

Journal Pre-proof

Problematic and non-problematic engagement in Online Sexual Activities across the lifespan

Rafael Ballester-Arnal, Jesús Castro-Calvo, Marta García-Barba, Estefanía Ruiz-Palomino, Ma Dolores Gil Llario



PII: S0747-5632(21)00097-2

DOI: <https://doi.org/10.1016/j.chb.2021.106774>

Reference: CHB 106774

To appear in: *Computers in Human Behavior*

Received Date: 20 May 2020

Revised Date: 27 February 2021

Accepted Date: 3 March 2021

Please cite this article as: Ballester-Arnal R., Castro-Calvo J., García-Barba M., Ruiz-Palomino E. & Llario M.D.G., Problematic and non-problematic engagement in Online Sexual Activities across the lifespan, *Computers in Human Behavior*, <https://doi.org/10.1016/j.chb.2021.106774>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2021 Elsevier Ltd. All rights reserved.

Authors' contribution

RBA and MDGL contributed to study design, obtaining funding, and study supervision.

RBA, MDGL, JCC, and ERP participated in recruiting participants and collecting data.

RBA, JCC, and MGB, were involved in the analysis/interpretation of data and writing of the paper. All authors read and approved the final manuscript.

Journal Pre-proof

Problematic and non-problematic engagement in Online Sexual Activities across the lifespan

Rafael Ballester-Arnal¹, Jesús Castro-Calvo², Marta García-Barba¹, Estefanía Ruiz-Palomino¹ & M^a Dolores Gil-Llario³

¹Dpto. Psicología Básica, Clínica y Psicobiología. Universitat Jaume I, Castellón, Spain

²Dpto. Personalidad, Evaluación y Tratamientos Psicológicos, Universitat de València, Estudi General, Spain

³Dpto. Psicología Evolutiva y de la Educación. Universitat de València. Estudi General, Spain

Correspondence author

Correspondence concerning this paper should be addressed to Jesús Castro Calvo, Departamento de Personalidad, Evaluación y Tratamientos Psicológicos. Facultad de Psicología. Universitat de València. València, Spain. Postal address: Av. Blasco Ibáñez, 21, València, Spain (46010). Phone: +34 963 983395; Fax: +34 963 864669; E-mail: Jesus.Castro@uv.es

Co-authors e-mail and ORCID

Rafael Ballester-Arnal (rballest@uji.es; Orcid: 0000-0003-4421-1144).

Jesús Castro-Calvo (Jesus.Castro@uv.es; Orcid: 0000-0001-6611-9643).

Marta García-Barba (barbam@uji.es; Orcid: 0000-0002-9316-6733).

Estefanía Ruiz-Palomino (eruiz@uji.es; Orcid: 0000-0001-8948-9233).

María Dolores Gil-Llario (dolores.gil@uv.es; Orcid: 0000-0003-4985-1327).

Funding sources

This research was supported by grant P1.1B2012-49 and P1.1B2015-82 of the University Jaume I of Castellón. MGB is funded by grant ACIF/2018/241 of the *Consellería de Educación, Cultura y Deportes de la Comunidad Valenciana (España)*.

Conflict of interest

The authors declare no conflict of interest.

Manuscript re-submission

February 27th, 2021

1 **Problematic and non-problematic engagement in Online Sexual Activities across**
2 **the lifespan**

3

4

5 **Manuscript re-submission**

6

February 27th, 2021

7

Journal Pre-proof

1 **Abstract**

2 During the last decade, the number of people using the Internet for sexual purposes has
3 increased exponentially. However, most studies conducted so far have analyzed Online
4 Sexual Activity (OSA) of adolescents and young people, meaning that we have few
5 information on how this phenomenon is expressed across the lifespan. The aim of this
6 study was to analyse three aspects of OSA (prevalence of different OSAs, motives to
7 engage in OSA, and excessive and problematic engagement in OSA) in a large sample
8 of individuals in different developmental stages. A self-selected sample of 8,040
9 individuals between 12-85 years old were recruited and completed an online survey.
10 Participants were distributed into five age groups and compared (<18 years old, between
11 18-25, between 26-40, between 41-60, and >60). OSA was highly prevalent across all
12 the developmental stages, including people older than 60 years old. Differences
13 according to the age in the use of the Internet for sexual purposes were small-to-
14 moderate, but we identified some age-related trends in different aspects of OSA.
15 Finally, gender was important when it came to understanding these minor age
16 differences. This study provides a preliminary foundation for identifying the unique
17 characteristics of OSA across the lifespan.

18 **Keywords:** Online Sexual Activities (OSAs); Prevalence; Motives; Problematic
19 engagement; Lifespan.

20

1 **1. Introduction**

2 During the last decade, the number of people using the Internet for sexual
3 purposes has increased exponentially (Ogas & Gaddam, 2011). The availability of
4 multiple devices allowing access to different sex-related activities from any location and
5 24/7 explains this popularity (Döring & Mohseni, 2018). The myriad of Online Sexual
6 Activities (hereafter, OSAs) currently available may be classified into three categories
7 depending on whether they are accompanied or not by subjective sexual arousal and
8 whether they require contact with an online partner to be conducted (Shaughnessy et al.,
9 2011). The first category (i.e., ‘solitary-arousal activities’) refers to OSAs that increase
10 subjective sexual arousal and do not require contact with other users to be conducted,
11 such as pornography use. The second category (‘partnered-arousal activities’) comprises
12 OSAs oriented to increase subjective sexual desire and requiring contact with other
13 users to be conducted, such as engaging in sexual contact through chat or webcam. The
14 last category (‘non-arousal activities’) refers to OSAs that do not increase subjective
15 sexual arousal and are typically conducted alone (e.g., look for sexual information
16 online). This taxonomy of OSAs has been confirmed in later empirical studies (Wéry &
17 Billieux, 2016), highlighting its usefulness when characterizing the wide variety of
18 sexual activities available online.

19 Different studies have demonstrated that the use of the internet for sexual
20 purposes has become extremely prevalent (Klein & Cooper, 2019; Regnerus et al.,
21 2016), emerging as one of the most popular sexual outlets among adolescents (Efrati &
22 Gola, 2018), adults (Wéry & Billieux, 2016), and older adults (Ševčíková, Vašek, et al.,
23 2020). Preliminary studies suggest that users’ age constitutes an important aspect when
24 explaining the engagement in OSAs. In particular, users’ age seems to modulate aspects
25 such as the prevalence of different OSAs (e.g., pornography use [Wolak et al., 2007] or

1 having sexual chats [Daneback et al., 2005]), motives fuelling the use of the Internet for
2 sexual purposes (Castro-Calvo et al., 2018), or the incidence and characteristics of
3 excessive and problematic engagement in OSAs (Ševčíková, Blinka, et al., 2020). Some
4 studies propose that age differences in the use of the Internet for sexual purposes are the
5 result of generational differences (i.e. the effect of ‘birth cohorts’), whereas others
6 suggest that these differences are largely due to individual dispositions changing across
7 the lifespan (‘aging effect’) (Price et al., 2016). Separating the effect of the ‘birth
8 cohort’ from the ‘aging effect’ is complex, and requires the availability of repeated
9 cross-sectional data or longitudinal data from different birth cohorts (Price et al., 2016).
10 An alternative to these complex and costly methodologies is to compare the OSA of
11 individuals of different ages at a given point in time. This is the approach followed by
12 the majority of studies, including this research. These studies are limited when it comes
13 to distinguishing between the effect of the ‘birth cohort’ from the ‘aging effect’, but
14 they provide a picture of the unique characteristics of OSA at different developmental
15 stages (i.e., particular periods in the life sequence in which individuals share common
16 biopsychosocial features). However, most studies conducted so far from this approach
17 are limited by one or more of the following aspects: (a) the comparison between narrow
18 age ranges (e.g., individuals between 11-13, 14-15, and 16-17 years old [Sabina et al.,
19 2008]) or between extremely broad ranges (e.g., participants older than 50 years old vs.
20 between 18-49 [e.g., Ševčíková et al., 2020]); (b) the use of limited sample sizes (e.g.,
21 <150 participants [e.g., Ševčíková et al., 2020]); (c) the analysis of particular OSAs
22 (e.g., use of chats or webcams for sexual purposes [Daneback et al., 2005]) instead of a
23 more comprehensive variety of online sex-related activities; or (d) the analysis of
24 specific aspects of OSA (typically, the prevalence of sex-related activities), overlooking
25 other important areas (e.g., the motives fuelling OSA or its consequences). To address

1 these limitations, in this study we analyse three different aspects of OSA (i.e.,
2 prevalence of different OSAs, motives to engage in OSA, and excessive and
3 problematic engagement in OSA) in a sample of 8,040 individuals between 12-85 years
4 old distributed into five age groups: <18 years old, between 18-25, between 26-40,
5 between 41-60, and >60.

