following day's survey). These five items are summarized as follows:

Daily frequency of pornography use (FPU). Two free response items asked participants to report how many times they had (i) watched pornography without

masturbating, and (ii) watched pornography while masturbating, respectively. Daily FPU was computed by summing the frequencies reported on both items.

Daily duration of pornography use. A third free response item asked participants to report (in minutes) how much time in total they had spent watching pornography.

Daily frequency of masturbation without pornography. A fourth free response item asked participants to report how many times they had masturbated without watching pornography.

Daily frequency of alternative sexual activity. A fifth free response item asked participants to report how many times they had engaged in any sexual activity other than pornography use or masturbation (e.g., oral sex, intercourse).

Daily abstinence effort. Daily abstinence effort was assessed using a single item adapted from a previous pornography abstinence study (Fernandez et al., 2017) that asked participants to rate the extent to which they were trying their best to abstain from pornography use since waking up that day, on a 10-point scale (0 = “I did not try at all” to 10 = “I tried my best”).

Daily craving. Daily craving was assessed using a modified four-item version of the five-item Penn Alcohol Craving Scale (PACS; Flannery et al., 1999), adapted for pornography use¹⁷. Four PACS items were modified to refer to pornography use instead of alcohol, and asked participants to rate their craving for pornography since waking up that day in terms of frequency of thoughts about pornography, intensity of craving at its strongest point, difficulty resisting pornography, and average craving since waking. A fifth item from the original PACS assessing the duration of thoughts of alcohol was excluded on the basis that it would be challenging for participants to distinguish craving frequency from craving duration when reporting on a 24-hour period (Hallgren et al., 2018). Responses were indicated on a seven-

¹⁷ The PACS has also been adapted as a measure of gaming withdrawal symptomatology in previous gaming abstinence studies (Evans et al., 2018; Katpsis et al., 2016a).

point scale, with response options differing according to each item. The scale demonstrated excellent internal consistency across all time points ($\alpha = 0.90\text{--}0.97$).

Daily positive and negative affect. Daily positive and negative affect were assessed using the 10-item International Positive and Negative Affect Schedule-Short Form (I-PANAS-SF; Thompson, 2007). The I-PANAS-SF comprises two five-item subscales, positive affect and negative affect, which are each composed of a list of adjectives describing positive (e.g., ‘inspired’) and negative (e.g., ‘upset’) affective states, respectively. Participants rated the extent to which they felt these affective states since waking up that day on a five-point scale (1 = “*very slightly or not at all*” to 5 = “*extremely*”). Internal consistency was very good across all time points for both positive affect ($\alpha = 0.80\text{--}0.88$) and negative affect ($\alpha = 0.80\text{--}0.86$) subscales.

Daily withdrawal symptoms. Daily withdrawal symptoms were assessed using a modified 14-item version of the 28-item Wisconsin Smoking Withdrawal Scale (WSWS; Welsch et al., 1999), adapted for pornography use. The 28 original WSWS items are divided into seven subscales (anger, anxiety, concentration, craving, hunger, sadness and sleep). Only items from four of the subscales (anger, anxiety, concentration and sadness) were retained as these mapped onto the more commonly self-reported categories of withdrawal-like symptoms in previous pornography studies (i.e., irritability/frustration, anxiety, difficulty concentrating and depressed mood; Dwulit & Rzymiski, 2019a; Fernandez et al., 2021a). The modified scale comprised 14 items which were composed of statements describing specific symptoms (e.g., “*It has been difficult to think clearly*”). Participants rated their agreement with these statements on a five-point scale (0 = “*strongly disagree*” to 4 = “*strongly agree*”) based on how they felt in general since waking up that day. A composite score was computed based on the mean score of all the items. The scale demonstrated excellent internal consistency across all time points ($\alpha = 0.91\text{--}0.93$).

6.2.4 Baseline measures

Demographic information

Participants reported demographic information at baseline, including gender, age, sexual orientation, relationship status, and nationality.

Baseline frequency of pornography use (FPU)

Past four-week frequency of pornography use (FPU). One item assessed participants' FPU over the previous four weeks on a seven-point scale (0 = "less than 3 times a week on average" to 6 = "more than once a day on average").

Past seven-day frequency of pornography use (FPU). Two free-response items asked how many times over the past seven days participants had (i) watched pornography without masturbating, and (ii) watched pornography while masturbating, respectively. Past seven-day FPU was computed by summing the frequencies reported on both items.

Baseline duration of pornography use

Past four-week average duration of pornography use per session. One item assessed participants' average duration of pornography use per session over the previous four weeks on a 10-point scale (1 = "5 minutes or less" to 10 = "3 hours or more").

Past seven-day duration of pornography use. Past seven-day duration of pornography use was assessed by one free response item that asked participants to report how much time in total (in minutes) they watched pornography over the past seven days.

Past four-week frequency of masturbation without pornography. One item assessed participants' frequency of masturbation without pornography over the past four weeks on a six-point scale (1 = "never" to 6 = "about 7 or more times a week on average").

Past four-week percentage of pornography use accompanied by masturbation. One item asked participants to estimate what percentage (from 0–100) of all their pornography watching sessions in the past four weeks was accompanied by masturbation.

Baseline abstinence effort (past seven days). Baseline abstinence effort was assessed using the same single item used to assess daily abstinence effort, but asked participants to rate the extent to which they were trying their best to abstain from pornography use over the past seven days.

Baseline craving (past seven days). Baseline craving was assessed using the same four PACS items used to assess daily craving, but asked participants to rate their craving for pornography during the previous seven days. The scale demonstrated very good internal consistency ($\alpha = 0.81$).

Baseline positive and negative affect (past seven days). Baseline positive and negative affect were assessed using the 10-item I-PANAS-SF, but asked participants to rate their positive and negative affect during the past seven days. Internal consistency was fair for both positive affect ($\alpha = 0.77$) and negative affect ($\alpha = 0.77$) subscales.

Baseline withdrawal symptoms (past seven days). Baseline withdrawal symptoms were assessed using the same modified 14-item WSWS used to assess daily withdrawal symptoms, but asked participants to rate their withdrawal symptoms during the past seven days. The scale demonstrated very good internal consistency ($\alpha = 0.89$). Outcome measures (baseline and daily) are presented in Appendix H.

Problematic pornography use (PPU). PPU was assessed using the 18-item Problematic Pornography Consumption Scale (PPCS; Bóthe et al., 2018) ($\alpha = 0.92$). PPCS assesses past six-month PPU covering six factors: salience, tolerance, mood modification, withdrawal, relapse and conflict (Griffiths, 2005) on a seven-point scale (1 = “never” to 7 = “all the time”). Higher scores indicate greater problematic pornography consumption.

Intrinsic desire to quit or reduce pornography use. One item assessed whether or not participants intrinsically desired to quit or reduce their pornography use at the time of the baseline survey. Participants indicated their agreement with one of the following three

response options: “*I want to reduce my pornography use, but I don’t want to completely quit/stop using pornography*”, “*I want to completely quit/stop using pornography*” or “*I have no desire to reduce or completely quit/stop using pornography*”.

Moral disapproval of pornography. Moral disapproval of pornography was assessed using the single item “*I believe that pornography use is morally wrong*” used in previous studies (Grubbs, Kraus, et al., 2019) rated on a seven-point scale (1 = “strongly disagree” to 7 = “strongly agree”).

6.2.5 Attention check measures

To screen for inattentive responding and to encourage attentive responding, attention check items (i.e., “*Please select [specific answer] to this question*”; Shamon & Berning, 2020) were embedded in the surveys (one in the baseline survey and two in each daily survey). If participants selected the wrong answer on these items, they were alerted with a pop-up message encouraging them to remain attentive throughout the rest of the survey.

6.2.6 Data analysis

Prior to conducting any substantive analyses, the dataset was screened for careless responding based on several criteria typically used in online survey research. First, examination of responses to the attention check items showed that all participants passed more than half of all attention checks, with 95% of the sample having an attention check pass rate of $\geq 88\%$. Second, an examination of response time per item indicated that there were no participants who completed any of the surveys too quickly (i.e., quicker than two seconds per item – Huang et al., 2012). Third, long-string analysis indicated that two participants appeared to engage in invariant responding on one of the scales in one of the daily surveys (i.e., providing a string of consistent responses on more than half of the scale – Curran, 2016). However, these two participants had a 100% attention check pass rate across all the

surveys. Therefore, when considered together, none of the participants were flagged for careless responding.

All analyses were performed within the R environment (R Core Team, 2021). Due to the nested nature of the data (daily measures [level 1] nested within participants [level 2]) multilevel modeling (MLM) was utilized to examine group differences. Multilevel models model all available data from all participants regardless of missing observations, and as such are robust to missing data. MLM is consistent with the intent-to-treat approach as all participants are retained in the analysis (listwise deletion is not required).

Models with continuous data (e.g., craving) were fit using the *lmer()* function in the *lme4* package (Bates et al., 2015) with Restricted Maximum Likelihood (REML) estimation. The *p*-values were estimated with the *lmerTest* package using Satterthwaite's degrees of freedom method (Kuznetsova et al., 2017). These models were checked to verify that they met assumptions of linearity, homoscedasticity and normality using a residuals versus fitted values plot, a scale-location plot and a normal probability plot, respectively. The plots indicated that these assumptions were met for all models, except for the negative affect model, which indicated deviation from normality. Negative affect was log-transformed to reduce skewness and approximated a normal distribution after transformation. Models with count data (e.g., FPU) were fit using the *glmer()* function in the *lme4* package using a Poisson distribution, while the model with ordinal data (i.e., abstinence effort) was fit using the *clmm()* function from the *ordinal* package (Christensen, 2019).

For all models, the maximal random effects structure (Barr et al., 2013) was used, with a random intercept for participant and a random slope for time (i.e., Day | Participant), which allowed each participant to have their own intercept and slope across time (days). Where models failed to converge while using the default optimizer in *lme4*, models were re-fit with all available optimizers (Bates et al., 2015). If models converged and produced

similar results while using the other optimizers, the non-convergence warnings were regarded as false positives and an alternative optimizer was used instead. If models still failed to converge while using the other optimizers, the random effects structure was simplified to 1 | Participant (by removing the random slope term) to facilitate model convergence¹⁸.

For all confirmatory and exploratory analyses, all predictors and interactions were first entered into an initial ‘full’ model. Using a backward elimination procedure, reduced models were specified by removing non-significant predictors. At each step, the more parsimonious model was compared to the previous model using the *anova()* function, which computes χ^2 statistics representing the differences in deviance between the two models with corresponding *p*-values based on likelihood ratio test comparisons (Bates et al., 2015). This process was repeated until the best-fitting model was identified for each separate outcome measure. The baseline score of each outcome measure¹⁹, frequency of masturbation without pornography, and frequency of alternative sexual activity were controlled for as covariates in all confirmatory and exploratory models. Given the relatively broad definition of regular pornography use in the present study (\geq three times a week), past four-week FPU was also included as a covariate in all confirmatory models. Results of the best fitting models are presented in the Results section in Tables 3 and 4, while all model fit and comparison statistics are presented in Appendices K-L and O-P.

Effect sizes of individual fixed effects were determined by computing the semi-partial R^2 statistic (Jaeger et al., 2017) through the *r2beta* function in the *r2glmm* package (Jaeger, 2017) using the Kenward-Roger approach. The semi-partial R^2 statistic represents the unique

¹⁸ Specific models that had non-convergence issues and how these were addressed are detailed in Appendices J & O.

¹⁹ Because the baseline score of each outcome measure represented a retrospective estimation of how participants felt in general over the past seven days, whether daily scores increased or decreased relative to baseline was not examined. The tendency for individuals to overestimate the intensity of positive and negative affect when recalling past affect is a robust finding in the literature (Ben-Zeev et al., 2009; Kardum & Daskijević, 2001; Thomas & Diener, 1990). Therefore, the baseline scores would be expected to be inflated relative to the daily scores and as such were only controlled for as covariates.

proportion of variance explained by each individual predictor in the model, above and beyond the variance explained by all other predictors in the model. Wherever a final model included a significant interaction, post-hoc analyses were conducted to clarify the nature of the interaction using the *emmeans* package (Lenth, 2021). The *emmeans* function was used to compute estimated marginal means and conduct pairwise comparisons of interest, while the *emmip* function was used to create interaction plots using estimated marginal means.

6.3 Results

6.3.1 Manipulation check analyses

To determine whether participants in the abstinence group adhered to instructions to try their best to abstain from pornography during the experimental period, group differences in abstinence effort, FPU and duration of pornography use during the experimental period were examined (see Appendix J). The abstinence group reported significantly greater daily abstinence effort ($M = 4.72$, $SD = 3.77$) compared to the control group ($M = 0.96$, $SD = 2.39$), controlling for past seven-day abstinence effort (odds ratio = 0.01, $z = -9.37$, $p < .001$). The abstinence group also reported significantly lower daily FPU ($M = 0.27$, $SD = 0.80$) compared to the control group ($M = 0.93$, $SD = 1.04$), controlling for past seven-day FPU (incidence rate ratio [IRR] = 4.95, $z = 9.38$, $p < .001$). The abstinence group also reported significantly lower daily duration (in minutes) of pornography use ($M = 4.25$, $SD = 15.30$) compared to the control group ($M = 16.91$, $SD = 23.05$), controlling for past seven-day duration of pornography use ($b = 12.70$, $t[171.76] = 6.97$, $p < .001$). Taken together, these group differences indicate that the abstinence instructions were effective at inducing attempts to abstain from pornography in the abstinence group during the experimental period.

While the majority of participants in the abstinence group ($n = 47/86$; 54.65%) did not report any pornography use at all during the experimental period, a considerable proportion of participants ($n = 39/86$; 45.35%) reported using pornography at least once during this

period. More specifically, seven participants (8.14%) reported using pornography once, eleven (12.79%) reported using pornography twice, nine reported using pornography three times (10.47%) and twelve (13.95%) reported using pornography four or more times. For these participants, pornography use during the experimental period might be indicative of two possibilities: (i) a lack of adherence to instructions to try their best to abstain from pornography, and/or (ii) a failure to abstain from pornography despite attempting to do so (i.e., a ‘lapse’). These participants were not excluded from the analyses for two reasons. First, the intention-to-treat principle states that all randomized participants should be included in analyses according to their originally assigned condition, regardless of protocol adherence in order to maintain comparability between groups obtained through randomization and minimize the risk of bias (Gupta, 2011). Second, the purpose of the abstinence instructions was to induce attempts at abstinence (which is within participants’ control) and not necessarily the achievement of successful non-use (which may not entirely be within all participants’ control, given the difficulty that may come with trying to regulate habitual pornography use for seven days). Lapses are common in real-world pornography abstinence attempts (Fernandez et al., 2021a), and therefore emphasizing attempted abstinence over successful non-use may arguably have greater ecological validity. Furthermore, nicotine abstinence research has demonstrated that excluding participants who relapse from analyses may be counterproductive because these participants are most likely to experience the greatest amount of withdrawal in the first place (see Hughes, 2007c; Piasecki, et al., 2003a, 2003b; Shiffman et al., 2004).

6.3.2 Confirmatory analyses

Table 6.2 presents the means and standard deviations for all outcome variables in the confirmatory analyses (see Appendix I for means and standard deviations of all study variables).

Table 6.2
Means and standard deviations of all outcome variables in confirmatory analyses

	Baseline ^a	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Craving								
Abstinence	12.55 (3.40)	7.05 (5.00)	7.80 (6.07)	8.26 (5.88)	7.64 (6.13)	6.30 (5.86)	7.74 (6.49)	8.00 (6.32)
Control	11.51 (3.93)	6.80 (4.29)	7.11 (5.29)	5.93 (4.27)	6.23 (4.92)	6.35 (5.17)	6.04 (5.32)	5.88 (5.10)
Total	12.02 (3.70)	6.92 (4.64)	7.44 (5.67)	7.08 (5.25)	6.92 (5.58)	6.33 (5.51)	6.91 (5.99)	6.92 (5.81)
Positive affect								
Abstinence	14.41 (3.47)	13.99 (3.68)	12.99 (4.04)	13.29 (4.17)	13.19 (4.22)	13.04 (4.18)	13.93 (4.37)	14.05 (4.51)
Control	14.39 (4.00)	12.99 (4.35)	13.03 (4.62)	12.87 (4.34)	13.03 (4.03)	13.25 (4.55)	13.07 (4.33)	13.51 (4.80)
Total	14.40 (3.74)	13.48 (4.05)	13.01 (4.34)	13.08 (4.25)	13.11 (4.12)	13.14 (4.36)	13.51 (4.36)	13.78 (4.65)
Negative affect								
Abstinence	12.50 (4.14)	9.96 (4.45)	9.94 (4.16)	9.42 (4.03)	9.49 (4.28)	8.81 (3.74)	8.91 (3.50)	9.22 (3.67)
Control	12.24 (4.40)	9.57 (4.12)	9.57 (4.53)	9.70 (4.55)	9.00 (4.32)	10.09 (4.78)	9.35 (4.47)	8.99 (4.00)
Total	12.37 (4.26)	9.77 (4.28)	9.75 (4.35)	9.56 (4.29)	9.24 (4.30)	9.46 (4.33)	9.12 (4.00)	9.10 (3.84)
Withdrawal symptoms								
Abstinence	2.15 (0.66)	1.83 (0.73)	1.82 (0.71)	1.73 (0.75)	1.74 (0.82)	1.62 (0.74)	1.71 (0.72)	1.70 (0.72)
Control	2.13 (0.74)	1.92 (0.84)	1.81 (0.78)	1.80 (0.87)	1.70 (0.83)	1.80 (0.86)	1.73 (0.86)	1.71 (0.79)
Total	2.14 (0.70)	1.88 (0.79)	1.82 (0.75)	1.76 (0.81)	1.72 (0.82)	1.71 (0.81)	1.72 (0.79)	1.70 (0.75)

Note. ^aBaseline measures asked about the past seven days.

Results of the MLM analyses (see Table 6.3) showed no statistically significant main effects of group on craving ($b = -0.34$, $t[165.38] = -0.68$, $p = .498$, semi-partial $R^2 = 0.003$), positive affect ($b = -0.34$, $t [170.18] = -0.85$, $p = .396$, semi-partial $R^2 = 0.004$), negative affect ($b = 0.00$, $t [165.79] = 0.12$, $p = .906$, semi-partial $R^2 = 0.000$) or withdrawal symptoms ($b = 0.10$, $t [164.02] = 1.42$, $p = .157$, semi-partial $R^2 = 0.012$), controlling for baseline scores, past four-week FPU, frequency of masturbation without pornography and frequency of alternative sexual activity. This means that contrary to H₁, there were no significant differences between the abstinence and control groups on any of the outcome measures. The addition of a group \times PPU interaction term did not improve model fit (see Appendices K & L) for the craving model ($\chi^2 = 1.35$, $p = .245$), positive affect model ($\chi^2 = 1.57$, $p = .210$), negative affect model ($\chi^2 = 0.59$, $p = .443$) or withdrawal symptoms model ($\chi^2 = 1.50$, $p = .220$). This means that contrary to H₂, there was no significant interaction

between group and PPU on any of the outcome measures. In sum, neither of the confirmatory hypotheses were supported.

