



# Are romantic orientation and sexual orientation different? Comparisons using explicit and implicit measurements

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## Abstract

Recent research has characterized romantic love as overlapping with but distinct from sexual desire. We explore whether romantic orientation—the preferred gender(s) of romantic partners—also relates to but differs from sexual orientation—the preferred gender(s) of sexual partners. We developed explicit and implicit measures of romantic orientation to examine their associations with explicit and implicit sexual orientation. Further, because sociocultural values have been suggested to influence people’s choice for romantic partners but less so on sexual orientation, we also explored the associations of romantic and sexual orientation with two theoretically related sociocultural values: negative attitudes towards lesbian, gay, and bisexual individuals, and traditional Asian values on family continuity. We recruited an online sample of ethnic Chinese heterosexual, bisexual, and gay/lesbian adults and found that after accounting for the statistical overlap between the two explicit constructs, the unique component of each explicit measure related exclusively to its corresponding implicit measure, but not to the other implicit measure. Moreover, implicit romantic orientation linked more strongly to sociocultural values than did implicit sexual orientation. These findings urge for distinguishing romantic orientation from sexual orientation and implicit from explicit processes to fully understand people’s romantic and sexual experiences.

**Keywords** Romantic orientation · Sexual orientation · Sexual desire · Romantic love · LGB

## Introduction

When people describe themselves as lesbian, gay, bisexual (LGB), or straight, many would conflate their romantic and

sexual experiences. For many individuals, adults especially, their most intense affectional bonds are often intertwined with sexual desire, and subsequently, the labels such as LGB and straight denote not only the gender(s) to which people are attracted sexually, but also romantically. Therefore, these identity labels might be more accurately referred to as “sexual-romantic orientation identities” than as “sexual orientation identities” (Diamond, 2003).

However, romantic love and sexual desire do not always coincide. For example, at the behavioral level, people may have romantic love towards one person without having sexual desire (such as asexual people falling in love or as in platonic relationships or passionate friendships; Bogaert 2015; Way, 2011) or engage in sexual activities with someone outside a romantic context (as in casual sex; Garcia et al., 2012), suggesting that the target of someone’s sexual desire and romantic love can differ. At the neural level, studies have revealed that experiences of romantic love and sexual desire involve overlapping yet distinct neuroendocrine processes (Diamond & Dickenson, 2012).

These behavioral and neural differences raise the possibility that sexual desire and romantic love are shaped by

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different factors. Regarding sexual desire, the mainstream view is that it is oriented towards one or more genders by biological factors more than by sociocultural values (Bailey et al., 2016; Diamond, 2003). Supporting this perspective, researchers have found that sexual orientation—defined as sexual desire for the same gender, another gender, or more than one genders—is associated with biological factors in early developmental periods, such as prenatal exposure to gonadal hormones, genes, and (in males) maternal immune system (Bailey et al., 2016). In contrast, there is less clear evidence of sociocultural values (e.g., liberal attitudes on same-sex marriage) influencing sexual orientation.

Compared to the research on the origins of sexual orientation, fewer studies have examined the phenomenon of romantic orientation, which we define as intense desire for romantic relationships with persons of the same gender, another gender, or more than one genders. Following other relationship researchers, our definition of “romantic love” (also called “passionate love”) refers to pair-bonds between romantic partners and between intimate friends, as well as other forms of adult attachment (Hazan & Shaver, 1987; Thompson, 2006). These relationships often involve physical intimacy but not necessarily sexual intimacy (Diamond & Dubé, 2002; Thompson, 2006). This intimacy motivation (the motivation to establish close, meaningful, and positive relationships with other people; Weinberger et al., 2010) also differentiates romantic orientation from marital intention, as unlike romantic orientation, marital intention can be fueled solely by nonromantic motivations such as social pressure or instrumental needs (Ren et al., 2019).

