

Sexual orientation across porn use, sexual fantasy, and in-person sexuality: Visualizing branchedness and coincidence via sexual configurations theory

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Abstract

Sexual orientation describes sexual interests, approaches, arousals, and attractions. People experience these interests and attractions in a number of contexts, including in-person sexuality, fantasy, and porn use, among others. The extent to which sexual orientation is divergent (branched) and/or overlapping (coincident) across these, however, is unclear. In the present study, a gender/sex and sexually diverse sample ($N = 30$; 15 gender/sex/ual minorities and 15 majorities) manipulated digital circles representing porn use, in-person sexuality, and fantasy on a tablet during in-person interviews. Participants used circle overlap to represent the degree of shared sexual interests across contexts, and circle size to indicate the strength and/or number of sexual interests within contexts. Across multiple dimensions of sexual orientation (gender/sex, partner number, and action/behavior), we found evidence that sexual interests were both branched and coincident. These findings contribute to new understandings about the multifaceted nature of sexual orientations across contexts and provide a novel way to measure, conceptualize, and understand sexual orientation in context.

Key words: porn, fantasy, partnered sexuality, sexual configurations theory, sexual orientation

Introduction

Sexual orientation is a central focus of sexuality research, and it describes sexual interests, approaches, arousals, and attractions (van Anders, 2015). People experience these attractions and interests in different sexual situations or contexts, including *in-person sexuality* (sexual interactions in which at least one partner is physically present), *fantasy* (auditory, visual, and/or sensory thoughts about sexuality), and *porn use* (auditory, visual, and/or written sexual media), among others. While these three contexts overlap and connect, they are also understood very differently.

In-person sexuality is often treated as more meaningful or important than sexuality that centers around porn or fantasy. With porn use, for example, it is common for researchers to ask questions about how the frequency or content of pornography use impacts in-person behaviors (e.g., Braithwaite et al., 2015; Donnerstein, 1980), relationship satisfaction (for a review, see Campbell & Kohut, 2017), or sexual scripts with in-person partners (for a review, see Carrotte et al., 2020) than it is to conduct research that investigates the reverse or just use of porn alone.

In addition, and somewhat paradoxically, these three contexts—*in-person sexuality*, *fantasy*, and *porn use*—are often seen as interchangeable in terms of sexual interests, or that sexual interests in one translate to the others. This is evident in general understandings and in research. Many studies use porn as ‘sexual stimuli’ to assess gender/sex orientation as a broader construct (e.g., Chivers et al., 2010; Jabbour et al., 2020). It is also common to use the frequency with which people fantasize about different gender/saxes as a measure of their sexual orientation (e.g., Rieger et al., 2005; Rosenthal et al., 2012).

Because porn and fantasy are given less primacy than *in-person sexuality*, and because sexual interests are assumed to be the same across these contexts, we know less about how

central each of these contexts are to people's sexuality, and the extent to which sexual orientation (e.g., interests and attractions) is similar or distinct across these contexts is unclear. An open question is thus whether people are attracted to or interested in the same phenomena during porn use, fantasy, and in-person sexuality, and how strong these interests and attractions are.

We focus on these three specific contexts (porn use, fantasy, and in-person sexuality) for several reasons. First, engagement in all three of these sexual contexts is common and not mutually exclusive (i.e., it is common for people to engage in all three sexual contexts) (Herbenick et al., 2010; Leitenberg & Henning, 1995; Wright, 2013; Wright et al., 2013), making it possible to focus on similarities and differences in sexual interests/attractions across these contexts. We focus on in-person sexuality as opposed to partnered sexuality more broadly, to avoid the contextual ambiguity of certain forms of sexuality that happen online (e.g., watching a cam performer online is arguably both porn use and partnered sexuality, but not *in-person* sexuality).

Sexual Orientation Across Porn, Fantasy, and In-Person Sexuality

Understanding what sexual orientation is can facilitate understanding the extent to which it varies across sexual contexts such as porn use, fantasy, and in-person sexuality. Sexual Configurations Theory (SCT; van Anders, 2015) is one useful framework and theory for doing so. In SCT, sexual orientation is defined as sexual (erotic and/or nurturant) interests, arousals, approaches, and attractions (van Anders, 2015) and as distinguishable from sexual identity (one's sense of self and/or community membership[s]), and sexual status (the sexual behaviors that a person engages in) (for discussion, see Korchmaros et al., 2013; Rosario & Schrimshaw, 2014; van Anders, 2015).

SCT not only defines sexual orientation as distinct from identity and status, but orientation itself as multidimensional (van Anders, 2015). Based on past research and lived experiences¹, SCT suggests that orientation has multiple dimensions, including gender/sex² orientation, which refers to interests, approaches, and attractions related to gender/sex and is the most common understanding of sexual orientation. Gender/sex orientation can be directed towards gender (i.e., masculinity, femininity, gender-diversity), sex (i.e., maleness, femaleness, sex-diversity), or whole identities or selves that involve intertwined aspects of both gender and sex (i.e., men, women, gender/sex-diverse people).

Past research, to the best of our knowledge, has not focused directly on whether gender/sex orientation can branch³ (i.e., not overlap) across the sexual contexts of porn, fantasy, and in-person sexuality. One reason to believe that it can, however, is that research shows that *other* aspects of gender/sex sexuality, including sexual identity and sexual status, can branch across these contexts. For example, some straight people with in-person sexuality directed towards other-gender/sex partners fantasize about being with similar gender/sex partners (Joyal et al., 2015; Renaud & Byers, 1999) and/or watch gay/lesbian porn (Downing et al., 2017; Joyal et al., 2015; Pornhub, 2014; Schauer, 2005). In addition, some women differ in how strongly linked their degrees of attractions to women and men are across (in-lab) erotic auditory stories

¹ Lived experience refers to the ‘insider’ knowledge that group members have and the value of this information for scholars and others; this knowledge is often (but not limited to) stories and accounts of what it means to live as “a specific person within a specific set of social contexts” (van Anders, 2015, p. 1178; Van Manen, 2004).

² We use the term gender/sex to indicate ‘gender *and/or* sex.’ We do so, as opposed to using ‘gender’ *or* ‘sex,’ in cases where socially constructed gender and biological sex are intertwined and cannot be disentangled (van Anders, 2015; van Anders & Dunn, 2009).

³ Using language such as ‘branched’ and ‘coincident’ instead of alternatives (e.g., ‘discordant’ or ‘concordant’) reflects the reality of sexuality, whereby many people’s orientation, identity, and status branch, and does so in neutral ways that do not fall into valenced notions of ‘alignment normativity,’ or assumptions of coincidence (van Anders, 2015).

and daily (in-person) lives; for some, gendered attractions across these contexts are substantially branched (Diamond et al., 2020).

Heterosexual scripts also seem to matter for how gender/sex sexual orientation plays out in porn, fantasy, and in-person sexuality. For example, in-person sexual encounters situate men as initiators (Simon & Gagnon, 1986; Wiederman, 2005) yet, in some genres of mainstream porn, women seem to take on more initiating roles and, likewise it is not uncommon for men to report sexual fantasies about being submissive to women (Joyal et al., 2015; Sakaluk et al., 2014; Vannier et al., 2014). Signifiers of gender/sex, including femaleness and maleness seem to vary in significance by context, too. For example, large penises or breasts seem to be a prominent feature of mainstream porn compared to in-person sexuality and fantasy (Hesse & Pedersen, 2017; Joyal et al., 2015; Lever et al., 2006).

Gender/sex sexuality is one dimension of sexual orientation, and SCT also discusses “partner-number” sexual orientation. Partner-number sexuality pertains to the number of sexual partners in relationships (e.g., preferring open relationships to monogamy or polyfidelity), to sexual events (e.g., interest in threesomes, group-sex, dyadic sex), and to time (e.g., interest in having one partner for life, interest in having multiple monogamous partners over a period of time). Similar to gender/sex sexuality, past research suggests that partner-number sexuality can branch across porn use, fantasy, and in-person sexuality, and group sex is one example of this. Group sex features in fantasy and porn at rates that exceed in-person sexuality (Hald & Štulhofer, 2016; Joyal et al., 2015; Pornhub, 2018; Thompson & Byers, 2017). Sexual aspects of threesomes in particular show marked branching in conjunction with gender/sex. Here, straight-identified men report high interest in threesomes with two women, but less interest or even aversion to threesomes with another man and one woman, even if they would not make direct

contact with the other man (Ariely & Loewenstein, 2006; Joyal et al., 2015; Thompson et al., 2021; Thompson & Byers, 2017). Yet men commonly view porn that depicts two men with one woman (Pound, 2002). As another example, people in sexually exclusive relationships with one person often fantasize about encounters that involve their committed relationship partner *and* others (Lehmiller, 2020).

SCT also leaves space for other dimensions, such as action/behavior orientation. This refers to interests, approaches, and attractions to specific sexual behaviors or practices and is relevant when thinking about orientation across contexts, given that interests in specific behaviors may branch, like kissing (Herbenick et al., 2019; Hughes et al., 2007). In many cultures, lip-to-lip kissing is prevalent for in-person sexuality (Herbenick et al., 2019; Hsu et al., 1994; Noorishad et al., 2019; Person et al., 1989). Kissing is also relatively common in fantasy (Amaral Saramago et al., 2017; Hsu et al., 1994; Noorishad et al., 2019; Person et al., 1989), sexually explicit romance novels (Ménard & Cabrera, 2011), more relationally focused genres of porn (Corneau et al., 2017), and the work of some feminist-identified film producers, such as Erika Lust (Tholl, 2019). In mainstream porn, however, kissing is markedly less frequent than it is in fantasy or in-person sexuality (Downing Jr. et al., 2014; Vannier et al., 2014).

The Importance of Social Location for Orientation Across Porn Use, Fantasy, and In-Person Sexuality

Sexual selves are not only informed by sexuality, but also incorporate other aspects of people's lives. Social location, or one's place amidst intersecting axes of identity, oppression, and privilege, is both a part of and a product of one's sexual configuration. Accordingly, gender/sex and sexual diversity—and, of course, a wide array of axes of identity and oppression—may also relate directly to experiences and interests across porn use, fantasy, and in-person

sexuality. For example, Thompson and colleagues (2020) found that, compared to heterosexual people, non-heterosexual people have more experience with and more interest in mixed-gender/sex threesomes in-person. In contrast, rates of engagement with threesomes in *porn* are similar across non-heterosexual and heterosexual people (Hald & Štulhofer, 2016) and vary by sub-type of *fantasy*—open relationship fantasies, for example, are more popular among non-heterosexual people but rates of infidelity fantasies do not differ significantly (Lehmiller, 2020).