Table 6.3
Multilevel model results for all outcome variables in confirmatory analyses

Outcome variable	Fixed effect	Estimate (SE)	df	t	P	95% CI	Semi-partial R ²
Craving	Intercept	0.48 (0.97)	169.57	0.49	0.626	-1.43 – 2.38	
	Group	-0.34 (0.50)	165.38	-0.68	0.498	-1.32 – 0.64	0.003
	PPU	0.09 (0.02)	164.16	4.45	<0.001	0.05 – 0.13	0.108
	Baseline craving	0.08 (0.10)	162.89	0.85	0.394	-0.11 – 0.27	0.004
	Past four-week FPU	0.28 (0.16)	171.74	1.67	0.096	-0.05 – 0.60	0.016
	Frequency of masturbation without pornography	0.46 (0.30)	937.60	1.53	0.127	-0.13 – 1.04	0.002
	Frequency of alternative sexual activity	-0.33 (0.34)	1008.16	-0.97	0.334	-0.99 – 0.34	0.001
Positive affect	Day	-0.06 (0.07)	169.49	-0.86	0.392	-0.21 – 0.08	0.004
	Intercept	4.92 (0.96)	177.57	5.10	<0.001	3.03 – 6.81	
	Group	-0.34 (0.40)	170.18	-0.85	0.396	-1.13 – 0.45	0.004
	Baseline positive affect	0.59 (0.05)	172.79	10.83	<0.001	0.48 – 0.69	0.405
	Past four-week FPU	-0.03 (0.12)	174.38	-0.21	0.832	-0.27 – 0.22	0.000
	Frequency of masturbation without pornography	-0.23 (0.21)	1042.37	-1.13	0.260	-0.64 – 0.17	0.001
	Frequency of alternative sexual activity	0.20 (0.23)	979.97	0.86	0.389	-0.25 – 0.64	0.001
Negative affect ^a	Day	0.07 (0.05)	168.00	1.37	0.172	-0.03 – 0.17	0.011
	Intercept	1.49 (0.08)	172.69	18.19	<0.001	1.33 – 1.65	
	Group	0.00 (0.04)	165.79	0.12	0.906	-0.07 – 0.08	0.000
	Baseline negative affect	0.05 (0.00)	166.29	11.56	<0.001	0.04 – 0.06	0.445
	Past four-week FPU	0.01 (0.01)	168.72	0.80	0.425	-0.01 – 0.03	0.004
	Frequency of masturbation without pornography	-0.00 (0.02)	1062.73	-0.19	0.850	-0.04 – 0.03	0.000
	Frequency of alternative sexual activity	0.02 (0.02)	975.31	0.94	0.347	-0.02 – 0.06	0.001
Withdrawal symptoms	Day	-0.01 (0.00)	167.64	-2.68	0.008	-0.02 – -0.00	0.041
	Intercept	0.35 (0.15)	167.19	2.18	0.031	0.03 – 0.66	
	Group	0.10 (0.07)	164.02	1.42	0.157	-0.04 – 0.24	0.012
	PPU	0.01 (0.00)	165.11	2.61	0.010	0.00 – 0.01	0.040
	Baseline withdrawal symptoms	0.58 (0.05)	169.21	11.40	<0.001	0.48 – 0.68	0.434
	Past four-week FPU	-0.02 (0.02)	168.35	-1.03	0.305	-0.07 – 0.02	0.006
	Frequency of masturbation without pornography	0.02 (0.04)	1023.51	0.56	0.576	-0.05 – 0.10	0.000
Withdrawal symptoms	Frequency of alternative sexual activity	-0.04 (0.04)	990.12	-0.86	0.389	-0.12 – 0.05	0.001
	Day	-0.03 (0.01)	172.70	-3.28	0.001	-0.05 – -0.01	0.061

Note. ^alog-transformed. All models were random slope models with Day|Participant random effects. The best fitting models are presented. CI = confidence interval; SE = standard error.

Although not hypothesized *a priori*, MLM analyses showed a statistically significant main effect of time on both negative affect ($b = -0.01$, $t[167.64] = -2.68$, $p = 0.008$, semi-

partial $R^2 = 0.041$) and withdrawal symptoms ($b = -0.03$, $t[172.70] = -3.28$, $p = 0.001$, semi-partial $R^2 = 0.061$), indicating a decrease in negative affect and withdrawal scores in both groups over the experimental period.

6.3.3 Exploratory analyses

In considering the lack of support for the confirmatory hypotheses, it was noted that in terms of past four-week FPU, the large majority of the sample reported using pornography three times a week or four times a week (61.4%), with fewer reporting five times a week or six times a week (19.3%), and once a day or more than once a day (19.3%). This appeared to be contributed to by the large proportion of female participants (64.2%) in the sample, most of whom reported past four-week FPU of three times a week or four times a week (77.0%), with fewer reporting five times a week or six times a week (13.3%), and once a day or more than once a day (9.7%). This was in contrast with male participants, who had a roughly equal proportion of participants reporting past four-week FPU of three times a week or four times a week (32.8%), five times a week or six times a week (31.1%), and once a day or more than once a day (36.1%). Examination of baseline characteristics of the sample by gender showed statistically significant gender differences, most notably male participants having significantly higher PPU ($F[1,172]=9.027$, $p = 0.003$), craving ($F[1,172]=7.168$, $p = 0.008$) and past four-week FPU ($F[1,172]=51.768$, $p < 0.001$) than female participants (see Appendix M for a complete summary of baseline characteristics by gender).

On the basis that abstinence effects might manifest only at higher levels of past four-week FPU, exploratory MLM analyses were run on each outcome measure to account for potential moderating effects of past four-week FPU. All variables in the confirmatory MLM models were retained, but with past four-week FPU now specified as a moderator (i.e., three-way interaction [group \times PPU \times past four-week FPU] or two-way interaction [group \times past

four-week FPU)²⁰. Given that there were important gender differences in baseline characteristics, gender was controlled for as a covariate in these models. It is important to emphasize that these analyses should be interpreted with caution given the limited statistical power in the current sample to detect three-way interaction effects if any exist.

MLM results showed that past four-week FPU played a significant moderating role in the craving model (see Table 6.4) but not the positive affect, negative affect and withdrawal symptoms models (see Appendix N). Results of the exploratory craving model are presented below.

Table 6.4
Multilevel model results for exploratory craving model

Outcome variable	Fixed effect	Estimate (SE)	df	t	P	95% CI	Semi-partial R ²
Craving	Intercept	5.41 (2.84)	160.01	1.90	0.059	-0.17 – 10.98	
	Group	-7.36 (3.61)	160.97	-2.04	0.043	-14.45 – -0.27	0.025
	PPU	-0.04 (0.05)	160.81	-0.78	0.437	-0.13 – 0.06	0.017
	Past four-week FPU	-0.93 (0.79)	158.53	-1.17	0.244	-2.48 – 0.63	0.002
	Gender	0.44 (0.57)	160.82	0.77	0.445	-0.68 – 1.56	0.004
	Baseline craving	0.07 (0.09)	158.10	0.70	0.488	-0.12 – 0.25	0.003
	Frequency of masturbation without pornography	0.37 (0.30)	905.33	1.26	0.209	-0.21 – 0.96	0.002
	Frequency of alternative sexual activity	-0.37 (0.34)	997.84	-1.09	0.277	-1.03 – 0.30	0.001
	Day	-0.05 (0.07)	170.18	-0.68	0.496	-0.19 – 0.09	0.003
	Group × PPU	0.19 (0.06)	161.66	2.93	0.004	0.06 – 0.32	0.050
	Group × past four-week FPU	1.22 (1.01)	160.69	1.21	0.228	-0.76 – 3.19	0.009
	PPU × past four-week FPU	0.03 (0.01)	159.08	2.46	0.015	0.01 – 0.05	0.013
	Group × PPU × past four-week FPU	-0.04 (0.02)	160.43	-2.30	0.023	-0.07 – -0.01	0.032

Note. One participant in the abstinence group and one participant in the control group who identified as ‘agender’ were excluded from these analyses, resulting in $N = 174$. Model is random slope model with Day|Participant random effect. The best fitting model is presented. CI = confidence interval; SE = standard error.

In the craving model, there was a significant main effect of group ($b = -7.36$, $t[160.97] = -2.04$, $p = 0.043$, semi-partial $R^2 = 0.025$), a significant two-way group × PPU interaction ($b = 0.19$, $t[161.66] = 2.93$, $p = 0.004$, semi-partial $R^2 = 0.050$) and a significant two-way PPU × past four-week FPU use interaction ($b = 0.03$, $t[159.08] = 2.46$, $p = 0.015$, semi-

²⁰ All exploratory models followed the same backward elimination procedure as the confirmatory models, where more complex models were compared to reduced models until the best-fitting model was found for each outcome measure (see Appendices O & P).

partial $R^2 = 0.013$). However, the main effect and two-way interactions were qualified by a significant three-way group \times PPU \times past four-week FPU interaction ($b = -0.04$, $t[160.43] = -2.30$, $p = 0.023$, semi-partial $R^2 = 0.032$). To probe the pattern of this three-way interaction, contrasts between abstinence and control groups (see Appendix Q) were examined at combinations of either high (+ 1 SD) or low (-1 SD) values on the PPCS and six values corresponding to all six response anchors on the past four-week FPU item (1 = '3 times a week', 2 = '4 times a week', 3 = '5 times a week', 4 = '6 times a week', 5 = 'once a day' and 6 = 'more than once a day'). The plot of this interaction is presented in Figure 6.3.

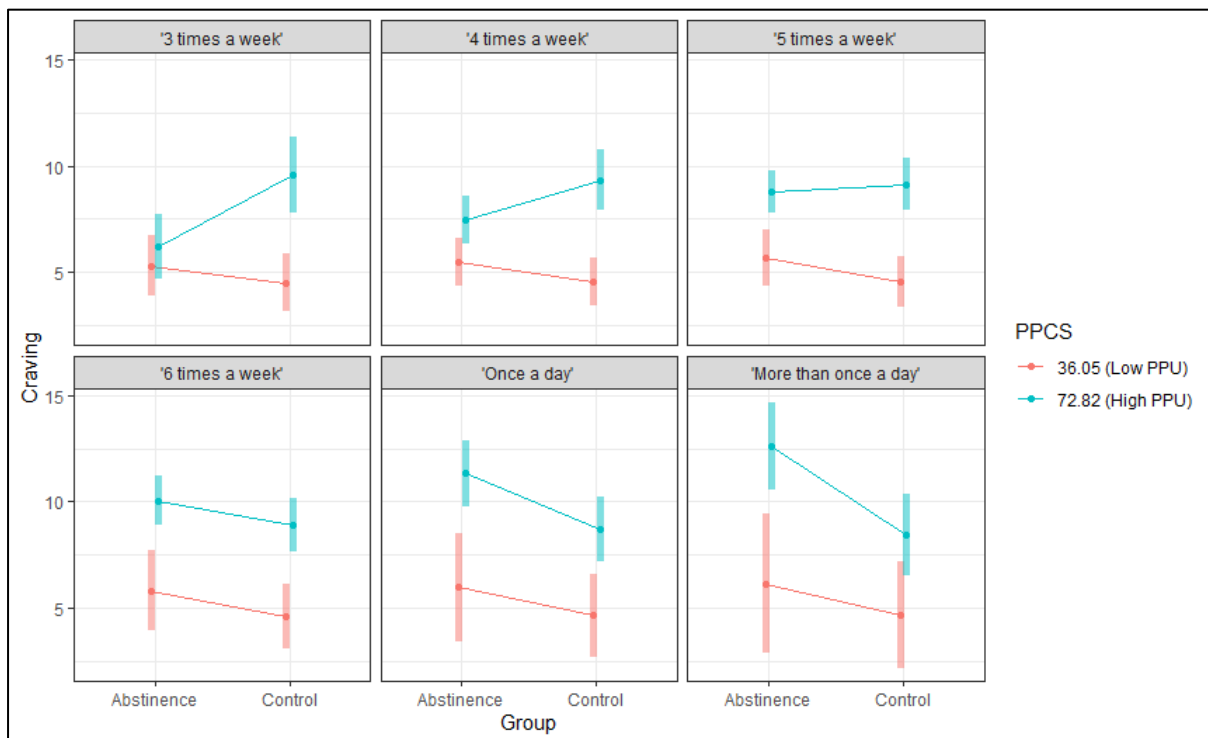


Figure 6.3. Effect of group on craving by PPU level (± 1 SD) at all six levels of past four-week FPU

At low levels of PPU, there were no significant differences between abstinence and control groups on craving at all levels of past four-week FPU. However, at high levels of PPU, there were differential effects of group on craving depending on level of past four-week FPU. More specifically, the control group had significantly higher craving than the

abstinence group over the experimental period when PPU level was high and past four-week FPU was ‘3 times a week’ ($b = -3.38, t[163] = -3.04, p = 0.016$). On the contrary, the abstinence group had significantly higher craving than the control group over the experimental period when PPU level was high and past four-week FPU was ‘once a day’ ($b = 2.65, t[160] = 2.65, p = 0.036$) or when PPU level was high and past four-week FPU was ‘more than once a day’ ($b = 4.16, t[161] = 3.17, p = 0.016$). There were no significant differences between abstinence and control groups at high levels of PPU and when past four-week FPU was ‘4 times a week’, ‘5 times a week’ or ‘6 times a week’.

6.4 Discussion

The present study used a randomized controlled design to examine if (i) negative abstinence effects potentially reflective of withdrawal-related symptoms manifest when regular pornography users (defined in the present study as having used pornography \geq three times a week in the past four weeks) try to abstain from pornography for a seven-day period, and (ii) if these negative abstinence effects only manifest (or manifest more strongly) for those with higher levels of PPU.

6.4.1 Confirmatory analyses

The results showed that both confirmatory hypotheses (H_1 and H_2) were not supported. Contrary to the first hypothesis, there were no significant main effects of group (abstinence vs. control) on craving, negative affect, positive affect, or withdrawal symptoms during the experimental period, controlling for baseline scores. This indicates that when assessed prospectively in comparison with a non-abstaining control group, no evidence of withdrawal-related symptoms was found for the abstaining participants in this sample. This finding is in contrast with previous cross-sectional research relying on retrospective self-report that found 72.2% of pornography users who had at least one past pornography

abstinence attempt recalled experiencing at least one withdrawal-like symptom upon cessation (Dwulit & Rzymiski, 2019a).

The second hypothesis that negative abstinence effects during the experimental period would only manifest (or manifest more strongly) for those with higher levels of PPU was also not supported, as there were no significant group \times PPU interaction effects on all outcome measures. Nonetheless, it is important to interpret this finding in light of the fact that because this was a non-clinical sample of regular pornography users, the range of scores on the PPCS was relatively low ($M = 54.72$, $SD = 18.60$, with only 15.3% of the sample having PPCS scores that met or exceeded the suggested clinical cutoff of ≥ 76 in Bóthe et al., 2018). This finding does not rule out the possibility that in a sample with higher levels of PPU, moderating effects of PPU might be observed.

An unexpected finding was that both negative affect and withdrawal symptoms decreased over the experimental period for both abstinence and control groups. This decrease appeared to be indicative of the “*downward drift*” phenomenon (see Gilbert et al., 2019, p. 538), which is the tendency for participants to report progressively fewer negative affect-related symptoms when tested repeatedly, regardless of assignment to treatment or control. This phenomenon has been observed in studies of abstinence from cigarette smoking (Gilbert et al., 2002) and gaming (Evans et al., 2018) and also non-abstinence-related studies (e.g., Sharpe & Gilbert, 1998). While multiple explanations have been proposed for the phenomenon (Arrindell, 2001; Sharpe & Gilbert, 1998), one plausible explanation is that repeated testing (in the present study, the daily surveys) acts as an intervention that facilitates self-monitoring of negative affect and possibly coping mechanisms to deal with the negative affect. This finding further underscores the importance of including a non-abstaining control group in future prospective abstinence studies, as decreases in negative affective symptoms over time by abstaining participants could easily be misattributed to abstinence.

6.4.2 Exploratory analyses

Importantly, exploratory analyses provided partial support for the possibility that the null findings observed in the confirmatory analyses could have been the result of not accounting for the moderating effects of a third variable (i.e., past four-week FPU). The majority of the sample (61.4%) reported past four-week FPU on the lower end of the spectrum (i.e., three or four times a week), in large part contributed to by the large proportion of female participants in the sample (64.2%) most of whom also reported past four-week FPU of three or four times a week (77.0%). Consistent with past research (Chen et al., 2018; Grubbs, Wright, et al., 2019; Weinstein et al., 2015), female participants in this sample had lower baseline rates of FPU, PPU, and craving than male participants. Therefore, the possibility that abstinence effects might only manifest at higher levels of FPU was examined in exploratory models with past four-week FPU added as a moderator and gender controlled for as a covariate.

A significant three-way group \times PPU \times past four-week FPU interaction on craving was found, but past four-week FPU did not play a significant moderating role in the negative affect, positive affect, and withdrawal symptoms models. At high levels of PPU (+1 SD), the control group had higher craving scores than the abstinence group over the experimental period when past four-week FPU was ‘three times a week’, but inversely the abstinence group had higher craving scores than the control group over the experimental period when past four-week FPU was ‘once a day’ or ‘more than once a day’. Notably, this indicates that there was an abstinence effect on craving when PPU was high, but only once past four-week FPU reached the threshold of daily use. It is noteworthy that this effect was found even though high PPU at +1 SD (i.e., $M = 72.82$) in this sample did not reach the clinical cutoff of ≥ 76 specified in Bóthe et al. (2018). This finding is similar to a previous cross-sectional survey of undergraduates in Canada that found an increase in addiction-related

symptomatology once FPU reached the threshold of daily use (Harper & Hodgins, 2016). It is uncertain as to why the abstinence group reported significantly lower craving than the control group at high levels of PPU and past four-week FPU of ‘three times a week’, but one speculative explanation could be that abstaining participants below a specific threshold of FPU (i.e., three times a week) due to lower habit strength (Siriani & Vishwanath, 2016) had enough self-regulation such that they were able to successfully implement strategies to regulate their experience of craving (e.g., prevent its occurrence or reduce its intensity whenever it did emerge) to help them achieve the abstinence goal.

There are two possible interpretations of the abstinence effect on craving under high PPU and high FPU conditions that are not necessarily mutually exclusive. First, if negative abstinence effects are interpreted within an addiction framework as withdrawal-related symptoms, then craving could potentially be a withdrawal symptom in PPU. High FPU on its own (without high PPU) may be indicative of preoccupation with pornography that may not be associated with negative life consequences (Bóthe, Lonza, et al., 2020; Bóthe, Tóth-Király, et al., 2020), but the fact that craving manifested for those with daily or more FPU only when PPU was high reinforces the idea that abstinence-induced craving could be reflective of a dependency on pornography and potentially a withdrawal symptom (if a pornography withdrawal syndrome exists). This interpretation concurs with a finding from a recent systematic review that craving was the most common abstinence effect across multiple potential behavioral addictions (Fernandez et al., 2020). Second, craving could also have been a manifestation of sexual desire and/or arousal during the experimental period. Because higher baseline rates of FPU could have to some extent been reflective of higher sexual drive (Leonhardt et al., 2021), the fact that craving only manifested for those with high PPU when FPU was daily or more supports the sexual desire explanation. If participants’ primary sexual outlet was masturbating to pornography, then urges to use pornography could be a natural

manifestation of sexual desire and/or arousal throughout the deprivation period (Castro-Calvo et al., 2022). The fact that an abstinence effect was found for craving and not the other outcome variables (i.e., positive affect, negative affect and withdrawal symptoms) further lends support to this non-pathological interpretation, because affect-related disturbances would arguably be expected to also be present if an actual withdrawal syndrome exists. At the same time, the lack of abstinence effects on these other outcome variables needs to be interpreted with caution because given the limited statistical power in the sample to detect three-way interaction effects, similar but smaller effects may not have been detected for these variables. Overall, all findings in these exploratory analyses should be interpreted with caution because of their post-hoc exploratory nature and limited statistical power to detect effects of interest. While these exploratory findings are noteworthy, they should be regarded as hypothesis-generating for future studies.