While limited research has investigated biological influences on romantic orientation, several lines of studies have lent indirect support to influences of sociocultural values. Recent studies suggest that similar to influences of sociocultural values on people’s preferences for age, race/ethnicity, social status, personality traits, and intelligence in an ideal long-term romantic partner (Hatfield & Sprecher, 1995), these influences may extend to the romantic partner’s gender. For example, young adults raised by two lesbian mothers were found to be more likely than young adults raised by heterosexual single mothers to consider having a same-gender romantic relationship, and this difference was larger than the differences in having same-gender sexual attraction, sexual behavior, or sexual identity (Golombok & Tasker, 1996). Another study found that children raised in lesbian families reported lower expectations for future romantic involvement with another gender (Bos & Sandfort, 2010).<sup>1</sup> Although it is impossible to rule out genetic effects in both studies because the sampled children were born in these lesbian families, these studies together suggest

that the romantic orientation in people raised by two mothers may be influenced by the mothers’ openness towards same-gender relationships.

Other support for the influences of sociocultural values on romantic orientation comes from studies examining same-gender passionate friendships (Hatfield & Sprecher, 1986; Way, 2011), which resemble romantic love in four aspects: proximity seeking, safe haven, separation distress, and secure base (Diamond & Dubé, 2002). These same-gender passionate friendships are common during early adolescence (Li & Wong, 2018; Way, 2011), but often dissolve starting middle adolescence especially in boys (Way, 2011). According to the narratives of the young people (Way, 2011), one possible explanation for this developmental change is that heteronormative ideology becomes popular in peer social networks from middle adolescence, which suggests that romantic orientation may change with social norms such as (affirmative or intolerant) attitudes towards LGB individuals.

Finally, in the Chinese context, traditional Asian values such as filial piety, especially pressure to maintain family continuity, may have driven many sexual minority individuals to attend to, and act on, their other-gender romantic attraction and ignore their same-gender romantic attraction (Ren et al., 2019), thereby changing their subjective experiences of romantic orientation. Importantly, choosing to go into a certain relationship does not always imply romantic considerations, but could reflect external influences such as coercion from family members. Nevertheless, these initial choices may gradually change people’s romantic orientation, because as the committed partners spend time together, engage in communal activities, and confront life challenges together—intimacy, companionship, liking, and love may be cultivated, which has been demonstrated in experimental studies (Aron et al., 1997) and in arranged marriage in Asian cultures (Myers et al., 2005). In summary, it is possible that heteronormative and traditional Asian ideologies may contribute to romantic orientation.

Despite theoretical distinctions, prior studies have rarely measured sexual orientation and romantic orientation separately. Moreover, romantic orientation is often indistinguishable from sexual orientation in explicit self-reports, for two reasons. First, the person with whom an individual has sexual activities is often the same person with whom that individual develops a romantic relationship, and vice versa (Furman & Collibee, 2014). Second, people may be unaware that romantic orientation and sexual orientation can be different (reviewed in Diamond, 2003), therefore biasing their reports. Hence, when reflecting on their own past romantic and sexual experiences, people tend to report overlapping romantic orientation and sexual orientation. Nevertheless, the discrepancy between romantic orientation and sexual

<sup>1</sup> This study did not measure expectations for future sexual involvement.

orientation may occur at the implicit level. The dual-process theories have distinguished between explicit and implicit mental processes, positing that whereas explicit responses result from conscious, deliberate, advanced, and high-level mental processes, implicit responses result (at least in part) from unconscious, automatic, basic, and low-level mental processes (Greenwald & Lai, 2020). Therefore, when deliberate reflections are parceled out, as in implicit mental processes, the theoretical differences between romantic orientation and sexual orientation may be observed.

This study conceptualizes romantic orientation separately from sexual orientation. We developed novel measures of explicit and implicit romantic orientation and examined their associations with explicit and implicit sexual orientation. Based on the research reviewed above, we had the following exploratory hypotheses:

Hypothesis 1 (H1): Because people refer to sexual and romantic experiences when choosing a sexual identity label, we hypothesized that self-identified heterosexual, bisexual, and gay/lesbian people would have different explicit and implicit sexual orientation and explicit and implicit romantic orientation;