Social location can matter in another way for sexual orientation across contexts: online porn is heavily segregated, with relatively distinct spaces for ‘straight’ porn (sex between men with women, and heterosexually-oriented sex between women with women), ‘gay’ porn (sex between men), and queer/feminist porn.⁴ This commercial structure can steer people towards or away from certain kinds of porn, especially since some – like queer/feminist porn – may not be readily available on free sites (Macleod, 2018). Some gender/sexual minorities⁵ (perhaps especially nonmonosexual ones) may, as a result, choose to engage with free porn that they enjoy less or that they enjoy in ways that branch from their in-person and fantasy interests.

Gender/sexual majorities, on the other hand, may find more porn that coincides with their interests for fantasy and in-person sexuality, given the greater array of free content created with their interests in mind. This suggests that the “infrastructure” of porn, including cost/accessibility, may differentially shape the possibilities for coincidence with other contexts (e.g., fantasy, in-person sexuality) for minorities and majorities.

The Current Study: Branching/Coincidence in Sexual Orientation across Sexual Contexts

⁴ Pornhub.com, for example, has a distinct website for their ‘gay’ content; ‘feminist’ and ‘queer’ porn (e.g., ErikaLust.com, CrashPadSeries.com) advertise their websites as predominantly featuring queer and feminist content.

⁵ Rather than using minorities and majorities to mean statistical frequency, we mean to distinguish between people who experience *minoritization* (e.g., discrimination, stigma) and those who experience *majoritarian* privilege and status because of their sexual identity/orientation/status and/or gender/sex. There are, however, many other axes of power (e.g., wealth) through which individuals can experience majority privilege.

In the present study, we aimed to assess how sexual orientation branches/coincides across fantasy, porn use, and in-person sexuality, using SCT's theoretical framework (van Anders, 2015). To do this work, we developed a novel set of measures and concomitant visualizations for use with participants and to display results that are useful for studying branched/coincident sexual orientations, but also branching/coincidence in general. We conducted mixed-methods interviews where participants used a visual analog scale to represent their interests across porn, fantasy, in-person sexuality for our orientations of focus (action/behavior, gender/sex, and partner-number sexuality).

To measure sexual orientation, we operationalized it into interest *number*, *strength*, and *type*. Interest number referred to *how many* phenomena people were drawn to (e.g., having many interests for in-person sexuality versus a few foci for fantasy). Strength referred to how *strongly* people were drawn to phenomena (e.g., being strongly attracted to threesomes in fantasy and less so in porn). And interest type referred to *which* phenomena people were drawn to (e.g., which sexual behaviors people prefer to watch in porn versus fantasize about).

Our research question was: to what extent does interest number, strength, and type branch/coincide across porn use, fantasy, and in-person sexuality? We were interested in answering this question for each dimension of orientation: action/behavior, gender/sex, and partner-number, as well as overall orientation.

Method

Participants

Our sample for analyses ($N = 30^6$) included 15 gender/sex/ual minorities and 15 majorities. As per our eligibility criteria, all participants were at least 18 years of age ($M = 29.8$

⁶ Our primary consideration when deciding sample size was that we were conducting in-depth interviews. An N of 30 for in-depth qualitative studies is large (Braun & Clarke, 2013) but limited our ability to detect within and between subjects differences of a smaller magnitude (please see Discussion for details).

yrs, $SD = 14.2$) and had non-zero engagement with at least two sexual contexts at the time of the study; all engaged in some degree of fantasy, all but four had some engagement with porn, and all but six had some engagement with in-person sexuality.

We categorized participants as sexual minorities or majorities. To do so, we asked open-ended questions about participants' gender/sex and sexual identity/orientation. Specifically, we asked "What is your gender and/or sex? (Some options include woman/man, nonbinary, agender, transgender man/woman, cisgender woman/man, intersex, genderfluid, and/or two-spirit, etc.)" and "What is your sexual orientation/identity currently? (e.g., gay, heterosexual, etc.)." We also asked participants a multiple-choice question about whether they would want to be included in a trans/transgender category, a cisgender category, or neither, and a separate question about whether they would want to be included in a binary category, nonbinary category, or neither. Based on participant's responses to these open ended and multiple-choice questions, we categorized their responses, defining cisgender, heterosexual participants as gender/sex/ual majorities and all other participants as gender/sex/ual minorities (See [masked for review], *under review* for a more recent version of these questions and analytical frameworks).

Among gender/sex/ual majority participants, eight were cisgender heterosexual women and seven were cisgender heterosexual men. Among our gender/sex/ual minority participants, seven participants were cisgender women, four were cisgender men, and four were nonbinary. In terms of sexuality, minority participants were bisexual ($n = 6$), queer ($n = 3$), lesbian ($n = 3$), gay ($n = 2$), and pansexual ($n = 1$). Participants also described their race/ethnicity using open-ended text responses, which we categorized as White ($n = 22$), Multiracial ($n = 3$), Black ($n = 1$), Chinese ($n = 1$), Indian (India; $n = 1$), Latinx ($n = 1$), and Middle Eastern/Arab ($n = 1$). For a full list of demographic characteristics, see Table 1.

We recruited participants for this study through physical flyers and online classifieds (e.g., Kijiji) in a small/midsize city in Ontario. We determined eligibility through a two-step process that started by screening participants to make sure they were 18 years or older and lived or worked within 30 minutes' drive of our university (for ease of coming to campus for the in-lab portions of the study). We then asked participants who passed screening to complete a more comprehensive online background questionnaire (distributed by email) to assess further eligibility criteria – that they had non-zero past and/or current engagement with at least two of porn, fantasy, and in-person sexuality. We extended invitations to eligible participants with a goal of maximizing the diversity of our sample by gender/sex, race/ethnicity, and sexual orientation/identity. In total, 92 people participated in our background questionnaire and 69 indicated that they were interested in being interviewed.⁷ We extended 45 interview invitations and successfully scheduled 31 interviews.⁸ Participants who attended the interview were compensated with \$40 CAD, and all participants who completed the screening questionnaire had the option to enter a raffle for a \$50 CAD Amazon gift card awarded to one in every 14 participants.

Interview Procedure

There were three interviewers, one of whom guided each session with participants: the first author, an Asian-American sexual minority cisgender man ($n = 13$ interviews), the second

⁷ Of the 24 participants that expressed interest but did not receive an invitation to participate in an interview, two were not invited because they indicated they were only sexually active within one of our three target contexts (porn, fantasy, and in-person sexuality) and 22 met our eligibility criteria but were not invited because of our diversity goals. Midway through recruitment, for example, we had more cisgender women that had participated than men and nonbinary participants across our gender/sexual minority and majority samples, so some cisgender women that completed our background questionnaire after that point were not invited to interviews even if they were interested.

⁸ We decided not to conduct one of these interviews when, just after arriving, the participant asked the interviewer whether we would be obligated to report them if they were to hypothetically disclose sexual interest in children. We decided not to move forward with the interview because we were not apprised on the conditions under which we would have a duty to report (for a discussion of and recommendations around some of the issues involved, see, e.g., Mcphail et al., 2018), and discussed this with our university's ethics board.

author, a white sexual majority woman ($n = 9$), or the third author, a white sexual minority cisgender woman ($n = 8$). All interviewers were in their late 20s when the interviews were conducted. Interviews ranged in duration from 42-140 minutes ($M = 79$ min, $SD = 24$).

Interviews were semi-structured; interviewers had a script to guide them but were free to deviate from the script as they saw fit and we modified the script at a few points based on experiences during the interviews.

All interviews were conducted in a private room with the door closed. As a safety precaution because of the sexual content of our study, we also had a lab volunteer stationed in the room next door. Upon arrival, the interviewer would introduce the participant to the volunteer, explain that the volunteer was there as a safety precaution but would not be able to hear the interview, and explain that they would briefly pause the interview half-way through to check in with the volunteer as part of our protocol. After the participant had read and completed a letter of information/consent form, the interviewer would begin by asking the participant their pronouns and whether they would like to choose a pseudonym for use in any publications resulting from the work.

Interview Materials and Structure

In Figure 1, we show the structure of each interview. The interviewer provided the participant with a touch-screen tablet displaying a joint letter of information and consent form. Upon receiving consent, the interviewer gave a brief overview of the interview format, then advanced participants to a “warm-up” activity where participants listed up to three phenomena for porn, fantasy, and in-person sexuality that they were drawn or attracted to (data not reported in the present study). The interviewer then led participants through the other parts of the study where participants manipulated digital circles representing porn, fantasy, and in-person sexuality

in a series of diagrams on the tablet. Participants first worked through a pair of practice diagrams where the interviewer explained that they could make the circles overlap to indicate shared interests across contexts. And, they could change the circle size to indicate the number of interests they had, and how strong these interests were. Each circle started at 50% and could be increased to a maximum of 100% or decreased to a minimum of 0%. The circle size was visible to participants as a whole integer percentage in real time for participants as they adjusted their circles. In Figure 2, we show an example of how one participant configured their diagram and provide a link to an example diagram that readers can interact with (https://queensu.qualtrics.com/jfe/form/SV_eR1k3VUspyCTOPY).

During each interview, participants completed separate diagrams for action/behavior, gender/sex, partner number, and ‘overall’ orientation in that order. Interviewers provided an explanation for each diagram and then asked participants follow up questions about how they configured their diagrams after they finished. To help clarify ‘action/behavior orientation’ we gave participants an example of someone who found they were drawn to bondage in fantasy, did not enjoy depictions of bondage in porn, and were not interested in practicing bondage in-person. To help explain gender/sex orientation, the interviewer gave definitions and examples of gender, sex, and gender/sex as well as how these might branch or coincide across contexts (e.g., being attracted to men in-person and drawn to a broader range of genders/sexes in fantasy). To help explain partner-number orientation, the interviewer explained this could pertain to the number of partners they were interested in being with at once (e.g., threesomes versus dyads), the number of partners they were interested in having simultaneously (e.g., dating one person versus dating multiple people separately but contemporaneously), and/or the number of partners they were interested in having over time (e.g., one lifetime partner versus one partner at a time but several

over the course of one's life). For the 'overall' orientation diagram, we asked participants to map their interests for porn, fantasy, and in-person sexuality, but collapsed across action/behavior, gender/sex, and partner-number orientations.