6.4.3 Implications

In sum, the findings of the present study have two main implications for understanding the potential manifestation of withdrawal-related symptoms during pornography abstinence. First, confirmatory analyses showed that there was no evidence of negative abstinence effects (i.e., withdrawal-related symptoms) among a sample of pornography users who were using pornography at least three times a week, and this was not dependent on level of PPU (but with the caveat that the sample had relatively low levels of PPU). These null findings are important to emphasize as they provide preliminary evidence that the average regular pornography user who uses pornography somewhat regularly (i.e., a few times a week) generally does not experience withdrawal-like symptoms while trying to abstain from pornography for a seven-day period.

Second, exploratory findings raise the possibility that negative abstinence effects might manifest only when both baseline FPU and PPU are high – a hypothesis that needs to

be tested in future prospective studies. Exploratory analyses found that craving was an abstinence effect when PPU was high, but only once past four-week FPU was at least daily or more. This tentatively suggests that craving could potentially be a PPU withdrawal symptom if a pornography withdrawal syndrome exists, but future adequately powered studies need to verify this finding *a priori* and rule out alternative theoretical explanations (e.g., craving being solely a manifestation of sexual arousal). While craving was the only significant abstinence effect under these conditions, it cannot be ruled out that adequately powered studies might find other abstinence effects.

Overall, it is crucial that the findings of the present study be considered in terms of its specific sample characteristics (i.e., non-clinical, majority female sample of undergraduates, most of whom were using pornography 3–4 times a week [61.4%], had PPCS scores below the clinical cutoff of 76 [84.7%], and had no intrinsic desire to quit their pornography use [89.8%]). These findings may not generalize to clinical samples, non-clinical samples with higher FPU or PPU, predominantly male samples, or samples composed solely of pornography users intrinsically motivated to quit their pornography use. Future studies using similar prospective designs and diverse samples with varying gender ratios and levels of FPU, PPU, and intrinsic motivation to abstain from pornography use are needed to replicate and extend these findings.

6.4.4 Limitations and directions for future research

The present study has several limitations that need to be highlighted. First, because the study's aim was to investigate abstinence effects irrespective of gender, there were no gender restrictions in the inclusion criteria, resulting in a sample that was close to two-thirds (64.2%) female. Compared to females, males tend to use pornography more for sexual pleasure (Bóthe, Tóth-Király, Bella, et al., 2021; Grubbs, Wright, et al., 2019) and have a stronger sex drive in general (Baumeister et al., 2001), and as such may be more reliant on

pornography as a sexual outlet than females. Therefore, it may be reasonable to speculate that males could have greater difficulty abstaining from pornography than females even if they have similar rates of baseline FPU. However, because females had lower past four-week FPU than males in the present sample, exploratory analyses with gender as moderator were not run because they would have been difficult to disentangle from exploratory analyses with past four-week FPU as moderator. Future studies could consider restricting inclusion criteria to just male participants to examine if abstinence effects manifest in a male-only sample or run adequately powered studies with both genders included (but with narrower inclusion criteria for baseline FPU [e.g., \geq six times a week]) to investigate potential varying abstinence effects by gender, if any.

Second, despite having a significantly shorter recall period compared to a single end-of-week assessment, end-of-day surveys still rely on retrospection and as such remain susceptible to some recall bias (Newman & Stone, 2019). Research comparing aggregated momentary affect ratings throughout the day to retrospective end-of-day affect ratings demonstrates that end-of-day ratings of negative affect tend to be slightly biased towards peak and recent affect (Neubauer et al., 2020). Future studies can use EMA instead of daily surveys for greater sensitivity to fluctuations of affect throughout the day.

Third, because the baseline measures for all outcome variables had a bigger recall period (past seven days) compared to the daily measures (past day), changes in daily scores relative to baseline could not be examined. Incorporating a pre-intervention period where baseline data are also collected using the same daily surveys would allow for standardization of measures and examination of changes from baseline.

6.4.5 Conclusion

Current understanding of the potential manifestation of withdrawal-related symptoms during abstinence from pornography is still in its infancy. The present study is the first to

prospectively examine the manifestation of withdrawal-related symptoms in abstaining participants in comparison to a non-abstaining control group, in contrast with previous research that has relied on retrospective self-report of perceived abstinence effects. The present study contributes preliminary data that represent a first step towards understanding whether and under what conditions withdrawal-related symptoms may (or may not) manifest when regular pornography users attempt to abstain from pornography use for a seven-day period. More prospective data across diverse samples are needed to verify and expand upon the findings of the present study.

PART IV: GENERAL DISCUSSION

Chapter 7

The present thesis had two broad aims: (i) explore phenomenological experiences of abstinence-based recovery from CSB and PPU among members of abstinence-based recovery communities, and (ii) examine short-term effects of abstinence from pornography on withdrawal-related symptoms in regular pornography users. The three empirical studies conducted uniquely contribute to knowledge by providing novel insights into abstinence-based recovery as an intervention for CSB and PPU (Empirical Studies 1 and 2) and advancing current theorizing about whether withdrawal-related symptomatology manifests in relation to PPU (Empirical Study 3). Additionally, the two systematic reviews conducted also uniquely contribute to knowledge by reviewing the state of evidence of theoretical conceptualization and psychometric assessment of PPU (Systematic Review 1) and synthesizing existing research evidence on short-term abstinence effects across potential behavioral addictions to shed light on the manifestation of addiction-related symptomatology (i.e., withdrawal, craving, and relapse) and the potential utility of short-term abstinence as an intervention for behavioral addictions (Systematic Review 2).

7.1 Summary and synthesis of findings

In Systematic Review 1 (Fernandez & Griffiths, 2021), 22 psychometric instruments assessing PPU were reviewed. Findings of the review indicated that the instruments had inconsistent theoretical conceptualizations of PPU due to a lack of consensus in the field about how best to operationalize CSB and PPU. Addiction emerged as the most common theoretical framework used by the instruments ($n = 13$). The most frequently assessed addiction components across the instruments were impaired control ($n = 16$), salience ($n = 14$), mood modification ($n = 13$), interpersonal conflict ($n = 11$), and general life conflict ($n = 11$). Less frequently assessed were withdrawal ($n = 9$) and tolerance ($n = 3$) likely due to

these components not being universally accepted in the field as necessary components of behavioral addiction (e.g., Starcevic, 2016). The Problematic Pornography Consumption Scale (PPCS; Bóthe et al., 2018) was identified as being the only instrument that assesses all six of Griffiths' (2005) components of addiction (i.e., salience, mood modification, withdrawal, tolerance, conflict, relapse). Importantly, this review highlighted that while there was a high level of consensus across the instruments on some addiction components (e.g., impaired control and salience), there is a need for further empirical research into the less agreed upon components (e.g., withdrawal and tolerance) to determine if these should be included in the theoretical conceptualization and operationalization of PPU.

In Systematic Review 2 (Fernandez et al., 2020), 47 prospective studies examining effects of short-term abstinence across six potential behavioral addictions (i.e., exercise, gambling, gaming, mobile phone use, pornography use, and social media use) were reviewed. Findings of the review indicated that there is a paucity of prospective studies investigating abstinence effects in relation to potential behavioral addictions, except for exercise ($n = 22$). Across all six behaviors, exercise demonstrated the most reliable pattern of withdrawal-like symptoms, the primary symptom of which was mood disturbances. Importantly, craving was the most common abstinence-induced effect across multiple behaviors, highlighting its importance to be assessed in future prospective abstinence studies of potential behavioral addictions. There were no prospective abstinence studies on sexual behavior in general, but three studies investigating abstinence effects specifically from pornography indicated there might be some benefits of short-term abstinence from pornography including greater relationship commitment (Lambert et al., 2012), less delay discounting (Negash et al., 2016) and insight about compulsivity in one's own pattern of pornography use (Fernandez et al., 2017). There were no studies that examined effects of short-term pornography abstinence on withdrawal-related symptomatology, which is a prominent gap in PPU empirical research.

Three categories of positive effects of abstinence were observed across a few behaviors, including alleviation of negative effects attributed to the behavior, insight, and positive behavioral changes, which suggests that short-term abstinence could potentially be a useful intervention for specific problematic behaviors. However, the review highlighted the need for more empirical research to understand not only potential positive effects of abstinence but also its potential counterproductive or adverse consequences (e.g., rebound effects and compensatory behaviors) before its utility as a clinical intervention for specific problematic behaviors can be properly evaluated.

7.1.1 Phenomenological experiences of abstinence-based recovery from CSB and PPU

In Empirical Study 1 (Fernandez et al., 2021a), 104 abstinence journals by male members of a pornography ‘rebooting’ forum, *Reboot Nation*, were analyzed using phenomenologically-informed thematic analysis. The analysis yielded four main themes (with nine subthemes). The first theme, *abstinence is the solution to pornography-related problems*, revealed how abstinence was viewed by members as the logical solution to their problems (i.e., perceived addiction, sexual difficulties, and negative psychosocial consequences) because it was perceived that their pornography use had led to these problems. The second theme, *sometimes abstinence seems impossible*, illustrated how challenging abstinence was typically experienced to be, due to the difficulty of managing sexual desire during abstinence and the re-emergence of habitual behavior patterns and/or cravings triggered by the ubiquity of cues for pornography use. The third theme, *abstinence is achievable with the right resources* outlined how a combination of internal (e.g., cognitive behavioral strategies) and external (e.g., social support) resources made abstinence achievable for many members. The fourth theme, *abstinence is rewarding if persisted with*, described how members who persisted with abstinence typically reported a range of benefits

which they attributed to abstinence, including an increase in abstinence self-efficacy and self-control, as well as improvements in psychosocial and sexual functioning.

In Empirical Study 2 (Fernandez et al., 2021b), data from in-depth interviews with 14 members of an ‘S’ group, Sex and Love Addicts Anonymous (SLAA) were analyzed using phenomenologically-informed thematic analysis. Five themes emerged from the analysis. The first theme, *unmanageability of life as impetus for change* saw members typically describing the escalating negative consequences of their sexual behavior as being the catalyst for their initiation into recovery. The second theme, *addiction as a symptom of a deeper problem*, revealed how members, after some time in recovery, came to view their addiction as a symptom of unresolved underlying issues, including unresolved developmental trauma, a disordered search for validation and attention, and a disordered search for intimacy and love. The third theme, *recovery is more than just abstinence*, illustrated how the meaning of recovery for members also expanded beyond just abstinence to the long-term maintenance of the quality of their recovery as a whole. The fourth theme, *maintaining a new lifestyle and ongoing work on the self*, described how members learned that the quality of their recovery was dependent on maintaining a new lifestyle comprising clear behavioral boundaries, regular connection with the fellowship and ongoing work on the self through 12-step work and psychotherapy. The fifth theme, *the gifts of recovery*, saw members describing how this new way of living resulted in positive changes beyond the alleviation of CSB symptoms including personal transformation and improvements in overall quality of life.

There were notable commonalities in phenomenological experiences of abstinence-based recovery experiences and sense-making of these experiences across members of both communities that are worth highlighting. First, members of both communities described their initiation into abstinence-based recovery as being primarily motivated by the escalating negative consequences attributed to the problematic sexual behavior. Second, members of

both communities strongly emphasized receiving social support from other members as being crucial to the success of their recovery. Third, members of both communities appeared to have a mechanism in place that enabled them to immediately share with other members of the community if they were experiencing momentary urges to lapse into the problematic behavior – for *Reboot Nation* members this was posting in their journals or communicating with an accountability partner, and for SLAA members this was initiating phone calls with their sponsor or other members. Fourth, members of both communities believed that making significant lifestyle changes were necessary for maintaining abstinence. Fifth, members of both communities described similar kinds of benefits of abstinence-based recovery including increased abstinence self-efficacy over the problematic behavior, increased self-control in general, and improved psychosocial functioning. Sixth, members of both communities generally appeared to hold the view that complete abstinence was the only feasible way to recover because they would not be able to successfully engage in the problematic behavior in a controlled way/in moderation. To make sense of this notion, *Reboot Nation* members tended to use neuroscientific language (e.g., addiction-related circuitry in the brain being triggered after engagement), while SLAA members tended to use 12-step spiritual language (i.e., powerlessness over the addiction).

At the same time, there were fundamental differences in sense-making of abstinence-based recovery across members of both communities which also need to be highlighted²¹.

While both communities used addiction language to describe their problematic sexual behavior, their etiological emphases appeared to be distinct. *Reboot Nation* members tended to emphasize their addiction as resulting primarily from exposure to pornography as a

²¹ It should be noted that some of the differences observed here could have to some extent been a result of *Reboot Nation* members' primary (and often sole) problematic sexual behavior being pornography use. While most (12/14) SLAA members also reported compulsive pornography use, only one member reported pornography use as his primary problematic sexual behavior. It is possible that 'S' group members whose primary problematic sexual behavior is pornography use may have varied sense-making of recovery from SLAA members in this sample.

particularly addictive stimulus, while SLAA members tended to emphasize their addiction as resulting primarily from unresolved underlying psychological and/or spiritual issues. As a result of this difference in etiological emphases, the perceived solution to the problem also appeared to be framed differently. For *Reboot Nation* members, if pornography consumption itself was perceived as being primarily responsible for the development of their addiction, then abstaining from pornography was seen as the logical solution. Lifestyle changes were seen as important inasmuch as they enabled successful abstinence from pornography. However, for SLAA members, because their addiction was seen to be a manifestation of deeper issues within the self, recovery was viewed as being more than just abstinence – hence the significance given to ongoing work on the self through 12-step work and psychotherapy. Lifestyle changes were seen as important for facilitating the quality of their recovery as a whole (manifesting in ‘emotional and mental sobriety’; Helm, 2019, p. 29), of which successful abstinence was a byproduct. These distinct ways of making sense of recovery also appeared to manifest in varied emphases in the kinds of benefits of abstinence-based recovery described by both members of both communities. *Reboot Nation* members tended to emphasize the reversal of the perceived negative effects of pornography use (i.e., improvements in psychosocial and sexual functioning), which they attributed to abstaining from pornography. While SLAA members also described benefits related to improvements in functioning, they tended to emphasize benefits related to spiritual growth and personal transformation (e.g., increased in other-centeredness, gratitude, and strength of character), which they attributed not only to abstaining from the problematic sexual behavior but their continued practice of their program of recovery.

Overall, these two studies fill an important gap in the literature where little had previously been known about the phenomenological experiences of abstinence-based recovery of members of these two abstinence-based recovery communities. These analyses

provide unique insights into what abstinence-based recovery from CSB and PPU is like from the perspectives of individuals with lived experiences and the intricacies of abstinence-based recovery as an intervention from CSB and PPU.

7.1.2 Short-term effects of abstinence from pornography on withdrawal-related symptoms

Empirical Study 3 examined if negative abstinence effects potentially reflective of withdrawal-related symptoms manifested when regular pornography users attempted to abstain from pornography for seven days, and if these negative abstinence effects would only manifest (or manifest more strongly) for those with higher levels of PPU. The present study fills gaps in the literature highlighted by both systematic reviews, that more empirical research needs to be conducted on the less agreed upon components of addiction, such as withdrawal and tolerance, to inform the theoretical conceptualization of PPU (Systematic Review 1) and that there were no prospective studies that had examined the effects of short-term abstinence from pornography on withdrawal-related symptoms (Systematic Review 2). The methodological design of the present study was informed by both Systematic Review 2 and Empirical Study 1. Systematic Review 2 highlighted the importance of craving to be assessed as a potential withdrawal-related symptom as the most common abstinence-induced effect across multiple potential behavioral addictions, and the importance of the use of a non-clinical population in preliminary abstinence studies before adverse effects of abstinence are first understood (Fernandez et al., 2020). Empirical Study 1 informed the use of a modified 14-item version of the Wisconsin Smoking Withdrawal Scale (WSWS; Welsch et al., 1999) adapted for pornography use as one outcome measure of withdrawal-related symptoms, because self-reported categories of withdrawal-like symptoms by ‘rebooting’ forum members (Fernandez et al., 2021a) overlap to a considerable extent with symptoms of smoking withdrawal (Hughes, 2007b).

A total of 176 undergraduate students who were regular pornography users (64.2% female; watched pornography \geq three times a week in the past four weeks) were randomly assigned to an abstinence group (instructed to attempt to abstain from pornography for seven days; $n = 86$) or a control group (free to watch pornography as usual; $n = 90$). Participants' craving, positive and negative affect, and withdrawal symptoms were assessed at baseline and each night of the seven-day period. Contrary to the confirmatory hypotheses, multilevel modeling analyses showed that there was no evidence of abstinence effects on withdrawal-related symptoms in the sample, and this was not dependent on level of PPU (but with the caveat that the sample had relatively low levels of PPU). However, exploratory analyses revealed a significant three-way interaction (group \times PPU \times past 4-week frequency of pornography use [FPU]) on craving, where an abstinence effect on craving was found at high levels of PPU only once past 4-week FPU reached the threshold of daily use. While these exploratory analyses should be interpreted with caution because of the limited statistical power to detect three-way interaction effects if any exist, they suggest that negative abstinence effects could potentially manifest when there is a combination of high PPU and high FPU, which needs to be investigated in future prospective abstinence studies

This empirical study contributed to current gaps in understanding about the potential manifestation of withdrawal in relation to PPU. Previous studies on withdrawal in PPU had previously relied on retrospective surveys (e.g., Dwulit & Rzymiski, 2019a) or withdrawal items within PPU psychometric instruments (e.g., Bóthe et al., 2018) that assume that participants engage in significant periods of abstinence in the first place. The present study is the first to prospectively examine the potential manifestation of abstinence-induced withdrawal-like symptoms in a sample of regular pornography users with varying levels of PPU and contributes preliminary data that advance current understanding on whether and

under what conditions withdrawal-related symptoms may (or may not) manifest during short-term abstinence from pornography.

7.2 Implications

The findings of the present thesis have implications for advancing current knowledge about (i) abstinence-based recovery from CSB and PPU and (ii) the potential manifestation of withdrawal in relation to PPU.

7.2.1 Abstinence-based interventions from CSB and PPU

1. Abstinence-based interventions for CSB and PPU need to be contextualized according to the way abstinence is framed by the specific recovery community and/or individual.

While members of both *Reboot Nation* and SLAA engaged in abstinence-based interventions, there were important differences in the etiological conceptualizations of their problematic behavior, which in turn affected the way the need for abstinence was justified and the meaning of abstinence was constructed. Arguably the most fundamental difference in sense-making of abstinence across both communities was that *Reboot Nation* members typically framed abstinence as the goal of their recovery, while SLAA members typically framed abstinence as being a result of their recovery, which comprised goals beyond abstinence – resulting in two somewhat varied interventions in practice. The qualitative analyses in the present thesis underscore the importance of context-sensitivity in understanding abstinence-based interventions for CSB and PPU, a sentiment similarly articulated by a recent qualitative study showing how abstinence was experienced and perceived differently by two individuals who both chose abstinence as an intervention goal in their recovery from PPU (Sniewski & Farvid, 2019).

2. Abstinence-based interventions for CSB and PPU are particularly challenging due to the presence of sexual desire and ubiquity of sexual cues, with successful abstinence appearing to require significant lifestyle changes.