6 1.1 Prevalence of OSA across the lifespan

7 In a cross-cultural study comparing the lifetime prevalence of different OSAs in
8 four countries (Canada, Germany, Sweden, and the U.S.), Döring et al. (2017) found
9 that most participants (90%) used the Internet to obtain sexual education, 76% to access
10 porn, and 31% to have sexual conversations with other users through chat/webcam.
11 Comparing by gender, men reported significantly higher lifetime prevalence of
12 pornography use than women (96% vs. 61%) and a similar prevalence for the remaining
13 OSAs. These results are consistent with those reported in other studies. For instance,
14 Anisimowicz & O'Sullivan (2017) found a prevalence of porn consumption of 88% in
15 men and 67% in women residing in North America. In terms of time investment, men
16 reported watching pornography for around 4.5 hours per week (3.5 h in women). In a
17 study conducted among 1,557 Spanish college students, 59% of men and 24% of
18 women reported having looked for online pornography; as for the use of the internet to
19 participate in sexual chatrooms, 21% of men and 8.6% of women reported doing so
20 (Ballester-Arnal, Castro-Calvo, et al., 2016). These results are illustrative of one of the
21 central conclusions around the role of gender in influencing engagement in OSA: that
22 men are more likely than women to report engaging in OSA, spend more time doing so,
23 and present a greater probability of problematic engagement (Wéry & Billieux, 2017).
24 Gender also impacts on the preference for certain OSAs: whereas men tend to prefer
25 solitary-arousal activities (typically, pornography), women seem to be more interested

1 in partnered-arousal activities (e.g., sexual chats) or in non-arousal activities (Wéry &
2 Billieux, 2017). These differences may be explained by the fact that mainstream porn is
3 focused on male pleasure, pushes females' fantasies and desires into the background,
4 and includes notable levels of violence towards women (Gorman et al., 2010).

5 As for how the prevalence of these OSAs changes across the lifespan, traditional
6 wisdom suggests that young people are more likely to use the Internet for sexual
7 purposes than older people (Price et al., 2016). This belief is based on the view that
8 accessibility to Information and Communication Technologies (ICTs) influences on the
9 use of the Internet for sexual purposes: as young people tend to be more familiar with
10 ICTs and are more digitally literate than older adults (aka 'digital divide' [Friemel,
11 2016]), the former will be more predisposed to use the Internet for sexual purposes.
12 Therefore, it is expected that OSA consumption declines as people grow older. This is
13 the main conclusion derived from the study by Price et al. (2016). In this research,
14 authors employed data derived from the General Social Survey (a nationally
15 representative, repeated, cross-sectional sample of 27,284 adults from the USA) to
16 analyse trends in pornography consumption over a 40-year period (1973-2012). These
17 researchers found that young adults (i.e., people between 18 and 26 years old) were
18 more than twice as likely to report using pornography as adults aged 45-53 years old
19 (both in men and women). Similarly, Miller et al. (2020) concluded that "pornography
20 use tapers-off with age" after conducting a literature review of studies reporting the
21 prevalence of men's pornography use. One of the limitations that these authors found
22 when conducting their literature review was that "the majority of studies employed
23 relatively young samples (e.g. convenience samples of university students)" (Miller et
24 al., 2020, p. 520). As a case in point, average age of participants in the majority of the
25 reviewed studies was below 25 years old.

1 The aforementioned conclusion (i.e., OSA consumption declines as people grow
2 older) is inconsistent with the results obtained by recent studies, in which older adults
3 used the Internet for sexual purposes as much as –or even more than– younger adults.
4 As a case in point, Ševčíková, Blinka, et al. (2020) compared a sample of 158 subjects
5 aged between 50 and 77 years old and 2,322 between 18 and 49, finding that the former
6 reported a similar frequency of pornography use and a higher frequency of use of chats
7 and/or webcams for sexual purposes. Similarly, another research in which 800 Czech
8 adults aged 50 or older reported on their pornography consumption found that around
9 82% of men confirmed doing so (Ševčíková, Vašek, et al., 2020). This figure was
10 similar to that reported by Döring et al. (2017) and greater than that reported by
11 Ballester-Arnal, Castro-Calvo, et al. (2016), both in samples of university students. In
12 Czech adult women (Ševčíková, Vašek, et al., 2020), prevalence of pornography use
13 was 32%, in this case, notable below that reported in college samples. These mixed
14 findings suggest that age differences in the prevalence of OSAs may be mediated by
15 gender. In line with this hypothesis, Daneback et al. (2005) found that the use of chats
16 or webcams for sexual purposes steadily increased with age in women, but not in men:
17 in women, this OSA reached its peak prevalence (37%) between 35-49 years old,
18 whereas in men, peak prevalence (38%) was observed at an earlier age (between 18-28
19 years old). Finally, the use of the Internet to look for sexual education (i.e., non-arousal
20 activity) across the lifespan seems to follow an inverted U-shape: in people between 12-
21 24 years old, age is a positive predictor of online sexual information seeking (i.e., youth
22 are more likely to search for sexual information online as they get older) (Nikkelen et
23 al., 2020); however, the prevalence of this OSA tend to decline after this age, especially
24 in older people (Scandurra et al., 2021).

1 These mixed results suggest that the relationship between age and prevalence of
2 OSA may be more complex than initially considered. However, there is a paucity of
3 data on the interaction between age, gender, and prevalence of OSAs. In this research,
4 we shed light on this issue by comparing the prevalence of twelve OSAs across five
5 developmental stages in a large sample of both men and women (1st study aim).

6 1.2 Motives for engaging in OSAs across the lifespan

7 Compared with the research efforts invested in exploring other aspects of
8 sexuality, current knowledge about reasons and motives fueling the engagement in
9 OSAs is limited. Even so, a recent systematic review identified seven motives behind
10 the use of the Internet for sexual purposes (Castro-Calvo et al., 2018): (a) motives
11 related to the structural characteristics of the medium (including anonymity and the
12 belief that one's identity is concealed online, convenience of OSAs over offline sexual
13 behaviors, and the chance to explore sexuality without safety concerns); (b) curiosity
14 and sexual education (use of the Internet to satisfy sexual curiosity or to increase
15 knowledge regarding sex and sexuality); (c) social enhancement and/or peer pressure
16 (engagement in OSA as a form of social relationship enhancement or as a consequence
17 of social pressure); (d) sexual arousal and pleasure seeking (engagement in OSAs to
18 achieve sexual satisfaction and pleasure); (e) Online/offline sexuality enhancement (use
19 of the Internet for meeting sexual/romantic partners or to achieve instant gratification of
20 sexual desire through the interaction with other users); (f) anonymous fantasizing (use
21 of the Internet to generate new and exciting sexual fantasies); and (f) mood management
22 (use of OSA as a coping mechanism when users are confronted with unpleasant
23 emotional states, stressors, or other psychological or physiological states that threaten
24 their stability or their sense of control).

1 In their review, Castro-Calvo et al. (2018) concluded that the limited number of
2 studies exploring the influence of age on motives fuelling OSA hindered the
3 identification of potential differences in their relevance across the lifespan. However,
4 they found a clear link between age and motives: whereas engagement in OSAs for
5 educational purposes or anonymity lost importance with age, pleasure seeking motive
6 and online/offline sexuality enhancement became more relevant. Based on these
7 findings, they proposed that first episodes of OSA engagement (typically around 12-13
8 years old) were usually fuelled by social and educational motives (e.g., learning “how to
9 have sex”), whereas pleasure seeking and online/offline sexuality enhancement became
10 relevant during adolescence (remaining important in later developmental stages). They
11 also proposed that structural characteristics of Internet sex (i.e., anonymity and
12 accessibility) also fuelled the early engagement in these activities and remain important
13 in explaining OSA in later stages. However, this theoretical proposal on the relevance of
14 different motives for engaging in OSAs across the lifespan still requires empirical
15 confirmation. For this reason, the second study aim was to compare the relevance of
16 eight motives to engage in OSAs across five developmental stages in a large sample of
17 both men and women.