H2: Because the conceptual distinction between romantic orientation and sexual orientation may be obscured by deliberate reflections at the explicit level, we hypothesized that (H2a) after controlling for explicit sexual orientation, implicit romantic orientation, but not implicit sexual orientation, would relate positively to explicit romantic orientation; similarly, we also hypothesized that (H2b) after controlling for explicit romantic orientation, implicit sexual orientation, but not implicit romantic orientation, would relate positively to explicit sexual orientation;

H3: Considering the empirical evidence and theoretical reasoning on the associations between sociocultural values and romantic orientation and sexual orientation, we hypothesized that same-gender romantic orientation would relate to fewer negative attitudes towards LGB people and weaker endorsement of values on family continuity, at both explicit and implicit levels. Moreover, romantic orientation would relate more strongly to these two sociocultural values than sexual orientation, at both explicit and implicit levels.

## Methods

### Participants

Between a predetermined sampling period (10 February 2018 through 22 June 2018), we recruited participants using advertisements describing an online study focusing on “similarities and differences between sexual orientation and romantic orientation.” We invited participants from a large

university in Hong Kong through advertisements posted on campus, participant pool of the undergraduate-level course Introduction to Psychology, and mass emails sent to all undergraduate students. In addition, we advertised to the general public through Facebook, online forums, and snowballing. Efforts were also made to recruit participants from China mainland through snowballing. The purposive sampling aimed to reach potential participants representing a diverse range of sexual identity. Participants were invited to the study if they (1) were ethnic Chinese; (2) were residing in Hong Kong, Taiwan, Macau, or China mainland at the time of recruitment; and (3) aged 18–39 years. The first two inclusion criteria were adopted to ensure that the participants grew up in a Chinese cultural background. The age range was developmentally appropriate for studying romantic orientation and sexual orientation for three reasons: First, participants of this age range are in general sexually active (e.g., Cheung et al., 2008). Second, passionate romantic love is highly relevant to late adolescence and early adulthood (Hatfield & Sprecher, 1986). Third, large-scale representative studies in China found that 5% of secondary-school students and 7% of university students identified as LGB (Yan et al., 2018; Zhang et al., 2017), suggesting that Chinese sexual minority people start to identify as LGB in adolescence and warranting the comparisons between the sexual identity groups in our sample.

A total of 861 participants started the online survey. For the purpose of this study, we did not analyze data from trans participants ( $n=52$ ), intersex participants ( $n=3$ ), and cisgender participants who were questioning their sexual orientation ( $n=18$ ), who were asexual ( $n=2$ ), and who had missing data on sex, gender identity, or sexual identity ( $n=50$ ). Data from trans participants were not analyzed, because (1) they comprised diverse groups of people (trans men, trans women, genderqueer people, and people of other genders), of which the group sizes were too small ( $n$ s ranged from 5 to 28 with a median of 6.5) for separate statistical analyses; and (2) our measures of romantic orientation and sexual orientation were largely gender-binary from today’s viewpoint (see Measures), making them less valid for the trans participants, who might perceive their sexual orientation in a nonbinary way (Galupo et al., 2018). Data exclusion resulted in data analyzed from 736 participants (60.9% females;  $M_{\text{age}} = 21.48$ ,  $SD_{\text{age}} = 3.61$ ). This sample size is sufficient to detect small effects in analysis of variance (ANOVA) and regression analysis (Faul et al., 2009).

Compared to male participants, female participants were slightly younger in age,  $t(734) = -2.26$ ,  $p = .024$ , Cohen’s  $d = -0.17$ , slightly lower educated,  $\chi^2(3, 736) = 8.28$ ,  $p = .041$ , Crammer’s  $V = .11$ , and slightly more likely to be heterosexual or bisexual,  $\chi^2(2, 736) = 31.41$ ,  $p < .001$ , Crammer’s