Both qualitative analyses demonstrate that abstinence-based interventions for CSB and PPU can be particularly difficult to navigate because unlike abstinence-based interventions from substance use disorders where complete abstinence from substances are often a long-term goal of recovery, complete abstinence from sexual behavior is almost never a long-term goal of recovery. Therefore, individuals in recovery would need to define, often through trial-and-error, what healthy fulfillment of their sexual desire means to them behaviorally. For example, the experiences of *Reboot Nation* and SLAA members suggest that masturbation can be part of the solution as an effective sexual outlet for some, but can be counterproductive and trigger cravings for others, particularly during early abstinence.

The analyses also showed how successful abstinence from the problematic sexual behavior appears to require significant lifestyle changes (e.g., being disciplined in one's day-to-day routine and enforcing strict boundaries about the kind of digital media consumed), particularly to minimize exposure to internal cues (e.g., negative affect) and external cues (e.g., sexual visual cues) that could trigger cravings and old habit patterns. This corresponds with observations made by previous authors that an abstinence approach from CSB and PPU would likely require significant amounts of effort and attention, in large part due to the intertwining of digital technology use with everyday life (Griffiths, 2001; Sniewski & Farvid, 2019; Young, 2008). Importantly, members' experiences across both communities suggest that having access to a support group for social support and accountability is an invaluable resource for individuals engaged in abstinence-based recovery to aid successful abstinence.

3. Abstinence could potentially be a beneficial intervention goal in recovery from CSB and PPU, but further research is needed to verify if self-perceived benefits can be attributed to abstinence and to investigate potential adverse effects of abstinence-based interventions.

A range of self-perceived benefits reported by *Reboot Nation* and SLAA members (e.g., increased abstinence self-efficacy over the problematic behavior, increased self-control

in general, and improved psychosocial and sexual functioning) suggest that abstinence-based recovery could be a beneficial intervention for CSB and/or PPU. However, while qualitative findings are useful for exploring potential benefits of interventions, they need to be verified by follow-up quantitative research. Prospective longitudinal and experimental/dismantling designs are needed to establish if specific self-perceived benefits are better attributable to intervening factors within the intervention other than abstinence from the problematic sexual behavior (e.g., specific lifestyle changes beyond abstinence could contribute to improved mood).

In addition, even if abstinence-based interventions have benefits, they may also have potential adverse or counterproductive effects that need to be investigated in future empirical research before they can be properly evaluated as interventions for CSB and PPU. With regards to behavioral addictions in general, Systematic Review 2 highlighted that rebound effects (i.e., an increase in post-abstinence engagement in the behavior compared to baseline) and engaging in compensatory behaviors (i.e., engaging in substitute behaviors that may also be harmful or problematic) may be counterproductive consequences of short-term abstinence that need to be examined in abstinence intervention studies (Fernandez et al., 2020). With regards to sexual behavior more specifically, some authors have suggested that temporary celibacy contracts advocated by clinicians treating CSB (e.g., Carnes, 1989) may potentially lead to maladaptive negative attitudes about sexuality (Coleman, 1990; Kingston & Firestone, 2008; Neves, 2021) and also warrants examination in future studies.

Moreover, community-specific concerns have been raised in the present thesis and in the literature that need to be noted by researchers and clinicians. Inherent disadvantages of support groups in general include the culture of individual communities being shaped by the unique composition of individuals participating at any given time, and the potential for misinformation (Salmon, 1995; Turner, 2017; Zweben & Ashbrook, 2012). Empirical Study

1 (Fernandez et al., 2021a) showed how some individuals attempting abstinence from pornography without psychoeducation on how to effectively deal with thoughts and urges may instinctively engage in counterproductive strategies, such as thought suppression (Wegner et al., 1987), which could be potentially harmful because it may lead to paradoxical increases in sexual preoccupation (Efrati, 2019). A recent critical narrative analysis of posts on the ‘rebooting’ subreddits *r/NoFap* and *r/pornfree* illustrated how some members’ rigid framing of abstinence as a collective moral commitment resulted in intense shame and sense of failure at its violation and appeared to be a major factor contributing to the maintenance of distress in their recovery (Chasioti & Binnie, 2021). Some *NoFap* members may hold unscientific beliefs in the intrinsic benefits of semen retention (e.g., ‘superpowers’ such as self-confidence and sexual magnetism; Hartmann, 2020; Taylor & Jackson, 2018). Empirical Study 2 (Fernandez et al., 2021b) showed how some SLAA members might feel pressured into conforming to specific norms in definitions of bottom-line behaviors depending on the culture of an individual ‘S’ group or the beliefs of an individual sponsor. All in all, it is important that clinicians are fully aware of both the potential benefits and disadvantages of participation in specific ‘rebooting’ forums and ‘S’ groups before recommending participation in these communities to clients as an adjunct to therapy.

4. Moderation/controlled use as an intervention goal within CSB and PPU interventions warrants further empirical examination.

A notable finding across both qualitative analyses was that there appeared to be little consideration among members for a non-abstinence (i.e., moderation/controlled use) approach to recovery from CSB and PPU because of the belief that moderation or controlled use is unachievable due to the addictive nature of pornography (Empirical Study 1; Fernandez et al., 2021a) or powerlessness over the addiction (Empirical Study 2; Fernandez et al., 2021b). However, due to how challenging abstinence-based recovery appears to be, a

moderation or controlled use approach to recovery may be a more pragmatic option for some individuals with CSB and PPU if it is established to be feasible and able to produce similarly beneficial outcomes. A moderation/controlled use approach has been shown to be achievable and associated with long-term improvements in functioning for alcohol use disorder (Witkiewitz et al., 2020, 2021) as well as gambling disorder (Ladouceur et al., 2009; Stea et al., 2014) and needs to be examined empirically for CSB and PPU in future research.

7.2.2 The potential manifestation of withdrawal in relation to PPU

1. Qualitatively reported heightened negative affective states during abstinence by ‘rebooting’ members provide information about possible PPU withdrawal symptoms that can be examined quantitatively by prospective abstinence studies.

Empirical Study 1 showed how *Reboot Nation* members described heightened negative affective states potentially reflective of withdrawal-related symptoms during abstinence, including depressed mood and mood swings, anxiety, fatigue, ‘brain fog’, headache, insomnia, restlessness, loneliness, frustration, irritability, stress and decreased motivation (Fernandez et al., 2021a). When considered together with withdrawal-like symptoms retrospectively self-reported by pornography users about previous cessation attempts in a previous survey study (Dwulit & Rzymiski, 2019a), broad categories of potential withdrawal-like symptoms emerge (i.e., depressed mood/sadness, anxiety, irritability/anger/frustration, and attention disturbances/difficulty concentrating) and warrant quantitative examination in prospective abstinence studies.

2. Preliminary prospective data suggest the possibility that PPU withdrawal symptoms (if a pornography withdrawal syndrome exists) may only manifest at high levels of FPU and PPU, a hypothesis which needs to be investigated in future prospective abstinence studies

Empirical Study 3 provided preliminary evidence suggesting that the average regular pornography user who uses pornography somewhat regularly (i.e., a few times a week), even

at higher levels of PPU, generally does not experience withdrawal-like symptoms when trying to abstain from pornography for seven days (but with the caveat that the sample was 64.2% female and had relatively low levels of PPU). However, because exploratory analyses found an abstinence effect on craving when PPU was high and past four-week FPU crossed the threshold of daily use, the possibility that withdrawal-related symptoms may manifest only at high levels of FPU and PPU needs to be investigated in future prospective studies.

3. Craving may be a PPU withdrawal symptom if a withdrawal syndrome exists, but non-pathological interpretations of abstinence effects are important to rule out.

Because exploratory analyses in Empirical Study 3 found that craving was an abstinence effect when PPU was high and past 4-week FPU was at least daily or more, craving could potentially be a PPU withdrawal symptom if a withdrawal syndrome exists. While the finding from Systematic Review 2 that craving was a common abstinence effect across multiple potential behavioral addictions including gambling, gaming, mobile phone use, and social media use (Fernandez et al., 2020) strengthens the interpretation of craving as a potential withdrawal-related symptom, future studies need to replicate the finding that craving is a pornography abstinence effect and rule out non-pathological explanations for any negative abstinence effects. Systematic Review 2 discussed at length how negative abstinence effects in relation to potential behavioral addictions in general may not necessarily be addiction-related withdrawal symptoms, but could be a manifestation of a non-pathological dependency on the behavior to achieve a specific function. For example, boredom during abstinence in the case of gaming and social media use (King et al., 2016; Stieger & Lewetz, 2018) may be the result of a historical reliance on a single behavior for entertainment, while craving for pornography, in the case of pornography use, may be the result of a historical reliance on masturbating to pornography for sexual release.

4. There is a lack of convergence in findings about pornography abstinence effects when the prospective RCT study is compared to retrospective survey and qualitative studies, but further research is needed to understand why.

Both a previous retrospective survey of Polish pornography users (Dwulit & Rzymiski, 2019a) and Empirical Study 1 (Fernandez et al, 2021) found that pornography users perceived a range of negative effects of abstinence from pornography potentially indicative of withdrawal-related symptoms, common symptoms of which included depressed mood, anxiety, irritability, attention disturbances and feelings of loneliness. However, no evidence of negative abstinence effects was found when examined within a prospective RCT design in Empirical Study 3, even for pornography users with higher levels of PPU. Exploratory analyses found that an abstinence effect on craving at high levels of PPU only once FPU was at least daily or more. However, even under these conditions, no abstinence effects on negative affective symptoms were found (which should arguably be interpreted with caution because due to limited statistical power in the sample, it is possible that similar but smaller effects may not have been detected for these negative affective symptoms).

There are two possible explanations for this difference in the findings. First, it is possible that due to its rigorous methodology (prospective design, randomization, and the presence of a non-abstaining control group) the RCT study was able to demonstrate that any subjectively self-perceived negative cognitive-affective states during abstinence by pornography users in the retrospective and qualitative studies had likely been misattributed to abstinence and instead had a different source (e.g., preexisting affective states that had previously been self-medicated by pornography consumption). Alternatively, the lack of abstinence effects observed in the RCT study could have been a function of the specific sample used. It is possible that abstinence effects may have been observed in (a) a sample with higher PPU and/or FPU, or (b) a predominantly male sample. To establish which

explanation is true, future prospective studies are needed to determine if the findings of this preliminary prospective study can be replicated across diverse samples with varying gender ratios and levels of FPU and PPU.

7.3 Unique contributions to knowledge

In this section, the unique contributions to knowledge of the present thesis are summarized. Systematic Review 1 was the first systematic review of PPU psychometric instruments in the field. This review uniquely contributed to knowledge by summarizing the theoretical conceptualizations, diagnostic features, psychometric properties, and strengths and limitations of 22 psychometric instruments. The review also provided insight regarding the lack of consensus in the field about how best to operationalize PPU, discussed contextual factors potentially affecting assessment of PPU, and provided recommendations for clinicians and researchers intending to use PPU instruments in clinical practice and research.

Prior to Systematic Review 2, there had previously only been systematic reviews of the effects of abstinence from exercise in the literature. Systematic Review 2 filled this gap in the literature by reviewing the state of evidence on short-term abstinence effects across multiple potential behavioral addictions to provide further insight regarding the potential manifestation of addiction-related symptomatology (i.e., withdrawal, craving, and relapse) and the potential utility of short-term abstinence as an intervention for behavioral addictions. The review also showed that while withdrawal and craving were examined to some extent across the studies, the investigation of relapse using abstinence protocols was underutilized within behavioral addiction research. The review also provided recommendations for researchers intending to conduct research concerning behavioral addictions using experimental abstinence protocols.

Empirical Study 1 was the first study to conduct a qualitative analysis of abstinence experiences of members of a ‘rebooting’ forum using phenomenologically-informed thematic

analysis. The only previous qualitative study of a ‘rebooting’ forum had used a critical lens using discourse analysis to examine how members of the *r/NoFap* forum constructed discourses of masculinity on the forum (Taylor & Jackson, 2018). Therefore, experiential qualitative analyses of ‘rebooting’ members’ experiences that give voice to their own perspectives and meanings had been lacking in the literature. Empirical Study 1 filled this gap by conducting an analysis that prioritized members’ phenomenology (i.e., sense-making about their own experiences). This study provided insight to what the ‘rebooting’ experience was like from members’ own perspectives and provided further insights into abstinence-based recovery as an approach for addressing PPU.

Empirical Study 2 was the first study to conduct a qualitative analysis of CSB recovery experiences of members of an ‘S’ group (i.e., SLAA) using an inductive approach. Previous qualitative analyses of ‘S’ groups had either used only female participants (Dhuffar & Griffiths, 2015), used a deductive approach to data analysis that asked specific research questions about the recovery process (i.e., manifestation of behavioral addiction symptomatology and coping strategies used to deal with these symptoms; Ševčíková et al., 2018) or examined a specific aspect of the recovery process (i.e., perceptions of effectiveness of psychotherapy plus 12-step participation, Yamamoto, 2020). Empirical Study 2 uniquely contributed to knowledge by exploring the recovery experience as a whole among 14 SLAA members, where novel themes and insights emerged regarding how members described and made sense of their recovery journeys.

Finally, Empirical Study 3 was the first study in the PPU field to experimentally investigate the effects of abstinence from pornography on withdrawal-related symptoms. Previous studies investigating withdrawal had relied on retrospective self-reports of perceived withdrawal symptoms (e.g., Dwulit & Rzymiski, 2019) which are subject to recall bias. While the non-clinical, majority female sample of regular pornography users in Empirical Study 3

was a significant limitation of the study, the findings of the study contributed important preliminary data that represented a first step toward understanding whether and under what conditions withdrawal-related symptoms may (or may not) manifest during abstinence from pornography. It also recommended replication across more diverse samples.

7.4 Methodology

In this section, the philosophical assumptions underpinning the research methodologies used in the present thesis and strengths and limitations of the specific methods used are discussed.

7.4.1 Pragmatism as an overarching research paradigm

The overarching research paradigm guiding the research methodologies used throughout the present thesis was pragmatism (see Kaushik & Walsh, 2019, for an overview). Historically, the two main research paradigms that have dominated social science research have been post-positivism and constructivism (Feilzer, 2010). Post-positivism, generally associated with quantitative approaches, makes claims for knowledge based on objectivity, cause-and-effect thinking, deductive reasoning, and theory verification (Cresswell & Plano Clark, 2011). Constructivism, generally associated with qualitative approaches, emphasizes developing subjective perceptions of a phenomena, inductive reasoning, and theory generation (Creswell & Plano Clark, 2011). Pragmatism acts as a bridge between these two paradigms, in that it avoids a forced-choice dichotomy between both worldviews and embraces both ends of the objectivity-subjectivity continuum (Kaushik & Walsh, 2019). Pragmatism is based on the proposition that researchers should use the philosophical and/or methodological approach that best fits the specific research question being investigated (Tashakkori & Teddlie, 1998) and does not require or exclude a particular method or methods mix (Feilzer, 2010). Because of the primacy it gives to the research question above specific methods, pragmatism also provides the philosophical foundation for mixed-methods research

(Morgan 2014). Mixing quantitative and qualitative methods can be useful for providing findings from different types of data for corroboration and enhancement of understanding, where the strengths of one method can be used to complement the other (Johnson et al., 2007).

Therefore, in the present thesis, a qualitative approach based on a constructivist paradigm was used to achieve the first aim because the research question was concerned with subjective perceptions and meanings of abstinence-based recovery experiences (Empirical Studies 1 and 2), while a quantitative approach based on a post-positivist paradigm was used to achieve the second aim because the research question was concerned with objectively determining if withdrawal symptoms manifest during pornography abstinence, beyond subjective perceptions (Empirical Study 3). Elements of two mixed-methods designs, the sequential exploratory design and the convergent parallel design (Creswell & Plano Clark, 2011), were also applied in the present thesis (Empirical Studies 1 and 3). However, it should be noted that while the present thesis incorporates elements of the two aforementioned mixed-methods designs, the incorporation of these elements was minimal and these designs did not form a major part of the overarching methodological framework of the research project. Empirical Studies 1 and 2 were fundamentally qualitative, based on a constructivist paradigm, while Empirical Study 3 was fundamentally quantitative, based on a post-positivist paradigm.

7.4.2 Strengths and limitations of qualitative methods used

Online forum data and semi-structured interview data. In Empirical Study 1, publicly available online forum data were collected. An advantage of using existing online forum data is that they allowed for observation of members' experiences naturalistically, without researcher influence (Holtz et al., 2012). Because their anonymity is preserved, individuals on online forums may be more likely to be open about their experiences and

perspectives (Griffiths, 2005b; Holtz et al., 2012). On the other hand, a disadvantage is that it limits the collection of further information that may be useful to contextualize the analysis, including sociodemographic information about forum members and answers to specific questions that would help to answer the research question (Holtz et al., 2012). In Empirical Study 2, data were collected using in-depth semi-structured interviews. Unlike collecting forum data, collecting data via semi-structured interviews enables posing specific questions to participants that are directly relevant to the research question, including follow-up questions for probing. In-depth interviews comprising of a combination of closed- and open-ended questions, allow for increased reflection, explanation and elaboration on answers provided and a greater depth of the data gathered (Adams, 2015). However, semi-structured interviews also have inherent disadvantages, including the lack of anonymity, potentially discouraging openness in some participants and the possibility of interviewer bias (e.g., asking leading questions; Roulston & Halpin, 2022).

Phenomenological approach to data analysis. In both Empirical Study 1 and Empirical Study 2, a phenomenological approach to data analysis was used. Phenomenology (Husserl, 1931) is the study of lived experience, and aims to understand the nature and meaning of phenomena as they present themselves in consciousness (Sundler et al., 2019; van Manen, 2016). Advantages of phenomenological analysis include giving voice to the perspectives of individuals with lived experience of a phenomenon and generating new insights into the studied phenomenon (Willig, 2007). Understanding the sense-making of individuals in recovery from mental health problems in particular is valuable because regardless of whether the narratives constructed are verified scientifically, they are important in shaping an individual's approach to recovery (Llewellyn-Beardsley et al., 2019). On the other hand, a key limitation of phenomenological analysis is that because it prioritizes understanding individuals' experiences from their own viewpoints, it does not seek to

critically evaluate their narratives in light of existing theoretical frameworks, unlike more critical approaches to data analysis and interpretation such as critical discourse analysis (Willig, 2017).

7.4.3 Strengths and limitations of quantitative methods used

Randomized controlled trial design. In Empirical Study 3, a randomized controlled trial (RCT) design was used. RCTs must have three different components: controlled manipulation of at least one variable, use of a control or comparison group, and random assignment to the treatment group (Connelly & Woolston, 2016). The use of a control group and randomization are principal methods in ensuring that an RCT has rigorous internal validity (Mohr et al., 2009). The strength of the RCT design is that it allows causal claims about the population in the study to be deduced from probability differences between treatment and control groups (Cartwright, 2007). However, RCTs are limited in the extent to which they are generalizable to the wider population (because of the use of a homogenous participant sample) or applicable in real-world situations (because they prioritize controlled conditions that prioritize internal validity over ecological validity; Sharma et al., 2020). In addition, another limitation of the RCT design when applied to psychological interventions specifically is the risk of bias given the difficulty of blinding participants to the intervention they are receiving, compared to pharmacological treatments which typically achieve blinding through matching placebo pills (Juul et al., 2021).