To conclude the interview, we asked participants debriefing questions (e.g., about which parts of the interviewer were clear/more difficult) and compensated them \$40 CAD plus their parking expenses if applicable.

Analyses

Assessing Convergent Validity and Reliability of the Diagrams

To assess validity of participant diagram responses, we had a coder go through each interview transcript and compare the explanations participants gave for their diagram configurations to the way they actually configured their diagrams. They assessed the extent to which each participant's diagram configurations matched their explanations for why they configured their diagrams the way they did (if provided given).

To assess reliability, we examined the correlations between diagram responses for the 'overall' diagram and our diagrams for gender/sex, partner-number, and action/behavior sexuality. Given that the configuration of the 'overall' diagram should correspond to participant's interests across the other diagrams, we expected positive correlations for scores (for both circle size and circle overlap) between our overall and specific diagrams.

Visualizing Interest Number and Strength Across Contexts

We visualized circle size for each participant through three sets of annuli (i.e., ring shaped objects bounded by concentric circles, represented in Figure 3). The annuli in shades of purple represented the size of participant in-person circles, those in shades of burgundy represented the size of porn circles, and those in shades of green represented the size of fantasy

circles. Each annulus covered a 5% radii range, with the inner-most annuli covering 0% to 5% and the outer-most annuli covering 95% to 100%. The opacity of each annuli corresponded to the number of participants whose circle radii fell within that annulus's range: the most opaque annuli had the highest number of circle radii that fell within their ranges, while fully transparent (white, because of the plot background) annuli had no circle radii that fell that within them. The dashed lines overlaying the annuli corresponded to the average size of each circle with 95% confidence intervals. We generated separate plots for each orientation: action/behavior, gender/sex, and partner-number orientation. Please see our supplemental materials for additional analysis and coding details.

Visualizing Sexual Orientation Interest Type Across Contexts

Participants indicated how coincident their sexual orientation interest type was across contexts through positioning their circles as more or less overlapping. We normalized the amount of overlap between each pair of contexts (e.g., porn & fantasy) as the ratio of the area of their intersection ($A(a \cap b)$; e.g., the parts of the porn and fantasy modality circles that overlapped) to the area of their union ($A(a \cup b)$; i.e., the sum of their intersection and the non-overlapping area of the two circles):

$$f(a, b) = \frac{A(a \cap b)}{A(a \cup b)} * 100 \quad (1)$$

In this normalized form, the overlap is independent of the unit of measurement for area, and it is invariant under changes in overall strength of the two factors for a given participant. We report this standardized value as a percentage, with possible values between zero (no coincidence) and 100 (complete coincidence).

To visualize branched and coincident interest type across participants, we calculated the average distance across each pair of circles (porn & fantasy, fantasy & in-person, and porn & in-

person) and then constructed a triangle where the sides corresponded to these average distances and each corner of the triangle was one of the dashed circle's centers. Without loss of generality, we placed the dashed circle representing porn on the bottom left, the circle for fantasy on the bottom right, and the in-person circle on top (rotating the dashed circles would yield the same results). Prior to plotting each participant's set of individual circles, we rotated them around the triangle of average circle centers to minimize the distance between each individual circle center and its average circle's center while maintaining the positions of the individual circles relative to one another. The problem of finding a triangle location that minimizes the distance between the circles for each modality is mathematically equivalent to the problem of finding the mechanical equilibrium position of two, frictionless, rigid triangles where the triangles' vertices are attached pairwise with zero-length springs. Python code that solves for mechanical equilibrium using the `scipy` package's `fsolve` routine is provided in supplementary information (Virtanen et al., 2020).

Comparisons Across Contexts

We wanted to determine how coincident/branched interest number/strength and type were, and whether this was moderated by gender/sex/ual identity. For interest number/strength, we compared circle size across contexts (porn circles, fantasy circles, and in-person circles). For interest type, we compared standardized circle overlap across circle pairs (porn & fantasy, porn & in-person sexuality, fantasy & in-person sexuality).⁹

Software

⁹One participant set their porn modality circle to 0% for gender/sex orientation as well as partner-number orientation. We coded this participant as missing data for the standardized overlap between porn & fantasy and porn & in-person because it was counterintuitive to compute the overlap between two modality circles in cases where one of the contexts had been removed by being set to zero.

We conducted data cleaning, coding, and plotting using R (version 4.0.3), Python (version 3.8), and the Statistical Package for the Social Sciences (SPSS; version 27). We provide code for all analyses and plots in our supplement.

Results

Validity and Reliability of the Diagram Measures.

For our participants ($N = 30$), the majority had full agreement between their verbal explanation and their diagram configurations ($n = 20$); for a minority of participants ($n = 9$), there was partial agreement or agreement could only be partially determined because participants did not give a verbal explanation for all parts of their diagram. For one participant, we were unable to determine agreement because their interview responses were too brief. Overall, this indicates that participants were able to use the diagrams to convey the configuration of their interests across contexts and dimensions of orientation.

For circle size, correlations between specific diagrams and the overall diagram ranged in magnitude from $r = .24$ to $r = .66$. Except for the correlation between the fantasy circles across the partner-number and overall diagrams, all were significant at $p < .05$. For circle overlap, correlations ranged from $r = .38$ to $r = .78$ and were significant at $p < .05$. This demonstrates consistency (i.e., reliability) in the way participants responded across diagrams. For details, please see our supplementary material.

Q1: How was Interest Number and Strength Configured Across Porn, Fantasy, and In-Person Contexts?

In Figure 3, we visualized interest number/strength across porn, fantasy, and in-person sexuality for action/behavior orientation, gender/sex orientation, partner-number orientation, and overall orientation.

In Table 2, we list the average size of each modality circle with a 95% CI. Notably, the average participant had interests of moderate strength for each modality, given that none of the average circle sizes, nor their 95% CIs, overlapped with 0%.

We analyzed whether sexual orientation interest *number/strength* differed significantly by modality, and whether this was moderated by participant gender/sex/ual identity. To do so, we conducted a separate ANOVA for each diagram: action/behavior orientation, gender/sex orientation, partner-number orientation, and overall orientation. Each ANOVA was mixed design, with a three-level within subjects factor for modality (porn circles, fantasy circles, and in-person circles) and a two-level between subjects factor for gender/sex/ual identity (gender/sex/ual minorities, gender/sex/ual majorities), and circle area as our dependent measure. Table 3 shows the full results of each ANOVA and follow up pairwise comparisons.

Sexual orientation interest number/strength was significantly highest for in-person sexuality, followed by fantasy, followed by porn for three orientation dimensions—gender/sex sexuality, action/behavior sexuality, and overall sexuality—but not partner number sexuality as indicated by circle size (see Table 5 for statistics). Together, these findings indicate that, across most dimensions of orientation, interest number/strength branched across contexts. These patterns held across gender/sex/ual identity with no significant differences between gender/sex/ual minorities vs. majorities.

Partner-number orientation differed from this pattern of branching, however, showing coincidence across contexts given no significant differences in circle size. Additional follow-up comparisons showed that interest number/strength for porn was significantly higher for partner-number orientation than for both action/behavior orientation, $t(29) = 3.88, p < .001, d = 0.71$, 95% CI [0.30, 1.10], and gender/sex orientation, $t(29) = 2.09, p = .046, d = 0.38$, 95% CI [0.01,

0.75]. In contrast, interest number/strength for in-person sexuality was significantly *lower* for partner-number orientation than for action/behavior orientation, $t(29) = -3.37, p = .002, d = -0.62, 95\% \text{ CI } [-1.00, -0.22]$, but did not significantly differ from gender/sex orientation, $t(29) = -0.97, p = .339$. For fantasy, interest number/strength did not significantly differ across partner-number, action/behavior, and gender/sex orientation. Together, these findings indicate that interest number/strength for partner-number orientation was relatively high for porn and low for in-person sexuality.

Q2: How was Sexual Orientation Interest Type Configured Across Porn, Fantasy, and In-Person Sexuality?

In Figure 4, we visualized the extent to which sexual orientation *interest type* overlapped and diverged across porn, fantasy, and in-person sexuality for each dimension of sexual orientation (i.e., action/behavior, gender/sex, partner-number, and overall sexual orientation).

In Table 4, we show the average overlap of each pair of contexts with a 95% CI. Notably, there was neither full branchedness nor full coincidence across any pair of contexts given that neither their average overlap nor their 95% CIs overlapped with 0% or 100%. This indicates that, across dimensions of sexual orientation, interest type was both branched *and* coincident for all pairs of contexts.

We analyzed whether sexual orientation interest type was significantly more coincident (i.e., overlapping) across certain pairs of contexts, and whether this was moderated by participant gender/sex/ual identity. Like sexual orientation interest number/strength above, we conducted a separate ANOVA for each diagram: action/behavior sexual orientation, gender/sex sexual orientation, partner-number sexual orientation, and overall sexual orientation. Each ANOVA was mixed design, with a three-level within subjects factor for circle pair (porn &

fantasy circles, porn & in-person circles, and fantasy & in-person circles) and a two-level between subjects factor for gender/sex/ual identity (gender/sex/ual minorities and majorities), and the standardized area of overlap across pairs of circles as our dependent measure. In Table 5, we show the full results of each ANOVA and follow up pairwise comparisons.

Sexual orientation interest type overlapped significantly more across fantasy and in-person sexuality than for porn and in-person sexuality for all orientation dimensions as indicated by circle overlap (see Table 5 for statistics). In addition, interest type for porn and fantasy overlapped significantly more than for porn and in-person sexuality—but just for action/behavior orientation and partner-number orientation. Interest type overlapped significantly more for fantasy and in-person sexuality than for porn and fantasy—but just for gender/sex orientation. Together, these findings indicate that, across dimensions of orientation, interest type was the most coincident for fantasy and in-person sexuality, the least coincident for porn and in-person sexuality, and more varied for porn and fantasy. These patterns held across gender/sex/ual identity with no statistically significant differences between gender/sex/ual minorities vs. majorities.