**Table 1** Demographic Characteristics

Variable	Women ( <i>n</i> = 448)	Men ( <i>n</i> = 288)	Men vs. women (ref.) <i>t</i> (734) or $\chi^2$ ( <i>df</i> , 736)	<i>p</i>
Age (in years), <i>M</i> ( <i>SD</i> )	21.24 (3.40)	21.85 (3.90)	2.26	.024
Residence, <i>n</i> (%)			0.00	.970
Hong Kong	415 (92.6)	267 (92.7)		
Macau, Taiwan, or Mainland	33 (7.4)	21 (7.3)		
Education, <i>n</i> (%)			8.28	.041
Senior high school or below	140 (31.3)	78 (27.1)		
Further education qualifications	30 (6.7)	14 (4.9)		
Bachelor's degree	244 (54.4)	157 (54.5)		
Master's degree or above	34 (7.6)	39 (13.5)		
Marital status, <i>n</i> (%)			0.07	.791
Single (never married)	439 (98.0)	283 (98.3)		
Not single	9 (2.0)	5 (1.7)		
Number of children, <i>n</i> (%)			0.04	.839
None	444 (99.1)	285 (99.0)		
One or more	4 (0.9)	3 (1.0)		
Employment status, <i>n</i> (%)			0.67	.881
Student	358 (79.9)	229 (79.5)		
Full-time employment	60 (13.4)	43 (14.9)		
Part-time employment	17 (3.8)	9 (3.1)		
Other	13 (2.9)	7 (2.5)		
Subjective socioeconomic status, <i>M</i> ( <i>SD</i> )	5.69 (1.65)	5.72 (1.74)	0.22	.826
Religion, <i>n</i> (%)			3.54	.316
None/atheist/agnostic	358 (79.9)	219 (76.0)		
Buddhist	10 (2.2)	13 (4.5)		
Catholic/Protestant/other Christian	72 (16.1)	51 (17.7)		
Other	8 (1.8)	5 (1.8)		
Sexual identity, <i>n</i> (%)			31.41	<.001
Heterosexual	240 (53.6)	125 (43.4)		
Bisexual	139 (31.0)	68 (23.6)		
Lesbian/gay	69 (15.4)	95 (33.0)		

Note. ref. = reference. Age range: 18–39 years. Range of subjective socioeconomic status: 1–10; a larger value indicates a higher perceived social status

$V = .21$ . See Table 1 for detailed demographic information by participant gender.

## Procedures

Ethical approval was obtained from the Ethics Committee in the Department of Psychology at the University of Hong Kong. Electronic informed consent was obtained from all participants prior to their participation in the study.

Participants first downloaded the Inquisit 5 Web player to their local computers, which ensured high data quality in remote testing by three means: (1) the app ran the study in a full-screen mode when participants' mice and function keys were disabled so they were not allowed to switch to other programs while doing the tests; (2) the app automatically adapted the user interface to the devices so the locations and dimensions of the stimuli were standardized across participants; and (3) the app downloaded the stimuli to the local devices prior to launching the study and relied on

high-performance native system APIs to achieve precision of stimuli presentation and data recording in milliseconds.

Participants took the online survey in their preferred language, in either English, traditional Chinese, or simplified Chinese. All translations were cross-checked by the authors and additionally by a research assistant with a professional degree in translation. Among the 736 participants, 501 (68.1%) took the survey in traditional Chinese, 119 (16.2%) in English, and 116 (15.8%) in simplified Chinese. Language selection had little influence on the study variables (see Results).

The 20-min online survey was sequentially presented in four sections: (1) a demographic survey (including questions about explicit sexual orientation), (2) a measure of implicit sexual orientation, (3) a measure of implicit romantic orientation, and (4) questionnaires of explicit romantic orientation, values on family continuity, and attitudes towards LGB individuals. The order of these sections was determined for the following reasons: (1) demographic

characteristics, including a question on sexual identity, were asked first to minimize missing data on essential information; (2) the measure of explicit romantic orientation was presented in the last section to reduce potential common method bias (Conway & Lance, 2010) with the measure of explicit sexual orientation, which were both self-report measures and used the same Likert scale; (3) the adjacency of the implicit measures would not raise common method bias (Conway & Lance, 2010) due to the different format of these measures (see Measures). At the end of the study, we compensated participants by giving course credits or by offering a prize draw to win one cash award of HK\$500 (approximately US\$63).