Self-report survey data. Self-report surveys were used to assess variables potentially indicative of withdrawal-related symptomatology in Empirical Study 3. Strengths of using self-reported measures of affective states are that they generally display excellent construct validity in terms of their temporal stability and relation with non-self-report data (Gray & Watson, 2007) and have been found to not be skewed toward more socially desirable responses (Watson & Vaidya, 2003). In addition, the use of end-of-day surveys instead of

end-of-week surveys in the present survey were also useful for overcoming potential biases leading to reductions in accuracy when participants are asked to make retrospective judgments about past affective experiences (Robinson & Clore, 2002).

However, some limitations with regards to psychometric assessment of withdrawal-related symptoms specifically should be highlighted. First, the smoking abstinence literature has indicated that while aggregating single items into categories/factors is more reliable than single items, variation in the occurrence and duration of specific symptoms within each symptom group may be masked (Patten & Martin, 1996b). Additionally, the use of general affect measures (e.g., the PANAS), while having excellent psychometric properties, may include items that may not be valid indicators of withdrawal (Patten & Martin, 1996b). Finally, self-report assessment of withdrawal symptoms may arguably be limited if not corroborated by potential psychophysiological indicators of withdrawal such as cortisol levels, blood pressure, and heart rate (Hughes, 2007c; Patten & Martin, 1996b; Pies, 2009).

7.4.4 Strengths and limitations of mixed methods used

Sequential exploratory design. An element of the sequential exploratory design (Creswell & Plano Clark, 2011) was incorporated in the present thesis, where qualitative findings about self-perceived withdrawal-like symptoms in Empirical Study 1 informed the choice of quantitative measure of withdrawal-related symptoms in Empirical Study 3. The key strength of the sequential exploratory design is that the preceding exploratory qualitative phase of a study helps to develop and/or inform a second quantitative phase of a research study. This design is particularly useful when researchers need to develop and test a quantitative instrument because none is available or to identify which variables to examine quantitatively when variables are unknown (Edmonds & Kennedy, 2017). The main challenge of this design is that the two-phase approach can be time-consuming because the

qualitative data need to be carefully collected and analyzed thoroughly before they can be used to inform the quantitative phase (Creswell & Plano Clark, 2011).

Convergent parallel design. An element of the convergent parallel design (Creswell & Plano Clark, 2011) was also incorporated in the present thesis, where qualitative findings about self-perceived withdrawal-like symptoms from Empirical Study 1 were compared with quantitative findings about abstinence effects from Empirical Study 3. The main strength of this design is that it enables triangulation of methods by directly comparing quantitative statistical findings with qualitative findings for corroboration and validation purposes (Creswell & Plano Clark, 2011). However, challenges include difficulty merging quantitative and qualitative data in a meaningful way and requiring careful design of both studies so that the same concepts are being investigated (Cresswell & Plano Clark, 2011). Also, while divergence of qualitative and quantitative data may be beneficial in facilitating unanticipated insight into phenomena, it can also be difficult to reconcile and may require the collection of additional data (Pluye et al., 2009).

7.5 Limitations and directions for future research

In this section, limitations and future research directions of the present thesis in addition to the ones presented in each of the empirical chapters are highlighted. First, both qualitative studies analyzed specific support groups (i.e., *Reboot Nation* as a specific ‘rebooting’ community and SLAA as a specific ‘S’ group) and as such the findings may not generalize to other ‘rebooting’ communities (e.g., *r/NoFap*, *r/PornFree*) and ‘S’ groups (e.g., SA, SAA). Given the possibility that there may be important subcultural differences across these individual communities, experiences and sense-making of abstinence-based recovery may be idiosyncratic depending on the specific community analyzed. Importantly, *Reboot Nation* and *r/PornFree* communities may place less emphasis on abstaining from masturbation than *r/NoFap* communities which may have a significant impact on the

abstinence experience (Chasioti & Binnie, 2021; Fernandez et al., 2021a). Similarly, SLAA members, due to their exposure to the ‘love addiction’ concept in the SLAA program may be more likely to make sense of their compulsive sexual behavior as being a symptom of an underlying love addiction (Fernandez, 2021b), which may not be the case for SA or SAA members. Future research should analyze these other ‘rebooting’ communities and ‘S’ groups to examine if the findings from the qualitative studies in the present thesis have replicability and transferability to these other communities.

Second, investigation of abstinence-based recovery in the present thesis was limited by the specific methods used (i.e., qualitative analyses of online forum data and semi-structured interview data). Follow-up research on ‘rebooting’ communities and ‘S’ groups using various methods including larger-scale qualitative and/or quantitative surveys and prospective longitudinal studies of abstinence attempts would be useful for providing further insight into abstinence-based recovery from CSB and PPU.

Third, the withdrawal measure used in Empirical Study 3 (the WSWS [Welsch et al., 1999] adapted for pornography use), while informed by findings of Empirical Study 1, was a limitation. Because the primary aim of Empirical Study 1 was not to explore potential withdrawal-related symptoms specifically, self-perceived withdrawal-like symptoms reported by forum members in their journals may not be a comprehensive representation of categories of negative cognitive-affective and/or physical states perceived by all members during abstinence. Future qualitative and quantitative surveys that ask abstaining individuals specifically about any perceived withdrawal-related symptoms are needed, so that proper measures of pornography-specific withdrawal-related symptoms can be developed and used in prospective abstinence studies.

Fourth, the analyses conducted in Empirical Study 3 were only able to answer broad questions about whether there were effects of abstinence on the outcome variables over the

seven-day experimental period. Future abstinence studies could consider examining whether there are potential curvilinear (e.g., inverted-U) trajectories of abstinence, similar to what is observed during abstinence from substances, such as nicotine (Piper et al., 2011). In addition, adding a qualitative component at the end of the study as part of a sequential explanatory design (Creswell & Plano Clark, 2011), where participants are asked a series of open- and closed-ended questions about their abstinence experience, may lead to deeper insight about potential manifestation of withdrawal-like symptoms not captured by the quantitative data.

Finally, the abstinence manipulation in Empirical Study 3 focused specifically on instructions to attempt to abstain from pornography for seven days. Future studies could consider varying the specific behaviors (e.g., masturbation or any sexual activity in addition to pornography) or time frame (e.g., a two-week period) specified in abstinence instructions to investigate if these would result in any differences in outcomes.

7.6 Final remarks

The present thesis investigated abstinence from CSB and PPU to fill current gaps in knowledge about CSB and PPU assessment and intervention. Qualitative analyses of phenomenological experiences of abstinence among members of two abstinence-based recovery communities provided unique insights into abstinence-based recovery from CSB and PPU. Quantitative examination of short-term effects of abstinence from pornography provided preliminary data that inform current theorizing about whether withdrawal should be included in theoretical conceptualizations of PPU. While limited by the specific methods and samples used, the present thesis represents an important first step in understanding abstinence-based recovery and short-term abstinence effects in the context of CSB and PPU. Further empirical research on abstinence from CSB and PPU using diverse samples and a range of methods is needed to verify and build upon the findings of the present thesis.

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Appendix A

Declaration of collaborative work

Systematic Reviews 1 and 2 and Empirical Studies 1 and 2 have been published in peer reviewed academic journals. Empirical Study 3 has been submitted for publication in a peer reviewed academic journal.

Systematic reviews

Fernandez, D. P., & Griffiths, M. D. (2021). Psychometric instruments for problematic pornography use: A systematic review. *Evaluation and the Health Professions*, 44(2), 111-141. <https://doi.org/10.1177/0163278719861688>

Fernandez, D. P., Kuss, D. J., & Griffiths, M. D. (2020). Short-term abstinence effects across potential behavioral addictions: A systematic review. *Clinical Psychology Review*, 76, 101828. <https://doi.org/10.1016/j.cpr.2020.101828>

Contribution of the first author (David P. Fernandez) to each of these systematic reviews:

- Initiation and development of research idea and design
- Systematic literature search and data extraction
- Organization and synthesis of literature
- Write-up of the manuscripts
- Implementation of feedback provided by co-authors

Empirical studies

Fernandez, D. P., Kuss, D. J., & Griffiths, M. D. (2021a). The pornography “rebooting” experience: A qualitative analysis of abstinence journals on an online pornography abstinence forum. *Archives of Sexual Behavior*, 50(2), 711-728. <https://doi.org/10.1007/s10508-020-01858-w>

Fernandez, D. P., Kuss, D. J., & Griffiths, M. D. (2021b). Lived experiences of recovery from compulsive sexual behavior among members of sex and Love Addicts anonymous: A qualitative thematic analysis. *Sexual Health & Compulsivity*, 28(1-2), 47-80. <https://doi.org/10.1080/26929953.2021.1997842>

Fernandez, D. P., Kuss, D. J., Justice, L. V., Fernandez, E. F., & Griffiths, M. D. (2022). *Effects of a seven-day pornography abstinence period on withdrawal-related symptoms in regular pornography users: A randomized controlled study* [Manuscript submitted for publication]. Department of Psychology, Nottingham Trent University.

Contribution of the first author (David P. Fernandez) to each of these empirical studies:

- Initiation and development of research idea and design
- Participant recruitment
- Data collection
- Data cleaning
- Data analysis
- Write-up of the manuscripts
- Implementation of feedback provided by co-authors

Declaration of Co-Author Contribution: The content of the chapters presented in the thesis reflect the original and independent work completed by the first author (David P. Fernandez). Input from the additional co-authors was provided in the form of general feedback / guidance and manuscript edits in line with the normal working expectations of a PhD Student – Supervisor relationship. No original content in the thesis or accompanying journal articles was produced by any co-authors listed.

Appendix B

Summary of study characteristics (Systematic Review 2)

Study	Participants	Procedure	Design/ type	Key outcome measures	Relevant findings	Theoretical interpretation of effects	Addiction framework considered?	Withdrawal/ craving assessed?	Relapse assessed?
<i>Exercise (n = 22)</i>									
Baekel and (1970)	14 college students; exercised ≥ 3 times/week	All participants instructed to abstain from exercising for one month	EXP; SR	Exercise Deprivation Questionnaire	Deprivation resulted in increased sexual tension, anxiety, need to be with others; decreased appetite and quality of sleep	Non-addiction-related psychological effects	No	IND	NA
Thaxton (1982)	33 'habitual' runners (24 M, 9 F, $M_{age} = 36.0$); ran \geq 5 times/week for past 1 year	Random assignment to deprived group (instructed to abstain from running for 24 hours) or non- deprived group (ran for 30 minutes)	EXP; SR	POMS (McNair, Lorr & Droppleman, 1971), galvanic skin response (GSR; as measure of tension)	Non-pre-tested deprived group had higher depression and GSR scores than non-pre-tested non-deprived group. No significant differences for anxiety, vigor and fatigue scores	Addiction-related withdrawal	Yes	DIR	NA
Crossman et al. (1987) Study 1	31 runners (15 M and 16F, $M_{age} =$ 17.0); ran $M = 42$ miles/week	All participants tested 26-30 hours after last exercise	N; SR	STAI (Spielberger, Gorsuch & Lushene, 1970), 8-item mood scale (Polivy, 1981)	No overall deprivation main effects. Deprivation effects varied as a function of gender and level of competition – males and athletes competing at higher levels had more negative moods than females and athletes competing at lower levels during layoff, who had more positive moods.	Addiction-related withdrawal Possible relief from fatigue	Yes	DIR	NA
Crossman et al. (1987) Study 2	20 swimmers (8 M, 12 F, $M_{age} = 14.3$), swam $M = 8$ km/day	All participants instructed to abstain from exercise for 5 days	EXP; SR	STAI (Spielberger et al., 1970), 14-item mood scale (Polivy, 1981)	No overall deprivation main effects. Deprivation effects varied as a function of gender and level of competition – males and athletes	Addiction-related withdrawal Possible relief from fatigue	Yes	DIR	NA

					competing at higher levels had more negative moods than females and athletes competing at lower levels during layoff, who had more positive moods				
Morris et al. (1990)	40 male runners ($M_{age} = 37.0$); ran ≥ 3 times/week for 10 miles for past 3 months	Random assignment to deprived group (instructed to abstain from running for 2 weeks) or control group. Preceded by 2-week baseline and post-abstinence exercise as usual	EXP; SR	GHQ-28 (Goldberg & Hillier, 1979), Zung Anxiety and Depression Scales (Zung, 1974), daily exercise diary	Somatic symptoms, anxiety, insomnia and feelings of being under strain were greater in the deprived group than in the control group after both the first and second weeks of deprivation. Symptoms of depression and anxiety were greater in the deprived group at the end of the second week	Addiction-related withdrawal, or beneficial effects of exercise lost due to abstinence	Yes	DIR	IND
					Perfect abstinence compliance reported				
Gauvin & Szabo (1992)	21 college students (14 M, 7 F, $M_{age} = 23.6$, $SD = 5.40$); exercised ≥ 3 times/week in past 4 months	Random assignment to experimental condition (instructed to abstain from exercise for 7 days) or control condition (exercise as usual)	EXP; SR	Well-Being Questionnaire	Participants in exercise deprivation group reported more physical symptoms than at baseline and compared to the control group during and following deprivation. No differences were found on psychological well-being.	Cannot conclude abstinence effects due to withdrawal because no indication of exercise addiction in participants	Yes	DIR	NA
Szabo & Gauvin (1992)	24 university students (16 M, 8 F, $M_{age} = 23.5$, $SD = 1.05$); exercised $M = 8.25$ hours/week over 5-6 months	Random assignment to experimental condition (instructed to abstain from exercise for 7 days) or control condition (exercise as usual)	EXP; SR	Heart rate, mental arithmetic test as stress task	Exercise deprivation did not have an effect on stress response	No support for exercise-stress response link	No	IND	NA
Conboy (1994)	61 runners (51 M, 10 F, $M_{age} = 34.6$, $SD = 10.02$)	All participants completed 10 'run days' and 2-5 'no-run days' (instructed not	N; SR	POMS (McNair et al., 1971), Commitment to Running scale	Participants reported more dysphoria (i.e., increase in tension, depression, anger, fatigue, confusion and total mood	Addiction-related withdrawal	Yes	DIR	NA

to change their schedule in any way)

(Carmack & Martens, 1979)

disturbance, and decrease in vigor) on 'no run' compared to 'run' days. Commitment or dependence, on their own, did not predict dysphoria.

Emotional strength – exercise as 'positive addiction'

High commitment-high dependence runners least prone to dysphoria, low-commitment-high dependence runners most prone to dysphoria

Mondin et al. (1996)	10 'habitual' runners (6 M, 4 F, $M_{age} = 37.0$, $SD = 4.5$); exercised 6-7 days/week	All participants instructed to abstain from exercise for 3 days. Preceded by 1-day baseline and 1-day post-abstinence exercise as usual	EXP; SR	POMS (McNair et al., 1971), STAI (Spielberger et al., 1970), Depression Adjective Checklist (Lubin, Hornstra & Dean, 1978), 24-h history questionnaire (sleep, physical health, exercise, well-being)	Exercise deprivation resulted in increased total mood disturbance, state anxiety, tension, depression and confusion, and decreased vigor. By Day 3, anxiety, tension, depression and total mood disturbance decreased	Non-addiction related 'withdrawal' Decrease in symptoms by third day possibly due to anticipation of exercise	Yes	IND	NA
Szabo and Parkin (2001)	20 martial artists (10 M, 10 F, $M_{age} = 28.4$, $SD = 6.6$); trained $M = 3.6$ times/ week	All participants underwent 14-day baseline period, 4-day pre-deprivation, 7-day deprivation (instructed to abstain from exercise), 3-day post-deprivation period	EXP; SR	Well-Being Questionnaire (Gauvin & Szabo, 1992), abbreviated version of POMS (Grove & Prapavessis, 1992)	During deprivation, increases observed in anger, depression, negative affect, tension, and total mood disturbance, and decreases observed in positive affect and vigor Perfect abstinence compliance reported	Non-addiction related 'withdrawal'	No	IND	IND
Aidman & Woollard (2003)	60 runners, (30 M, 30 F, $M_{age} = 24.2$); trained ≥ 5 times weekly	Random assignment to exercise-deprived group (instructed to abstain from exercise for one day) or	EXP; SR	POMS (McNair et al., 1971), resting heart rate (as measure of anxiety)	Exercise-deprived group reported increased depression, anger, fatigue, confusion and resting heart rate, and reduced vigor within 24 hours of missing training session.	Addiction-related withdrawal	Yes	DIR	NA

control group
(exercise as usual)

Glass et al. (2004)	18 healthy adults (11 F, 7 M, $M_{age} = 25.2$, $SD = 3.25$); exercised at least 4 hours/week	All participants asked to abstain from exercise for 7 days	EXP; SR	Short form of McGill Pain Questionnaire (Melzack, 1987), MFI (Smets, Garssen, Bonke & De Haes, 1995), Beck Depression Inventory (Beck, Ward, Mendelson, Mock & Erbaugh, 1961), STAI (Spielberger et al., 1970)	8 participants developed somatic symptoms after 1 week of abstinence, including fatigue, pain and mood disturbances	Hypoactive function of biological stress response system	No	IND	NA
Berlin et al. (2006)	40 regular exercisers (25 F, 15 M, $M_{age} = 31.3$, $SD = 7.5$); exercised ≥ 3 times /week	Random assignment to exercise deprivation group (instructed to abstain for 2 weeks) or control group (exercise as usual)	EXP; SR	POMS, Beck Depression Inventory-II (Beck, Steer & Brown, 1996), MFI (Smets et al., 1995)	Deprivation group experienced increased fatigue, depression and negative mood states	Negative mental health effects Fatigue – decreased fitness levels	No	IND	NA
Weinstein et al. (2007)	40 regular exercisers (25 F, 15 M; $M_{age} = 31.3$, $SD = 7.5$); exercised ≥ 3 times /week in past 6 months	Random assignment to exercise deprivation group (instructed to abstain from exercise for 2 weeks) or control group (exercise as usual)	EXP; SR	POMS, Beck Depression Inventory-II (Beck et al., 1996), MFI (Smets et al., 1995)	Deprivation resulted in higher negative mood scores compared to control	Reduced baseline parasympathetic activity	No	IND	NA
Hausenblas et al. (2008)	40 regular exercisers (14 M, 26 F, $M_{age} = 20.5$, $SD = 2.5$)	All participants underwent 3 days of regular exercise routine, followed by 3 days of exercise deprivation	EXP; SR	Exercised-induced feeling inventory (EFI; Gauvin & Rejeski, 1993)	Positive engagement and revitalization greater on ‘true’ abstinence days as opposed to non-abstinence days. Lower exercise dependence participants had greater	Non-addiction-related withdrawal Possible relief from obligation	Yes	IND	IND

					positive engagement, revitalization and tranquility.				
					7.5% of participants did not comply with abstinence protocol				
Kop et al. (2008)	40 regular exercisers (25 F, 15 M, $M_{age} = 31.3$); ≥ 3 times /week in past 6 months	Random assignment to exercise deprivation (instructed to abstain from exercise for 2 weeks) or control group (continued exercise)	EXP; SR	POMS (McNair et al., 1971), Beck Depression Inventory-II (Beck et al., 1996), MFI (Smets et al., 1995), heart-rate variability-based indices as a measure of autonomic nervous system activity	Deprivation group had increased negative mood symptoms and fatigue compared to control group	Responses not associated with changes in inflammatory markers	No	IND	NA
Niven et al. (2008)	58 female regular exercisers ($M_{age} = 26.1$, $SD = 8.2$)	Random assignment to abstinence (instructed to abstain for 3 days) or control group (exercise as usual)	EXP; SR	UWIST-Mood Adjective Checklist (Matthews, Jones & Chamberlain, 1990), Body Dissatisfaction Scale from the Eating Disorder Inventory (Garner, Olmstead & Polivy, 1983)	Abstinence group had decrease in hedonic tone and energetic arousal and increase in tense arousal (affect disturbances) and increased body dissatisfaction compared to control group Perfect abstinence compliance reported	Negative mental health effects	No	IND	IND
Poole et al. (2011)	26 regular exercisers (13 M, 13 F, $M_{age} = 25.5$, $SD = 4.5$); ≥ 3 times /week in past 6 months	Random assignment to deprivation group (instructed to abstain from exercise for 2 weeks) or control group (continued exercise)	EXP; SR	POMS (McNair et al., 1971), GHQ-28 (Goldberg & Hillier, 1979), inflammatory markers from plasma, heart rate variability	Deprivation group had significant increases in negative mood	Mood increases related to decreases in IL-6 (cytokine) concentration	No	IND	NA
Zeller et al. (2011)	26 regular exercisers (18 M, 8 F, $M_{age} = 41.7$, SD	All participants instructed to abstain from exercise for 7 days	EXP; SR	Medical Outcomes Study Short Form-36 physical and health scales (Ware,	Significant decrease in quality of life, and increase in non-articular tenderness observed following exercise deprivation	Hypoactive function of biological stress response system	No	IND	NA

