

**Concurrent and Longitudinal Associations between In-Person and Online Sexual
Behaviors and Sexual Subjectivity in Heterosexual, Cisgender, and Sexual and Gender
Minority Adolescents**

Abstract

Adolescents learn that they are sexual beings with choices, desires, and deserving of pleasure, which corresponds to sexual subjectivity. Sexual subjectivity evolves over time and through sexual experience. Past research has less investigated how online sexual behaviors (i.e., sexting and pornography use), especially among sexual and gender minorities, might contribute to the development of sexual subjectivity. Importantly, no study has explored the directionality of associations between sexual subjectivity and sexual behaviors. This prospective study examined the bidirectional associations between sexual behaviors and sexual subjectivity across gender and sexual identities. An autoregressive cross-lagged analysis with a multi-group approach among 3150 adolescents ($M_{ageT1}=15.5$, $SD_{age}=0.6$; $M_{ageT2}=16.4$, $SD=0.55$; 52.3% cisgender girls and 15.6% sexual minority adolescents at baseline/T1) revealed that sexual subjectivity was positively associated with oral/manual stimulation, sexual intercourse, and sexting one year later. Masturbation and pornography use were not significantly related to sexual subjectivity over time. No significant bidirectional association was observed. No gender and sexual orientation differences were observed in any of the associations. This work provides one of the most comprehensive examinations to date concerning the directional influences of sexual subjectivity and the range of sexual experiences comprising adolescents' sexual lives.

Keywords: Adolescents; Sexual subjectivity; Sexual behaviors; Online sexual behaviors; Sexual minority.

One of the most important developmental tasks during adolescence is the exploration of sexuality (Gagnon & Simon, 1973; Tolman, 2002). Adolescents are curious about the relational and sexual aspects of their lives, which in turn shape their sexual selves (Kotiuga et al., 2023; Tolman & McClelland, 2011). These developments enable adolescents to acquire insights into what it means to be a sexual being with concomitant choices, risks, and desires as well as the critical lesson that they are deserving of pleasure (Zimmer-Gembeck & French, 2016) – all of which corresponds to sexual subjectivity. Cross-sectional (e.g., Horne & Zimmer-Gembeck, 2005) and longitudinal (e.g., Hewitt-Stubbs et al., 2016) studies have shown that young women and men with sexual experience report greater sexual subjectivity. While the research on adolescents' sexual behaviors, even among sexual and gender minority youth (SGM), has grown in the last decade (e.g., Költő et al., 2024; Maheux, Zhou et al., 2020; Van Ouytsel et al., 2019a, 2020; Ybarra et al., 2016), there is a significant gap concerning how sexual exploration through online sexual behaviors (i.e., sexting and pornography use) may contribute to the development of sexual subjectivity in contemporary youth. These new online opportunities can play a role in the way teens define themselves as sexual beings (Stern, 2002), particularly for SGM youth (e.g., Böthe et al., 2020).

Given that greater sexual subjectivity can also facilitate sexual experimentation among youth (Zimmer-Gembeck & French, 2016), a guiding premise of this work is that there are a range of previously unexamined possible bidirectional associations between sexual behaviors and sexual subjectivity (Hewitt-Stubbs et al., 2016; Zimmer-Gembeck et al., 2011; Hensel et al., 2011). The aims of the current study were to investigate the prospective, bidirectional associations between in-person and online sexual behaviors (i.e., masturbation, oral and manual

stimulation, sexual activity with vaginal and/or anal penetration, sexting, and pornography use) and sexual subjectivity, considering potential gender and sexual orientation-based differences.

Sexual Subjectivity

Sexual subjectivity refers to the ability to see oneself as a sexual being, encompassing sexual thoughts, feelings, and bodily sensations, as well as the sense of agency to express one's sexual needs and ensure sexual safety and pleasure (Horne & Zimmer-Gembeck, 2006; Tolman, 2005). Key components include: sexual body-esteem, or positive feelings toward one's body (Horne & Zimmer-Gembeck, 2006); entitlement to sexual desire and pleasure, which involves beliefs about one's right to experience desire and pleasure, both individually and with a partner, including sexual self-efficacy (Zimmer-Gembeck & French, 2016); and sexual self-reflection, which refers to emotional and cognitive processing of one's sexual behaviors and attitudes (Zimmer-Gembeck et al., 2011).

Gender Differences

Past studies have shown that sexual subjectivity differs by gender and sexual orientation, but current findings are mixed. In cross-sectional and prospective studies involving adolescents and young adults aged 14 to 25 years, boys reported higher levels of sexual body-esteem, entitlement to self-pleasure, and sexual self-efficacy, whereas girls reported higher entitlement to sexual pleasure from a partner (Kotiuga et al., 2022; Hewitt-Stubs et al., 2016; Paquette et al., 2023). Some findings are inconsistent, as two Canadian studies found no significant gender differences regarding entitlement to self-pleasure and sexual self-efficacy (Kotiuga et al., 2022) or similar levels of sexual self-reflection (Paquette et al., 2023). No prior study examined sexual subjectivity among gender diverse teens (i.e., genderfluid, genderqueer, and non-binary). The cross-sectional designs limited documenting the evolution of sexual subjectivity over time.

Sexual Orientation Differences

Two studies among adolescents and emerging adults found no significant differences between HC and diverse sexual identities' sexual subjectivity levels (Paquette et al., 2023; Rivera et al., 2023). These results are surprising as two studies found that, compared to heterosexual women, sexual minority women felt more entitled to sexual pleasure from themselves and from their partner, were more self-efficacious in achieving sexual pleasure, and thought more about the sexual aspects of their lives (Boislard & Zimmer-Gembeck, 2011; Horne & Zimmer-Gembeck, 2006). However, not all findings align in this direction; for instance, one study has shown that sexual minority adolescents had lower sexual body esteem than heterosexual girls (Bragard & Fisher, 2024). Nevertheless, the majority of studies examining sexual subjectivity have been conducted with Australian late adolescents (aged 16 and over) or young adults (18 to 25 years old), which limits our knowledge of adolescents' sexual subjectivity, in particular, sexual and gender diverse (i.e., nonbinary) adolescents and boys.

Masturbation

Masturbation could help adolescents gain a better understanding of their body and sexual desires (Watson & McKee, 2013). It is more common than engaging in partnered sexual activities during adolescence especially among boys who report masturbating more often than girls (74% vs. 48%, respectively; Fortenberry et al., 2010). Masturbation may facilitate multiple aspects of sexual subjectivity, as research among women has shown that masturbation allows for the exploration of sexual desires (Fahs & Frank, 2014), pleasure, and empowerment (Bowman, 2014; Hogarth & Ingham, 2009). Young women who reported masturbating and having orgasms outside of penetrative sexual intercourse had higher levels of sexual subjectivity (Horne & Zimmer-Gembeck, 2005). Qualitative findings demonstrated that young women described a

multitude of feelings related to masturbation, such as pleasure, awkwardness, and guilt, while also emphasizing its role in fostering self-knowledge, control, and physical pleasure (Foust et al., 2022). However, the association between sexual subjectivity and masturbation has not been investigated.

Oral and Manual Stimulation

Adolescents are more likely to engage in oral sex before engaging in intercourse with penetration (Beckmeyer et al., 2021; Halpern-Felsher et al., 2005). In a study among lesbian, gay, and bisexual participants about the physically intimate behaviors that they included, and engaged in, in their definitions of sex, manual-genital and oral-genital stimulation were the two most popular behaviors (Sewell et al., 2017). Studies of US adolescents showed that 20% to 55% had previously engaged in oral stimulation (Fortenberry et al., 2010; Lindberg et al., 2008; Mosher et al., 2002). As for gender differences in providing and receiving manual as well as oral stimulation, in general, boys reported receiving it more often than girls (Fortenberry et al., 2010; Vannier & O'Sullivan, 2012; Wood et al., 2016).

One cross-sectional study examined the association between oral stimulation and sexual subjectivity among adult women who reported having had a male partner the last time they had sex. Women's entitlement to sexual pleasure from partners predicting verbal consent was a function of increased self-efficacy in achieving pleasure. If a woman feels that she can both receive and provide pleasure (entitlement to pleasure from partner), she will be more likely to request and receive oral stimulation (self-efficacy in achieving sexual pleasure; Satinsky & Jozkowski, 2015). Although not focused on sexual subjectivity, research shows that adolescents report fewer negative feelings, such as guilt or low self-worth, after oral sex compared to vaginal sex (Halpern-Felsher et al., 2005). However, girls may be more vulnerable to negative emotional

and social outcomes, such as reduced intimacy or physical satisfaction (Brady & Halpern-Felsher, 2007; Lefkowitz et al., 2016), reflecting persistent sexual double standards (e.g., Kreager et al., 2016). However, despite the centrality of these behaviors in adolescent sexual experimentation, the association between oral and manual stimulation and sexual subjectivity has never been studied among this group.