Discussion

How does sexual orientation branch and coincide across sexual contexts? We used a mixed-methods approach to investigate people's interests across porn, fantasy, and in-person sexuality. To do so, we focused on overall sexual orientation and three specific dimensions: action/behavior sexuality, gender/sex sexuality, and partner-number sexuality. For each of these dimensions, we focused on the extent to which interest number, strength, and type coincided and branched across contexts. We found that sexual interest number/strength branched for most dimensions of orientation (action/behavior, gender/sex, and overall), with participants reporting

significantly higher interest number/strength for in-person sexuality than porn or fantasy. With sexual interest type, there was branching and coincidence across all pairs of contexts, but porn and in-person sexuality were significantly more branched than other modality pairs. What does this mean?

Our findings for sexual interest/number strength suggest that in-person sexuality may generally be more central to people than porn or fantasy for some dimensions of orientation, but not all. Social contact is important to most people (e.g, Fiske, 2018), and it is perhaps unsurprising that people reported the highest interest/strength for in-person sexuality, given that it was the only context that we focused on that involved direct human to human connection. We also found, however, that interest number/strength for porn and fantasy was greater than zero for all dimensions of orientation, suggesting that these contexts are also relevant to many people's sexual configurations.

For partner-number sexuality, we did not find evidence that people differ in interest number/strength across contexts. And, we found that interest number/strength for partner-number orientation was relatively high for porn and low for in-person sexuality compared to other dimensions of sexual orientation, like gender/sex and action/behavior. This pattern of results suggests that for porn, partner-number interests may be especially strong or varied and, accordingly, that porn and fantasy are not just subsidiary to in-person sexuality but seem to be especially important contexts for partner-number orientation.

We also focused on the similar and different interests (i.e., interest type) that people had for different dimensions of orientation. Overall, interests were partially branched and partially coincident across each dimension of orientation that we focused on (action/behavior, gender/sex, and partner number), and participants showed a range of patterns of overlap and distinction. In

other words, people can have different *and* similar sexual interests across porn use, fantasy, and in-person sexuality, and the extent of this similarity/difference varies by individual.

These findings also support our conceptualization of partner-number and action/behavior, in addition to gender/sex, as dimensions of sexual orientation. As shown in Table 4 and in Figure 4, partner-number and action/behavior sexual interests were at least somewhat coincident across sexual contexts. This suggests coincidence in the phenomena that people are oriented to, while also showing differences across porn, fantasy, and in-person sexuality.

Our findings are partially consistent and partially not with studies of gender/sex orientation that measure genital and self-reported arousal to porn and their correlations with sexual fantasies or in-person attractions to different gender/sexes; as such, there are several implications from our results. The literature tends to show heterosexual cisgender women exhibiting lower correlations between their arousal to porn and their fantasy or in-person attractions while lesbian cisgender women have shown somewhat stronger correlations, though these findings are somewhat varied by methodology (e.g., Chivers et al., 2010; Kukkonen, 2015; Kukkonen et al., 2007; Peterson et al., 2010).¹⁰ These low to moderate correlations are consistent with our findings of partially branched interest type for gender/sex across porn and fantasy, as well as across porn and in-person sexuality.

Allosexual cisgender men, on the other hand, have shown moderate to strong correlations between their arousal to porn and their fantasy or in-person attractions (Chivers et al., 2010; Jabbour et al., 2020), but a large minority (as many as one third of participants in some studies, e.g., Rieger et al., 2005) have been excluded from these analyses altogether because they had

¹⁰ Notably, most of these studies have used researcher-selected stimuli and clips of audio-visual pornography. The strength of these correlations may differ with virtual reality porn and/or participant-chosen stimuli (Chadwick et al., 2018; Goldey & van Anders, 2016).

little to no genital and/or self-reported arousal to the porn they were shown. Clearly, if they were included, overall correlations would be much lower. High correlations among some cisgender men and little to no correlation among others is consistent with the range in coincidence across porn and fantasy and porn and in-person that we found in the present the study.

In some cases (especially in the case of bisexual men), researchers have interpreted low (or no) correlations between genital arousal and in-person attractions or fantasy frequencies to mean that self-reported in-person attractions were exaggerated or perhaps based in something other than genital arousal (though this original finding has been superseded by later studies and meta analyses; e.g., Cerny & Janssen, 2011; Jabbour et al., 2020). Our findings from the present study suggest that, rather than non-genital measures being inaccurate, lower (or no) correlations can be evidence of branching interests/attractions across porn, fantasy, and in-person sexuality, which has further implications for how orientation is studied and understood.

With the exception of sexual fluidity research on the extent to which gender/sex sexual orientation branches over time (e.g., Diamond et al., 2017), studies of sexual orientation often focus on understanding its latent (or unobserved) properties. For example, studies of sexual orientation that measure genital arousal to porn have tended to focus on the characteristics of orientation *in general*, rather than what people are aroused by *in porn* specifically. Differences between interests/attractions within porn compared to within fantasy or in-person attractions are often conceptualized as “noise,” measurement error, or discord, because similarities are of primary interest. In the present study, we focused specifically on three relatively distinct but commonly studied contexts—porn, fantasy, and in-person sexuality—and found that, in addition to similarities, many people had non-trivial differences in their interests and attractions. This suggests that at least some facets of orientation are *context-dependent*, not just in strength of

interest, but in interest type. In other words, paying attention to the context in which interests and attractions take place explains meaningful variation in what people are attracted to. To understand orientation, we need a greater understanding of sexual orientation within contexts.

One potentially fruitful avenue of future research related to sexual orientation within contexts could focus on what distinguishes contexts from each other. In the present study, for example, we focused on porn, fantasy, and in-person sexuality, but what distinguishes these contexts from each other and which distinctions matter for people's attractions? In addition, porn, fantasy, and in-person sexuality can be further divided into more specific contexts: porn exists in several different mediums; in-person sexuality happens in relationships, hook-ups, and many varied interpersonal settings; people fantasize during masturbation and during partnered sex (Leitenberg & Henning, 1995). Exploring more specific contexts (e.g., how interests branch across different forms of pornography) and what distinguishes contexts from one another is likely to provide valuable insights.

Our findings for sexual orientation interest type across contexts may be relevant outside research methods, including for people who experience distress related to sexual fantasy or porn use, and for clinicians who work with this population. Specifically, we found that branchedness in interest type across contexts like porn and in-person sexuality is common (see Table 4), but a lack of awareness of this may contribute to people's concerns about their own sexuality or their partner's. For example, in Kohut and colleagues' (2017) study of porn use in the context of relationships, one woman participant described her partner's concerns, saying "... he gets these ideas that I really want a guy with a huge cock like in the videos, he gets insecure..." Greater understanding that interests can be present/important in one context (like large penises in porn), but not another (like the irrelevance of large penises with partners), could help people move from

automatic assumptions about their partner's (or their own) interests to having conversations (or engaging in self-reflection) about whether or not their interests are the same across contexts.

Overall, our findings show that people's interests across porn, fantasy, and in-person sexuality both branch and coincide. This means that sexual orientation itself cannot be assumed to be similar *or* assumed to be different across contexts and instead there may be person- and time-specific branchedness and/or coincidence. General and research understandings tend to give primacy to in-person sexuality over porn use and fantasy, and assume that people have the same (or similar) sexual interests across these three contexts. Our research shows that this works sometimes and for some people but is inaccurate for others. Instead, we empirically demonstrated that porn and fantasy, as well as in-person sexuality, are distinguishable sexual spaces or domains that matter in their own right and have interests that branch and coincide across them. These findings contribute to a growing body of empirical support for sexual configurations theory (Abed et al., 2019; Beischel et al., 2021; Schudson et al., 2017) – which articulates the importance of branchedness/coincidence and multi-dimensionality to sexual orientation – and add to it by focusing on the multidimensionality of sexual orientation across contexts.

Limitations

There are several limitations to the present study, in addition to its strengths. In each interview, participants would complete diagrams in the order of action/behavior orientation, gender/sex orientation, partner-number orientation, then overall orientation. While this allowed us to keep our interview script consistent, it introduced the possibility of order effects. Interviewers also had flexibility to deviate from their script and tailored their follow-up questions to the way participants had configured their diagrams, as is best practice in qualitative research

for semi-structured interviews (e.g., Braun & Clarke, 2013). This helped with participant comprehension and made the questions we asked more germane, but also created more variance in the study environment across participants.

In addition, for each diagram, the circle size parameter represented both interest number and strength. Pretests suggested that this would be more intuitive for participants because it limited the diagrams to two adjustable parameters: circle size and circle position. One trade-off, however, is that we had less precision when interpreting circle size. A participant could have made a circle large for different reasons, including having a lot of interests, a few strong interests, or both. An additional adjustable diagram parameter, such as opacity, could ameliorate this so that participants could indicate interest number and strength separately, though obviously at the cost of additional cognitive demand to participants. In addition, we explained to participants that a circle of size ‘0%’ represented a context in which they had no interests, but we did not give a precise anchor for ‘100%,’ the inclusion of which may have improved conceptual clarity for participants.

The results from this study come from in-depth, mixed methods interviews with 15 gender/sex/ual minorities and 15 gender/sex/ual majorities. This interview format allowed us to collect rich qualitative data, in addition to the quantitative data presented in the present study, and helped ensure that participants understood the constructs we were interested in and the diagrams they used. One trade-off, however, was that our study was not optimally powered to detect between group differences, such as between gender/sex/ual minorities and majorities. Future survey research with streamlined measures and larger sample sizes of specific groups could, for example, compare configurations across participants who identify as monosexual and those who identify as bisexual or pansexual, or between those who practice monoamory and

polyamory. And, there are obviously a number of other social location variables and experiences with minoritization that are likely to provide additional important insights.

Embedding these diagrams in a future survey instead of an interview would also make it easier to assess factors such as the impact of level of education, ease of using the diagrams, and the utility and ease of the diagrams compared to more traditional measures of sexual orientation. We could also explore the impact of asking participants follow up questions about how they configured their diagrams; their knowledge that they would be asked to elaborate on their circle positions may have influenced how they configured them.

In the present study, we focused on branching and coincidence across sexual contexts, rather than what specifically participants were attracted to or interested in. One trade-off of this approach is that we learned less about the specific interests that branch and coincide across contexts. This gestalt approach provided valuable insights, and others could be gained by taking a more granular approach and focusing on specific interest type for each modality across action/behavior, gender/sex, and partner-number sexuality.