### Missing Data

Given the length and task demands of the study, participants were allowed to skip one or more sections to minimize withdrawal from larger parts of the study. Among the 736 participants whose data were analyzed in this study, the numbers (and percentages) of participants who provided valid data in the first, second, third, and fourth sections were 736 (100%), 700 (95.1%), 355 (48.2%), and 607 (82.5%), respectively. The large amount of invalid data in the third section is because 167 (22.7%) participants skipped this section, possibly due to the lengthy and complex procedure of the implicit romantic orientation measure (see Measures and Supplemental Material for more information). Moreover, data in this section from another 214 (29.1%) were removed according to Hussey et al.'s (2015) data cleaning procedure (see Supplemental Material). The amount of data removed during data cleaning was comparable to prior studies, which found that using the stringent exclusion criteria resulted in a large amount of exclusion but also more reliable measurement (Hussey et al., 2015; Nicholson & Barnes-Holmes, 2012). Compared to participants who skipped one or more sections ( $n=380$ ), participants who provided valid data in all four sections ( $n=356$ ) were slightly younger,  $t(734) = -2.12, p = .034, d = -0.16$ , slightly more likely to reside in Hong Kong,  $\chi^2(1, 736) = 4.06, p = .044$ , Crammer's  $V = .07$ , slightly more likely to be single,  $\chi^2(1, 736) = 4.15, p = .042, V = .08$ , and slightly more likely to be bisexual or lesbian/gay,  $\chi^2(2, 736) = 8.70, p = .013, V = .11$  (for all demographic comparisons, see Table S1). Within each section, the variable missingness was 0–6.3%. Given the high missingness from one particular measure (implicit romantic orientation) and the weak association between the auxiliary variables and the missingness, it is unlikely to obtain full recovery of information from modern missing data handling techniques such as multiple imputation (Lee & Carlin, 2012). Therefore, we adopted a conservative approach by using pairwise deletion (i.e., information was deleted only when the data needed for

a particular analysis were missing), while acknowledging the potential bias in the findings (see Discussion).

## Measures

### Explicit sexual orientation

Participants reported their sexual orientation using a subset of the items from the Klein Sexual Orientation Grid (Klein et al., 1985) that assess sexual identity, sexual attraction, sexual behavior, and sexual fantasies in the past 12 months. Participants rated on Likert scales ranging from *exclusively heterosexual* (0) to *exclusively lesbian/gay* (6) for sexual identity, and from *other-gender only* (0) to *same-gender only* (6) for sexual attraction, sexual behavior, and sexual fantasies. Participants were categorized into three sexual identity groups according to their self-reported sexual identity: *heterosexual* (0–1), *bisexual* (2–4), and *lesbian/gay* (5–6), as in other studies (e.g., Rieger et al., 2015). Following prior work (Rieger & Savin-Williams, 2012), an average score of sexual attraction, sexual behavior, and sexual fantasies were used to evaluate explicit sexual orientation;  $\alpha = .98$  and  $.94$  for men and women, respectively.

### Explicit romantic orientation

The 15-item Passionate Love Scale (Hatfield & Sprecher, 1986) was modified to measure explicit romantic orientation. The Passionate Love Scale was developed to capture different components of romantic love, including cognition (e.g., “I possess a powerful attraction for this person”), emotion (“I would feel deep despair if this person left me”), and behavior (“I sense my body responding when this person touches me”). We modified the rating scale from measuring the frequency of romantic experiences to measuring the genders of the partners, such that participants rated to whom they had romantic feelings in the past 12 months, using a 7-point Likert scale ranging from *exclusively to the other gender* (0) to *exclusively to the same gender* (6). The timescale was set to the past 12 months in parallel to that for sexual orientation and to reduce the confound of sexual fluidity over a longer timescale (Diamond et al., 2017), as changes in sexual attraction over a longer period could affect the long-term associations of sexual orientation with romantic orientation and with sexual identity. If an item did not apply, the participants were asked to select the option “I have not had this experience or not applicable,” which was coded as a missing value. The average percentages of all participants selecting this option was 5.1% across the 15 items (range, 1.9–8.3%), suggesting that it was uncommon for participants to not have romantic experiences in the past 12 months. A composite score of explicit romantic

orientation was created by averaging all items;  $\alpha = .99$  for men and women.