Sexual Activity with Vaginal and/or Anal Penetration

Sexual intercourse plays a complex role in the formation and maintenance of dyadic relationships (Fortenberry, 2013). According to a Health Survey in Québec, Canada, conducted among 62,227 high school students aged 14 and over, approximately 30% had at least one sexual activity with vaginal penetration, and 6% had at least one anal encounter. The survey also revealed that proportionally more adolescent girls than adolescent boys had at least one vaginal sexual encounter (28% vs 26%), while it was not significantly different for anal sexual encounters (6.1%% vs 6.3%; Québec Statistical Institute, 2018).

Sexual subjectivity progresses with sexual experience and thus cross-sectional (Horne & Zimmer-Gembeck, 2005) and longitudinal studies (Hewitt-Stubbs et al., 2016; Zimmer-Gembeck et al., 2011) have examined the association between sexual experience (i.e., romantic kissing [tongue/French], sexual fantasizing, self-masturbation, light touching [above the waist], heavy touching [below the waist], oral sex [giving and receiving], vaginal penetration) and sexual subjectivity. These studies divided their participants into five groups according to their history of sexual experiences: (1) participants with no sexual experience; (2) participants with sexual experiences but without having had penetrative sexual intercourse; (3) participants who had their first penetrative sexual intercourse at age 17 or older (normative); (4) participants who had penetrative sexual intercourse starting at age 16 (intermediate); and (5) participants who had

penetrative sexual intercourse at age 15 or younger (early). Overall, findings showed that young women and men (aged between 16 and 25) with sexual experience (i.e., who had penetrative sexual intercourse) had greater sexual subjectivity than their inexperienced counterparts. However, these studies grouped individuals based on overall sexual experience and age at first vaginal intercourse (i.e., participants with penetrative sexual intercourse aged 17 and over), without examining how different sexual behaviors might be associated with sexual subjectivity. In addition, when examining the association between sexual experience and sexual self-concept (i.e., the general understanding that each individual has their own sexual self; Deutsch et al., 2014), a four-year study among adolescent girls revealed that their sexual experience had a bidirectional association with their sexual self-concept (Hensel et al., 2011). Thus, adolescent girls' sexual self-concept became more positive over time in response to an increase in sexual behavior, and enhancements in sexual self-concept also foreshadowed increased sexual behaviors over time (Hensel et al., 2011). However, this study only assessed vaginal penetrative sex to represent sexual experience.

Sexting

Sexting and pornography use are prevalent among adolescents (e.g., Böthe et al., 2020; Madigan et al., 2018), yet past studies on sexual subjectivity did not examine online sexual behaviors. Although sexting was initially conceptualized as an online risk behavior, it is becoming a widespread form of exploration and expression of sexuality (e.g., Burić et al., 2020; Maheux, Evans, et al., 2020). It is defined as the electronic exchange of sexually suggestive text messages, images, and videos of its creator naked or semi-nude (Mori et al., 2020; Ringrose et al., 2013). According to two meta-analyses, the prevalence of sexting (i.e., sending and receiving a sext) ranged from 0.9% to 60.0% among adolescents aged 11-18 (Barrense-Dias et al., 2017;

Mori et al., 2021). As for gender differences, some studies have either reported no significant differences in the frequency of sexting (Brinkley et al., 2017; Madigan et al., 2018), a higher frequency for boys (e.g., Dodaj et al., 2020; Van Ouytsel et al., 2019b) or a higher frequency for girls (e.g., Burén & Lunde, 2018; Reed et al., 2020), whereas SGM adolescents tend to engage in more sexting than their HC counterparts (e.g., Needham, 2021; Ojeda et al., 2020).

To our knowledge, only one cross-sectional study specifically examined the association between sexting frequency and sexual subjectivity. Among adolescent girls, sexual subjectivity was a protective factor against negative sexting correlates, and was associated with more positive sexting outcomes (Bragard & Fisher, 2022). However, this study was conducted with cisgender adolescent girls, which limits our knowledge of boys and SGM adolescents.

Pornography Use

Approximately 50% to 93% of adolescents have indicated that they had viewed pornography in their lifetime, and on average, they begin doing so between the ages of 11 and 13 years, according to data from nationally representative and large-scale studies from the US, Canada, and Europe (Böthe et al., 2020; Donevan et al., 2022; Wright & Stulhofer, 2019; Wright et al., 2020). While no significant differences were observed in SGM and HC boys' pornography use frequency, as both of these groups used pornography weekly or more often, girls overall reported lower usage (Böthe et al. 2019; 2020). Moreover, SGM girls tended to watch pornography more frequently (i.e., once a month) than HC girls (i.e., less than once a month; Böthe et al. 2020). For SGM girls, pornography could be a source of information about different sexual activities but also as a means of exploring their sexual and gender identities (e.g., Böthe et al., 2019, 2020; Bradford et al., 2019). Unfortunately, no study has investigated the association between pornography use and sexual subjectivity.

The Current Study

The current study aimed to examine the prospective, bidirectional associations between in-person and online sexual behaviors (i.e., masturbation, oral and manual stimulation, sexual activity with vaginal and/or anal penetration, sexting, and pornography use) and sexual subjectivity, while considering potential gender and sexual orientation-based differences. It was hypothesized that all in-person and online sexual behaviors would predict greater sexual subjectivity one year later. We examined whether sexual subjectivity would predict in-person and online sexual behaviors in an exploratory manner. Gender and sexual orientation-based differences in these associations were also examined in an exploratory manner. We controlled for alcohol and substance use as prior studies suggest that they are correlates of sexual behavior in adolescence (e.g., Dodaj et al., 2020; Ševčíková, 2016; Shorey et al., 2019). Given that part of data collection took place during the COVID-19 pandemic, we also controlled for whether participants responded to the Time 1 survey before (i.e., March 2020) or during the pandemic.

Method

Participants and Procedure

This study is part of a larger ongoing Canadian longitudinal project on adolescents' sexual wellbeing, and the data used in the present study were collected in the second and third waves. As several variables (e.g., sexual subjectivity) were introduced during the second wave of the data collection, only the second and third waves of the project were used in the current study. Data collection took place between November 2019 and March 2021 for the second wave (Time 1 for the present study) and October 2020 and March 2022 for the third wave (Time 2). Both waves were collected during the COVID-19 pandemic, which led to attrition of participants at T1 of the present study due to school closures. Thus, a total of 2001 participants were included in

the sample at T1 ($M_{\text{age}} = 15.46$ years, $SD = 0.60$, range = 14 to 18, grade 10) and 2800 participants were included at T2 ($M_{\text{age}} = 16.41$ years, $SD = 0.55$, range = 15 to 18, grade 11). The final analysis included data from 3150 adolescents, who had either only responded to T1, T2, or both times (see Figure 1 for more details on the sample). Detailed sociodemographic information is presented in Table 1.

Participants were recruited through their high schools from rural and metropolitan areas. Schools presenting White and multi-ethnic populations as well as different socioeconomic backgrounds were approached to ensure sample diversity. Of 50 schools approached, 23 schools accepted to be part of the study, 17 did not respond to our emails or calls and 10 refused to participate. The high workload of teachers and the presence of other ongoing research projects within the school might have explained the refusals. Each class was visited by two trained research assistants who presented the aims of the study and supervised the completion of the online self-report surveys. Participants who were eligible provided their own informed consent ($n_{\text{acceptance}T1} = 2077$; $n_{\text{acceptance}T2} = 2892$; $n_{\text{refusal}T1} = 25$; $n_{\text{refusal}T2} = 40$) and completed the survey through a secure platform, *Qualtrics Research Suite*¹. The survey took approximately 45 minutes to complete on an electronic tablet provided to each participant by our team.

During COVID-19 pandemic school closures (March to June 2020), students from ten of the schools ($n = 454$) completed the measures at home via an online survey, with a research assistant's contact information provided for support. To maintain confidentiality, no personal information (e.g., name or email address) was linked to participants' survey responses, which is similar to the in-class data collection. After the school re-openings in the fall of 2020

¹ In (masked for review), adolescents can provide their own informed consent from age 14. Not relying on parental consent can ensure the safety of students involved in the study, and can prevent sampling biases that may distort the results.

(recruitment period from September to March 2022), all participating high schools resumed in-class data collection, with additional COVID-19 safety measures in place.