Conclusions

Our novel mapping task provided new insights into sexual orientation as multi-dimensional across sexual contexts. We showed that sexual interest number/strength and interest type branch and coincide across porn, fantasy, and in-person sexuality. This challenges the assumption that sexual orientation is the same or similar across contexts, building on sexual configurations theory, and provides new avenues and a powerful methodology for future research.

Our results suggest that sexual interests for porn and sexual fantasy are not interchangeable with interests for in-person sexuality, and orientation should not be assumed to

be the same across modalities. This has implications for our understandings of what sexual orientation is, how researchers can measure it, and how clinicians might work to ameliorate unfounded distress that may be experienced when interests branch across sexual contexts.

Through showing that interests can branch across contexts via a novel methodological approach, our results build on sexual configurations theory to provide a new framework for understanding and studying sexual orientation in context and as multifaceted.

Declarations

Ethics Approval

The study was approved by the Queen's University General Ethics Review Board (Ethics approval number: 6027938).

Consent to Participate

Informed consent was obtained from all individual participants included in the study.

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Conflicts of interest/Competing interests

The authors declare that they have no conflicts of interest.

Availability of data and materials (data transparency)

To request data or study materials, contact (redacted) at (redacted).

Code availability

All code for analyses and data visualizations are contained in our supplemental material. To request the code for the diagrams, contact (redacted) at (redacted).

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Figures

Figure 1

Interview Study Procedures

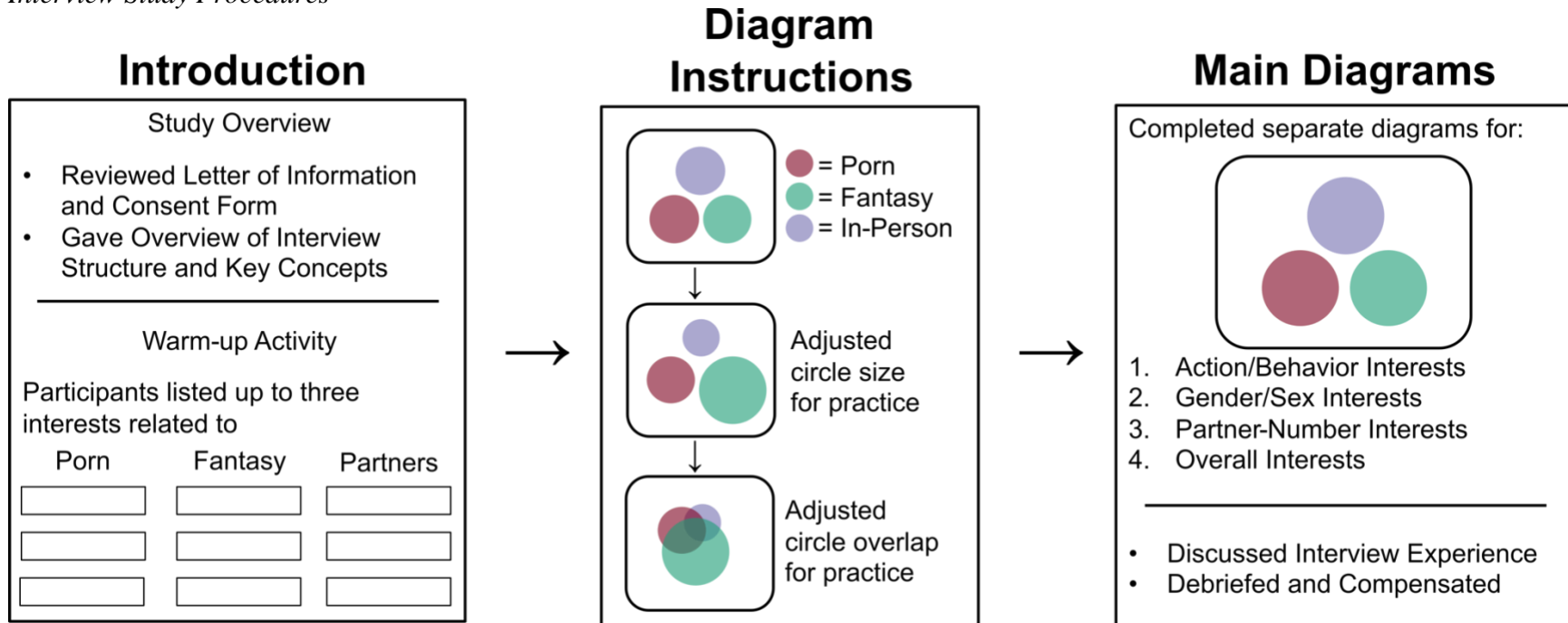


Figure 1 Caption

Note. The interview began with an introduction, which consisted of a joint letter of information and consent form, an overview of key concepts (e.g., ‘porn,’ ‘fantasy,’ and ‘in-person sexuality’), and a warm-up activity, where participants listed sexual interests related to fantasy, porn, and in-person sexuality. After the introduction, participants received diagram instructions, where participants practiced adjusting circle size and circle overlap in discrete steps. After receiving completing diagram instructions, participants proceeded to the main diagrams, where they completed separate diagrams for different dimensions of sexual orientation. After the final diagram, participants discussed their experience in the interview, were debriefed and compensated.

Figure 2

Configuration Diagrams: The Initial Diagram (a; seen by all participants) Followed by One Participant's Configuration (b)

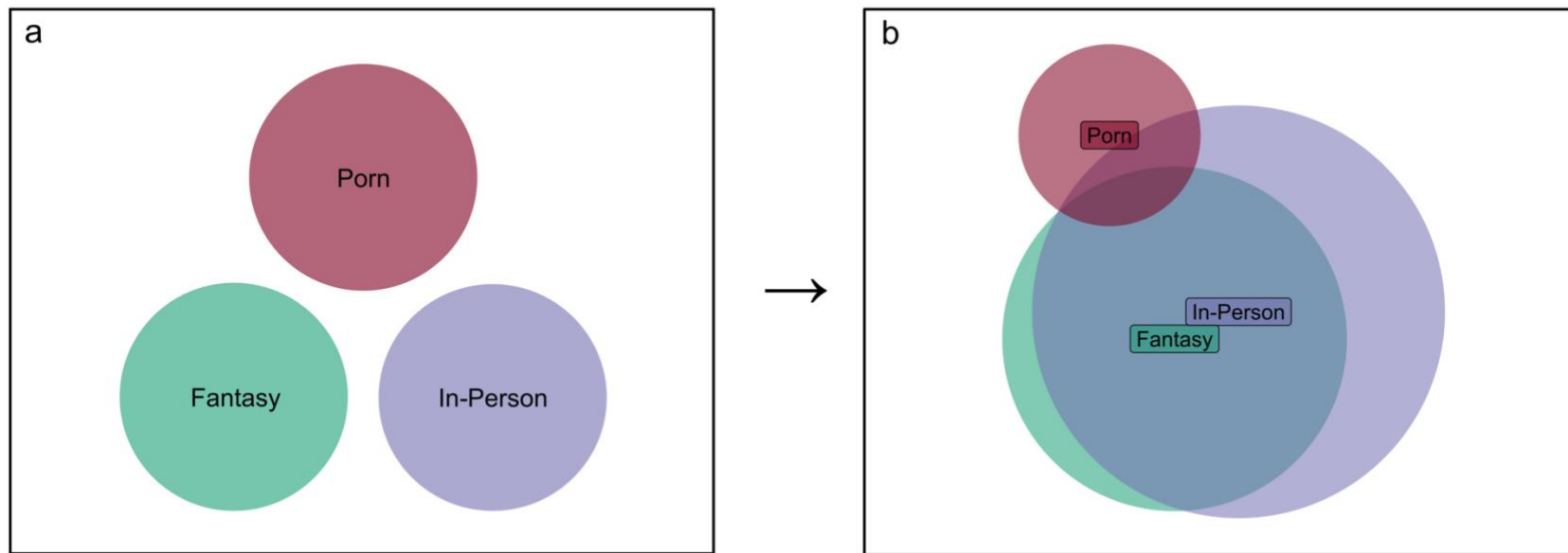


Figure 2 Caption

Note. All participants saw the initial diagram (2a, where we set the circle's starting positions at 50% of maximum possible size and to be nonoverlapping. Figure 2b shows one participant's circle configuration their circles for action/behavior orientation (i.e., their interests across contexts related to specific sexual actions and/or behaviors). They made their circle for in-person sexuality the largest, indicating the most interest number/strength. They made their fantasy circle close in size but smaller, indicating less but still considerable interest number/strength, and their porn circle the smallest, indicating considerably less interest number/strength. The considerable overlap between in-person sexuality and fantasy indicated many shared interests. The smaller overlap between porn and in-person sexuality and then fantasy indicated some but fewer shared interests. For each participant's configuration for each diagram (action/behavior, gender/sex, partner-number, and overall orientations), please refer to our supplementary material. To interact with our diagram tool, please visit the following link:

https://queensu.qualtrics.com/jfe/form/SV_eR1k3VUspyCTOPY

Figure 3

Interest Number/Strength is Branched and Coincident Across Contexts (Fantasy, In-Person Sexuality, and Porn).