18 1.3 Excessive and problematic engagement in OSAs across the lifespan

19 Consequences of the use of the Internet for sexual purposes (i.e., benefits and
20 potential harms) has been a topic of considerable scientific and public debate (Döring,
21 2009). On the one hand, studies suggest that most OSA users do not experience any
22 harmful outcome derived from their use of the Internet for sexual purposes (Ballester-
23 Arnal et al., 2014). On the contrary, OSA may contribute to fulfilment of sexual desires
24 (Daneback et al., 2013), compensate for the lack of knowledge about sexuality or
25 receive support about sexual concerns (Smith, 2013), find romantic or sexual partners in

1 safe environments (i.e., avoiding the risks of a face-to-face encounter) (Courtice &
2 Shaughnessy, 2018), add variety to offline sexual relationships (Daneback et al., 2009),
3 and distract from boredom and everyday problems (Hald & Malamuth, 2008). On the
4 other hand, OSA could become problematic when carried out abusively in terms of
5 frequency, severity, and functional impairment (Ballester-Arnal, Castro-Calvo, et al.,
6 2016; Wéry & Billieux, 2017). Excessive and problematic engagement in OSAs (also
7 known as cybersex addiction, online sexual compulsivity, or Internet sex addiction) is
8 characterized by symptoms such as: (a) loss of control over OSA, (b) persistent desire
9 and/or unsuccessful efforts to stop, reduce, or control OSA; (c) use of OSAs as a coping
10 mechanism; and (d) social, physical, and psychological consequences derived from the
11 OSA (Wéry & Billieux, 2017). Excessive and problematic engagement in OSA may be
12 classified as a subtype of Compulsive Sexual Behavior Disorder (CSBD) (Gola et al.,
13 2020), an impulse control disorder characterized by a persistent failure to control
14 intense and recurrent sexual impulses, urges, and/or thoughts, resulting in repetitive
15 sexual behavior that causes a marked impairment in important areas of functioning
16 (Castro-Calvo et al., 2020; Kraus et al., 2018). The identification of this clinical
17 condition is much more complex than simply attend to the time invested online for
18 sexual purposes (Bóthe et al., 2020); its diagnosis actually requires a more in-depth
19 assessment of the nature and context of individual's online sexual problems, as well as a
20 comprehensive knowledge on how this condition is manifested in different populations
21 (e.g., in terms of symptoms and other pathological indicators).

22 As in other areas of internet sexuality, most studies exploring excessive and
23 problematic engagement in OSA were conducted in young samples (e.g., adolescents
24 [Ballester-Arnal, Giménez-García, et al., 2016], young adults [Giordano & Cashwell,
25 2017], or middle-aged [Studer et al., 2019]). Therefore, our current knowledge on this

1 issue is biased, and probably only representative of the expression of this condition in
2 young people. Some preliminary research has found that age is inversely correlated with
3 problematic engagement in OSA. In particular, Grubbs et al. (2019) found that the risk
4 that people define themselves as “addicted to pornography” tend to decrease with age.
5 However, this conclusion is at odds with the results from the few studies exploring
6 problematic OSA in older samples. One illustrative example is the study conducted by
7 Ševčíková, Blinka, et al. (2020). In this research, authors found that older participants
8 (i.e., subjects aged ≥ 50 years old) scored above the younger sample (subjects between
9 18-49 years old) in a scale assessing excessive and problematic engagement in OSA.
10 Furthermore, they found that certain psychosocial circumstances associated to aging
11 (such as retirement and the boredom resulting from the discontinuation of occupational
12 activities) increased the risk of problematic engagement in OSAs, meaning that certain
13 aspects that tend to appear as people grew older may increase the risk of suffering from
14 this clinical condition. Unfortunately, this study did not explore the prevalence of older
15 people qualifying for a diagnosis of excessive and problematic OSA engagement or the
16 unique expression of different symptoms of this condition across the lifespan. Given
17 these limitations and the very lack of relevant literature on this issue, the last aims of
18 our study were: (a) to explore the prevalence and characteristics of excessive and
19 problematic engagement in OSA across five developmental stages in a large sample of
20 both men and women (3rd study aim) and (b) to analyze the interplay between the age,
21 the type of OSA, and the motives behind OSA engagement when it comes to predict the
22 risk of problematic OSA (4th study aim).

23 **2. Methods**

24 2.1 Participants and procedure

1 Data acquisition was conducted between 2016 and 2019 through a secured
2 online platform designed *Ad Hoc* for this research (<https://adiccionalsexouji.es/>).
3 Sampling objective was to assess OSA in a large sample of Spanish community
4 members (see Giménez-García et al. [2020] for a characterization of the sexual behavior
5 of Spanish people). Participants were enrolled utilizing a combination of active and
6 passive recruitment strategies. Active recruitment included: (a) email blast through
7 different institutions' listservs (universities, organizations, etc.); (b) dissemination of the
8 study on radios and newspapers websites; (c) posting banners on Facebook through the
9 suggested publications marketing service; and (d) posting tear-off flyers in high-density
10 spots (shopping centers, supermarkets, etc.). The study survey was also accessible
11 through any search engine by combining terms such as "cybersex" OR "online sexual
12 activity" AND "assessment" (in Spanish) (passive recruitment). Active recruitment
13 strategies may allow the assessment of more diverse participants' profiles (non-OSA
14 users, occasional users, etc.), whereas passive recruitment through the aforementioned
15 searching terms may result in the assessment of a narrower participants' profile
16 (typically, regular-OSA users, heavy-OSA users, and even problematic OSA users). The
17 study procedures were carried out in accordance with the Declaration of Helsinki. The
18 Institutional Review Board of the Jaume I University approved the study (P1.1B2012-
19 49). Prior to enrolment, volunteer participants in the research were informed about the
20 study aims (explicitly mentioning that they would be asked about their sexual
21 behaviour). Those who agreed to participate and started the survey confirmed that: (a)
22 they consented to participate (participants >18 years old) or (b) their legal guardians
23 were informed about their intention to complete the survey and consented them to
24 participate (participants <18 years old).

1 During the time the study was accessible, around 10,000 participants accessed
2 the survey. Initial data derived from the online platform were screened to avoid
3 duplicitous, inconsistent and/or fake responses. Only those participants who completed
4 80% of the survey were included in the study. After removals, a total of 8,040
5 participants were included in the final dataset. The average time to complete the study
6 was 27.82 minutes ($SD=13.83$) and participants did not receive compensation for
7 participating.

8 2.2 Instruments

9 2.2.1 Sociodemographic characteristics

10 Participants were asked to report their gender (men/women), age, religious
11 (*atheist/ non-practicing believer/ practicing believer*), and political ideology (Likert
12 scale ranging from 0 [*left-wing extremist*] to 10 [*extreme right wing*]).

13 2.2.2 Offline sexual behavior

14 Participants completed a series of questions assessing basic aspects of their
15 sexual behavior, such as: (1) whether they were engaged or not in a stable relationship
16 (*yes/no*); (2) sexual orientation (*heterosexual/homosexual/bisexual*); (3) whether they
17 had ever engaged or not in sexual intercourse with an opposite-sex or a same-sex
18 partner (*yes/no*); (4) whether they had ever engaged in different sexual behaviors
19 (masturbation [*yes/no*]/oral sex/vaginal intercourse/anal intercourse); and (5) frequency
20 of sexual activity (including masturbation) (Likert scale ranging from 0 [*less than 6*
21 *times per year*] to 7 [*more than three times per week*]).

22 2.2.3 Online sexual behaviour: characteristics, motives and types of OSA

23 First, participants in the study self-reported whether they use the Internet for
24 sexual purposes (*yes/no*). Those who answered positively, were asked about: (1)
25 average time per week spent on OSAs in minutes (1 item); (2) devices employed to

1 access OSAs (2 items); (3) motives to engage in OSAs (8 items); and (4) types of OSAs
2 performed (12 items). Items comprising each scale were generated by the authors or
3 extracted and adapted from previous studies (Castro-Calvo et al., 2018; Kvaalem et al.,
4 2014; Shaughnessy et al., 2014; Wéry & Billieux, 2016). All the items except those
5 referring to the time spent online for sexual purposes were asked on a dichotomous
6 scale (*yes/no*). Information on scales content and psychometric properties is reported in
7 detail in the results section.

8 2.2.4 Excessive and problematic engagement in OSAs

9 Excessive and dysfunctional engagement in OSAs (i.e., cybersex addiction) was
10 assessed through the Spanish version of the Internet Sex Screening Test (ISST,
11 Ballester-Arnal et al., 2010). The ISST evaluates the degree to which online sexual
12 behaviour is excessive, problematic, and associated with significant distress and
13 impairment. Twenty-five items on a dichotomous scale (*true/false*) provide a total score
14 ranging from 0 to 25. Internal consistency ($\alpha=.88$) and test-retest stability ($r=.82$) in a
15 sample of college students between 18-25 years old was appropriate (Ballester-Arnal et
16 al., 2010). In this study, internal consistency was excellent ($\alpha=.93$; $\omega=.93$).

17 Furthermore, participants answered three questions on Self-perceived
18 problematic engagement in OSA: (1) Have you ever been worried about your cybersex
19 consumption?; (2) Do you think you spend more time than advised online for sexual
20 purposes?; and (3) Do you think that sex on the Internet interferes in some way in your
21 life? The items were asked on a dichotomous scale (*yes/no*).