At each time point, three attention-testing questions were distributed within the survey to test whether participants were attentive while answering the survey. Their data were considered invalid if they were less than fourteen years old ($n = 4$), had inconsistent answers through the survey ($n_{inconsistentT1} = 2$; $n_{inconsistentT2} = 1$), or failed two out of three of these questions ($n_{failedquestionsT1} = 45$; $n_{failedquestionsT2} = 51$; Thomas & Clifford, 2017). Participants were given a list of community and institutional psychological support resources and were also compensated with a \$10 gift card. Ethical approval was granted by the ethics committees of the two related universities and school boards, and the study was carried out under the Declaration of Helsinki.

Measures

Participants were offered the English and French versions of the survey and they could choose the version they preferred. The measures were translated by our laboratory using the “back-translation” method (Vallerand, 1989) if they were not already available in French. Also, every term was verified by native-languages psychologists and sex researchers. For example, every term related to gender and sexual orientation was translated and adapted to each language.

Sociodemographic Characteristics

Sociodemographic characteristics (i.e., age, sex assigned at birth, gender identity, etc.) were collected using investigator-derived questions, based on best practices (e.g., Bauer et al., 2017).

Gender Identity Status, Trans Status and Sexual Orientation

Participants reported their gender identity status with one item following prior recommendations (Bauer et al., 2017): “What gender or gender identity do you identify with?”

(answer options: *men, women, indigenous or other cultural gender minority identity [e.g., two-spirit], nonbinary, gender fluid or something else [e.g., genderqueer], other [with specification]*). Participants responded to one item regarding their transgender status: “Some people are trans (including transgender, transsexual, persons having undergone a transition/gender-affirming process, etc.). Are you a trans person?” (answer options: *I am not a trans person; I am a trans man; I am a trans woman; I am a nonbinary trans person; I am questioning my gender identity; I don’t know what it means; other*). For data analyses, three groups were created based on participants’ reported sex assigned at birth, gender identity and trans status: cisgender boys, cisgender girls, and gender diverse adolescents. Adolescents who reported the same sex assigned at birth and gender identity as well as “not identifying as a trans person” or “don’t know what trans means” were categorized as cisgender boys and girls. Adolescents who reported being “trans” (i.e., trans men, women, or nonbinary), their gender being “nonbinary, gender fluid, or other (e.g., genderqueer)”, identifying with “indigenous cultural gender identity or other cultural gender identities” or “other”, and who indicated “questioning their gender identity” were categorized as gender diverse adolescents. Participants reported on their sexual orientation with one item following prior recommendations (Weinrich, 2014): “People describe their sexual orientation in different ways. Which expression best describes your current sexual orientation? If no expression describes you, check “None of the above” and write the answer that describes you personally” (answer options: *heterosexual; gay/lesbian; heteroflexible; homoflexible; bisexual; asexual; pansexual; queer; I do not know yet or I am currently questioning my sexual orientation; none of the above; I don’t want to answer; other [with specification]*). Participants who indicated that they did not want to answer had their

data recoded to be missing. For data analyses, two groups were formed: heterosexual and sexual minority.

Alcohol and Substance Use Frequency

Lifetime alcohol and drug use were evaluated using a single *yes/no* question created by the research team: “Have you ever consumed alcohol or drugs?”. Adolescents who reported having ever used alcohol or drugs were assessed with the following question: “During the last 12 months, how many times did you consume these products?” (answer options: *alcohol; cannabis [pot, marijuana, hashish, oil, etc.]; other drugs [ecstasy, amphetamines, speed, cocaine, acid, etc.]*). Participants indicated their responses concerning each substance on a 7-point scale ranging from “*Never consumed*” (0) to “*Every day*” (6; Landry et al., 2004). We computed a new substance use frequency score based on the lifetime and frequency answers. We recoded the responses of the adolescents who indicated that they had not consumed before (i.e., answering “*no*” to the lifetime alcohol and drug use question; $n_{T1} = 510$, 25.5%; $n_{T2} = 496$, 17.7%;) to represent “*Never consumed*” in the frequency question. We used the new substance use frequency variable in further analyses.

Timing of Survey Completion regarding COVID-19

One item was created to determine whether participants completed the survey before the COVID-19 pandemic (i.e., before March 11, 2020²; coded as 0; $n = 1204$, 58.7%) or during the pandemic (from March 11, 2020; coded as 1; $n = 846$, 41.3%) based on the survey completion date. We only created this new variable for the second wave of the study because it took place during the school closures. During the third wave, the schools had reopened and the in-class data collection protocol could be followed.

² The start date of the COVID-19 pandemic was identified as March 11, 2020, as this is when the World Health Organization declared the COVID-19 viral disease a pandemic (Infection Prevention and Control Canada, 2023).

Masturbation Frequency

Two items were used to measure masturbation frequency. Before answering any masturbation-related questions, participants read the following definition created by the research team: “For the following questions, “masturbation” refers to seeking sexual pleasure by self-stimulation of the genitals (i.e., by oneself), either by manual caresses, sex toys, rubbing, pressure or any other technique. Masturbation may or may not lead to an orgasm.” The first item evaluated the presence of masturbation: “Do you masturbate?” (answer options: *yes/no*). For those who had masturbated before, we displayed a second question about masturbation frequency: “On average, over the past three months, how often did you masturbate?” This question was rated on an 8-point Likert scale ranging from “*Not once in three months*” (1) to “*More than once a day*” (8). We computed a new masturbation frequency score based on the lifetime and frequency of masturbation answers. We recoded the responses of the adolescents who indicated that they had not masturbated before (i.e., answering “*no*” to the lifetime masturbation question; $n_{T1} = 562$, 28.3%; $n_{T2} = 624$, 22.4%) to represent “*Not once in the three months*” in the masturbation frequency question. We used the new masturbation frequency variable in further analyses.

Oral and Manual Stimulation

Oral and manual stimulation were measured with five items developed by our research team. The first item evaluated dichotomously the history of oral or manual sexual activity (i.e., “With your consent, have you ever exchanged sexual activity [manual or oral] with someone?”). The next two items assessed the frequency to which a sexual partner manually and orally stimulated the participant's genitals (e.g., “When you have [have had] sexual activities with a partner [with your consent], how often did your partner manually stimulate your genitals?”). The

final two items evaluated the frequency to which the participant had stimulated orally and manually their sexual partner's genitals (e.g., "When you have [have had] sexual activities with a partner [with your consent], how often did you orally stimulate his or her genitals?"). These items were rated on a 5-point Likert scale ranging from "*Always*" (0) to "*Never*" (4). In this study, the correlation between the oral and manual items was $r = 0.84$ at T1 and $r = 0.86$ at T2. Based on the first question (i.e., lifetime experience), we computed new oral and manual sexual activity scores. We recoded the responses of those adolescents who indicated that they had not engaged in these sexual activities before (i.e., answering "*no*" to the lifetime experience question; $n_{T1} = 1140$, 57.1%; $n_{T2} = 1308$, 46.9%) to represent "*Never*" in the frequency questions. Then, we computed the oral and manual sexual activity scores in one variable that we used in subsequent analyses.

Sexual Activity with Vaginal and/or Anal Penetration

Two items were used to assess sexual activity with vaginal and/or anal penetration (Québec Statistical Institute, 2018). Participants were provided with the following definition before answering the items: "sexual intercourse with penetration includes the penetration of the vagina or the anus with the penis, fingers, sex toy, etc.". The first item evaluated the presence or absence of sexual activity: "Have you ever had sex with vaginal or anal penetration, with your consent?" (answer options: *yes/no*). The second item was answered by those who had engaged in sexual activities with penetration before. They answered a question about the frequency of this activity: "Approximately how many sexual activities with penetration did you have in your life?" This question was rated on a 5-point Likert scale ranging from "*Less than 5*" (1) to "*More than 100*" (5). We computed a new score based on the lifetime sexual activities with penetration question and recoded the responses of those adolescents who indicated that they had not engaged

in this activity before (i.e., answering “no”; $n_{T1} = 1374$, 68.3%; $n_{T2} = 1603$, 57.5%) to represent “0” in the frequency of sexual activities with penetration question. We used the new frequency variable in further analyses.

Sexting

Sexting frequency was evaluated via two questions used in a previous study (Drouin et al., 2013): “In the last year, how often did you engage in the following: 1) Sent sex texts (text messages with sexual content), 2) Sent sex pictures or videos”. These two questions were rated on a 6-point Likert scale ranging from “Never” (1) to “Very Frequently” (6). In this study, the correlation between the two items was $r = 0.76$ at T1 and $r = 0.77$ at T2. We computed a new score based on the frequency of sending texts and sending pictures or videos and used the new frequency variable in subsequent analyses.