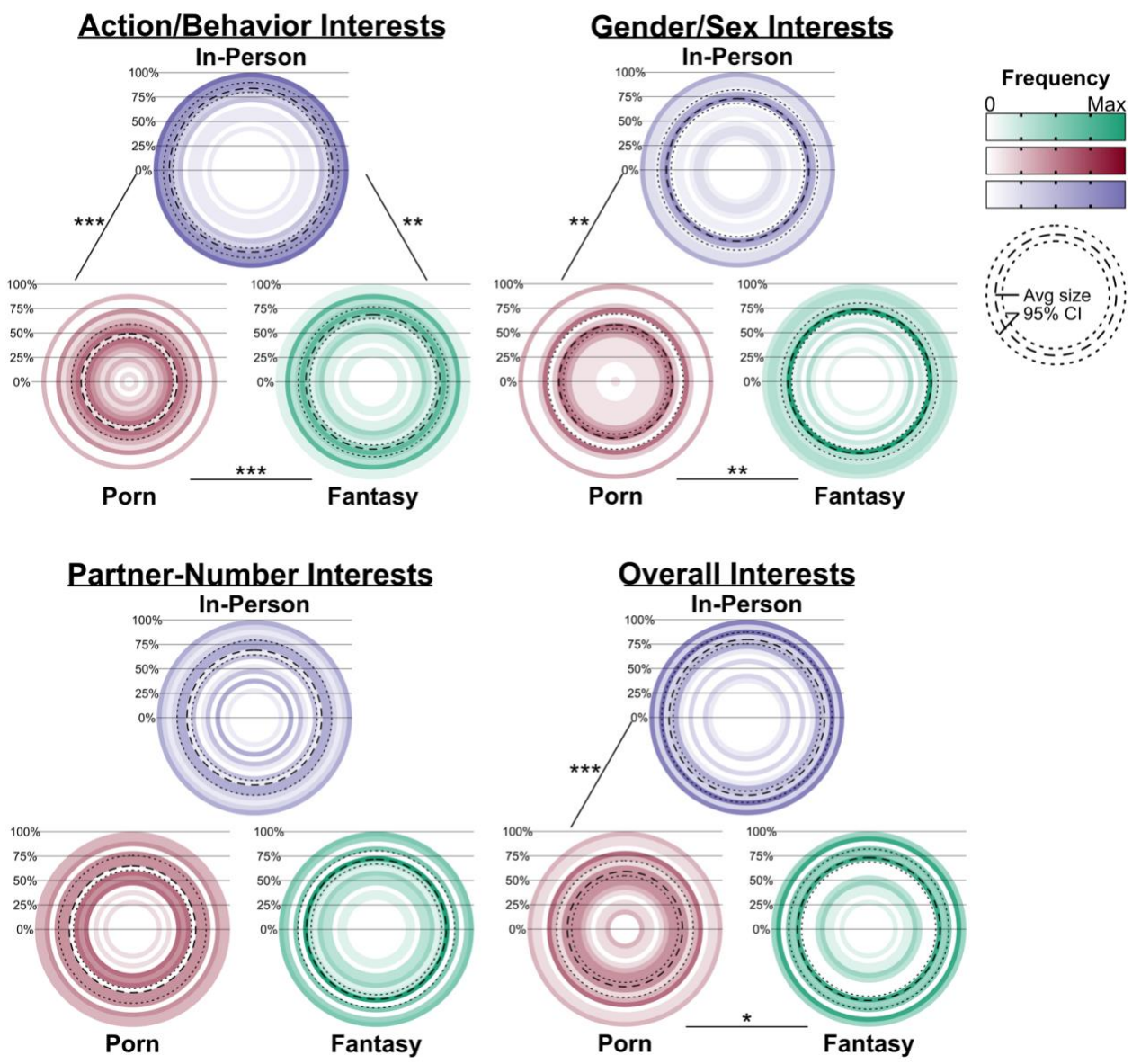


Figure 3 Caption

Note. This figure shows that for many dimensions of orientation that we examined (action/behavior, gender/sex, and overall interests), average interest number/strength branched across contexts, such that people reported significantly higher interest/number strength for in-person sexuality (see Table 3 for analyses). For partner-number interests, average interest number/strength coincided, such that there were no significant differences porn, fantasy, and in-person sexuality. The three black dashed circles represent the average size of each modality with 95% confidence intervals. The annuli (rings formed by concentric circles) represent five percent ranges in circle radii size. The innermost annuli of each circle represent radii ranging from 0% to 5% and the outermost represent those ranging from 95% to 100%. The opacity of each annuli represents the number of participants whose circle fell within that annuli's range. The more opaque an annulus, the more participants who set their circle to that size. For all dimensions of orientation, the highest number of participants falling within the same annulus was seven except for gender/sex sexuality, where it was nine. Asterisks denote significant differences in circle size across porn, fantasy, and in-person sexuality. '*' indicates a significant difference at $p < .05$; '**' denotes $p < .01$; '***' denotes $p < .001$.

Figure 4

Sexual Orientation Interest Type Is Branched and Coincident Across Contexts (Porn, Fantasy, In-Person Sexuality)

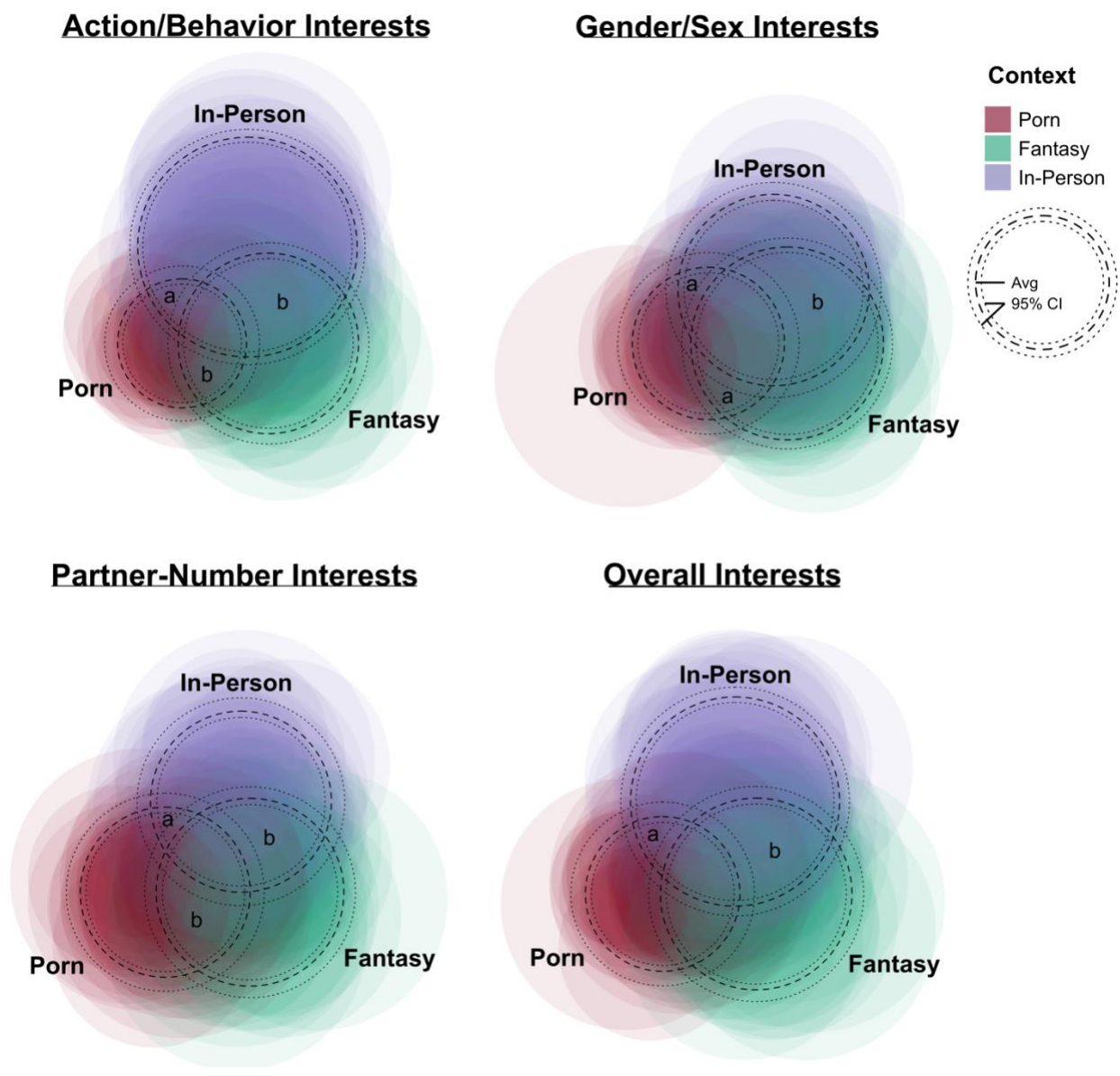


Figure 4 Caption

Note. This figure shows that for each dimension of orientation that we examined (action/behavior, gender/sex, partner-number, and overall interests), interest type was somewhat coincident (overlapping) and somewhat branched (distinct) across all pairs of porn, fantasy, and in-person sexuality. For action/behavior and partner-number orientation, porn and in-person sexuality overlapped significantly less than the other two pairs. For gender/sex orientation, fantasy and in-person sexuality overlapped significantly more than the other two pairs. And for ‘overall’ orientation, fantasy and in-person sexuality overlapped significantly more than porn and in-person sexuality. The black dashed circles represent the average size and relative position of each modality with 95% confidence intervals. The colored circles represent individual participants’ configurations: the sizes and relative positions of each modality. Areas of intersection labeled “a” and “b” differ significantly from each other in coincidence at $p < .05$.

Tables

Table 1

	All <i>N</i> (%)	Minorities <i>n</i> (%)	Majorities <i>n</i> (%)
<i>Participant Characteristics</i>			
Age			
18-27	18 (60)	11 (73)	7 (47)
28-37	4 (13)	1 (7)	3 (20)
38-47	4 (13)	2 (13)	2 (13)
48-57	1 (3)	0 (0)	1 (7)
58-67	3 (10)	1 (7)	2 (13)
Race/Ethnicity ^a			
White	22 (73)	11 (73)	11 (73)
Multiracial	3 (10)	1 (7)	2 (13)
Black	1 (3)	1 (7)	0 (0)
Chinese	1 (3)	1 (7)	0 (0)
Indian (India)	1 (3)	0 (0)	1 (7)
Latinx	1 (3)	0 (0)	1 (7)
Middle Eastern/Arab	1 (3)	1 (7)	0 (0)
Gender/Sex ^a			
Cisgender Women	15 (50)	7 (47)	8 (53)
Cisgender Men	11 (37)	4 (27)	7 (47)
Nonbinary	4 (13)	4 (27)	0 (0)
Sexual Orientation/Identity ^a			
Straight/Heterosexual	15 (50)	0 (0)	15 (100)
Bisexual	6 (20)	6 (40)	0 (0)
Lesbian	3 (10)	3 (20)	0 (0)
Queer	3 (10)	3 (20)	0 (0)
Gay	2 (7)	2 (13)	0 (0)
Pansexual	1 (3)	1 (7)	0 (0)
Religion ^a			
Not religious	9 (30)	4 (27)	5 (33)
Christian	5 (17)	2 (13)	3 (20)
Atheist	4 (13)	2 (13)	2 (13)
Catholic	4 (13)	1 (7)	3 (20)
Agnostic	3 (10)	3 (20)	0 (0)
anti-religious	1 (3)	0 (0)	1 (7)
Buddhism	1 (3)	0 (0)	1 (7)
Jewish	1 (3)	1 (7)	0 (0)
Muslim	1 (3)	1 (7)	0 (0)
Unitarian/Pagan/Hindu	1 (3)	1 (7)	0 (0)
Education			
High school graduate	3 (10)	2 (13)	1 (7)
Some college/university	14 (47)	7 (47)	7 (47)