22 2.3 Data analysis

23 Participants were distributed into five groups according to their age: participants
24 under 18 years old (early adolescents and adolescents), aged from 18 to 25 (young
25 adults), from 26 to 40 (adults), from 41 to 60 (older adults), and over 60 years old

1 (elderly). These age groups were chosen because of comparison purposes: previous
2 studies conducted in Spain have explored OSA in people under 18 years old (Ballester-
3 Arnal, Giménez-García, et al., 2016; Castro-Calvo et al., 2016) and between 18-25
4 (Ballester-Arnal, Castro-Calvo, et al., 2016); therefore, using these two age ranges
5 ensured the availability of culturally matched data to compare the results from the
6 present study. The remaining age groups were chosen because they represent typical
7 developmental stages used in previous studies (e.g., Smith & Baltes, 1990). This
8 approach is similar to that followed by Price et al. (2016) to compare pornography
9 consumption in different age groups. Taking into account gender differences in the use
10 of the Internet for sexual purposes (Ballester-Arnal, Castro-Calvo, et al., 2016), all the
11 study analyses were performed comparing men and women separately. All in all, in this
12 study we compared our results across age groups but within gender.

13 Analysis were conducted using the SPSS statistic package (version 25.0). To
14 compare participants' profile in each age group, we performed one-way analyses of
15 variance (ANOVAs) for continuous variables and chi-square tests for categorical
16 variables. Given our large sample size, differences according to the age were analysed
17 on the basis of their effect sizes instead of their significance levels. Two effect size
18 indices (Cohen's f for ANOVAs and Cramer's V for chi-square tests) were computed by
19 using G*Power (version 3.1). For Cohen's f , effect sizes of about .10 were considered
20 small, close to .25 moderate, and greater than .40 large (Cohen, 1988); for Cramer's V ,
21 these sizes corresponded to values of .10, .30, and .50 (Ellis, 2010).

22 As for the sociodemographic data, offline sexual behaviour, and basic online sexual
23 behaviour (i.e., having engaged or not in OSAs, time spent online for sexual purposes,
24 devices usually employed to access OSAs, and motives behind OSAs engagement),
25 participants were compared at an item-level (i.e., percentages of positive responses). For

1 the type of OSAs usually performed, besides these item-level comparisons, we also
2 conducted an Exploratory Factor Analyses (EFA); through this method, we aimed to
3 reduce the number of variables involved in data analysis and simplify interpretation of
4 the results by identifying common categories or factors. FACTOR software (version
5 9.2) was employed to perform this EFA on the basis of the tetrachoric/polychoric
6 correlation matrix; this method is recommended when modeling dichotomous data and
7 the univariate distribution of ordinal items is asymmetric or has an excess of kurtosis
8 (such in the scale employed to assess OSAs) (Ferrando & Lorenzo-Seva, 2017). We
9 employed Parallel Analysis (PA) to determine the number of factors to retain. This
10 analysis was also conducted on the basis of the polychoric correlation matrix using
11 optimal implementation function (Timmerman & Lorenzo-Seva, 2011). Following
12 Gaskin and Happell's (2014) recommendations, factors were extracted through
13 Principal Components Analysis (PCA), applying oblique rotation (Oblimin). Different
14 reliability indexes were calculated for the resulting factors: in particular, we employed
15 an R package (userfriendlyscience) (Peters, 2014) to estimate Ordinal Cronbach's alpha
16 and Omega (scales comprising ≥ 3 items) or Spearman-Brown reliability (scales
17 comprising only two items) (Eisinga et al., 2013).

18 Then, we used different indicators for the analysis of excessive and problematic
19 engagement in OSAs. First, we identified excessive and problematic OSA users
20 according to their scores on the ISST (score ≥ 19) (Carnes et al., 2001). This cut-off
21 score has been used in previous studies (Ballester-Arnal, Castro-Calvo, et al., 2016;
22 Ballester-Arnal, Giménez-García, et al., 2016), but its sensitivity and specificity in
23 identifying excessive and pathological engagement in OSAs has not been established yet.
24 Thus, results derived from this classification should be consider tentative. We also
25 compared participants according to different indicators of self-perceived severity

1 perception. Finally, we employed the total score from the ISST as a dependent variable
2 in a hierarchical linear regression (stepwise method) to analyse the predictive power of
3 different independent variables over OSA severity (1st step, main effects), as well as the
4 interaction between these variables and the age (2nd step, interaction effects).

5 **3. Results**

6 3.1 Participants characteristics

7 The study sample comprised 8,040 participants distributed into five categories:
8 the first (early adolescents and adolescents) and the last category (elderly) included less
9 than 500 participants (*n* of 373 and 466 respectively), whereas category of young adults
10 (*n*=2,739; 37.1%), adults (*n*=2,271; 30.7%) and older adults (*n*=1,540; 20.8%)
11 comprised more than 1,500 participants. Table 1 shows participants' characteristics.
12 Except in the early adolescents and adolescents group (44.5% males; 55.5% females),
13 most respondents were males (between 60%-82.9% in the remaining age categories).
14 These differences did not affect our results given that statistical analyses were
15 performed independently for each men and women. Only minor differences emerged
16 between groups regarding religious ($V=0.07$) and political beliefs ($V=0.09$).

17 INSERT TABLE 1

18 As for offline sexual behaviour, small-to-moderate differences emerged in most
19 aspects assessed (V and $f > .08$). Early adolescents, adolescents, and elderly showed the
20 greater disparities, whereas middle-aged categories (i.e., young adults, adults, and older
21 adults) displayed a very similar offline sexual behaviour. In early adolescents and
22 adolescents, their offline sexual behaviour was characterized by greater sexual diversity
23 (29% of non-heterosexuals) and a lower percentage of participants with a steady partner
24 (30.3%) or reporting having had sexual intercourse (51.5%). Average frequency of
25 sexual activity was also lower (around once a week) compared to those reported in the

1 middle-aged categories (one to three times per week). On the contrary, only 7.4% of
2 elderly participants reported a non-heterosexual sexual orientation, the majority had a
3 steady partner (74.3%), and more than 90% reported having engaged in sexual
4 intercourse. As a result, lifetime prevalence of partnered sexual behaviours was notable
5 higher (60.1% for oral sex, 72.1% for vaginal intercourse, and 27% for anal sex).

6 3.2 General online sexual behaviour across the lifespan

7 Basic online sexual behaviour according to the gender and the age group is
8 reported in table 2. In males, most respondents used the Internet for sexual purposes,
9 with small differences ($V=0.17$) according to the age group. Average time spent online
10 for sexual purposes ranged between 3.9 hours per week in early adolescents and
11 adolescents (233.67 minutes) and 7.1 hours in adults (426.60 minutes) ($f=0.13$).
12 Regarding the devices usually employed to access OSA, a consistent pattern emerged:
13 access to OSAs through the PC remained stable across the five age categories (ranging
14 between 72.5% and 91.7%, $V=0.082$), whereas percentage of participants reporting
15 accessing through mobile devices linearly decreased from 82.6% (early adolescents and
16 adolescents) to 18.10% (elderly) ($V=.31$).

17 INSERT TABLE 2

18 In females, differences according to the age category were notable higher than
19 that observed in males. Whereas more than 80% of early adolescents and adolescents,
20 young adults and adults used the Internet for sexual purposes, this percentage decreased
21 to 63% in older adults and to 34.6% in elderly. Differences according to the age in the
22 time spent online for sexual purposes did not reach statistical significance ($f=.05$);
23 however, participants in the elderly category only spent around 27 minutes per week (on
24 average, 1h and 30 min less than participants in the other categories). As reported in

1 males, early adolescents and adolescents preferred to engage in OSAs through mobile
2 devices (68.4%), this figure systematically decreasing with age ($V=0.25$).

3 3.3 Prevalence of specific OSAs across the lifespan (1st study aim)

4 Preferences for different types of OSAs according to the age are presented in
5 table 3 (males) and 4 (females). To simplify data presentation and analyses, we first
6 performed an EFA on the whole sample to identify common categories behind different
7 OSAs. To verify the applicability of the EFA to the 12-item scale assessing this aspect,
8 the Kaiser-Meyer-Olkin index ($KMO=0.824$), the Barlett's test of sphericity (χ^2
9 $(66)=12295.30$, $p<0.001$), and the determinant of the polychoric correlation matrix
10 (0.0843) were tested. After PA of the polychoric correlation matrix, we estimated that
11 the appropriate number of factors to be retained was three (eigenvalues >1.22). Factorial
12 solution derived from the PCA revealed that this three-factor structure explained
13 65.33% of the total variance (factor 1=42.60%; factor 2=12.55%; factor 3=10.17%).
14 Item distribution resonates well with previous classifications of OSAs (Shaughnessy et
15 al., 2011; Wéry & Billieux, 2016), and internal consistency of the resulting factors was
16 appropriate (α and ω between .77 and .88).

17 INSERT TABLE 3 AND 4

18 The first factor corresponded to 'non-arousal sexual activities' ("*getting*
19 *sexuality information by visiting educational websites*" and "*reading erotic material*
20 *online*"). In this factor, we observed moderate differences according to the age category
21 in both males ($f=0.15$) and females ($f=0.21$), with young adult participants displaying
22 the higher average score (M of 1.49 and 1.61 respectively) followed by early
23 adolescents and adolescents (M of 1.33 and 1.53). At an item-level, the prevalence of
24 both OSAs achieved its peak value in young adults (81.7% in males and 90.9% in
25 females), progressively decreasing after this age.