	= 11.1); exercised ≥ 4 times/week			Kosinski & Keller, 1994), rheumatological (non-articular tenderness) measurement					
Ablin et al. (2013)	94 regular exercisers (48 M, 44 F, $M_{age} = 27.2$, $SD = 5.6$); ran ≥ 5 times/week	Random assignment to one of four groups (1) exercise restriction (2) sleep restriction (6 hours nightly); (3) both; (4) neither (control). Restriction period 10 days.	EXP; SR	Short form of McGill Pain Questionnaire (Melzack, 1987), MFI (Smets et al., 1995), Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977), Perceived Stress Scale (Cohen & Williamson, 1988), STAI (Spielberger et al., 1970), POMS (McNair et al., 1971), Multiple Ability Self-Report Questionnaire (Seidenberg, Haltiner, Taylor, Hermann & Wyler, 1994), Modified Somatic Symptoms Perceptions Questionnaire (Main, 1983), Psychomotor Vigilance Task (Dinges & Powell, 1985)	Exercise deprivation resulted in increased fatigue, but no changes in mood.	Negative health effect	No	IND	NA
Antunes et al. (2016)	18 male regular runners (age range = 18 – 40); exercised ≥ 5 times/week	All participants instructed to abstain from exercise for 7 – 14 days	EXP; SR	Brunel Mood Scale (BRUMS; Rohlf et al., 2008), physical and biochemical measures	Exercise addiction group, compared to control group, showed increase in depression, confusion, anger, fatigue and decreased vigor that improved post-exercise	Addiction-related withdrawal Exercise addiction – possible dysfunctional endocannabinoid system	Yes	DIR	NA

Krivosek & Lushnikov (2017)	50 professional male athletes ($M_{age} = 23.2, SD = 1.5$)	Athletes tested under two conditions: (1) during active training sessions; (2) during exercise deprivation (7 days)	EXP; SR	Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983); psychophysiological measures	Athletes with exercise addiction, compared to athletes without exercise addiction are characterized by lower brain bioelectric activity, growth in the muscular tension, increased sympathetic activity, and elevated levels of anxiety and depression.	Addiction-related withdrawal	Yes	DIR	NA
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Gambling (n = 2)

Tavares et al. (2005)	150 treatment-seeking patients (62 M, 88F); 49 pathological gamblers (PG; $M_{age} = 45.4, SD = 11.3$), 101 alcohol-dependent subjects (ADS; $M_{age} = 40.7, SD = 11.4$)	Participants monitored by phone to ensure between 5 – 21 days of abstinence achieved from any mood-altering substance and from gambling	N; SR	Weiss Craving Scale (Weiss, Griffin & Hufford, 1995), PACS (Flannery, Volpicelli & Pettinati, 1999), Beck Anxiety Inventory (Beck, Epstein, Brown & Steer, 1988), Beck Depression Inventory (Beck et al., 1961)	PGs had higher craving scores compared to ADS. Alcohol craving correlated with both depression and anxiety, but gambling craving correlated only with depression.	Addiction-related craving	Yes	DIR	NA
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de Castro et al. (2007)	92 treatment-seeking patients (46 M, 46F); 50 pathological gamblers (PG; $M_{age} = 45.0, SD = 9.9$) and 42 alcohol-dependent subjects (ADS; $M_{age} = 43.0, SD = 10.6$)	Participants monitored by phone to ensure between 5 – 21 days of abstinence achieved from any mood-altering substance and from gambling	N; SR	Weiss Craving Scale (Weiss et al., 1995), PACS (Flannery et al., 1999), Positive and Negative Affect Scale Extended Form (PANAS-X; Watson & Clark, 1994), Self-Report Social Adjustment Scale-Revised (SAS-R; Gorenstein et al., 2002)	PGs had higher craving scores compared to ADS. Gambling craving more dependent on external factors and related to an unpleasant dearousing state, while alcohol craving associated with internal cues and unpleasant arousing state	Addiction-related craving	Yes	DIR	NA
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Gaming (n = 7)

King et al. (2016)	24 regular gamers (20 M, 4 F, $M_{age} = 24.6, SD = 5.8$); 9 met criteria for Internet Gaming Disorder (IGD)	All participants instructed to abstain from gaming for 84 hours	EXP; SR	Qualitative survey consisting of 13 open-ended questions	Reactions to abstinence characterized by boredom and drive for mental stimulation; DSM-5 IGD withdrawal symptoms (i.e., sadness, anxiety, irritability) very rarely observed Perceived positive effects included free time used for other activities, increase in insight into harms of gaming, positive modifications to gaming activity post-abstinence Participants reported total compliance with abstinence protocol	Addiction-related withdrawal Abstinence useful intervention	Yes	DIR	IND
Kaptsis et al. (2016)	24 regular gamers (20 M, 4 F, $M_{age} = 24.6, SD = 5.8$); 9 met criteria for IGD	All participants instructed to abstain from gaming for 84 hours	EXP; SR	Internet Gaming Withdrawal Scale (IGWS) – modified version of PACS (Flannery et al., 1999), Depression, Anxiety and Stress Scales (DASS-21; Lovibond & Lovibond, 1995), PANAS (Watson et al., 1988)	Although IGD group had generally higher withdrawal scores than non-IGD group, withdrawal symptoms, affect, and psychological distress declined over time in both groups. Implication that ‘withdrawal’-related symptomatology is stronger when gaming compared to when not gaming. Participants reported total compliance with abstinence protocol	Addiction-related withdrawal	Yes	DIR	IND
King et al. (2017)	24 regular gamers (20 M, 4 F, $M_{age} = 24.6, SD = 5.8$); 9 met criteria for IGD	All participants instructed to abstain from gaming for 84 hours	EXP; SR	Internet gaming activity (hours), Internet Gaming Cognition Scale (IGCS), IGD criteria checklist	Clinically significant improvement in IGD symptoms in 75% of IGD group at 28-day follow-up. 63% of IGD group showed reliable change in maladaptive gaming cognitions, and 38% of IGD group achieved reliable reduction of time spent gaming. Non-IGD group	Abstinence useful intervention Potential role of self-monitoring in producing benefits	Yes	NA	IND

					experienced reliable improvements in IGD symptoms for 38% of participants				
					Participants reported total compliance with abstinence protocol				
King et al. (2018)	186 help-seeking problematic gamers (177 M, 9 F, $M_{age} = 23.4$, $SD = 5.2$); all met five or more criteria for IGD	All participants reported willingness to attempt to abstain from games for 7 days	N; SR	Internet gaming activity, IGD criteria checklist, Internet Gaming Withdrawal Scale (IGWS) – modified version of PACS (Flannery et al., 1999), Depression, Anxiety and Stress Scales (DASS-21; Lovibond & Lovibond, 1995), gaming activity during abstinence period	83% of participants reported abstinence non-adherence or study dropout ('non-abstainers') Non-abstainers reported greater tendency to play action shooting games and to endorse IGD withdrawal criterion at baseline Number of days abstinent during abstinence not related to age, amount of gaming, IGD symptoms, craving, and mood symptoms	Abstinence non-adherence possibly related to addiction-related withdrawal, structural characteristics of games	Yes	DIR	DIR
Evans et al. (2018)	37 habitual (daily) adolescent gamers referred by concerned parents (34 M, 3 F, $M_{age} = 14.8$, $SD = 1.6$); 3 met criteria for IGD, 9 'at-risk'	Random assignment to abstinence condition (instructed to abstain from gaming for 84 hours) or control condition (instructed to play games as usual)	EXP; SR	Internet Gaming Withdrawal Scale (IGWS) – modified version of PACS (Flannery et al., 1999), Depression, Anxiety and Stress Scales (DASS-21; Lovibond & Lovibond, 1995), PANAS (Watson et al., 1988), 8-open ended feedback questions	Both groups greater withdrawal symptom scores at baseline than at any other point and significant reduction in withdrawal symptoms post-baseline maintained at 7-day follow up. Craving may be driven more by factors other than mere actual time spent playing Perceived effects of abstinence boredom, increase in other valued activities, attitude shifts towards gaming, and decrease in gaming post-abstinence	Addiction-related withdrawal Abstinence useful intervention Potential role of self-monitoring in producing effects	Yes	DIR	IND

Dong et al. (2019a)	103 regular game users (RGU). 23 met criteria for IGD after 1 year (RGU_IGD; $M_{age} = 22.34$, $SD = 2.1$); compared to 23 who did not (RGU_RGU; $M_{age} = 22.87$, $SD = 2.2$)	All participants experienced sudden deprivation from gaming immediately after 20 minutes of uninterrupted play	EXP; IVSP	Game craving questionnaire (modified from brief version of Questionnaire of Smoking Urges; Cox, Tiffany & Christen, 2001), cue-elicited craving task, fMRI scan	RGU_IGD subjects, compared with RGU_RGU subjects, showed relatively increased bilateral lentiform nucleus activations following gaming during deprivation versus prior to gaming. Lentiform activation during deprivation was associated with cue-induced craving in RGU_IGD group and the development of IGD one year later.	Addiction-related craving-related processes	Yes	DIR	NA
Dong et al. (2019b)	119 university students (63 M, 56 F, $M_{age} \approx 21.0$); 65 recreational game users (RGU); 54 with IGD	All participants instructed to play game lasting 20 minutes, and experienced both 4-minute conditions: (1) Gaming condition - once 'enemy encountered'; (2) mandatory break condition - internet connection interrupted	EXP; IVSP	Game craving questionnaire (modified from brief version of Questionnaire of Smoking Urges; Cox et al., 2001), fMRI scan	Males and females with IGD differ in terms of craving related functional connectivity, with the gaming condition possibly more relevant for males and the mandatory break condition more relevant for females in distinguishing IGD from RGU.	Addiction-related craving-related processes	Yes	DIR	NA
<i>Mobile phone use (n = 6)</i>									
Skierkowski & Wood (2012)	23 university students (13 F, 10 M, age 18-23 years)	Participants identified as high or low users (based on a median split of baseline texting averages) randomly assigned to a 3- or 5-day period of restricted texting (instructed to abstain from text messaging	EXP; SR	Mixed-methods surveys consisting of questions related to frequencies and patterns of alternative behaviors, non-compliance and anxiety	High text users had more thoughts about texting compared to low text users. No difference in anxiety between high and low text users. Most qualitative responses to restriction period included terms related to 'anxiety', although no difference between high text users and low text users on anxiety.	Non-pathological reliance on technology for communication	Yes	IND	IND

		during restriction period)			No difference in anxiety between 3 and 5 day conditions. No difference in compliance between high text and low text users – possible dishonest reporting due to fear of not receiving full participation credit				
Cheever et al. (2014)	163 university students (83 M, 80 F, $M_{age} = 24.4$, $SD = 6.1$)	Random assignment to either have mobile phone removed from possession, or allowed to keep phone but silence it and keep it out of sight (both conditions for 60 minutes)	EXP; SR/VSP	STAI (Spielberger et al., 1970)	Participants reported more anxiety over time, regardless of condition. Heavy daily users reported more anxiety over time, while moderate daily users reported more anxiety over time only when their device was removed. Low daily users reported no change in anxiety over time.	Separation anxiety or fear of missing out (FoMO; Przybylski et al., 2013)	Yes	IND	NA
Clayton et al. (2015)	41 university students (30 F, 11 M, $M_{age} = 21.2$, $SD = 3.78$)	All participants underwent both experimental conditions (but randomly assigned to different orders): (1) word search puzzle with iPhone in possession, (2) word search puzzle without iPhone while it was ringing (both conditions 5 minutes)	EXP; IVSP	Objects Incorporated into the “Extended Self” scale (Sivadas & Machleit, 1994), six item short form of STAI (Marteau & Bekker, 1992), blood pressure as measure of anxiety, heart rate as measure of defensive responding to iPhone ringing, aversive and appetitive activation items, word search puzzle task	When participants were not allowed to answer their ringing iPhones during word search puzzle, heart rate and blood pressure increased, self-reported feelings of anxiety and unpleasantness increased, and self-reported extended self and performance on cognitive task decreased.	iPhone as ‘extension of self’, based on ‘extended-self’ theory (Belk, 2013)	No	IND	NA

Sapacz et al. (2016)	152 university students (35 M, 117 F, 85% of participants age range 18 – 24)	Random assignment to one of four conditions (all 3 – 5 minutes): (1) Phones taken away from participants out of the room; (2) Asked to place their phones on their tables but not use them; (3) Asked to put their phones either in their pockets or backpacks and not use them; (4) Not given any instructions about cell phone use	EXP; SR/VSP	STAI (Spielberger et al., 1970)	State anxiety only increased when participants had their phones in front of them but were instructed not to use them. High levels of baseline mobile phone use did not predict increased anxiety within experimental conditions	Cannot conclude increased anxiety due to addiction-related withdrawal Possible ‘attachment’ to phone	Yes	DIR	NA
Cutino & Nees (2017)	87 university students (61 F, 26 M, $M_{age} = 19.48$, $SD = 1.17$)	Random assignment to restricted mobile access (asked to turn phone in) or control condition, during 60-minute study session	EXP; VSP	STAI (Spielberger et al., 1970), attainment of study goals, problematic mobile phone use (PMPU)	Anxiety did not differ between participants in restricted vs. control condition Participants with higher PMPU in the abstinence condition did not show greater increases in anxiety over the study session compared to all other participants Participants in restricted condition self-reported attainment of 12% more of their study goals compared to control condition	No evidence of addiction-related withdrawal Alleviation of negative effects attributed to mobile phone use	Yes	DIR	NA
Eide et al. (2018)	127 university students (92 F, 35 M, $M_{age} = 25.0$, $SD = 4.5$)	Randomly assigned to 72-hour restriction condition (handed in smartphone to be kept in a secure	EXP; VSP	Smartphone Withdrawal Scale (modified version of Cigarette Withdrawal Scale; CWS; Etter,	Restriction group experienced greater withdrawal symptoms and FoMO compared to control group.	Addiction-related withdrawal	Yes	DIR	NA

locked cabinet) or control condition.

2005), Fear of Missing Out Scale (FoMOS; Przybylski, Murayama, DeHaan & Gladwell, 2013), PANAS (Watson et al., 1988), open-ended qualitative question about challenges of restriction

Withdrawal symptoms, FoMO and positive affect reduced significantly over time, regardless of condition.

Restriction not related to positive or negative affect

Pornography use (n = 3)

Lambert et al. (2012) (Study 3)	20 university students (10 M, 10 F, age range 18 – 24); used pornography >1/month	Random assignment to either abstinence condition (instructed to abstain from pornography for 3 weeks) or control condition (instructed to abstain from favorite food)	EXP; SR	Measure of relationship commitment, frequency of pornography use	Abstinence from pornography group reported a higher percentage chance of being with their partners in the future compared to control condition Frequency of use during abstinence <i>M</i> = 1.42, <i>SD</i> = .67	Alleviation of negative effects attributed to pornography use	Yes	NA	IND
Negash et al. (2015) (Study 2)	37 university students (24 M, 13 F, age range 18 – 28); used pornography > 1/month	Random assignment to either abstinence condition (instructed to abstain from pornography for 3 weeks) or control condition (instructed to abstain from favorite food)	EXP; SR	Delay discounting task, frequency of pornography use	Pornography abstinence group chose larger, later rewards more frequently compared to favorite food abstinence group Frequency of use during abstinence <i>M</i> = 1.53, <i>SD</i> = .83	Alleviation of negative affects attributed to pornography use	Yes	NA	IND
Fernandez et al. (2017)	76 male pornography users (<i>M</i> _{age} = 22.7, <i>SD</i> = 3.45); used	All participants instructed to abstain from pornography for 14 days	EXP; SR	Frequency of pornography use and abstinence effort items, Cyber Pornography	Abstinence effort predicted greater perceived compulsivity, possible mediating role of craving (not explicitly assessed). May reflect	Addiction-related relapse and potentially craving. Abstinence useful behavioral experiment.	Yes	IND	DIR

pornography $M = 4.84$ times in past 2 weeks

Use Inventory-9 (CPUI-9; Grubbs, Volk, Exline & Pargament, 2015)

insight into actual compulsivity in own behavior.