Pornography Use

Pornography use was assessed with two items based on questions used in past studies (e.g., Carroll et al., 2017; Kohut et al., 2018; Maas et al., 2018). Before answering the pornography-related questions, participants were provided the following definition (Kohut et al., 2018): “For the following questions, the term ‘pornography’ is used to refer to intentionally looking at or listening to (i) pictures or videos of nude individuals, (ii) pictures or videos in which people are having sexual activities.” The first item evaluated the presence or absence of pornography use: “Have you ever watched pornography in your life” (answer options: 1 = yes, 0 = no). The second item was answered by participants who indicated having viewed pornography and were asked about the frequency of use in the last three months (“On average in the last three months, how many times did you watch pornography?”) on an 8-point scale from “Never” (0) to “Many times per day” (7). We computed a new pornography use frequency variable based on

the responses to the lifetime pornography use and frequency of pornography use variables.

Adolescents who indicated that they had not used pornography previously (i.e., answering “no” to the lifetime pornography use question; $n_{T1} = 550$, 27.8%; $n_{T2} = 605$, 21.9%) had their responses recoded to “Never” in the pornography use frequency question. In further analyses, this new pornography frequency variable was used.

Sexual Subjectivity

This construct was assessed using the Short Sexual Subjectivity Inventory (SSSI-11; Paquette et al., 2023). This scale measures sexual desire and pleasure (i.e., entitlement of self-pleasure [2 items], entitlement to sexual desire and pleasure with a partner [3 items], and sexual self-efficacy [3 items]) and sexual self-reflection [3 items]). This measure includes 11 items (e.g., “I would not hesitate to ask for what I want sexually from a romantic partner”) rated on a five-point Likert scale ranging from “*Strongly disagree*” (1) to “*Strongly agree*” (8) with three reverse-coded items. A higher score indicates higher sexual subjectivity. The SSSI-11 demonstrated strong psychometric properties among HC and SGM adolescents and operated similarly across genders (cis and trans boys, cis and trans girls), sexual orientations (heterosexual and sexual minority), and languages (French and English; Paquette et al., 2023). In the present sample, the scale showed good reliability ($\alpha_{T1} = 0.80$; $\alpha_{T2} = 0.79$; $\omega_{T1} = 0.77$; $\omega_{T2} = 0.77$).

Statistical Analysis

Descriptive statistics (means, standard deviations, skewness, and kurtosis values), correlations between the examined variables, Cronbach’s alphas and McDonald’s omegas were examined using SPSS 29. As using only Cronbach’s alpha coefficients may be less reliable (McNeish, 2018; Sijtsma, 2009), reliability was assessed using two indicators (i.e., Cronbach’s alpha and McDonald’s omega).

Mplus 8.11 was used for cross-lagged panel analyses to examine the associations between in-person and online sexual behaviors and sexual subjectivity. All analyses were conducted using a multi-group approach, with two groups for gender (cisgender boys vs cisgender girls) and two groups for sexual orientation (heterosexual vs sexual minority). Given the small sample size in the gender minority group, we could not compare their group to the cisgender boys' and cisgender girls' groups statistically. However, we provided descriptive statistics for them (see Table 2 and Supplementary Table 1 for more details). The robust maximum-likelihood (MLR) estimator was used for the analyses. This estimator can provide fit indices and standard errors that are robust to non-normal distributions. Also, commonly used goodness-of-fit indices were examined to assess the acceptability of the models: the χ^2 values, Comparative Fit Index (CFI; ≥ 0.90 for acceptable; ≥ 0.95 for excellent), Tucker–Lewis's index (TLI; ≥ 0.90 for acceptable; ≥ 0.95 for excellent), and Root-Mean-Square Error of Approximation (RMSEA; ≤ 0.08 for acceptable; ≤ 0.06 for excellent) with 90% confidence intervals (Browne & Cudeck, 1993; Marsh et al., 2005; Schermelleh-Engel et al., 2003). The number of participants completing the scales at each timepoint are reported in Table 3. Data from adolescents who completed only T1, T2 or both were included in the analyses as well as participants who indicated not being sexually active (i.e., recoded as 0 or *Never* in the frequency question). Following previous recommendations, missing data were handled with the Full Information Maximum Likelihood method (Newman, 2014; Lang & Little, 2018).

First, the associations between in-person and online sexual behaviors and sexual subjectivity were examined with a fully saturated model in the total sample, without the control variables (Model 1). Next, the control variables (i.e., alcohol/substance use and timing of survey completion regarding COVID-19) were added to the model (Model 2). Multi-group analysis was

then used to check whether the model varied across gender (i.e., cisgender boys vs cisgender girls; Model 3). This difference test was pushed forward and the path coefficients between in-person and online sexual behaviors and sexual subjectivity were constrained to be equal across the groups (Model 4). These two last steps were also used to examine whether the model varied across sexual orientation (i.e., heterosexual vs sexual minority adolescents; Model 5 and 6). Changes in chi-square values, CFI, TLI and RMSEA values were inspected when comparing Models 3 and 4 as well as Models 5 and 6 (i.e., unconstrained and constrained models, respectively). The constrained and unconstrained models were shown to differ significantly (i.e., whether the paths differed significantly between cisgender boys and cisgender girls as well as heterosexual and sexual minority adolescents) when there was a significant corrected chi-square difference test, significant decreases in CFI and TLI ($\Delta\text{CFI} \leq 0.010$; $\Delta\text{TLI} \leq 0.010$), and significant increases in RMSEA ($\Delta\text{RMSEA} \leq 0.015$; Böhne et al., 2021a; Chen, 2007; Cheung & Rensvold, 2002).

Results

Descriptive Statistics and Correlations

Descriptive data (see Table 2) and correlations between the examined variables are presented in Table 3. Pearson correlations showed that all associations between in-person and online sexual behaviors and sexual subjectivity were significant, though the magnitude of the associations varied (r ranging between .18 to .40, $p < .001$; Table 3). As for the control variables, substance use frequency had positive associations with sexual subjectivity (r ranging from .24 to .28, $p < .001$) and timing of survey completion regarding COVID-19 (r ranging from .07 to .09, $p < .001$).

Associations between In-Person and Online Sexual Behaviors and Sexual Subjectivity

All estimated models showed excellent fit, see Table 4 for details. When examining whether the associations between in-person and online sexual behaviors and sexual subjectivity differed across gender (i.e., cisgender boys and cisgender girls), the constrained model (Model 4) was compared to the unconstrained one (Model 3). Changes in model fit indices remained in the acceptable range ($\Delta\text{CFI} = 0.000$; $\Delta\text{TLI} = 0.000$; $\text{RMSEA} = +0.005$). The corrected chi-square difference test was not significant ($\Delta\chi^2 = 57.60$, $p = 0.42$). These results suggest that associations between in-person and online sexual behaviors and sexual subjectivity did not differ significantly across cisgender boys and cisgender girls.

As for sexual orientation, the constrained model (Model 6) was compared to the unconstrained one (Model 5) to examine whether the associations between in-person and online sexual behaviors and sexual subjectivity differed across heterosexual and sexual minority adolescents. Changes in model fit indices remained in the acceptable range ($\Delta\text{CFI} = 0.000$; $\Delta\text{TLI} = 0.00$; $\text{RMSEA} = +0.001$). The corrected chi-square difference test was not significant ($\Delta\chi^2 = 56.13$, $p = 0.47$). These results suggest that associations between in-person and online sexual behaviors and sexual subjectivity did not differ significantly across heterosexual and sexual minority adolescents.

Therefore, following the principle of parsimony, results of Model 2 are reported in Table 4 and depicted in Figure 2 (see also Table 5 for all of the associations). When considering the results of this multivariate model (i.e., where the shared variance between the predictors is considered), greater T1 sexual subjectivity was associated with a higher frequency of oral and manual stimulation ($\beta = 0.09$, 95% CI = [0.06, 0.13], $p < 0.001$), higher frequency of sexual activity with vaginal and/or anal penetration ($\beta = 0.06$, 95% CI = [0.03, 0.10], $p < 0.001$), higher frequency of sexting ($\beta = 0.11$, 95% CI = [0.06, 0.15], $p < 0.001$), and a higher frequency of

substance use ($\beta = 0.04$, 95% CI = [0.01, 0.08], $p < 0.001$) at T2. Masturbation ($\beta = 0.03$, 95% CI = [-0.01, 0.07], $p = 0.09$) and pornography use ($\beta = -0.01$, 95% CI = [-0.04, 0.03], $p = 0.766$) were not significantly related to sexual subjectivity at T2 and no significant bidirectional association was observed.