Finished training other than college (e.g., vocational school; trade school)	1 (3)	1 (7)	0 (0)
Graduated from college (in the US: community college)	1 (3)	0 (0)	1 (7)
Graduated from university (in the US: 4-year college)	4 (13)	3 (20)	1 (7)
Received master's degree	5 (17)	1 (7)	4 (27)
Received professional degree (e.g., M.D., LL.B.)	1 (3)	1 (7)	0 (0)
Received doctoral degree	1 (3)	0 (0)	1 (7)
Occupation Status			
Student only	14 (47)	8 (53)	6 (40)
Student and employed (part- or full-time)	6 (20)	3 (20)	3 (20)
Employed non-student	7 (23)	3 (20)	4 (27)
Unemployed non-student	3 (10)	1 (7)	2 (13)
Household Income			
Less than \$10,000	4 (13)	2 (13)	2 (13)
\$10,000 - \$14,999	2 (7)	2 (13)	0 (0)
\$15,000 - \$24,999	5 (17)	1 (7)	4 (27)
\$25,000 - \$49,999	4 (13)	3 (20)	1 (7)
\$50,000 - \$99,999	5 (17)	1 (7)	4 (27)
\$100,000 - \$149,999	5 (17)	2 (13)	3 (20)
\$150,000 - \$199,000	3 (10)	3 (20)	0 (0)
\$200,000 or more	2 (7)	1 (7)	1 (7)
Disability			
No	24 (80)	9 (60)	15 (100)
Yes	6 (20)	6 (40)	0 (0)
Relationship Status			
Single (no sexual or romantic contacts)	7 (23)	5 (33)	2 (13)
Single (no relationships, some sexual contacts)	4 (13)	1 (7)	3 (20)
Dating	3 (10)	2 (13)	1 (7)
Committed relationship	8 (27)	3 (20)	5 (33)
Married/Common Law/Life Partnership	7 (23)	3 (20)	4 (27)
Other	1 (3)	1 (7)	0 (0)
Lifetime Sexual Partners ^b			
0	2 (7)	1 (7)	1 (7)
1	4 (13)	4 (27)	0 (0)
2-4	7 (23)	5 (33)	2 (13)
5-10	10 (33)	2 (13)	8 (53)
11-20	3 (10)	1 (7)	2 (13)
21-40	2 (7)	1 (7)	1 (7)
40+	2 (7)	1 (7)	1 (7)

^a We categorized participants' responses to an open-ended question about how they self-identify.

^b If participants provided an estimate with a lower bound (e.g., 40+), we used the lower bound. If they provided a range (e.g., "15-20), we took the value in the middle of the range.

Table 2*Average Interest Number/Strength by Modality with 95% CIs*

Diagram				
Modality	Action/Behavior	Gender/Sex	Partner-Number	Overall
Gender/sex/ual Minorities (N = 15)				
Porn	30.8% [20.4, 41.1]	37.5% [25.0, 50.1]	41.7% [28.0, 55.5]	36.0% [24.8, 47.1]
Fantasy	59.1% [45.3, 73.0]	63.7% [54.9, 72.6]	54.8% [39.8, 69.8]	60.4% [44.3, 76.5]
In-Person Sexuality	67.9% [54.9, 80.9]	61.6% [51.3, 71.8]	47.1% [34.6, 59.7]	65.8% [53.5, 78.0]
Gender/sex/ual Majorities (N = 15)				
Porn	24.7% [13.5, 35.9]	40.2% [24.1, 56.2]	52.1% [35.7, 68.5]	43.0% [25.8, 60.1]
Fantasy	41.6% [32.3, 50.9]	49.1% [35.2, 63.1]	54.7% [39.5, 69.9]	54.2% [40.2, 68.2]
In-Person Sexuality	76.7% [64.9, 88.4]	51.8% [32.6, 71.1]	57.1% [38.3, 75.9]	67.5% [51.4, 83.6]
All Participants (N = 30)				
Porn	27.7% [20.5, 35.0]	38.9% [29.3, 48.4]	46.9% [36.7, 57.1]	39.5% [29.8, 49.1]
Fantasy	50.4% [41.9, 58.9]	56.4% [48.2, 64.6]	54.7% [44.8, 64.7]	57.3% [47.2, 67.4]
In-Person Sexuality	72.3% [63.9, 80.7]	56.7% [46.3, 67.1]	52.1% [41.3, 62.9]	66.6% [57.1, 76.1]

Table 3*Interest Number/Strength (Circle Size) Compared Across Contexts*

Effect	Statistic(df)	<i>p</i>	Effect Size [CI ^a]
Action/Behavior Diagram			
Main Effect of Modality***	$F(2,56) = 30.81$	< .001	$\eta_p^2 = .52$ [.35, .62]
Porn Circle Size vs. Fantasy Circle Size***	$t(29) = -4.58$	< .001	$d = -0.84$ [-1.25, -0.41]
Porn Circle Size vs. In-Person Circle Size***	$t(29) = -7.45$	< .001	$d = -1.36$ [-1.85, -0.85]
Fantasy Circle Size vs. In-Person Circle Size**	$t(29) = -3.37$	.002	$d = -0.62$ [-1.00, -0.22]
Main Effect of Gender/Sex/ual Identity	$F(1,28) = 1.47$	.236	$\eta_p^2 = .05$ [.00, .22]
Modality x Gender/Sex/ual Identity Interaction	$F(2,56) = 2.72$	.075	$\eta_p^2 = .09$ [.00, .20]
Gender/Sex Diagram			
Main Effect of Modality**	$F(2,56) = 7.88$	.001	$\eta_p^2 = .21$ [.06, .35]
Porn Circle Size vs. Fantasy Circle Size**	$t(29) = -3.29$	.003	$d = -0.6$ [-0.99, -0.21]
Porn vs. In-Person**	$t(29) = -2.93$	.006	$d = -0.54$ [-0.91, -0.15]
Fantasy vs. In-Person	$t(29) = -0.16$	.872	$d = -0.03$ [-0.39, 0.33]
Gender/Sex/ual Identity	$F(1,28) = 1.14$	.294	$\eta_p^2 = .04$ [.00, .20]
Circle Pair x Gender/Sex/ual Identity Interaction	$F(2,56) = 1.60$	.211	$\eta_p^2 = .05$ [.00, .15]
Partner-Number Diagram			
Main Effect of Modality	$F(2,56) = 0.89$	.415	$\eta_p^2 = .03$ [.00, .11]
Porn Circle Size vs. Fantasy Circle Size	$t(29) = -1.58$	.124	$d = -0.29$ [-0.65, 0.08]
Porn Circle Size vs. In-Person Circle Size	$t(29) = -0.77$	.447	$d = -0.14$ [-0.5, 0.22]
Fantasy Circle Size vs. In-Person Circle Size	$t(29) = 0.44$	.662	$d = 0.08$ [-0.28, 0.44]
Gender/Sex/ual Identity	$F(1,28) = 0.82$	.374	$\eta_p^2 = .03$ [.00, .18]
Circle Pair x Gender/Sex/ual Identity Interaction	$F(2,56) = 0.50$	.608	$\eta_p^2 = .02$ [.00, .08]
Overall Diagram			
Main Effect of Modality**	$F(2,56) = 8.16$	.001	$\eta_p^2 = .22$ [.07, .35]
Porn vs. Fantasy*	$t(29) = -2.43$	.022	$d = -0.44$ [-0.82, -0.06]
Porn vs. In-Person***	$t(29) = -3.89$	< .001	$d = -0.71$ [-1.11, -0.30]
Fantasy vs. In-Person	$t(29) = -1.57$	.127	$d = -0.29$ [-0.65, 0.08]
Gender/Sex/ual Identity	$F(1,28) = 0.03$	.872	$\eta_p^2 = .00$ [.00, .06]
Circle Pair x Gender/Sex/ual Identity Interaction	$F(2,56) = 0.48$	.624	$\eta_p^2 = .02$ [.00, .08]

Note: ^a95% CI for cohen's *d*; 90% CI for η_p^2 . * denotes $p < .05$, ** denotes $p < .01$, and *** denotes $p < .001$.

Table 4*Average Interest Type Coincidence (Circle Overlap) with 95% CIs*

Modality Pair	Diagram			
	Action/Behavior	Gender/Sex	Partner-Number	Overall
Sexual Minorities (<i>N</i> = 15)				
Fantasy & In-Person Sexuality	28.2% [13.9, 42.6]	49.2% [32.1, 66.4]	39.2% [21.2, 57.2]	36.2% [21.0, 51.4]
Porn & Fantasy	15.2% [5.7, 24.8]	32.5% [15.1, 49.9]	36.0% [18.9, 53.1]	23.6% [10.5, 36.7]
Porn & In-Person Sexuality	12.9% [5.7, 20.2]	25.1% [9.6, 40.6]	26.9% [10.9, 43.0]	22.1% [8.8, 35.4]
Sexual Majorities (<i>N</i> = 15)				
Fantasy & In-Person Sexuality	28.2% [15.2, 41.2]	50.9% [34.1, 67.8]	26.8% [8.2, 45.5]	25.0% [12.4, 37.7]
Porn & Fantasy	30.2% [13.6, 46.8]	36.7% [17.6, 55.8]	29.8% [15.1, 44.5]	22.1% [10.4, 33.7]
Porn & In-Person Sexuality	14.6% [2.0, 27.1]	33.0% [14.8, 51.3]	6.7% [1.1, 12.3]	10.7% [2.9, 18.5]
All Participants (<i>N</i> = 30)				
Fantasy & In-Person Sexuality	28.2% [19.2, 37.3]	50.1% [38.8, 61.4]	33.0% [20.7, 45.4]	30.6% [21.1, 40.1]
Porn & Fantasy	22.7% [13.3, 32.1]	34.5% [22.5, 46.6]	32.8% [22.2, 43.3]	22.8% [14.6, 31.1]
Porn & In-Person Sexuality	13.7% [7.0, 20.5]	28.9% [17.7, 40.2]	16.5% [7.8, 25.1]	16.4% [8.8, 24.0]