Failed abstinence attempts when abstinence effort was high (i.e., relapse) predicted perceived compulsivity scores

Frequency of use during abstinence $M = 2.50$, $SD = 2.92$

Social media use (n = 7)

Sheldon et al. (2011)	98 university students (36 M, 33 F)	All participants experienced both conditions: (1) instructed not to use Facebook for 48 hours; (2) free to use Facebook for 48 hours	EXP; SR	Six-item relatedness need-satisfaction measure (Sheldon & Gunz, 2009), frequency of Facebook use	Sense of connection declined during abstinence Participants with larger increases in disconnection during deprivation period engaged in more usage during the free-choice period, even compared to baseline 23% of participants logged into Facebook during deprivation period	Use motivated by negative affect	Yes	IND	IND
Baumer et al. (2015)	3539 participants (1670 F, 1608 M)	Voluntary participation in "99 Days of Freedom" pledge to abstain from Facebook for 99 days	N; SR	Mixed-methods survey consisting of questions relating to feelings, friends' reactions, best and worst things that happened, average mood, adjectives to describe experience, reversion to Facebook, changes in social relationships	'Addiction-associated feelings' (e.g., withdrawal, craving, limited self-control) predicted likelihood of reversion to Facebook Positive moods while off Facebook decreased likelihood of reversion to Facebook, while negative moods while off Facebook increased likelihood of reversion to Facebook	Addiction-related withdrawal Use motivated by negative affect	Yes	DIR	IND

Maier et al. (2015)	82 university students (40 F, 42 M, $M_{\text{age}} = 27.7$); used Facebook $M = 70.3$ minutes/day	All participants instructed not to use Facebook for 14 days, but were free to use alternative social networking sites	EXP; VSP	Measures of SNS-stress creators, SNS-exhaustion, switching-stress creators, switching-exhaustion, discontinuous usage intention and behavior	Stress associated with switching away from Facebook during abstinence period reduced intentions to discontinue use of Facebook	Use motivated by negative affect	No	IND	IND
Tromholt (2016)	1095 Facebook users (942 F, 153 M, $M_{\text{age}} = 34.0$, $SD = 8.74$); spent approximately 1 hour on Facebook daily	Random assignment to treatment group (instructed to abstain from Facebook for 7 days) or control group (Facebook as usual)	EXP; SR	Life satisfaction item, five items from Center for Epidemiologic Studies Depression (CES-D) Scale (Radloff, 1977), four items from PANAS (Watson, Clark & Tellegen, 1988)	Abstinence group reported greater life satisfaction and greater affective well-being compared to control group. Effects greater for heavy Facebook users, passive Facebook users and users who tend to envy others on Facebook 13% of participants reported non-compliance	Alleviation of negative effects attributed to social media use	No	IND	IND
Stieger & Lewetz (2018)	152 participants (107 F, 45 M, $M_{\text{age}} = 27.4$, $SD = 11.9$); average daily social media use $M = 65$ minutes	All participants instructed to abstain from social media for 7 days (only phone calls, SMS or email allowed), preceded by 4-day baseline (social media use as usual), and followed by 4-day post-intervention (social media use as usual)	EXP; SR	Positive and Negative Affect Schedule-Short Form (I-PANAS-SF; Thompson, 2007), single items – craving, boredom, frequency and duration of social media use, feeling of social pressure to be on social media	During abstinence period, boredom and craving (conceptualized as withdrawal symptoms) and social pressure to use social media increased. No increase in effects in post-intervention phase compared to baseline. No significant effect of abstinence on affect. 59% of participants used social media at least once during deprivation period (conceptualized as relapse)	Addiction-related withdrawal FoMO possible explanation for social pressure to use social media	Yes	DIR	DIR

Turel et al. (2018)	555 university students (238 F, 317 M, $M_{age} = 24.01$); used Facebook as their primary social networking site	Random assignment to treatment group (instructed to abstain for Facebook for 7 days) or control group	EXP; SR	Short version of Perceived Stress Scale (PSS; Cohen, Kamarck & Mermelstein, 1983), self-report item of number of days successfully abstained, Bergen Facebook Addiction Scale (BFAS; Andreassen, Torsheim, Brunborg & Pallesen, 2012)	Reduction in perceived stress following social media abstinence; effect more pronounced for excessive users 38.2% did not manage successful complete abstinence for whole 7 days. People with excessive use and higher stress during abstinence were less successful at maintaining abstinence	Alleviation of negative effects attributed to social media use Use motivated by negative affect	Yes	IND	IND
Turel & Cavagnaro (2018)	415 university students (229 M, 186 F, age 19 - 49); use Facebook as primary social networking site	Random assignment to treatment group (instructed to abstain from Facebook for 7 days) or control group	EXP; SR	Time distortion (ratio of estimated time over actual time), change in time distortion (ratio of time distortion at t2 over time distortion at t1), Facebook use	Significant increase in time distortion observed for treatment group – both normal and “at-risk for addiction” users developed upward time distortion after abstinence. Post-abstinence bias was significantly more pronounced for “at-risk” users. Participants who ‘relapsed’ earlier had larger increases in time distortion In treatment group 36.4% did not manage to abstain for whole week	Addiction-related ‘homeostasis violation’	Yes	IND	IND

Note: DIR: directly assessed (effects conceptualized explicitly as withdrawal/craving/relapse); EXP: experimentally manipulated; GHQ-28: General Health Questionnaire-28; IND: indirectly assessed (effects not conceptualized explicitly as withdrawal/craving/relapse); IVSP: involuntary separation; MFI: Multidimensional Fatigue Inventory; PACS: Penn Alcohol Craving Scale; PANAS: Positive and Negative Affect Schedule; POMS: Profile of Mood States; N: naturally occurring; NA: not assessed; SR: self-restraint; STAI: State Trait Anxiety Inventory; VSP: voluntary separation.

Appendix C

References for outcome measures used in included studies (Systematic Review 2)

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Appendix D

Notable differences in frequencies of reported experiences across age groups (Empirical Study 1)

		<u>18-29 (n = 34)</u>	<u>30-39 (n = 35)</u>	<u>≥40 (n = 35)</u>	Relevant pairwise comparisons*
		<i>N</i>	<i>n</i>	<i>n</i>	
Attempted complete abstinence from pornography, masturbation, and orgasm	Yes	17	18	8	18-29 vs. ≥40: $\chi^2(1) = 5.50$ 30-39 vs. ≥40: $\chi^2(1) = 6.20$
	No	17	17	27	
Reported negative affect during abstinence	Yes	18	2	4	18-29 vs 30-39: $\chi^2(1) = 18.69$ 18-29 vs ≥40: $\chi^2(1) = 13.69$
	No	16	33	31	
Reported 'withdrawal-like' symptoms during abstinence	Yes	14	12	4	18-29 vs ≥40: $\chi^2(1) = 7.92$ 30-39 vs ≥40: $\chi^2(1) = 5.19$
	No	20	23	31	
Reported at least one relapse during abstinence attempt	Yes	27	16	12	18-29 vs 30-39: $\chi^2(1) = 8.34$ 18-29 vs ≥40: $\chi^2(1) = 14.29$
	No	7	19	23	
Reported positive affective effects of abstinence	Yes	16	7	2	18-29 vs 30-39: $\chi^2(1) = 5.68$ 18-29 vs ≥40: $\chi^2(1) = 15.29$
	No	18	28	33	

*All significant at $p < .025$ (Bonferroni-adjusted)

Appendix E

Interview schedule (Empirical Study 2)

- (1) Could you share a little bit about your sex addiction history?
- (2) What made you realize you had an addiction?
- (3) What were the consequences of not being able to regulate your sexual behavior?
- (4) What motivated you to start trying to change your behavior/recover from your addiction?
- (5) What are your goals in recovery?
- (6) What are some challenges you have faced so far in your recovery? How have you been attempting to overcome them?
- (7) What specific resources/strategies have you been using in helping you to achieve your goals in recovery?
- (8) What has life in recovery been like for you? What is life like now, compared to the past?

Appendix F

Illustrative example of the progression of coding from a basic code to a higher-level category (Empirical Study 2)

Interview excerpt	Basic code	Basic codes merged to form higher-level category
<p><i>“I remember like, as an addict, my life was terrible... I had a package of missing things at work... Missing things in a relationship, my faith, my school... So, everything was terrible. We're not talking about fixing that... hey you stop watching pornography. It's not about that. It's about fixing all the amazing things that I can have in my life... Then yes, I can move on to stop watching pornography. And that's what I'm experiencing today. Because I'm fixing all the things that I just missed with in the past... And that helps me to stay away from pornography...” (P02)</i></p>	<p>Fixing life first, then abstinence comes</p>	<p>Recovery is about getting one's life in order</p>
<p><i>“Yeah, first was more just to stop the behavior... stop the pornography and the chatting and I didn't want to do that anymore. But I must say at some point it also more shifted like... Um... That I was more working on creating a life I didn't want to escape from anymore. So, it was also more about not doing something but more about... yeah, working on all the other parts of my life... my relations, my financial situation, my work, my whole work-life balance my... so, work on all of those a lot.” (P03)</i></p>	<p>Goal in recovery to create a life he didn't want to escape from anymore</p>	<p>Recovery is about getting one's life in order</p>
<p><i>“What I learned after a year or so at SLAA is it's not fighting the addiction, it's just getting your life in order that's important. It's about regulating, it's about doing positive things. And over time, the obsession for sex or needing that closeness or that love relationship dissipates, and you get on with your life and doing the things you should be doing, and having much more positive mindset, far more mindful.” (P10)</i></p>	<p>Recovery not about fighting the addiction but getting life in order</p>	<p>Recovery is about getting one's life in order</p>

Appendix G

Instructions provided to the abstinence and control groups (Empirical Study 3)

Instructions provided to abstinence group

Dear participant,

You have been randomly assigned to the ‘abstinence’ group.

Instructions

Please try your best to abstain from watching any pornography for the next 7 days. The seven-day period starts from 5.00 am on Tuesday, [date] and ends at 5.00 am on Tuesday, [date].

‘Pornography’ is defined here as follows:

“any sexually explicit films, video clips or pictures which intends to sexually arouse the viewer; this may be seen on the Internet, in a magazine, in a book, or on television.”

Please note that successfully achieving complete abstinence over the 7 days is not required for your participation in the present study to be considered valid – what matters is that you are trying your best to not watch any pornography during this time. You will also be free to masturbate without using pornography or engage in any other non-pornography related sexual activity (e.g., have sexual intercourse) during the 7 days – the instruction is simply to try your best to not watch pornography. If you do happen to watch pornography during this time, you will be asked to report this honestly during the daily diary surveys, and this will not have an effect on any compensation you may be entitled to receive.

Instructions provided to control group

Dear participant,

You have been randomly assigned to the ‘no abstinence’ group.

Instructions

You are free to watch pornography as usual for the duration of this study (i.e., the next 7 days).

Appendix H

Outcome measures used in Empirical Study 3

Modified 4-item Penn Alcohol Craving Scale (PACS; Flannery et al., 1999) adapted for pornography use

Please read each question carefully and select the option that best describes your craving/desire to watch pornography during the past 7 days/since waking up today ^a .	
1. During the past 7 days/since waking up today, <i>how often</i> have you thought about watching pornography or about how good watching pornography would make you feel?	
<input type="radio"/>	0 – Never
<input type="radio"/>	1 – Rarely
<input type="radio"/>	2 – Occasionally
<input type="radio"/>	3 – Sometimes
<input type="radio"/>	4 – Often
<input type="radio"/>	5 – Most of the time
<input type="radio"/>	6 – Nearly all of the time
2. At its most severe point, <i>how strong</i> was your craving to watch pornography during the past 7 days/since waking up today?	
<input type="radio"/>	0 – None at all
<input type="radio"/>	1 – Slight (very mild) urge
<input type="radio"/>	2 – Mild urge
<input type="radio"/>	3 – Moderate urge
<input type="radio"/>	4 – Strong urge but easily controlled
<input type="radio"/>	5 – Strong urge and difficult to control
<input type="radio"/>	6 – Strong urge and uncontrollable
3. During the past 7 days/since waking up today, <i>how difficult would it have been</i> to resist watching pornography if you knew you had the opportunity to watch pornography?	
<input type="radio"/>	0 – Not difficult at all
<input type="radio"/>	1 – Very mildly difficult
<input type="radio"/>	2 – Mildly difficult
<input type="radio"/>	3 – Moderately difficult
<input type="radio"/>	4 – Very difficult
<input type="radio"/>	5 – Extremely difficult
<input type="radio"/>	6 – Would not be able to resist
4. Keeping in mind your responses to the previous questions, please rate your <i>overall average craving to watch pornography</i> during the past 7 days/since waking up today.	
<input type="radio"/>	0 – Never thought about watching pornography and never had the urge to watch
<input type="radio"/>	1 – Rarely thought about watching pornography and rarely had the urge to watch
<input type="radio"/>	2 – Occasionally thought about watching pornography and occasionally had the urge to watch
<input type="radio"/>	3 – Sometimes thought about watching pornography and sometimes had the urge to watch
<input type="radio"/>	4 – Often thought about watching pornography and often had the urge to watch
<input type="radio"/>	5 – Thought about watching pornography most of the time and had the urge to watch most of the time
<input type="radio"/>	6 – Thought about watching pornography nearly all of the time and had the urge to watch nearly all of the time

^aTime frame for baseline survey = during the past 7 days; time frame for daily survey = since waking up today.

*Modified 14-item Wisconsin Smoking Withdrawal Scale (WSWS; Welsch et al., 1999)
adapted for pornography use*

Please answer the following questions based on how you have felt or what you have noticed <i>over the past 7 days/since waking up today^a</i> . Answer based on how you felt in general during this time.					
	Strongly disagree 0	Disagree 1	Feel neutral 2	Agree 3	Strongly agree 4
1. I have been tense or anxious.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. My level of concentration is excellent.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I have felt impatient.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I have felt upbeat and optimistic.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I have found myself worrying about my problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I have felt calm lately.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I have felt sad or depressed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I have been irritable, easily angered.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I have been bothered by negative moods such as anger, frustration and irritability.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I have felt frustrated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I have felt hopeless and discouraged.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. It is hard to pay attention to things.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I have felt happy and content.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. It has been difficult to think clearly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

^aTime frame for baseline survey = over the past 7 days; time frame for daily survey = since waking up today.

International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF; Thompson, 2007)

Indicate to what extent you have felt like this <i>during the past 7 days/since waking up today^a</i> .					
	Very slightly or not at all 1	A little 2	Moderately 3	Quite a bit 4	Extremely 5
Upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hostile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Alert	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ashamed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inspired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determined	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attentive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

^aTime frame for baseline survey = during the past 7 days; time frame for daily survey = since waking up today.

Appendix I

Means and standard deviations of all study variables for abstinence and control groups (Empirical Study 3)

	Baseline	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Craving								
Abstinence	12.55 (3.40) ^a	7.05 (5.00)	7.80 (6.07)	8.26 (5.88)	7.64 (6.13)	6.30 (5.86)	7.74 (6.49)	8.00 (6.32)
Control	11.51 (3.93) ^a	6.80 (4.29)	7.11 (5.29)	5.93 (4.27)	6.23 (4.92)	6.35 (5.17)	6.04 (5.32)	5.88 (5.10)
Total	12.02 (3.70) ^a	6.92 (4.64)	7.44 (5.67)	7.08 (5.25)	6.92 (5.58)	6.33 (5.51)	6.91 (5.99)	6.92 (5.81)
Positive affect								
Abstinence	14.41 (3.47) ^a	13.99 (3.68)	12.99 (4.04)	13.29 (4.17)	13.19 (4.22)	13.04 (4.18)	13.93 (4.37)	14.05 (4.51)
Control	14.39 (4.00) ^a	12.99 (4.35)	13.03 (4.62)	12.87 (4.34)	13.03 (4.03)	13.25 (4.55)	13.07 (4.33)	13.51 (4.80)
Total	14.40 (3.74) ^a	13.48 (4.05)	13.01 (4.34)	13.08 (4.25)	13.11 (4.12)	13.14 (4.36)	13.51 (4.36)	13.78 (4.65)
Negative affect								
Abstinence	12.50 (4.14) ^a	9.96 (4.45)	9.94 (4.16)	9.42 (4.03)	9.49 (4.28)	8.81 (3.74)	8.91 (3.50)	9.22 (3.67)
Control	12.24 (4.40) ^a	9.57 (4.12)	9.57 (4.53)	9.70 (4.55)	9.00 (4.32)	10.09 (4.78)	9.35 (4.47)	8.99 (4.00)
Total	12.37 (4.26) ^a	9.77 (4.28)	9.75 (4.35)	9.56 (4.29)	9.24 (4.30)	9.46 (4.33)	9.12 (4.00)	9.10 (3.84)
Withdrawal symptoms								
Abstinence	2.15 (0.66) ^a	1.83 (0.73)	1.82 (0.71)	1.73 (0.75)	1.74 (0.82)	1.62 (0.74)	1.71 (0.72)	1.70 (0.72)
Control	2.13 (0.74) ^a	1.92 (0.84)	1.81 (0.78)	1.80 (0.87)	1.70 (0.83)	1.80 (0.86)	1.73 (0.86)	1.71 (0.79)
Total	2.14 (0.70) ^a	1.88 (0.79)	1.82 (0.75)	1.76 (0.81)	1.72 (0.82)	1.71 (0.81)	1.72 (0.79)	1.70 (0.75)
Abstinence effort								
Abstinence	1.06 (2.48) ^a	4.92 (3.89)	4.40 (3.56)	4.71 (3.65)	4.51 (3.92)	4.51 (3.73)	4.94 (3.71)	5.06 (3.99)
Control	1.19 (2.51) ^a	1.06 (2.43)	1.11 (2.57)	1.14 (2.53)	0.82 (2.26)	1.04 (2.54)	1.01 (2.48)	0.50 (1.83)
Total	1.13 (2.49) ^a	2.97 (3.76)	2.69 (3.48)	2.90 (3.60)	2.64 (3.68)	2.75 (3.62)	3.01 (3.72)	2.74 (3.83)
Frequency of pornography use (FPU)								
Abstinence	5.93 (4.49) ^b	0.20 (0.49)	0.45 (0.99)	0.33 (1.05)	0.17 (0.47)	0.20 (0.56)	0.31 (0.86)	0.25 (0.93)
Control	5.42 (2.96) ^b	1.14 (1.35)	0.93 (0.96)	0.93 (1.11)	0.98 (0.94)	0.83 (0.93)	1.03 (1.05)	0.69 (0.82)
Total	5.67 (3.78) ^b	0.68 (1.12)	0.70 (1.00)	0.63 (1.12)	0.57 (0.84)	0.51 (0.82)	0.66 (1.02)	0.47 (0.90)
Duration of pornography use								
Abstinence	108.88 (100.71) ^b	2.74 (8.14)	7.70 (26.00)	4.31 (12.72)	3.43 (11.49)	3.52 (16.61)	3.90 (10.17)	4.20 (15.33)
Control	110.60 (109.75) ^b	20.54 (28.34)	15.81 (21.74)	16.71 (21.03)	19.28 (24.60)	15.91 (21.51)	17.88 (24.81)	12.26 (17.76)
Total	109.76 (105.13) ^b	11.80 (22.77)	11.85 (24.18)	10.47 (18.39)	11.31 (20.69)	9.52 (20.06)	10.57 (19.86)	8.25 (17.03)

Frequency of masturbation without pornography								
Abstinence	1.84 (0.96) ^c	0.15 (0.53)	0.21 (0.85)	0.20 (0.72)	0.17 (0.66)	0.20 (1.00)	0.22 (0.84)	0.16 (0.51)
Control	2.09 (1.36) ^c	0.06 (0.24)	0.20 (0.55)	0.15 (0.42)	0.13 (0.47)	0.08 (0.35)	0.06 (0.34)	0.07 (0.30)
Total	1.97 (1.19) ^c	0.10 (0.41)	0.21 (0.71)	0.18 (0.59)	0.15 (0.57)	0.14 (0.76)	0.15 (0.65)	0.12 (0.42)
Frequency of alternative sexual activity								
Abstinence	NA	0.04 (0.19)	0.05 (0.27)	0.06 (0.36)	0.09 (0.36)	0.19 (1.35)	0.00 (0.00)	0.01 (0.11)
Control	NA	0.01 (0.11)	0.02 (0.15)	0.11 (0.46)	0.06 (0.33)	0.01 (0.11)	0.04 (0.25)	0.00 (0.00)
Total	NA	0.02 (0.15)	0.04 (0.22)	0.08 (0.41)	0.07 (0.34)	0.11 (0.97)	0.02 (0.18)	0.01 (0.08)

Note. ^aAsked about the past seven days; ^bAsked about total frequency or duration during the past seven days; ^cAsked about average frequency over the past four weeks on a non-equivalent scale to the daily measure; NA = not assessed

Appendix J

Multilevel model results for manipulation check analyses (Empirical Study 3)

Outcome variable	Fixed effects	Estimate (SE)	df	Incidence rate ratios	Odds ratios	t	z	p	95% CI
Abstinence effort ^a	Group	-4.45 (0.48)	Inf	-	0.01	-	-9.37	<0.001	0.00 – 0.03
	Past seven-day abstinence effort	0.19 (0.08)	Inf	-	1.21	-	2.43	0.015	1.04 – 1.42
	Day	-0.04 (0.05)	Inf	-	0.96	-	-0.82	0.411	0.88 – 1.05
FPU ^b	Intercept	-2.21 (0.21)	Inf	0.11	-	-	-10.75	<0.001	0.07 – 0.16
	Group	1.60 (0.17)	Inf	4.95	-	-	9.38	<0.001	3.54 – 6.91
	Past seven-day FPU	0.08 (0.02)	Inf	1.09	-	-	4.21	<0.001	1.05 – 1.13
	Day	-0.05 (0.02)	Inf	0.95	-	-	-2.61	0.009	0.92 – 0.99
Duration of pornography use	Intercept	0.48 (1.77)	245.03	-	-	0.27	-	0.787	-2.97 – 3.93
	Group	12.70 (1.82)	171.76	-	-	6.97	-	<0.001	9.14 – 16.27
	Past seven-day duration of porn use	0.05 (0.01)	176.24	-	-	5.35	-	<0.001	0.03 – 0.06
	Day	-0.46 (0.24)	978.07	-	-	-1.91	-	0.056	-0.93 – 0.01

Note. ^aOrdinal (fit using *clmm()* function). ^bPoisson (fit using *glmer()* function). The random effect for the abstinence effort model was Day | Participant; the random effects for both FPU and duration of pornography use models were simplified to 1|Participant to facilitate model convergence. Inf = infinity; CI = confidence intervals.