Discussion

Sexual exploration, through a variety of in-person and online sexual behaviors, may promote greater sexual subjectivity among adolescents (e.g., Hewitt-Stubbs et al., 2016). At the same time, greater sexual subjectivity can facilitate youths' sexual experimentation (Zimmer-Gembeck & French, 2016). The present study examined the prospective, bidirectional associations between in-person and online sexual behaviors and sexual subjectivity, considering potential gender and sexual orientation-based differences, which had received limited attention in the past. In the multivariate model, where the shared variance of the predictors was considered, there were no significant prospective, bidirectional associations between any sexual behaviors and sexual subjectivity. However, sexual subjectivity at baseline was positively associated with oral and manual stimulation, sexual activity with vaginal and/or anal penetration, and sexting one year later.

The associations between in-person and online sexual behaviors and sexual subjectivity did not differ significantly across cisgender boys and cisgender girls nor across heterosexual and sexual minority adolescents. This study provides some of the most comprehensive findings to date concerning the directional influences between sexual subjectivity and the range of sexual interactions comprising contemporary adolescents' sexual lives.

Associations between Sexual Subjectivity and In-Person and Online Sexual Behaviors

An important contribution of the present findings was to show that greater sexual

subjectivity at baseline was associated with oral and manual stimulation, sexual activity with vaginal and/or anal penetration, and sexting one year later, when all these sexual activities were considered in one model. Being able to reflect on oneself as a sexual being deserving of sexual pleasure seems to propel adolescents' self-confidence and openness towards new sexual experiences with an intimate partner. While most studies have shown that having more sexual experience was linked to greater sexual subjectivity, two studies have demonstrated that having higher levels of sexual subjectivity could be associated with more requesting and receiving oral stimulation (Satinsky & Jozkowski, 2015) as well as experiencing more positive sexting consequences and less chances of engaging in undesired sexual acts (Bragard & Fisher, 2022). Thus, evidence suggests that possessing a strong sense of sexual subjectivity may help individuals feel entitled to assert themselves, voice their needs in the contexts of sexual encounters, and reach pleasure during sexual activities (e.g., Satinsky & Jozkowski, 2014). Parallel to other work on sexual self-concept (Hensel et al., 2011; O'Sullivan et al., 2007), results suggest that sexual subjectivity evolves in a way whereby experiences both modify and reinforce how individuals view and experience themselves as sexual beings. Findings also align with the positive sexual development framework that acknowledges the importance of consensual and healthy sexual experiences during adolescence (Harden, 2014; Tolman & McClelland, 2011).

Moreover, while the bivariate correlations between sexual subjectivity, masturbation frequency, and pornography use were significant, the multivariate model revealed no significant associations once all variables were considered simultaneously. Adolescent girls' and women's masturbation practices are often depicted as shameful, abnormal, or non-existent (Kaestle & Allen, 2011), while adolescent boys and men are typically expected to be comfortable with masturbation, due to its prevalence and framing as a normal part of development (Galatzer-Levy,

2012; Kaestle & Allen, 2011). However, a study of 149 Black cisgender men, aged 25 to 35, revealed that many received negative messages about masturbation, including views that it is shameful, sinful, or a sign of inadequacy (Hargons et al., 2024). Although they also encountered positive (empowering, normal, and pleasure-oriented) and neutral (viewed as having both pros and cons) messages, this suggests that attitudes towards masturbation can complicate adolescents' experiences and self-reflections as sexual beings. Further research is needed to explore the association between perceptions of masturbation, the behavior itself, and its association with sexual subjectivity among adolescents, particularly as they learn about it through media, religious institutions, schools, family, and peers (Christensen et al., 2017; Endendijk et al., 2022).

Unlike the other sexual behaviors in this study, watching pornography is quite a passive behavior, but it can be accompanied by masturbation (Böthe et al., 2020; Kotiuga et al., 2022). It is also possible that other variables related to pornography use may relate to sexual subjectivity, as the context of pornography use (e.g., pornography use motivations) may play an essential role in favorable and less optimal outcomes (Böthe et al., 2021b, 2021c, 2022). Indeed, viewing pornography for sexual pleasure (i.e., to increase sexual arousal or help masturbation) may influence sexual subjectivity differently than watching pornography for emotional distraction and suppression (i.e., to cope with negative emotions; e.g., Böthe et al., 2021b, 2022).

Associations between In-Person and Online Sexual Behaviors and Sexual Subjectivity

In the multivariate model, sexual behaviors assessed at baseline (i.e., masturbation, oral and manual stimulation, sexual activity with vaginal and/or anal penetration, sexting, and pornography use) were not associated with sexual subjectivity one year later. Previous studies have shown a positive association between sexual experience and sexual subjectivity (e.g.,

Hewitt-Stubbs et al., 2016; Horne & Zimmer-Gembeck, 2005). However, these studies examined having sexual experience in general (i.e., romantic kissing [tongue/French], sexual fantasizing, self-masturbation, light touching [above the waist], heavy touching [below the waist], oral sex [giving and receiving], vaginal penetration) among young women and men aged between the ages of 16 and 25 (e.g., Hewitt-Stubbs et al., 2016; Horne & Zimmer-Gembeck, 2005; Zimmer-Gembeck et al., 2011). Past work did not examine the association between specific sexual behaviors and sexual subjectivity simultaneously. Furthermore, participants in the current study were adolescents aged 15 to 16 years who were beginning to explore their sexuality. As they gain experience, youth will develop a greater understanding of and confidence in their bodies and desires. They will also learn to trust each other and communicate their sexual preferences to their partners (Widman et al., 2014). These specific behaviors (i.e., masturbation, oral and manual stimulation, sexual activity with vaginal and/or anal penetration, sexting, and pornography use) and the direction of the associations may become more pronounced later in adolescence and emerging adulthood, during further exploration of their sexuality.

Gender and Sexual Orientation Differences

Gender and sexual orientation did not play a role in any of the associations. Hence, the current results did not support the prediction that the association would differ according to gender and sexual orientation (e.g., Boislard & Zimmer-Gembeck, 2011; Horne & Zimmer-Gembeck, 2006; Zimmer-Gembeck & French, 2016). The associations between these variables might manifest similarly across all adolescents. Sexual exploration during adolescence is part of a normative developmental process that is necessary for both psychosocial well-being and future adult sexual health (Brooks-Gunn & Paikoff, 1993; Diamond, 2006). Although initially surprising, this result appears to reflect the developmental stage of the study participants,

whereby adolescents aged 15 to 16 are gradually introduced to sexuality, both individually and with a partner. They are learning that they are sexual beings with choices, preferences, desires, and that they deserve pleasure (Zimmer-Gembeck & French, 2016), regardless of their gender and sexual orientation (Paquette et al., 2023; Rivera et al., 2023). This initial stage of sexual exploration, which continues throughout life, has the potential to create equality, regardless of gender identity and sexual orientation (Rivera et al., 2023). It is also possible that no significant differences exist when gender or sexual orientation are considered separately, but differences might emerge when both factors are examined simultaneously. For instance, sexual minority girls may feel a greater sense of entitlement to sexual pleasure, both from themselves and their partners, and may report higher self-efficacy in achieving sexual pleasure (Horne & Zimmer-Gembeck, 2006; Boislard & Zimmer-Gembeck, 2011). However, this possibility could not be explored in the current study, as the sample sizes for gender by sexual orientation subgroups were too small for meaningful analyses (e.g., pansexual cisgender girls, pansexual gender-diverse adolescents, etc.). Hence, collapsing across sexual minority identities may have obscured more nuanced findings; future studies should investigate between-group differences among sexual minority participants.