Table 5

<i>Interest Type Coincidence (Circle Overlap) Compared Across Modality Pairs</i>			
Effect	Statistic(df)	<i>p</i>	Effect Size [CI ^a]
Action/Behavior Diagram			
Main Effect of Modality Pair*	$F(2,56) = 4.82$	.012	$\eta_p^2 = .15$ [.02, .27]
Fantasy \cap In-Person vs. Porn \cap In-Person**	$t(29) = 3.56$	.001	$d = 0.65$ [0.25, 1.04]
Porn \cap Fantasy vs. Fantasy \cap In-Person	$t(29) = -0.94$	.357	$d = -0.17$ [-0.53, 0.19]
Porn \cap Fantasy vs. Porn \cap In-Person*	$t(29) = 2.22$	.034	$d = 0.41$ [0.03, 0.77]
Gender/Sex/ual Identity	$F(1,28) = 0.77$	.386	$\eta_p^2 = .03$ [.00, .17]
Modality Pair x Gender/Sex/ual Identity Interaction	$F(2,56) = 1.51$	.229	$\eta_p^2 = .05$ [.00, .15]
Gender/Sex Diagram			
Main Effect of Modality Pair***	$F(2,54) = 9.33$	< .001	$\eta_p^2 = .26$ [.09, .39]
Fantasy \cap In-Person vs. Porn \cap In-Person***	$t(28) = 4.11$	< .001	$d = 0.76$ [0.34, 1.17]
Porn \cap Fantasy vs. Fantasy \cap In-Person*	$t(28) = -2.48$	.020	$d = -0.46$ [-0.84, -0.07]
Porn \cap Fantasy vs. Porn \cap In-Person	$t(28) = 1.93$	.064	$d = 0.36$ [-0.02, 0.73]
Gender/Sex/ual Identity	$F(1,27) = 0.18$	.676	$\eta_p^2 = .01$ [.00, .12]
Modality Pair x Gender/Sex/ual Identity Interaction	$F(2,54) = 0.28$	.755	$\eta_p^2 = .01$ [.00, .06]
Partner-Number Diagram			
Main Effect of Modality Pair**	$F(2,54) = 5.84$	.005	$\eta_p^2 = .18$ [.03, .31]
Fantasy \cap In-Person vs. Porn \cap In-Person**	$t(28) = 3.58$	.001	$d = 0.66$ [0.26, 1.06]
Porn \cap Fantasy vs. Fantasy \cap In-Person	$t(28) = -0.18$	.859	$d = -0.03$ [-0.4, 0.33]
Porn \cap Fantasy vs. Porn \cap In-Person***	$t(28) = 4.02$	< .001	$d = 0.75$ [0.33, 1.15]
Gender/Sex/ual Identity	$F(1,27) = 3.09$	.090	$\eta_p^2 = .10$ [.00, .29]
Modality Pair x Gender/Sex/ual Identity Interaction	$F(2,54) = 0.78$	.465	$\eta_p^2 = .03$ [.00, .11]
Overall Diagram			
Main Effect of Modality Pair*	$F(2,56) = 4.58$	.014	$\eta_p^2 = .14$ [.02, .26]
Fantasy \cap In-Person vs. Porn \cap In-Person**	$t(29) = 2.97$	.006	$d = 0.54$ [0.15, 0.92]
Porn \cap Fantasy vs. Fantasy \cap In-Person	$t(29) = -1.41$	.169	$d = -0.26$ [-0.62, 0.11]
Porn \cap Fantasy vs. Porn \cap In-Person	$t(29) = 1.83$	.078	$d = 0.33$ [-0.04, 0.7]
Gender/Sex/ual Identity	$F(1,28) = 1.68$	.205	$\eta_p^2 = .06$ [.00, .23]
Modality Pair x Gender/Sex/ual Identity Interaction	$F(2,56) = 0.72$	.493	$\eta_p^2 = .02$ [.00, .10]

Note. A \cap B (e.g., Fantasy \cap Porn) represents the standardized overlap, shown in (1), between circle A and B. * denotes $p < .05$, ** denotes $p < .01$, and *** denotes $p < .001$.

^a95% CI for cohen's d ; 90% CI for η_p^2

Overview
Licensing
Libraries
Data
Codebook
Plot Code
Analyses

Supplement for Sexual Orientation Across Sexual Modalities

Redacted

Overview

This html document has code for all analyses and plots presented in [redacted]. For the Rmarkdown file used to generate this html document, click 'code' in the upper right hand corner of the document, then 'Download Rmd' from the dropdown menu.

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Libraries

This chunk of code shows the packages we used for our analyses and plots.

Hide

```
library(apaTables)
library(ggforce)
library(ggsignif)
library(kableExtra)
library(knitr)
library(psych)
library(tidyverse)
```

Data

Deidentified data is available upon request. Please contact [redacted].

Hide

```
Size_plot_data <- read_csv(file = "SEI_size_plot_data.csv")
Size_analysis_data <- read_csv(file = "SEI_size_analyses_data.csv")
Overlap_plot_data <- read_csv(file = "SEI_overlap_plot_data.csv")
Overlap_analysis_data <- read_csv(file = "SEI_Overlap_Analyses_data.csv")
```

Codebook

Variables within the `Size_plot_data` and `Overlap_plot_data` dataframes

- These dataframes are in 'long' format, with multiple rows of data for each participant.
- The `ID` variable refers to the participant ID assigned to each participant
- The `diagram` variable refers to which diagram data comes from. It has the following values:
 - `ActionsBehaviors` = the action/behavior orientation diagram
 - `GenderSex` = the gender/sex orientation diagram
 - `PartnerNumber` = the partner-number orientation diagram
 - `Composite` = the overall orientation diagram
 - `SizePractice` and `OverlapPractice` reference diagrams participants completed at the beginning of the interview to practice adjusting circle size and position.
- The `circle` variable refers to which context each circle represents. It has the following values:
 - `InPerson` refers to in-person sexuality circles
 - `Fantasy` refers to fantasy circles
 - `Porn` refers to porn circles
- The `Radius` variable gives the radius of each circle in pixels
- The `Percent` variable gives the area of each circle as a value ranging from 0 to 100
- The `Area` variable gives the area of each circle in pixels
- The `CoordinatesX` and `CoordinatesY` variables give the X and Y coordinates for the center of each circle

Variables within the `Size_analysis_data` and `Overlap_analysis_data` dataframes

- These dataframes are in 'wide' format, with a single row of data for each participant.
- The `ID` variable refers to the participant ID assigned to each participant
- The `Majority` variable refers to whether a participant was a gender/sex/ual minority or majority. It has the following values:
 - 1 = gender/sex/ual minority participant
 - 2 = gender/sex/ual majority participant
- The values of all other variables represent the area of different diagrams and regions (units = pixels)
 - In the `Overlap_analysis_data` dataframe, variables containing `PornXFantasy`, `PornXInPerson`, and `FantasyXInPerson` refer to the overlap across each of these pairs of circles.
 - In the `Size_analysis_data` dataframe, variables containing `Porn`, `Fantasy`, and `In-Person` refer to the area of each of these individual circles
 - Variables containing `Actions` or `ActionsBehaviors` refer to circles that came from the action/behavior orientation diagram
 - Variables containing `Gender` or `GenderSex` refer to circles that came from the gender/sex orientation diagram
 - Variables containing `Number` or `PartnerNumber` refer to circles that came from the partner-number orientation diagram
 - Variables containing `Comp2` refer to circles that came from the overall orientation diagram

Plot Code

Palette Sets Individual Diagrams Size Plots Overlap Plots

Hide

```
#palette sets
base_gradient <- "#ffffff"
paletteset0 <- tibble(fantasy = "#f0e921", porn = "#23b3f0", in.person = "#f02f21")
paletteset1 <- tibble(fantasy = "#1b9e77", porn = "#d95f02", in.person = "#7570b3")
paletteset2 <- tibble(fantasy = "#e41a1c", porn = "#377eb8", in.person = "#4daf4a")
paletteset3 <- tibble(fantasy = "#66c2a5", porn = "#fc8d62", in.person = "#8da0cb")
paletteset4 <- tibble(fantasy = "#7a600b", porn = "#7a0b3d", in.person = "#0b6f7a")
paletteset5 <- tibble(fantasy = "#1b9e77", porn = "#800020", in.person = "#7570b3") # paletteset1 with
burgundy for porn
gradient_n <- 49

palette0_gradients <- map(
  .x = paletteset0,
  .f = ~ colorRampPalette(
    colors = c(base_gradient, .x))(gradient_n)
  ) %>%
  set_names(nm = c("fantasy_colours", "in.person_colours", "porn_colours")) %>% as_tibble()

palette1_gradients <- map(
  .x = paletteset1,
  .f = ~ colorRampPalette(
    colors = c(base_gradient, .x))(gradient_n)
  ) %>%
  set_names(nm = c("fantasy_colours", "in.person_colours", "porn_colours")) %>% as_tibble()

palette2_gradients <- map(
  .x = paletteset2,
  .f = ~ colorRampPalette(
    colors = c(base_gradient, .x))(gradient_n)
  ) %>%
  set_names(nm = c("fantasy_colours", "in.person_colours", "porn_colours")) %>% as_tibble()

palette3_gradients <- map(
  .x = paletteset3,
  .f = ~ colorRampPalette(
    colors = c(base_gradient, .x))(gradient_n)
  ) %>%
  set_names(nm = c("fantasy_colours", "in.person_colours", "porn_colours")) %>% as_tibble()

palette4_gradients <- map(
  .x = paletteset4,
  .f = ~ colorRampPalette(
    colors = c(base_gradient, .x))(gradient_n)
  ) %>%
  set_names(nm = c("fantasy_colours", "in.person_colours", "porn_colours")) %>% as_tibble()

palette5_gradients <- map(
  .x = paletteset5,
  .f = ~ colorRampPalette(
    colors = c(base_gradient, .x))(gradient_n)
  ) %>%
  set_names(nm = c("fantasy_colours", "in.person_colours", "porn_colours")) %>% as_tibble()
```

Analyses

Action/Behavior Orientation Gender/Sex Orientation Partner-Number Orientation Overall Orientation

Cross Diagram Analyses

Circle Size Circle Overlap Individual Plots (Thumbnail) Individual Plots (Each)

Plot Repeated Measures ANOVA Pairwise Comparisons (R code and output)

Hide

action.behavior_size.plot