1 The second factor grouped five items assessing ‘partnered-arousal OSAs’. Small
2 to moderate differences ($f_{\text{males}}=0.16$; $f_{\text{females}}=0.15$) emerged when we compared average
3 scores according to the age group. In this case, respondents in the adult category
4 obtained the higher average score ($M_{\text{males}}=2.45$; $M_{\text{females}}=1.92$). At an item-level, we
5 observed the same pattern in the prevalence of the five OSAs included in this scale: i.e.,
6 the prevalence tended to increase until arriving to its peak in adults, progressively
7 decreasing after this age until reaching its lower value in elderly. This tendency was
8 equivalent in males and females. As an example, prevalence of “*having sex online via*
9 *webcam*” increased from 32.4% to 44.9% (>12.5% in males) and from 23.7% to 32.3%
10 (>8.6% in females) between early adolescents and adolescents and adults, and then
11 progressively decreased to 22% and 5.6% in elderly.

12 The third factor grouped together five items assessing ‘solitary-arousal OSAs’.
13 In this case, older adults obtained the higher average score ($M_{\text{males}}=2.11$; $M_{\text{females}}=1.51$),
14 and differences according to the age group reached a moderate effect size (f of 0.18 and
15 0.19 respectively). In males, the prevalence of pornography viewing varied in a narrow
16 range between 92% and 98.2% ($V=0.08$), meaning that this OSA was extremely popular
17 across all the lifespan; in women, prevalence of this OSA ranged between 81.9% and
18 91% in all the age categories except in elderly (50%) ($V=0.16$). For the remaining
19 OSAs, a similar tendency in the prevalence across the lifespan was observed in both
20 males and females: prevalence of OSAs included within this category systematically
21 increased until arriving to its peak in older adults, subsequently decreasing in elderly
22 (e.g., visiting contact sites systematically increased from early adolescents and
23 adolescents to older adults [27.8% to 52.2% in males; 13.4% to 22.2% in females], and
24 then decreased to 39.6% and 16.7% in elderly).

25 3.4 Motives to engage in OSAs (2nd study aim)

1 *learn about sex*” and “*to distract myself, take a break, or pass the time when bored*”
2 (33.3%).

3 3.5 Excessive and problematic engagement in OSAs (3rd and 4th study aims)

4 First, participants were compared according to different indicators of excessive
5 and problematic engagement in OSAs. As displayed in table 6, we observed small-to-
6 moderate differences according to the age category in the ISST average score
7 ($f_{\text{males}}=0.30$; $f_{\text{females}}=0.19$): in particular, scores in this scale remained stable in early
8 adolescents and adolescents and young adults (M of 10.06 and 10.15 in males; M of
9 6.05 and 5.58 in females), increased until reaching its peak value in adults (M of 11.91
10 and 6.35 respectively), and then progressively decreased with age (M of 5.76 and 1.92
11 in the elderly). In males, the proportion of participants qualifying as excessive and
12 problematic OSAs users was below 3.8% in early adolescents and adolescents and
13 young adults, ranged between 6.7%-8.0% in adults and older adults and none of the
14 participants in the elderly category displayed this profile. These differences reached a
15 small effect size ($V=0.10$). In females, the highest proportion of problematic OSAs users
16 was observed in early adolescents and adolescents (1.8%), and this figure was below
17 1.4% in the remaining age categories.

18 INSERT TABLE 6

19 Participants in the five age categories were also compared according to their
20 self-perceived severity perception (table 6). In males, a notable proportion of adults
21 were worried about their OSA (60.4%) or considered that they spent too much time
22 online for sexual purposes (62.8%); these figures decreased in the remaining age
23 categories, especially in the elderly (22.6% and 29.1%), reaching a small to moderate
24 effect size (V between 0.19 and 0.20). Similarly, an important proportion of adults
25 (30.2%) thought that OSAs interfered in their life, compared to 19.9% in early

1 adolescents and adolescents or 5.6% in elderly ($V=0.12$). In females, 58% of early
2 adolescents and adolescents were worried about their OSA, 11% considered they spent
3 too much time, and 2.9% thought that OSA interfered in their life.

4 Finally, we performed hierarchical linear regressions to estimate the predictive
5 power of different independent variables over excessive and problematic engagement in
6 OSAs (i.e., ISST total score) (Table 7). Age was included as a predictor (first step) and
7 as an interaction term (second step) to test its moderating effect on the relationship
8 between the independent variables and the ISST. However, predictive power of the
9 regression models did not significantly increase when age was introduced as an
10 interaction term (+1% in men; -0.2% in women); furthermore, none of these interaction
11 terms were significant, and so, they were excluded from the regression models. The
12 results of the linear regressions (main effects) revealed significant models accounting
13 for 42.6% of the variance of ISST scores in men and 43.9% in women. Age was a
14 significant predictor of ISST scores in both men ($\beta = -.068$) and women ($\beta = -.091$): in
15 particular, the risk of excessive and problematic engagement in OSAs decreased as
16 people grew older.

17 INSERT TABLE 7

18 **4. Discussion & Conclusions**

19 The main aim of this study was to explore the engagement in OSAs across the lifespan.
20 To address this aim, we analysed three different aspects of OSA (i.e., prevalence of
21 different OSAs, motives to engage in OSA, and excessive and problematic engagement
22 in OSA) in a sample of 8,040 individuals between 12-85 years old distributed into five
23 age groups. On the whole, this study found that: (a) OSA was highly prevalent across all
24 the developmental stages (including people older than 60 years old); (b) differences

1 according to the age in the use of the Internet for sexual purposes were small-to-
2 moderate (i.e., smaller than expected); and (c) considering gender was important when
3 it came to understanding these minor age differences.

4 The first aspect in which we observed consistent differences according to the age was
5 the devices employed to access OSA (moderate effect sizes). In both males and females,
6 the proportion of participants reporting the use of the personal computer to access OSA
7 slightly increased with age, whereas the use of mobile devices (such as smartphones or
8 tablets) linearly decreased (from 82.6% to 18.10% in men and 68.4% to 0% in women).
9 As a result, young people employed PCs or mobile devices to access OSA to a similar
10 extent, whereas older people mostly employed PCs. This finding explains contradictory
11 results from empirical studies and data published by the industry (e.g., Pornhub).
12 Empirical research conducted from a person-centered approach suggests that PCs
13 remain the main way to access sexually explicit materials on the Internet (Kvalem et al.,
14 2014); however, in its annual reports, Pornhub (i.e., one of the most popular
15 pornographic websites) documented an increase in the proportion of users accessing
16 pornography through mobile devices (from 49% in 2013 to 80.3% in 2018) (Pornhub,
17 2013, 2018). According to our results, it seems that the proliferation of new devices is
18 changing the way that people access and interact sexually via the Internet, but only
19 among young generations. This differential pattern has important implications, as the
20 greater accessibility to online sex facilitated by the use of mobile technologies may led
21 to an increased engagement in OSA (Wéry & Billieux, 2017).

22 As for the time spent online for sexual purposes, we found differences according to the
23 age in men (small effect size) but not in women. In men, adults and older adults spent
24 almost twice as long on the Internet for sexual purposes than early adolescents and
25 adolescents, young adults, and elderly (about 7 hours per week vs. 3-4 hours). In

1 women, time spent online for sexual purposes barely changed with age, except in
2 elderly: whereas weekly use remained stable around 2 hours in the majority of age
3 categories, elderly women spent less than 30 min per week online for sexual purposes.
4 Most studies conducted so far exploring this issue have done so analyzing time online in
5 general, not according to the age; given the differences found in our research according
6 to the age, results from these studies may be biased when they comprise male samples
7 and wide age ranges. For instance, Wéry & Billieux (2016) found that men between 18-
8 72 years old ($M_{age}=30$) spent an average of 3 hours per week in OSAs. Similarly,
9 Blais-Lecours et al. (2016) found that male users between 18-78 years old ($M_{age}=25$)
10 spent around 1 hour per week watching pornography. In light of our results, it is
11 possible that these figures resulting from large age ranges but mainly sampling young
12 adults were obscured by do not consider potential differences according to age, thus
13 hindering their generalizability and interpretability.