Strengths, Limitations, and Future Directions

This study examined the prospective, bidirectional associations between sexual subjectivity and in-person and online sexual behaviors among adolescents considering potential gender and sexual orientation-based differences. The age of participants (i.e., 15–16 years), their providing of their own informed consent, and the large sample are strengths of the study, as previous studies have been conducted with late adolescents (aged 16 and over) or young adults (18 to 25 years). Likewise, this study included a less frequently studied population in sexual

subjectivity and sexual behavior research, namely sexual minority adolescents, despite previous studies suggesting that these variables vary according to sexual orientation (e.g., Boislard & Zimmer-Gembeck, 2011; Bőthe et al., 2020; Fortenberry et al., 2010). Nevertheless, this study has some limitations. Pandemic-related restrictions may have reduced opportunities for in-person sexual contact, potentially affecting reported frequencies of adolescent sexual behavior. The effect sizes were relatively small, which indicates that other variables may play a role in the associations between sexual subjectivity and sexual behaviors (e.g., trauma, attachment, culture, self-esteem, body dissatisfaction). Furthermore, moderate to high correlations were observed among our sexual activity predictors. The use of the multivariate model provided us with the opportunity to estimate the unique contribution of each sexual activity while accounting for shared variance between the predictors. Consequently, it is possible that two predictors with significant bivariate associations may show non-significant unique contributions in a multivariate model due to overlapping explanatory power. This interpretation aligns with our study's aim to understand how different sexual behaviors relate to sexual subjectivity when considered together, rather than in isolation, which often better reflects the unique contributions of each predictor within the context of the included variables. Moreover, participants completed self-report measures, which may involve some biases (e.g., recall bias or under- or over-reporting; Štulhofer et al., 2021). Similarly, the sexual behaviors measured in this study were assessed over different time frames, which may have contributed to the observed associations, as shorter time frames (e.g., masturbation) may capture more transient experiences. This study is also limited by the small number of gender minority adolescents, such that we could not compare gender minority adolescents to the cisgender boys' and cisgender girls' groups due to the small sample size and low statistical power. Future studies should include and oversample gender minority people, as

no study has investigated their sexual subjectivity to our knowledge. In addition, participants could only select one choice for their gender identity, trans status, and sexual orientation, respectively, which limits the representation of potential fluidity in gender identity and sexual orientation. Moreover, future studies are needed to continue to explore the longitudinal associations between sexual subjectivity and in-person and online sexual behaviors in more diverse samples of adolescents as ours consisted of adolescents from a Western, educated, industrialized, rich, and democratic (WEIRD) country, which limits the generalizability of the findings to other populations. Future studies are needed to examine the intersecting roles of race/ethnicity in those associations in WEIRD and non-WEIRD samples (Klein et al., 2021), as preliminary evidence suggest that sexual subjectivity may differ according to ethnicity (e.g., Cheng et al., 2014; Bragard & Fisher, 2024).

Practical Implications

Sex education is one of the most effective ways to promote the safe and healthy exploration of sexuality and is one of the fundamental rights of adolescents (Lindberg & Maddow-Zimet, 2012; Schmidt et al., 2015; UNFPA, 2014). Sexual exploration during adolescence is a gradual process that incorporates an increasing number of sexual behaviors over time (e.g., Beckmeyer et al., 2021). Our results showed that greater sexual subjectivity among adolescents was associated with various sexual behaviors, including oral stimulation and sexting, regardless of gender identity and sexual orientation. The present findings may serve as a valuable starting point for discussions about sexual subjectivity and sexual exploration with adolescents, supporting educators in responding to students' questions and concerns about their sexual subjectivity and their sexual behaviors, both in-person and online. Most importantly, these findings can also inform their reflections regarding the ways in which sexual experiences can

contribute to self-perception (Diamond & Savin-Williams, 2009).

Conclusions

Answering the call to consider adolescent sexuality as unique and legitimate, not only as mimicking adult behavior (Bernardini, 2019; O’Sullivan et al., 2022), the current study examined the prospective, bidirectional associations between in-person and online sexual behaviors and sexual subjectivity among a large sample of sexually active middle adolescents, considering potential gender and sexual orientation-based differences. Our findings showed that sexual subjectivity was prospectively and positively associated with oral and manual stimulation, sexual activity with vaginal and/or anal penetration, and sexting. No gender and sexual orientation differences were observed in any of the associations. Engaging in different sexual behaviors may help teenagers develop more agency in their sexuality. Overall, findings highlight a relationship between sexual subjectivity and sexual experience.

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Availability of data and material: Our research team has full control of all data and we agree to allow the journal to review the data if needed. The authors of the paper can provide all study materials if requested.

Code availability: Our research team has full control on the code and agree to allow the journal to review it if needed. The authors of the paper can provide all study materials if requested.

Authors' contributions: (Masked for review) contributed to the study's conception and design, contributed to data collection, performed the statistical analysis, and drafted the manuscript; (Masked for review) conceived the study and obtained funding, provided material resources, participated in the design and coordination of the study, and helped to review the manuscript; (Masked for review) contributed to the study conception and design, performed the statistical analysis, and helped to draft and review the manuscript; (Masked for review) contributed to the study conception and design, and reviewed the manuscript; (Masked for review) contributed to the study conception and design, contributed to data collection, and helped to draft and review the manuscript; (Masked for review) conceived the study and obtained funding, provided material resources, participated in its design and coordination, helped to draft as well as review the manuscript, and offered supervision. All authors read and approved the final manuscript.

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Table 1*Detailed sociodemographic characteristics of the sample*

Characteristics	Total sample (N=1998-2001) T1	% T1	Total sample (N=2794-2800) T2	% T2
Sex assigned at birth				
Male	920	46.0	1314	46.9
Female	1081	54.0	1486	53.1
Gender				
Masculine/man	927	46.3	1309	46.8
Feminine/woman	1057	52.8	1448	51.7
Non-binary, gender fluid or something else	13	0.6	37	1.3
Indigenous or other cultural gender minority identity	2	0.1	2	0.1
Other	2	0.1	4	0.1
Trans status				
No, I am not a trans person	1969	98.4	2748	98.1
Yes, I am a trans man	3	0.1	5	0.2
Yes, I am a trans woman	0	0.0	5	0.2
Yes, I am a non-binary trans	4	0.2	14	0.5
I am questioning my gender identity	14	0.7	14	0.7
I don't know what it is	11	0.5	8	0.3
Sexual orientation				
Heterosexual	1669	83.5	2269	81.1
Questioning their sexual orientation	100	5.0	123	4.4
Gay or lesbian	25	1.3	49	1.8
Heteroflexible	30	1.5	36	1.3
Homoflexible	3	0.3	4	0.1
Bisexual	70	3.5	169	6.0
Queer	9	0.5	18	0.6
Pansexual	35	1.8	60	2.1
Asexual	4	0.2	11	0.4
None of these categories	37	1.8	42	1.5
I don't want to answer	17	0.9	19	0.7
Cultural identities				
French Canadian	1284	64.3	1846	65.9
English Canadian	257	12.9	407	14.5
American	16	0.8	22	0.8
European	71	3.5	77	2.8
African	70	3.5	64	2.3

Asian	39	1.9	43	1.5
Aboriginal/First Nations	30	1.5	27	1.0
Middle Eastern	64	3.2	79	2.8
Latin/ South American	51	2.6	54	1.9
Caribbean	56	2.8	8	0.3
Haitian	0	0.0	101	3.6
Other	60	3.0	72	2.6

Note. The final sample for Time 1 is 2001 and 2800 for Time 2. However, some participants did not respond to every sociodemographic question resulting in missing values for these specific questions. Therefore, for complete transparency, we reported ranges for sample sizes in the present table.

Table 2*Comparisons of Heterosexual, Cisgender and Gender and Sexually Minority Groups of Adolescents*

	Total sample of adolescents ($N =$ 1969-2001) $M (SD)/\text{Median}$	(1) Cisgender boys ($n =$ 890-909) $M (SD)$	(2) Cisgender girls ($n = 1037$ -1049) $M (SD)$	(3) Gender minority adolescents ($n = 38$ -41) $M (SD)$	(4) Heterosexual adolescents ($n = 1644$ -1669) $M (SD)$	(5) Sexually minority adolescents ($n = 122$ -313) $M (SD)$
T1						
Sexual subjectivity T1	3.36 (0.59)	3.36 (0.56)	3.36 (0.61)	3.15 (0.56)	3.36 (0.57)	3.40 (0.63)
Masturbation frequency T1	4.21 (2.39)	5.44 (1.20)	3.16 (2.19)	3.64 (2.47)	4.23 (2.40)	4.14 (2.30)
Oral and manual stimulation T1	0.91 (1.26)	0.99 (1.31)	0.86 (1.21)	0.70 (1.08)	0.93 (1.27)	0.86 (1.22)
Sexual activity with vaginal and/or anal penetration T1 ¹	0.88 (1.55)	0.82 (1.46)	0.95 (1.63)	0.53 (1.22)	0.90 (1.56)	0.81 (1.49)
Sexting frequency T1	1.67 (1.11)	1.60 (1.00)	1.72 (1.19)	1.53 (0.94)	1.65 (1.08)	1.77 (1.27)
Pornography use frequency T1	2.44 (2.25)	3.85 (1.99)	1.24 (1.68)	2.15 (2.24)	2.48 (2.27)	2.31 (2.12)
Substance use frequency T1	0.83 (0.83)	0.87 (0.89)	0.80 (0.77)	0.80 (0.97)	0.83 (0.80)	0.85 (0.93)
COVID-19 status T1	0.41 (0.49)	0.34 (0.48)	0.47 (0.50)	0.49 (0.51)	0.40 (0.49)	0.51 (0.50)
T2	Total sample of adolescents ($N =$ 850-2759) $M (SD)/\text{Median}$	(1) Cisgender boys ($n =$ 1272-1293) $M (SD)$	(2) Cisgender girls ($n = 1420$ -1437) $M (SD)$	(3) Gender minority adolescents ($n = 61$ -63) $M (SD)$	(4) Heterosexual adolescents ($n = 2236$ -2269) $M (SD)$	(5) Sexually minority adolescents ($n = 239$ -505) $M (SD)$
Sexual subjectivity T2	3.47 (0.56)	3.41 (0.53)	3.52 (0.58)	3.42 (0.64)	3.45 (0.55)	3.56 (0.60)
Masturbation frequency T2	4.40 (2.27)	5.46 (1.91)	3.45 (2.13)	4.37 (2.51)	4.41 (2.29)	4.42 (2.17)
Oral and manual stimulation T2	1.26 (1.39)	1.26 (1.40)	1.26 (1.38)	1.12 (1.34)	1.28 (1.40)	1.20 (1.37)
Sexual activity with vaginal and/or anal penetration T2	1.40 (1.91)	1.27 (1.82)	1.52 (1.98)	1.19 (1.84)	1.42 (1.92)	1.33 (1.89)