Appendix K

Model fit statistics of multilevel models in confirmatory analyses (Empirical Study 3)

Outcome variable	Model	Fixed effects	Random effects	AIC	BIC	logLik	Deviance	df
Craving	1	Group × PPU + baseline craving + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	6776.2	6841.8	-3375.1	6750.2	13
	2	Group + PPU + baseline craving + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	6775.6	6836.1	-3375.8	6751.6	12
	3	Group + baseline craving + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	6792.2	6847.7	-3385.1	6770.2	11
Positive affect	1	Group × PPU + baseline positive affect + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	5918.5	5984.1	-2946.3	5892.5	13
	2	Group + PPU + baseline positive affect + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	5918.1	5978.6	-2947.1	5894.1	12
	3	Group + baseline positive affect + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	5916.1	5971.6	-2947.1	5894.1	11
Negative affect ^a	1	Group × PPU + baseline negative affect + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	507.4	573.0	-240.7	481.4	13
	2	Group + PPU + baseline negative affect + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	506.0	566.6	-241.0	482.0	12
	3	Group + baseline negative affect + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	507.2	562.6	-242.6	485.2	11

Withdrawal symptoms	1	Group × PPU + baseline withdrawal symptoms + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	2049.3	2114.8	-1011.6	2023.3	13
	2	Group + PPU + baseline withdrawal symptoms + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	2048.8	2109.3	-1012.4	2024.8	12
	3	Group + baseline withdrawal symptoms + past four-week FPU + frequency of masturbation without pornography + frequency of alternative sexual activity + day	Day Participant	2053.3	2108.8	-1015.6	2031.3	11

Note. ^alog-transformed. AIC = Akaike information criterion; BIC = Bayesian information criterion; PPU = problematic pornography use. FPU = frequency of pornography use.

Appendix L

Model comparisons of multilevel models in confirmatory analyses (Empirical Study 3)

Outcome variable	Model comparison	χ^2	<i>df</i>	<i>p</i>
Craving	Model 1 vs. Model 2	1.35	1	0.245
	Model 2 vs. Model 3	18.64	1	<0.001
Positive affect	Model 1 vs. Model 2	1.57	1	0.210
	Model 2 vs. Model 3	0.01	1	0.940
Negative affect	Model 1 vs. Model 2	0.59	1	0.443
	Model 2 vs. Model 3	3.12	1	0.077
Withdrawal symptoms	Model 1 vs. Model 2	1.50	1	0.220
	Model 2 vs. Model 3	6.51	1	0.011

Appendix M

Baseline characteristics of the sample by gender (Empirical Study 3)

Characteristic	Males (<i>n</i> = 61)	Females (<i>n</i> = 113)	Total (<i>N</i> = 174)	Group difference
<i>Past four-week frequency of pornography use^a, n (%)</i>				$\chi^2(5) = 45.615, p < 0.001$
3 times a week on average	7 (11.48)	55 (48.67)	62 (35.63)	
4 times a week on average	13 (21.31)	32 (28.32)	45 (25.86)	
5 times a week on average	7 (11.48)	12 (10.62)	19 (10.92)	
6 times a week on average	12 (19.67)	3 (2.65)	15 (8.62)	
Once a day on average	13 (21.31)	9 (7.96)	22 (12.64)	
More than once a day on average	9 (14.75)	2 (1.77)	11 (6.32)	
<i>Past four-week frequency of pornography use^b (range 1 – 6), <i>M</i> (<i>SD</i>)</i>	3.62 (1.64)	1.98 (1.31)	2.56 (1.63)	F(1,172)=51.768, <i>p</i><0.001
<i>Past four-week average duration of pornography use per session^a, n (%)</i>				$\chi^2(7) = 5.885, p = 0.553$
5 minutes or less	2 (3.28)	11 (9.73)	13 (7.47)	
6 to 10 minutes	12 (19.67)	31 (27.43)	43 (24.71)	
11 to 20 minutes	18 (29.51)	30 (26.55)	48 (27.59)	
21 to 30 minutes	14 (22.95)	20 (17.70)	34 (19.54)	
31 to 45 minutes	10 (16.39)	11 (9.73)	21 (12.07)	
46 to 60 minutes	3 (4.92)	5 (4.42)	8 (4.60)	
1 to 1.5 hours	2 (3.28)	4 (3.54)	6 (3.45)	
1.5 to 2 hours	0 (0.00)	1 (0.88)	1 (0.57)	
<i>Past four-week average duration of pornography use per session^b (range 1 – 8), <i>M</i> (<i>SD</i>)</i>	3.57 (1.37)	3.22 (1.55)	3.34 (1.49)	F(1,172)=2.226, <i>p</i> =0.138
<i>Past four-week frequency of masturbation without pornography^a, n (%)</i>				$\chi^2(5) = 5.107, p = 0.403$
Never	28 (45.90)	50 (44.25)	78 (44.83)	
3 times or less in total	19 (31.15)	38 (33.63)	57 (32.76)	
Once a week on average	7 (11.48)	11 (9.73)	18 (10.34)	
2-3 times a week on average	2 (3.28)	11 (9.73)	13 (7.47)	

4-6 times a week on average	3 (4.92)	2 (1.77)	5 (2.87)	
7 or more times a week on average	2 (3.28)	1 (0.88)	3 (1.72)	
<i>Past four-week frequency of masturbation without pornography^b (range 1 – 6), M (SD)</i>	2.00 (1.30)	1.94 (1.11)	1.96 (1.18)	$F(1,172)=0.109, p=0.742$
<i>Past four-week percentage of pornography sessions accompanied by masturbation (range 0-100), M (SD)</i>	85.05 (21.60)	60.82 (35.79)	69.32 (33.55)	$F(1,172)=23.327, p<0.001$
<i>Past seven-day total frequency of pornography use, M (SD)</i>	6.80 (3.66)	5.05 (3.74)	5.67 (3.80)	$F(1,172)=9.389, p = 0.003$
<i>Past seven-day frequency of pornography use without masturbation, M (SD)</i>	1.52 (3.72)	1.67 (2.79)	1.62 (3.14)	$F(1,172)=0.088, p = 0.768$
<i>Past seven-day frequency of pornography use with masturbation, M (SD)</i>	5.28 (2.87)	3.38 (3.42)	4.05 (3.36)	$F(1,172)=13.587, p< 0.001$
<i>Past seven-day duration of pornography use in minutes, M (SD)</i>	138.13 (109.36)	92.67 (97.71)	108.61 (103.94)	$F(1,172)=7.880, p = 0.006$
<i>Problematic pornography use (range 0-126), M (SD)</i>	60.02 (18.22)	51.42 (17.91)	54.43 (18.43)	$F(1,172)=9.027, p = 0.003$
<i>Moral disapproval of pornography (range 1-7), M (SD)</i>	2.69 (1.57)	2.78 (1.62)	2.75 (1.60)	$F(1,172)=0.126, p = 0.723$
<i>Intrinsic desire to quit or reduce pornography use, n (%)</i>				$\chi^2(2) = 5.615, p = 0.060$
Reduce	34 (55.74)	51 (45.13)	85 (48.85)	
Quit	9 (14.75)	9 (7.96)	18 (10.34)	
No desire to reduce or quit	18 (29.51)	53 (46.90)	71 (40.80)	
<i>Abstinence effort, M (SD)</i>	0.79 (2.04)	1.33 (2.71)	1.14 (2.50)	$F(1,172)=1.859, p = 0.175$
<i>Craving for pornography (range 0-24), M (SD)</i>	13.00 (3.75)	11.45 (3.58)	11.99 (3.71)	$F(1,172)=7.168, p = 0.008$
<i>Negative affect (range 0-25), M (SD)</i>	11.39 (4.11)	12.76 (4.20)	12.28 (4.21)	$F(1,172)=4.264, p = 0.040$
<i>Positive affect (range 0 - 25), M (SD)</i>	14.64 (3.67)	14.28 (3.79)	14.41 (3.74)	$F(1,172)=0.358, p = 0.551$
<i>Withdrawal symptoms (range 0-4), M (SD)</i>	2.01 (0.63)	2.18 (0.72)	2.12 (0.69)	$F(1,172)=2.421, p = 0.122$

Note. ^aTreated as categorical variable. ^bTreated as continuous variable. *M* = mean, *SD* = standard deviation.

Appendix N

Multilevel model results for all outcome variables in exploratory analyses (Empirical Study 3)

Outcome variable	Fixed effect	Estimate (SE)	df	<i>t</i>	<i>p</i>	95% CI	Semi-partial R ²
Craving	Intercept	5.41 (2.84)	160.01	1.90	0.059	-0.17 – 10.98	
	Group	-7.36 (3.61)	160.97	-2.04	0.043	-14.45 – -0.27	0.025
	PPU	-0.04 (0.05)	160.81	-0.78	0.437	-0.13 – 0.06	0.017
	Past four-week FPU	-0.93 (0.79)	158.53	-1.17	0.244	-2.48 – 0.63	0.002
	Gender	0.44 (0.57)	160.82	0.77	0.445	-0.68 – 1.56	0.004
	Baseline craving	0.07 (0.09)	158.10	0.70	0.488	-0.12 – 0.25	0.003
	Frequency of masturbation without pornography	0.37 (0.30)	905.33	1.26	0.209	-0.21 – 0.96	0.002
	Frequency of alternative sexual activity	-0.37 (0.34)	997.84	-1.09	0.277	-1.03 – 0.30	0.001
	Day	-0.05 (0.07)	170.18	-0.68	0.496	-0.19 – 0.09	0.003
	Group × PPU	0.19 (0.06)	161.66	2.93	0.004	0.06 – 0.32	0.050
	Group × past four-week FPU	1.22 (1.01)	160.69	1.21	0.228	-0.76 – 3.19	0.009
	PPU × past four-week FPU	0.03 (0.01)	159.08	2.46	0.015	0.01 – 0.05	0.013
Group × PPU × past four-week FPU	-0.04 (0.02)	160.43	-2.30	0.023	-0.07 – -0.01	0.032	
Positive affect	Intercept	4.65 (1.15)	171.94	4.03	<.0001	2.39 – 6.91	
	Group	-0.39 (0.41)	167.43	-0.95	0.342	-1.18 – 0.41	0.005
	Gender	0.13 (0.49)	167.14	0.26	0.795	-0.86 – 1.08	0.000
	Baseline positive affect	0.59 (0.05)	170.30	10.84	<.0001	0.49 – 0.70	0.408
	Frequency of masturbation without pornography	-0.24 (0.21)	1032.06	-1.17	0.244	-0.65 – 0.16	0.001
	Frequency of alternative sexual activity	0.19 (0.23)	969.39	0.86	0.389	-0.25 – 0.64	0.001
	Past four-week FPU	0.01 (0.14)	169.09	0.10	0.924	-0.27 – 0.29	0.000
Day	0.07 (0.05)	167.82	1.28	0.201	-0.04 – 0.17	0.010	
Negative affect ^a	Intercept	1.29 (0.10)	163.05	12.50	<.0001	1.09 – 1.50	
	Group	0.01 (0.04)	160.87	0.34	0.736	-0.06 – 0.09	0.001
	PPU	0.00 (0.00)	161.39	2.09	0.039	0.00 – 0.00	0.026
	Past four-week FPU	0.01 (0.01)	162.45	1.00	0.318	-0.01 – 0.04	0.006
	Gender	0.10 (0.05)	161.44	2.19	0.030	0.01 – 0.20	0.029
	Baseline negative affect	0.05 (0.00)	162.00	10.76	<.0001	0.04 – 0.06	0.417
	Frequency of masturbation without pornography	-0.00 (0.02)	1046.72	-0.09	0.930	-0.04 – 0.04	0.000
	Frequency of alternative sexual activity	0.02 (0.02)	964.45	0.86	0.392	-0.02 – 0.06	0.001
Day	-0.01 (0.00)	167.42	-2.61	0.010	-0.02 - -0.00	0.039	
Withdrawal symptoms	Intercept	0.19 (0.18)	162.50	1.04	0.301	-0.17 – 0.55	
	Group	0.10 (0.07)	161.48	1.34	0.181	-0.04 – 0.24	0.011
	PPU	0.01 (0.00)	162.22	2.75	0.007	0.00 – 0.01	0.045
	Past four-week FPU	-0.00 (0.03)	163.66	-0.15	0.885	-0.05 – 0.05	0.000
	Gender	0.15 (0.09)	161.93	1.75	0.082	-0.02 – 0.32	0.019
	Baseline withdrawal symptoms	0.57 (0.05)	166.33	10.81	<.0001	0.46 – 0.67	0.413
	Frequency of masturbation without pornography	0.02 (0.04)	1014.50	0.64	0.521	-0.05 – 0.10	0.000
	Frequency of alternative sexual activity	-0.04 (0.04)	980.29	-0.94	0.347	-0.12 – 0.04	0.001
	Day	-0.03 (0.01)	166.64	-3.18	0.002	-0.05 - -0.01	0.057

Note. ^alog-transformed. One participant in the abstinence group and one participant in the control group who identified as ‘agender’ were excluded from these analyses, resulting in $N = 174$. All models are random slope models with Day|Participant random effects. The best fitting models are presented. CI = confidence interval; SE = standard error

Appendix O

Model fit statistics of multilevel models in exploratory analyses (Empirical Study 3)

Outcome variable	Model	Fixed effects	Random effects	AIC	BIC	logLik	Deviance	df
Craving	1	Group × PPU × past four-week FPU + baseline craving + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	6698.3	6783.9	-3332.2	6664.3	17
	2	Group × past four-week FPU + PPU + baseline craving + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	6703.4	6773.9	-3337.7	6675.4	14
Positive affect	1	Group × PPU × past four-week FPU + baseline positive affect + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	5841.8	5927.3	-2903.9	5807.8	17
	2	Group × past four-week FPU + PPU + baseline positive affect + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	5842.2	5912.6	-2907.1	5814.2	14
	3	Group + past four-week FPU + PPU + baseline positive affect + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	5841.0	5906.4	-2907.5	5815.0	13
	4	Group + past four-week FPU + baseline positive affect + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	5839.0	5899.4	-2907.5	5815.0	12
Negative affect ^a	1	Group × PPU × past four-week FPU + baseline negative affect + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	490.9	576.4	-228.4	456.9	17
	2	Group × past four-week FPU + PPU + baseline negative affect + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	486.11	556.6	-229.1	458.1	14
	3	Group + past four-week FPU + PPU + baseline negative affect + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	484.2	549.6	-229.1	458.2	13
	4	Group + past four-week FPU + baseline negative affect + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	486.4	546.8	-231.2	462.4	12
Withdrawal symptoms	1	Group × PPU × past four-week FPU + baseline withdrawal symptoms + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	2030.6	2116.1	-998.3	1996.6	17

2	Group × past four-week FPU + PPU + baseline withdrawal symptoms + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	2026.9	2097.4	-999.5	1998.9	14
3	Group + past four-week FPU + PPU + baseline withdrawal symptoms + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	2025.7	2091.1	-999.8	1999.7	13
4	Group + past four-week FPU + baseline withdrawal symptoms + frequency of masturbation without pornography + frequency of alternative sexual activity + day + gender	Day Participant	2031.1	2091.3	-1003.5	2007.0	12

Note. ^alog-transformed. AIC = Akaike information criterion; BIC = Bayesian information criterion; PPU = problematic pornography use. FPU = frequency of pornography use. Nelder Mead optimizer used for craving and withdrawal symptoms models due to non-convergence issues with default optimizer.

Appendix P

Model comparisons of multilevel models in exploratory analyses (Empirical Study 3)

Outcome variable	Model comparison	χ^2	<i>df</i>	<i>p</i>
Craving	Model 1 vs. Model 2	11.069	3	0.011
Positive affect	Model 1 vs. Model 2	6.431	3	0.092
	Model 2 vs. Model 3	0.798	1	0.372
	Model 3 vs. Model 4	0.062	1	0.803
Negative affect	Model 1 vs. Model 2	1.260	3	0.739
	Model 2 vs. Model 3	0.062	1	0.804
	Model 3 vs. Model 4	4.228	1	0.040
Withdrawal symptoms	Model 1 vs. Model 2	2.351	3	0.503
	Model 2 vs. Model 3	0.738	1	0.390
	Model 3 vs. Model 4	7.297	1	0.007

Appendix Q

Contrasts between abstinence and control groups at combinations of high (+1 SD) or low (-1 SD) PPU and all six levels of past four-week FPU (Empirical Study 3)

Outcome variable	PPU level	Past four-week FPU	Group	Estimated marginal mean (SE)	Estimate (SE) (Contrast: Abstinence vs Control)	df	t	p ^a
Craving	Low	3 times a week	Abstinence	5.31 (0.72)	0.82 (0.85)	160	0.96	0.453
			Control	4.49 (0.69)				
	Low	4 times a week	Abstinence	5.48 (0.57)	0.95 (0.68)	161	1.39	0.334
			Control	4.53 (0.57)				
	Low	5 times a week	Abstinence	5.65 (0.67)	1.08 (0.83)	163	1.30	0.334
			Control	4.57 (0.60)				
	Low	6 times a week	Abstinence	5.82 (0.95)	1.21 (1.18)	163	1.03	0.453
			Control	4.61 (0.77)				
	Low	Once a day	Abstinence	5.98 (1.29)	1.34 (1.60)	163	0.84	0.484
			Control	4.64 (1.00)				
	Low	More than once a day	Abstinence	6.15 (1.66)	1.47 (2.06)	163	0.72	0.518
			Control	4.68 (1.26)				
	High	3 times a week	Abstinence	6.19 (0.77)	-3.38 (1.11)	163	-3.04	0.016
			Control	9.57 (0.90)				
	High	4 times a week	Abstinence	7.48 (0.57)	-1.87 (0.84)	162	-2.23	0.082
			Control	9.35 (0.72)				
	High	5 times a week	Abstinence	8.77 (0.50)	-0.36 (0.70)	161	-0.52	0.604
			Control	9.13 (0.62)				
High	6 times a week	Abstinence	10.05 (0.59)	1.14 (0.77)	160	1.49	0.333	
		Control	8.91 (0.64)					
High	Once a day	Abstinence	11.34 (0.79)	2.65 (1.00)	160	2.65	0.036	
		Control	8.69 (0.77)					
High	More than once a day	Abstinence	12.62 (1.04)	4.16 (1.31)	161	3.17	0.016	
		Control	8.47 (0.97)					

Note. ^aFalse discovery rate (FDR) adjusted.