14 One of the main study aims was to analyze the prevalence of multiple OSAs in different
15 developmental stages, as well as the potential moderating effect of gender (1st study
16 aim). On this matter, our study revealed that age was relevant when it came to
17 understanding preference for different OSAs across the lifespan (small-to-moderate
18 effect sizes). In both men and women, we found a consistent pattern characterized by:
19 (a) during early developmental stages (i.e., childhood, adolescence, and young
20 adulthood), non-arousal OSAs such as reading erotica online or the use of the Internet to
21 find sexual education were extremely popular (prevalence between 77.8%-81.7% in
22 men and 89.7%-90.9% in women), together with certain solitary-OSAs aimed to
23 achieve sexual satisfaction (e.g., pornography use); (b) later, during adulthood (between
24 26-40 years old) , non-arousal OSAs became less relevant, solitary-OSAs remained
25 stable, and partnered-arousal OSAs (mainly, the use of chats or webcams for sexual

1 purposes) gained prominence until achieving their peak prevalence; (c) during middle
2 adulthood (i.e., from 41 to 60 years old), solitary-arousal OSAs emerged as the most
3 popular online sexual outlet, whereas partnered-arousal OSAs started to lose relevance;
4 (d) finally, during late adulthood (>60 years old), the prevalence of all the OSAs
5 assessed tended to decline (especially in women). These trends partially confirm some
6 of the findings derived from previous studies, but also refute many well established
7 beliefs on how sexuality is expressed online across the lifespan. For example, our
8 findings are at odds with studies suggesting that OSA tend to systematically decline
9 with age (Miller et al., 2020; Price et al., 2016). In our study, certain OSAs actually
10 became more prevalent as people grow older (mainly during during adulthood and
11 middle adulthood). As in other areas of sexuality (Ševčíková & Sedláková, 2020), in
12 our study we also appreciate a loss of interest for OSA during the final stages of life, but
13 this decline occurred later than initially suggested and mediated by gender. As a case in
14 point, prevalence of pornography consumption in men remained relatively stable across
15 the lifespan (between 92%-98.2%), whereas in women, prevalence of this OSA barely
16 changed between 81.9%-91% from childhood to middle-adulthood, but dramatically
17 decreased to 50% in elderly. These results are congruent with studies suggesting that
18 there is an important gender gap when it comes to analyse the impact of age on OSA
19 (Wright, 2013; Wright et al., 2013), meaning that the interplay between both aspects has
20 a central role that warrants further research.

21 The second study aim was to compare motives fueling OSA engagement in different
22 developmental stages, as well as the potential moderating effect of gender. Our results
23 indicated that age barely modulated reasons behind the engagement in OSA across the
24 lifespan, both in males and females (null or small effect sizes). Even so, we found some
25 age-related trends: (a) the prevalence of motives suggesting the use of OSAs for mood

1 management, mood enhancement, or emotional avoidance remained stable across most
2 developmental stages; (b) the use of OSAs for romantic and/or sexual purposes was
3 slightly higher for adults and older adults, and lower for early adolescents and
4 adolescents; and (c) the prevalence of most motives tended to decline for elderly. These
5 findings partially support a recent literature review proposing that certain reasons
6 behind the use of OSA are central during particular developmental stages (Castro-Calvo
7 et al., 2018). However, certain trends documented in this review (e.g., the special
8 relevance of sexual education motives during childhood and/or adolescence) were not
9 confirmed by our research. The use of OSA as a form of achieving sexual arousal and
10 pleasure (i.e., “*as an arousing visual aide to look at while masturbating*”) was the most
11 prevalent motive in all the age groups except in elderly. This finding is coherent with
12 recent empirical studies (Bothe et al., 2020) and theoretical models proposing that OSA
13 is mainly driven by hedonic motives (Grubbs et al., 2017). However, in the elderly, the
14 use of OSAs as a distractor was more commonly reported, suggesting that certain
15 ‘coping motives’ became more relevant than hedonic motives later in life. This is not
16 surprising, given that coping motives (aka ‘escapist motives’) are related to certain life
17 circumstances that tend to appear as people grow older (such as feelings of loneliness,
18 boredom, and lower life satisfaction –typical when people get retired– or the lack of a
19 committed relationship –e.g., when people become widowed–) (Weber et al., 2018).

20 The last study aims were to explore the prevalence and characteristics of excessive and
21 problematic engagement in OSA across the lifespan (3rd aim), as well as the interplay
22 between the age, different aspects of OSA engagement, and the risk of problematic
23 OSA (4th aim). As for the severity of OSA engagement, results derived from the ISST
24 revealed small-to-moderate differences according to the age category. First, we found
25 that both the severity and the prevalence of problematic use increased with age until

1 reaching its peak value in adults between 26-40 years old (8% in men; 1.4% in women).
2 These figures are similar to those obtained in empirical studies comprising samples with
3 an average age between 30-35 years old (e.g., Bóthe et al., 2020), but notably higher
4 than those reported in studies with younger samples (Ballester-Arnal, Castro-Calvo, et
5 al., 2016). This finding suggests that adulthood may constitute a sensitive period in the
6 development of problems with OSA, a conclusion that resonates with recent studies
7 highlighting that hypersexuality/CSBD does not typically appear to produce sufficient
8 distress and/or impairment to precipitate help-seeking until the third/fourth decade of
9 life (Kafka, 2014). Supporting this point, we also found that the prevalence of men and
10 women reporting having experienced interference derived from their OSA achieved its
11 peak value during adulthood (30.2% in men; 7.2% in women). Second, we found that
12 both the severity and the prevalence of people qualifying as problematic OSA users
13 tended to decline with age, especially during late adulthood (none of them qualified as a
14 problematic OSA user). Similarly, we also found that age was a significant predictor of
15 OSA severity: as reported in previous studies (Grubbs et al., 2019), the risk of
16 problematic engagement in OSAs decreased as people grew older. Finally, we found
17 that age did not moderate the relationship between different aspects of OSA use (time
18 online for sexual purposes, the type of OSA, and the motives behind OSA engagement)
19 and the risk of problematic OSA.

20 Despite a number of interesting and novel findings, this study was limited in different
21 ways. First, this was a cross-sectional research and therefore, it was limited when it
22 comes to addressing whether the documented age-related trends were the result of the
23 'birth cohort' or the 'aging effect' (Price et al., 2016). Therefore, future research is
24 needed to examine whether the findings derived from our study are attributable to the
25 'birth cohort', the 'aging effect', or the interaction between both aspects (as suggested

1 in previous studies) (Price et al., 2016). At a methodological level, longitudinal studies
2 comprising different birth cohorts would be preferable in future studies addressing this
3 important aim. Second, we assessed gender through a measure comprising only two
4 categories (*male/female*). Even when popular, this type of scale is limited and does not
5 represent the wide variety of gender expressions; therefore, we encourage the use of
6 alternative measures capturing cisgender identities, but also transgender identities (Tate
7 et al., 2013). This is also applicable to the measurement of aspects such as sexual
8 orientation (including more categories than the classical “hetero-/bi-/homo-sexual”) or
9 sexual behavior (including more hand-genital sexual behaviors, which may be important
10 in same-sex sexual encounters). Despite our large sample size, our study sample was
11 limited in different ways: (a) the number of participants in certain study subgroups (e.g.,
12 elderly females) was limited, (b) some of the age categories may have conflated
13 different developmental stages (e.g., early adolescents and adolescents), (c) participants
14 were self-selected (meaning that our sample was non-representative), and (d) certain
15 recruitment strategies may lead to the overinclusion of participants with a high
16 problematic OSA profile. These problems may have undermined to a certain extent the
17 generalizability of our findings. Therefore, further research is needed to corroborate our
18 findings and generate new evidence on the use of the Internet for sexual purposes across
19 the lifespan.