Sexting frequency T2	1.88 (1.23)	1.76 (1.14)	1.97 (1.28)	2.26 (1.46)	1.83 (1.19)	2.12 (1.36)
Pornography use frequency T2	2.58 (2.20)	3.87 (1.93)	1.42 (1.73)	2.70 (2.21)	2.63 (2.22)	2.38 (2.09)
Substance use frequency T2	0.99 (0.88)	1.02 (0.90)	0.95 (0.83)	1.12 (1.18)	0.98 (0.85)	1.06 (0.99)

Note. M = mean; SD = standard deviation. The final sample at T1 is 2001 and T2 is 2800. However, some participants did not respond to every sociodemographic question resulting in missing values for these specific questions. Therefore, for complete transparency, we reported ranges for sample sizes in the present table.

Table 3*Descriptive Statistics, Reliability Indices, and Correlations Between Sexual Subjectivity, and Sexuality-Related Variables*

Variables	<i>N</i>	Skew. (<i>SE</i>)	Kurt. (<i>SE</i>)	Range	<i>M</i> (<i>SD</i>)	α	ω	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Sexual subjectivity T1	1969	-0.43 (0.06)	0.88 (0.11)	1-5	3.36 (0.59)	.80	.77	—														
2. Sexual subjectivity T2	2759	-0.34 (0.05)	0.84 (0.09)	1-5	3.47 (0.56)	.79	.77	.63**	—													
3. Masturbation frequency T1 ^a	1987	-0.26 (0.06)	-1.45 (0.11)	1-8	4.21 (2.39)	—	—	.40**	.26**	—												
4. Masturbation frequency T2 ^a	2778	-0.41 (0.06)	-1.22 (0.09)	1-8	4.40 (2.27)	—	—	.32**	.32**	.71**	—											
5. Oral and manual stimulation T1 ^b	1993	0.98 (0.06)	-0.54 (0.11)	0-4	0.91 (1.26)	—	—	.29**	.23**	.22**	.13**	—										
6. Oral and manual stimulation T2 ^b	2784	0.48 (0.05)	-1.37 (0.09)	0-4	1.26 (1.39)	—	—	.31**	.35**	.20**	.17**	.73**	—									
7. Sexual activity with vaginal and/or anal penetration T1 ^c	1994	1.56 (0.06)	0.96 (0.11)	0-5	0.88 (1.55)	—	—	.23**	.18**	.11**	.05	.75**	.61**	—								
8. Sexual activity with vaginal and/or anal penetration T2 ^c	2784	0.91 (0.05)	-0.88 (0.09)	0-5	1.40 (1.91)	—	—	.25**	.30**	.12**	.09**	.70**	.78**	.74**	—							
9. Sexting frequency T1 ^d	1984	1.70 (0.06)	2.02 (0.11)	1-6	1.67 (1.11)	—	—	.32**	.24**	.21**	.12**	.53**	.47**	.42**	.42**	—						

10. Sexting frequency T2 ^d	2775	1.27 (0.05)	0.53 (0.09)	1-6	1.88 (1.23)	—	—	.28**	.35**	.14**	.19**	.41**	.55**	.32**	.46**	.58**	—						
11. Pornography use frequency T1 ^e	1978	0.23 (0.06)	-1.47 (0.11)	0-7	2.44 (2.25)	—	—	.35**	.22**	.75**	.61**	.18**	.16**	.08**	.07**	.20**	.13**	—					
12. Pornography use frequency T2 ^e	2760	0.13 (0.05)	-1.43 (0.09)	0-7	2.58 (2.20)	—	—	.27**	.24**	.62**	.73**	.13**	.14**	.04	.06**	.11**	.17**	.75**	—				
13. Substance use frequency T1 ^f	1999	1.43 (0.06)	2.83 (0.11)	0-6	0.83 (0.83)	—	—	.25**	.24**	.28**	.22**	.42**	.42**	.35**	.37**	.33**	.29**	.25**	.21**	—			
14. Substance use frequency T2 ^f	2797	1.21 (0.06)	1.84 (0.09)	0-6	0.99 (0.88)	—	—	.28**	.28**	.27**	.27**	.34**	.40**	.26**	.36**	.29**	.33**	.25**	.24**	.76**	—		
15. Timing of survey completion regarding COVID-19 T1 ^g	2001	0.35 (0.06)	-1.88 (0.11)	0-1	0.41 (0.49)	—	—	.09**	.07**	.01	.01	.07**	-.05*	.08**	.08**	.04	-.02	-.04	-.03	.08**	.02	—	

Note. ^a 1= More than once a day to 8= Not once in the past three months; ^b 1= Always to 5= Never; ^c 0 = no, 1 = yes; ^d 1 = Never to 6=

Very frequently; ^e 0 = Never to 7 = Many times per day; ^f 0= Never consumed to 6= Every day; ^g 0= Before March 11, 2020, 1= From

March 11, 2020. Skew. = Skewness; Kurt. = Kurtosis; *SE* = standard error; *M* = mean; *SD* = standard deviation; α = Cronbach's alpha;

ω = McDonald's omega. * $p < .05$. ** $p < .01$.

Table 4

Examination of the Associations between In-Person and Online Sexual Behaviors and Sexual Subjectivity across Heterosexual, Cisgender, and Sexual Minority Adolescents, Controlling for Substance Use Frequency and Timing of Survey Completion Regarding COVID-19 (N=3150)

Models	χ^2 (df)	CFI	TLI	RMSEA	RMSEA (90% CI)
Model 1: Fully saturated model, no control variable (total sample)	0.000 (0)	1.000	1.000	0.000	0.000-0.000
Model 2: With control variable (total sample)	0.000 (0)	1.000	1.000	0.000	0.000-0.000
Model 3: Model with control variables, grouping by gender groups (i.e., cisgender boys, cisgender girls, and gender diverse)	0.000 (0)	1.000	1.000	0.000	0.000-0.000
Model 4: Same as model 3, parameters constrained to be equal between the gender-based groups	57.603 (56)	1.000	1.000	0.005	0.000-0.018
Model 5: Model with control variables, grouping by sexual orientation-based groups (i.e., heterosexual and sexual minority adolescents)	0.000 (0)	1.000	1.000	0.000	0.000-0.000
Model 6: Same as model 5, parameters constrained to be equal between the sexual orientation-based groups	56.126 (56)	1.000	1.000	0.001	0.000-0.017

Table 5*Prospective Associations between Sexual Subjectivity and Sexual Well-Being, Controlling for COVID-19 Status*

Outcome	Beta	<i>p</i>
Sexual subjectivity T2		
Sexual subjectivity T1	0.606	< 0.001
Masturbation frequency T1	-0.003	0.914
Oral and manual stimulation T1	0.060	0.063
Sexual activity with vaginal and/or anal penetration T1	-0.008	0.775
Sexting frequency T1	0.020	0.407
Pornography frequency T1	-0.020	0.497
Substance use frequency T1	0.060	0.017
COVID-19 status	0.025	0.180
Masturbation frequency T2		
Sexual subjectivity T1	0.032	0.090
Masturbation frequency T1	0.562	< 0.001
Oral and manual stimulation T1	0.008	0.787
Sexual activity with vaginal and/or anal penetration T1	-0.018	0.515
Sexting frequency T1	-0.033	0.133
Pornography frequency T1	0.170	< 0.001