### Implicit sexual orientation

Implicit sexual orientation was measured by viewing times to swimsuit or underwear models (adapted from Lippa, 2017). Participants were presented with photos of 14 male models, 14 female models, and 14 nonhuman objects. The photos of models were selected online and were validated in an independent sample of 20 ethnic Chinese adults. Given the multi-cultural background in Hong Kong, both Asian and White models were selected, whose ratio was kept at 9 to 5. The photos of nonhuman objects were selected from the Open Affective Standardized Image Set (Kurdi et al., 2017; <http://osf.io/6pnd7>). All photo stimuli were cropped to the same dimensions, and adjusted to similar brightness, contrast, and saturation. The stimuli were presented in a randomized order, on the left side of the screen.

Participants were asked to rate how sexually attracted they were to each model on the same 7-point Likert scale ranging from *I am not at all sexually attracted to this person* (1) to *I am extremely sexually attracted to this person* (7), and to click “not applicable” for nonhuman object photos. Further instructions can be found in the sample screenshots in Figure S1. As soon as the participants rated a photo, it was replaced by a new photo. Unknown to the participants, the Inquisit Web player recorded the amount of time (in milliseconds) participants spent on viewing each photo. Viewing times were capped at 10 s to control for outliers. Overall, 3.5% of all trials were eliminated due to surpassing this cap.

For each participant, an average standardized viewing time (pro-men) was calculated by dividing the difference between the mean viewing time on all male model photos and the mean viewing time on all nonhuman object photos by the pooled standard deviation of viewing times on all photos (of women, men, and nonhuman objects). The viewing time on nonhuman object photos was taken as a baseline measure of viewing time to control for the reaction time a participant took to examine and respond to the stimuli. Likewise, an average standardized viewing time (pro-women) was calculated by dividing the difference between the mean viewing time on all female model photos and the mean viewing time on all nonhuman object photos by the pooled standard deviation of viewing times on all photos. Lastly, a viewing time (contrast) score was calculated for each male participant by subtracting the viewing time (pro-women) from the viewing time (pro-men), and for each female participant by subtracting the viewing time (pro-men) from the viewing time (pro-women), so that for each participant, a larger viewing time (contrast) score indicates greater preference towards the same gender.

### Implicit romantic orientation

The Implicit Relational Assessment Procedure (IRAP; Barnes-Holmes et al., 2006) was modified to create a measure of implicit romantic orientation. This IRAP was adopted, rather than a procedure similar to that measuring implicit sexual orientation, to minimize common method bias (Conway & Lance, 2010). In a total of six blocks, participants were presented with a gender label (i.e., women or men) and a target word describing “love” (e.g., care, cherish) or “not love” (e.g., loathe, despise), resulting in four trial combinations (i.e., women–love, men–love, women–not love, men–not love). There were six target words describing “love” and six describing “not love” (see Figure S2 for the complete list of words), which were rated as most strongly associated with “love” or “not love” out of 20 words in each domain in the same pilot study above, where participants also rated the attractiveness of female and male models.

Participants were asked to classify each combination into true or false according to the instruction of each block. Response latency for each trial was recorded in milliseconds as the time between the words were presented and a correct response. For each participant, data were cleaned and “D-IRAP” scores were calculated following established procedures (Hussey et al., 2015). Detailed instructions to the participants and scoring procedure can be found in the Supplemental Material. In short, a *D-IRAP* (pro-men) score was calculated, a larger value of which indicates a greater tendency to associate men with “love” or a smaller tendency to associate men with “not love.” Likewise, a *D-IRAP* (pro-women) score was calculated, a larger value of which indicates a greater tendency to associate women with “love” or a smaller tendency to associate women with “not love.” Lastly, a *D-IRAP* (contrast) score was calculated. A *D-IRAP* (contrast) score greater than 0 indicates an automatic preference to link the same gender to “love” (or the other gender to “not love”), a *D-IRAP* (contrast) score equal to 0 indicates no automatic preference to associate the same gender or the other gender with “love” or “not love,” and a *D-IRAP* (contrast) score smaller than 0 indicates an automatic preference to link the other gender to “love” (or the same gender to “not love”).