6. References

- 1 Anisimowicz, Y., & O'Sullivan, L. F. (2017). Men's and Women's Use and Creation of Online
2 Sexually Explicit Materials Including Fandom-Related Works. *Archives of Sexual*
3 *Behavior*, 46(3), 823–833. <https://doi.org/10.1007/s10508-016-0865-5>
- 4 Ballester-Arnal, R., Castro-Calvo, J., Gil-Llario, M. D., & Gil-Juliá, B. (2016). Cybersex
5 Addiction: A Study on Spanish College Students. *Journal of Sex & Marital Therapy*,
6 43(6), 567–584. <https://doi.org/10.1080/0092623X.2016.1208700>
- 7 Ballester-Arnal, R., Castro-Calvo, J., Gil-Llario, M. D., & Giménez-García, C. (2014).
8 Relationship status as an influence on cybersex activity: cybersex, youth, and steady
9 partner. *Journal of Sex & Marital Therapy*, 40(5), 444–456.
10 <https://doi.org/10.1080/0092623X.2013.772549>
- 11 Ballester-Arnal, R., Gil-Llario, M. D., Gómez-Martínez, S., & Gil-Juliá, B. (2010).
12 Psychometric properties of an instrument for assessing cyber-sex addiction. *Psicothema*,
13 22(4), 1048–1053.
- 14 Ballester-Arnal, R., Giménez-García, C., Gil-Llario, M. D., & Castro-Calvo, J. (2016).
15 Cybersex in the “Net generation”: Online sexual activities among Spanish adolescents.
16 *Computers in Human Behavior*, 57, 261–266. <https://doi.org/10.1016/j.chb.2015.12.036>
- 17 Blais-Lecours, S., Vaillancourt-Morel, M.-P., Sabourin, S., & Godbout, N. (2016).
18 Cyberpornography: Time Use, Perceived Addiction, Sexual Functioning, and Sexual
19 Satisfaction. *Cyberpsychology, Behavior, and Social Networking*, 19(11), 649–655.
20 <https://doi.org/10.1089/cyber.2016.0364>
- 21 Bothe, B., Tóth-Király, I., Bella, N., Potenza, M. N., Demetrovics, Z., & Orosz, G. (2020). Why
22 Do People Watch Pornography? The Motivational Basis of Pornography Use. *Psychology*
23 *of Addictive Behaviors*. <https://doi.org/10.1037/adb0000603>
- 24 Bóthe, B., Tóth-király, I., Potenza, M. N., Orosz, G., & Demetrovics, Z. (2020). High-
25 Frequency Pornography Use May Not Always Be Problematic. *Journal of Sexual*
26 *Medicine*, February, 1–19. <https://doi.org/10.1016/j.jsxm.2020.01.007>
- 27 Carnes, P. J., Delmonico, D. L., & Griffin, E. (2001). *In the Shadows of the Net: Breaking Free*
28 *of Compulsive Online Sexual Behavior*. Hazelden.
- 29 Castro-Calvo, J., Ballester-Arnal, R., Gil-Llario, M. D., & Giménez-García, C. (2016).
30 Common etiological pathways between toxic substance use, Internet and cybersex
31 addiction: The role of expectancies and antisocial deviance proneness. *Computers in*
32 *Human Behavior*, 63, 383–391. <https://doi.org/10.1016/j.chb.2016.05.066>
- 33

- 1 Castro-Calvo, J., Gil-Llario, M. D., Giménez-García, C., Gil-Juliá, B., & Ballester-Arnal, R.
2 (2020). Occurrence and clinical characteristics of Compulsive Sexual Behavior Disorder
3 (CSBD): a cluster analysis in two independent community samples. *Journal of Behavioral*
4 *Addictions*, 9(12), 446–468. <https://doi.org/10.1556/2006.2020.00025>
- 5 Castro-Calvo, J., Giménez-García, C., Gil-Llario, M. D., & Ballester-Arnal, R. (2018). Motives
6 to engage in Online Sexual Activities and their links to an excessive and problematic use:
7 a Systematic Review. *Current Addiction Reports*, 5(4), 491–510.
8 <https://doi.org/https://doi.org/10.1007/s40429-018-0230-y>
- 9 Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. L. Erlbaum
10 Associates.
- 11 Courtice, E. L., & Shaughnessy, K. (2018). The Partner Context of Sexual Minority Women's
12 and Men's Cybersex Experiences: Implications for the Traditional Sexual Script. *Sex*
13 *Roles*, 78(3–4), 272–285. <https://doi.org/10.1007/s11199-017-0792-5>
- 14 Daneback, K., Cooper, A., & Månsson, S.-A. (2005). An Internet Study of Cybersex
15 Participants. *Archives of Sexual Behavior*, 34(3), 321–328. [https://doi.org/10.1007/s10508-](https://doi.org/10.1007/s10508-005-3120-z)
16 [005-3120-z](https://doi.org/10.1007/s10508-005-3120-z)
- 17 Daneback, K., Ševčíková, A., Månsson, S. A., & Ross, M. W. (2013). Outcomes of using the
18 internet for sexual purposes: Fulfillment of sexual desires. *Sexual Health*, 10, 26–31.
19 <https://doi.org/10.1071/SH11023>
- 20 Daneback, K., Træen, B., & Månsson, S.-A. (2009). Use of Pornography in a Random Sample
21 of Norwegian Heterosexual Couples. *Archives of Sexual Behavior*, 38(5), 746–753.
22 <https://doi.org/10.1007/s10508-008-9314-4>
- 23 Döring, N. M. (2009). The Internet's impact on sexuality: A critical review of 15 years of
24 research. *Computers in Human Behavior*, 25(5), 1089–1101.
25 <https://doi.org/10.1016/j.chb.2009.04.003>
- 26 Döring, N. M., Daneback, K., Shaughnessy, K., Grov, C., & Byers, E. S. (2017). Online Sexual
27 Activity Experiences Among College Students: A Four-Country Comparison. *Archives of*
28 *Sexual Behavior*, 46(6), 1641–1652. <https://doi.org/10.1007/s10508-015-0656-4>
- 29 Döring, N. M., & Mohseni, M. R. (2018). Are Online Sexual Activities and Sexting Good for
30 Adults' Sexual Well-Being? Results From a National Online Survey. *International*
31 *Journal of Sexual Health*, 30(3), 250–263.
32 <https://doi.org/10.1080/19317611.2018.1491921>
- 33 Efrati, Y., & Gola, M. (2018). Understanding and predicting profiles of compulsive sexual
34 behavior among adolescents. *Journal of Behavioral Addictions*, 7(4), 1004–1014.

- 1 <https://doi.org/10.1556/2006.7.2018.100>
- 2 Eisinga, R., Grotenhuis, M. Te, & Pelzer, B. (2013). The reliability of a two-item scale:
3 Pearson, Cronbach, or Spearman-Brown? *International Journal of Public Health*, 58(4),
4 637–642. <https://doi.org/10.1007/s00038-012-0416-3>
- 5 Ellis, P. D. (2010). *The Essential Guide to Effect Sizes: Statistical Power, Meta-Analysis, and*
6 *the Interpretation of Research Results*. Cambridge University Press.
7 <https://doi.org/10.1017/cbo9780511761676>
- 8 Ferrando, P. J., & Lorenzo-Seva, U. (2017). Program FACTOR at 10: Origins, development and
9 future directions. *Psicothema*, 29(2), 236–240.
10 <https://doi.org/10.7334/psicothema2016.304>
- 11 Friemel, T. N. (2016). The digital divide has grown old: Determinants of a digital divide among
12 seniors. *New Media & Society*, 18(2), 313–331.
13 <https://doi.org/10.1177/1461444814538648>
- 14 Gaskin, C. J., & Happell, B. (2014). On exploratory factor analysis: a review of recent evidence,
15 an assessment of current practice, and recommendations for future use. *International*
16 *Journal of Nursing Studies*, 51(3), 511–521. <https://doi.org/10.1016/j.ijnurstu.2013.10.005>
- 17 Giménez-García, C., Castro-Calvo, J., Gil-Llario, M. D., & Ballester-Arnal, R. (2020). Sexual
18 Relationships in Hispanic Countries: a Literature Review. *Current Sexual Health Reports*,
19 12, 83–90. <https://doi.org/10.1007/s11930-020-00272-6>
- 20 Giordano, A. L., & Cashwell, C. S. (2017). Cybersex Addiction Among College Students: A
21 Prevalence Study. *Sexual Addiction and Compulsivity*, 24(1–2), 47–57.
22 <https://doi.org/10.1080/10720162.2017.1287612>
- 23 Gola, M., Lewczuk, K., Potenza, M. N., Kingston, D. A., Grubbs, J. B., Stark, R., & Reid, R. C.
24 (2020). What should be included in the criteria for compulsive sexual behavior disorder?
25 *Journal of Behavioral Addictions*, 2, 7–12. <https://doi.org/10.1556/2006.2020.00090>
- 26 Gorman, S., Monk-Turner, E., & Fish, J. N. (2010). Free Adult Internet Web Sites: How
27 Prevalent Are Degrading Acts? *Gender Issues*, 27(3–4), 131–145.
28 <https://doi.org/10.1007/s12147-010-9095-7>
- 29 Grubbs, J. B., Braden, A. L., Kraus, S., Wilt, J., & Wright, P. J. (2017). *Pornography and*
30 *Pleasure-Seeking: Toward a Hedonic Reinforcement Model*.
31 <https://doi.org/10.17605/OSF.IO/YKQ8S>
- 32 Grubbs, J. B., Kraus, S. W., & Perry, S. L. (2019). Self-reported addiction to pornography in a
33 nationally representative sample: The roles of use habits, religiousness, and moral