Substance use frequency T1	0.029	0.236
COVID-19 status	0.002	0.916
Oral and manual stimulation T2		
Sexual subjectivity T1	0.094	< 0.001
Masturbation frequency T1	-0.003	0.897
Oral and manual stimulation T1	0.547	< 0.001
Sexual activity with vaginal and/or anal penetration T1	0.098	< 0.001
Sexting frequency T1	0.087	< 0.001
Pornography frequency T1	-0.009	0.722
Substance use frequency T1	0.111	< 0.001
COVID-19 status	-0.018	0.262
Sexual activity with vaginal and/or anal penetration T2		
Sexual subjectivity T1	0.063	< 0.001
Masturbation frequency T1	-0.011	0.640
Oral and manual stimulation T1	0.272	< 0.001
Sexual activity with vaginal and/or anal penetration T1	0.487	< 0.001
Sexting frequency T1	0.032	0.163
Pornography frequency T1	-0.035	0.128
Substance use frequency T1	0.093	< 0.001
COVID-19 status	-0.031	0.039

Sexting frequency T2		
Sexual subjectivity T1	0.105	< 0.001
Masturbation frequency T1	-0.046	0.141
Oral and manual stimulation T1	0.129	0.001
Sexual activity with vaginal and/or anal penetration T1	-0.025	0.464
Sexting frequency T1	0.501	< 0.001
Pornography frequency T1	0.012	0.711
Substance use frequency T1	0.080	0.001
COVID-19 status	-0.045	0.016
Pornography frequency T2		
Sexual subjectivity T1	-0.006	0.766
Masturbation frequency T1	0.126	< 0.001
Oral and manual stimulation T1	0.037	0.196
Sexual activity with vaginal and/or anal penetration T1	-0.028	0.281
Sexting frequency T1	-0.041	0.055
Pornography frequency T1	0.652	< 0.001
Substance use frequency T1	0.018	0.366
COVID-19 status	-0.017	0.293
Substance use frequency T2		
Sexual subjectivity T1	0.042	0.012

Masturbation frequency T1	-0.021	0.387
Oral and manual stimulation T1	0.013	0.641
Sexual activity with vaginal and/or anal penetration T1	0.002	0.934
Sexting frequency T1	0.018	0.409
Pornography frequency T1	0.063	0.009
Substance use frequency T1	0.764	< 0.001
COVID-19 status	0.060	< 0.001

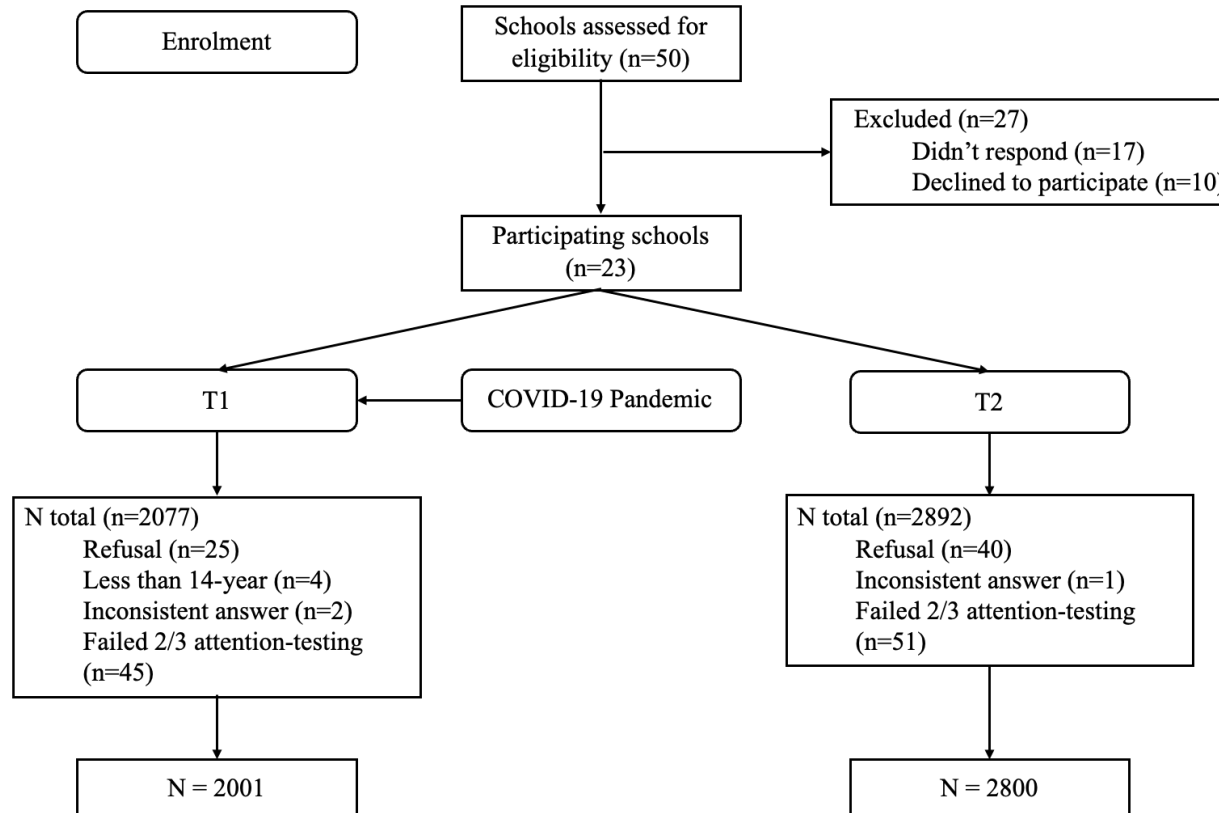
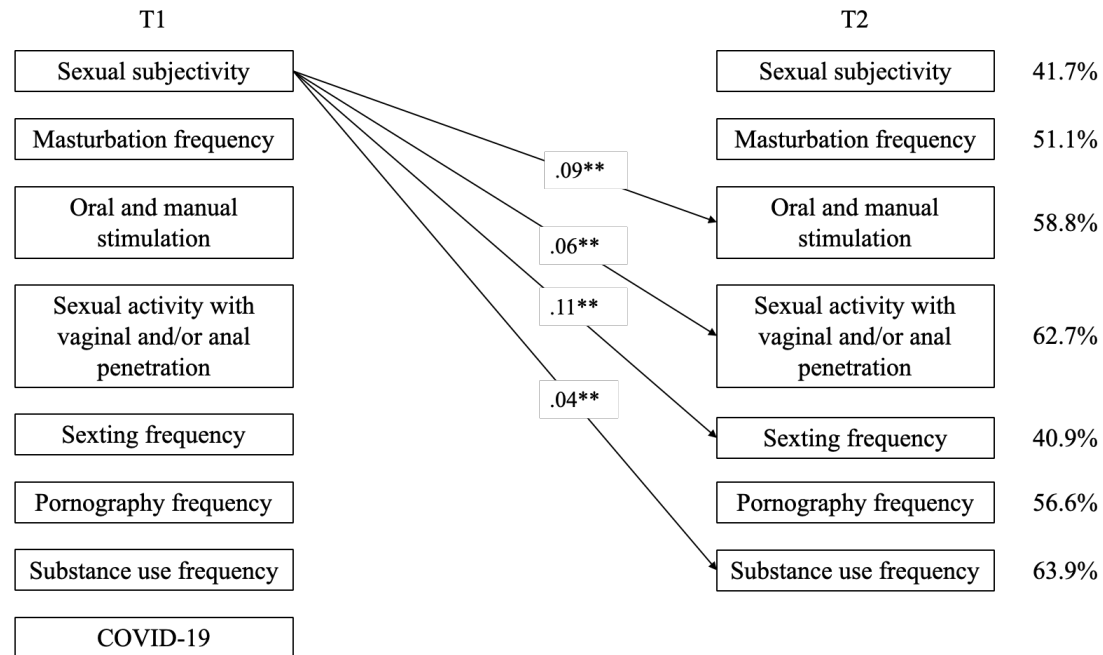
Figure 1*Description of the sample (T1-T2)*

Figure 2

Associations between Sexual Subjectivity and In-Person and Online Sexual Behaviors, Controlling for Substance Use Frequency and Timing of Survey Completion regarding COVID-19



Note. Correlations between the variables are not depicted for the sake of clarity. Only significant associations between T1 sexual subjectivity and T2 sexual outcomes and associations between T1 sexual outcomes and T2 sexual subjectivity are depicted for the sake of clarity. Coefficients are standardized regression coefficients. Explained variances of the outcomes are presented on the right side. Gender and sexual orientation did not differ significantly in any of the examined associations. * $p < 0.05$, ** $p < 0.01$.