- 1 incongruence. *Journal of Behavioral Addictions*, 8(1), 88–93.
2 <https://doi.org/10.1556/2006.7.2018.134>
- 3 Hald, G. M., & Malamuth, N. M. (2008). Self-Perceived Effects of Pornography Consumption.
4 *Archives of Sexual Behavior*, 37(4), 614–625. <https://doi.org/10.1007/s10508-007-9212-1>
- 5 Kafka, M. P. (2014). What happened to hypersexual disorder? *Archives of Sexual Behavior*,
6 43(7), 1259–1261. <https://doi.org/10.1007/s10508-014-0326-y>
- 7 Klein, J. L., & Cooper, D. T. (2019). Deviant Cyber-Sexual Activities in Young Adults:
8 Exploring Prevalence and Predictions Using In-Person Sexual Activities and Social
9 Learning Theory. *Archives of Sexual Behavior*, 48(2), 619–630.
10 <https://doi.org/10.1007/s10508-018-1251-2>
- 11 Kraus, S. W., Krueger, R. B., Briken, P., First, M. B., Stein, D. J., Kaplan, M. S., Voon, V.,
12 Abdo, C. H. N., Grant, J. E., Atalla, E., & Reed, G. M. (2018). Compulsive sexual
13 behaviour disorder in the ICD-11. *World Psychiatry*, 17(1), 109–110.
14 <https://doi.org/10.1002/wps.20499>
- 15 Kvaalem, I. L., Træen, B., Lewin, B., & Štulhofer, A. (2014). Self-perceived effects of Internet
16 pornography use, genital appearance satisfaction, and sexual self-esteem among young
17 Scandinavian adults. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*,
18 8(4). <https://doi.org/10.5817/CP2014-4-4>
- 19 Miller, D. J., Raggatt, P. T. F., & McBain, K. (2020). A Literature Review of Studies into the
20 Prevalence and Frequency of Men’s Pornography Use. *American Journal of Sexuality
21 Education*, 15(4), 502–529. <https://doi.org/10.1080/15546128.2020.1831676>
- 22 Nikkelen, S. W. C., van Oosten, J. M. F., & van den Borne, M. M. J. J. (2020). Sexuality
23 Education in the Digital Era: Intrinsic and Extrinsic Predictors of Online Sexual
24 Information Seeking Among Youth. *Journal of Sex Research*, 57(2), 189–199.
25 <https://doi.org/10.1080/00224499.2019.1612830>
- 26 Ogas, O., & Gaddam, S. (2011). *A billion wicked thoughts*. Penguin.
- 27 Peters, G.-J. Y. (2014). The alpha and the omega of scale reliability and validity: Why and how
28 to abandon Cronbach’s alpha and the route towards more comprehensive assessment of
29 scale quality. *European Health Psychologist*, 16(2), 56–69.
- 30 Pornhub. (2013). *Pornhub’s 2013 Year in Review*. <https://www.pornhub.com/insights/>
- 31 Pornhub. (2018). *Pornhub’s 2018 Year in Review*. <https://www.pornhub.com/insights>
- 32 Price, J., Patterson, R., Regnerus, M., & Walley, J. (2016). How much more XXX is generation
33 X consuming? Evidence of changing attitudes and behaviors related to pornography since

- 1 1973. *Journal of Sex Research*, 53(1), 12–20.
2 <https://doi.org/10.1080/00224499.2014.1003773>
- 3 Regnerus, M., Gordon, D., & Price, J. (2016). Documenting Pornography Use in America: A
4 Comparative Analysis of Methodological Approaches. *Journal of Sex Research*, 53(7),
5 873–881. <https://doi.org/10.1080/00224499.2015.1096886>
- 6 Sabina, C., Wolak, J., & Finkelhor, D. (2008). The Nature and Dynamics of Internet
7 Pornography Exposure for Youth. *CyberPsychology & Behavior*, 11(6), 691–693.
8 <https://doi.org/10.1089/cpb.2007.0179>
- 9 Scandurra, C., Mezza, F., Esposito, C., Vitelli, R., Maldonato, N. M., Bochicchio, V., Chiodi,
10 A., Giami, A., Valerio, P., & Amodeo, A. L. (2021). Online Sexual Activities in Italian
11 Older Adults: The Role of Gender, Sexual Orientation, and Permissiveness. *Sexuality
12 Research and Social Policy*. <https://doi.org/10.1007/s13178-021-00538-1>
- 13 Ševčíková, A., Blinky, L., Skarupova, K., Vasek, D., Škařupová, K., & Vašek, D. (2020).
14 Online Sex Addiction After 50: an Exploratory Study of Age-Related Vulnerability.
15 *International Journal of Mental Health and Addiction*.
16 <https://doi.org/https://doi.org/10.1007/s11469-019-00200-3>
- 17 Ševčíková, A., & Sedláková, T. (2020). The Role of Sexual Activity from the Perspective of
18 Older Adults: A Qualitative Study. *Archives of Sexual Behavior*, 49(3), 969–981.
19 <https://doi.org/10.1007/s10508-019-01617-6>
- 20 Ševčíková, A., Vašek, D., Blinky, L., Macháčková, H., & Ježek, S. (2020). Markers of Sexual
21 Life and Health in Association with Internet Use for Sexual Purposes in Czechs Aged 50
22 and Older. *Sexuality Research and Social Policy*. [https://doi.org/10.1007/s13178-020-
23 00463-9](https://doi.org/10.1007/s13178-020-00463-9)
- 24 Shaughnessy, K., Byers, E. S., Clowater, S. L., & Kalinowski, A. (2014). Self-appraisals of
25 arousal-oriented online sexual activities in university and community samples. *Archives of
26 Sexual Behavior*, 43(6), 1187–1197. <https://doi.org/10.1007/s10508-013-0115-z>
- 27 Shaughnessy, K., Byers, E. S., & Walsh, L. (2011). Online Sexual Activity Experience of
28 Heterosexual Students: Gender Similarities and Differences. *Archives of Sexual Behavior*,
29 40(2), 419–427.
- 30 Smith, J., & Baltes, P. B. (1990). Wisdom-Related Knowledge : Age / Cohort Differences in
31 Response to Life-Planning Problems. *Developmental Psychology*, 26(3), 494–505.
- 32 Smith, M. (2013). Youth Viewing Sexually Explicit Material Online: Addressing the Elephant
33 on the Screen. *Sexuality Research and Social Policy*, 10(1), 62–75.
34 <https://doi.org/10.1007/s13178-012-0103-4>

- 1 Studer, J., Marmet, S., Wicki, M., & Gmel, G. (2019). Cybersex use and problematic cybersex
2 use among young Swiss men: Associations with sociodemographic , sexual , and
3 psychological factors. *Journal of Behavioral Addictions*, 8(4), 794–803.
4 <https://doi.org/10.1556/2006.8.2019.69>
- 5 Tate, C. C., Ledbetter, J. N., & Youssef, C. P. (2013). A two-question method for assessing
6 gender categories in the social and medical sciences. *Journal of Sex Research*, 50(8), 767–
7 776. <https://doi.org/10.1080/00224499.2012.690110>
- 8 Timmerman, M. E., & Lorenzo-Seva, U. (2011). Dimensionality assessment of ordered
9 polytomous items with parallel analysis. *Psychological Methods*, 16(2), 209–220.
10 <https://doi.org/10.1037/a0023353>
- 11 Weber, M., Aufenanger, S., Dreier, M., Quiring, O., Reinecke, L., Wölfling, K., Müller, K. W.,
12 & Beutel, M. E. (2018). Gender Differences in Escapist Uses of Sexually Explicit Internet
13 Material: Results from a German Probability Sample. *Sexuality & Culture*, 22, 1171–1188.
14 <https://doi.org/10.1007/s12119-018-9518-2>
- 15 Wéry, A., & Billieux, J. (2016). Online sexual activities: An exploratory study of problematic
16 and non-problematic usage patterns in a sample of men. *Computers in Human Behavior*,
17 56, 257–266. <https://doi.org/10.1016/j.chb.2015.11.046>
- 18 Wéry, A., & Billieux, J. (2017). Problematic cybersex: Conceptualization, assessment, and
19 treatment. *Addictive Behaviors*, 64, 238–246. <https://doi.org/10.1016/j.addbeh.2015.11.007>
- 20 Wolak, J., Mitchell, K., & Finkelhor, D. (2007). Unwanted and wanted exposure to online
21 pornography in a national sample of youth internet users. *Pediatrics*, 119(2), 247–257.
22 <https://doi.org/10.1542/peds.2006-1891>
- 23 Wright, P. J. (2013). U.S. males and pornography, 1973-2010: Consumption, predictors,
24 correlates. *Journal of Sex Research*, 50(1), 60–71.
25 <https://doi.org/10.1080/00224499.2011.628132>
- 26 Wright, P. J., Bae, S., & Funk, M. (2013). United States women and pornography through four
27 decades: exposure, attitudes, behaviors, individual differences. *Archives of Sexual*
28 *Behavior*, 42(7), 1131–1144. <https://doi.org/10.1007/s10508-013-0116-y>

Highlights

- Few studies have explored differences in the use of the Internet for sexual purposes across the lifespan.
- We analyse the Online Sexual activity (OSA) of 8,040 individuals between 12-85 years old distributed into five age groups.
- OSA was highly prevalent across all the developmental stages (including people older than 60 years old)
- Differences according to the age in the use of the Internet for sexual purposes were small-to-moderate (i.e., smaller than expected).
- Gender was important when it came to understanding these minor age differences.