### Attitudes towards LGB individuals

The Attitudes Towards Lesbian and Gay Men Scale (Herek, 1988) was adapted to measure attitudes towards LGB individuals. Participants were asked to rate from *strongly disagree* (1) to *strongly agree* (5) on nine statements like “LGB people just can’t fit into our society.” For each participant, a mean score was calculated, so that a larger value indicates

more hostile attitudes towards LGB individuals;  $\alpha_s = .91$  and  $.87$  for men and women, respectively.

### Values on family continuity

Values on family continuity was measured by the “family continuity” subscale from the Contemporary Filial Piety Scale (Lum et al., 2016). Participants were asked to rate from *not at all important* (1) to *extremely important* (5) on two statements: “Have at least one child to carry on the family lineage” and “Have a child to ensure family continuity.” A mean scale score was calculated, so that larger values indicate greater importance placed on maintaining family continuity;  $\alpha_s = .78$  and  $.72$  for men and women, respectively, which were higher than those in the previous study (Lum et al., 2016).

## Results

### Preliminary analysis

As participants completed the survey by different languages, we first examined whether language version affected the focal measures. ANOVAs found no statistically significant differences by language version in the focal variables,  $ps > .12$ ,  $\eta_p^2 < .02$  (Table S2). We also compared the focal variables between participants who provided valid data in all four sections and those who did not and found no statistically significant difference in most variables,  $ps > .05$ ,  $ds < 0.17$ , with one exception: the former group ( $M = 2.54$ ,  $SD = 2.34$ ) reported slightly more same-gender explicit sexual orientation than the latter group ( $M = 2.08$ ,  $SD = 2.31$ ),  $t(733) = -2.70$ ,  $p = .007$ ,  $d = 0.20$  (Table S3).

### Romantic orientation and sexual orientation by sexual identity

Because sexual identity in everyday taxonomy is often jointly determined by sexual orientation and romantic orientation, we examined whether romantic orientation and sexual orientation, either assessed by explicit self-reports or implicit measures, differed across the three sexual identity groups: heterosexual, bisexual, and lesbian/gay. Due to the statistically significant main effects of participant gender or interaction effects of gender and sexual identity on the focal variables (Table S4), all exploratory analyses were conducted separately by participant gender.

Supporting H1, participants’ self-reported explicit sexual orientation and explicit romantic orientation associated with self-reported sexual identity in the expected direction to the most part. Specifically, 2 (gender: male vs. female)

$\times 3$  (sexual identity: heterosexual, bisexual, vs. lesbian/gay) ANOVAs showed statistically significant interaction effects on most variables of romantic orientation and sexual orientation at the explicit and implicit levels,  $ps < .001$ ,  $\eta_p^2 > .03$ , with only two exceptions on explicit romantic orientation and on the contrast scores of implicit romantic orientation (Table S4). Post hoc analyses with Bonferroni adjustment for multiple comparisons, coupled with one-sample  $t$  tests with Bonferroni adjustment comparing the scores to the mid-point of the scales, demonstrated that heterosexual participants scored lowest along the continuum ranging from exclusively other-gender sexuality/romantic love to exclusively same-gender sexuality/romantic love, bisexual participants scored around the mid-point, and lesbian/gay participants scored highest; all post hoc pairwise comparisons were statistically significant,  $ps < .05$ , and  $ds$  ranged from 1.67 to 9.51 (Table 2). Similar differences were found for implicit sexual orientation and implicit romantic orientation; most post hoc pairwise comparisons were statistically significant at the .05 level, and  $ds$  ranged from 0.54 to 1.79 (Table 2). For the pairwise comparisons that did not reach statistical significance after the stringent Bonferroni adjustment (e.g., between bisexual and lesbian women and between heterosexual and bisexual men on the contrast scores of implicit sexual orientation), the effects were in the hypothesized direction and ranged from small to medium magnitude in Cohen’s (1988) criteria,  $ds > 0.27$  (with one exception of the comparison between bisexual and lesbian women on implicit sexual orientation [pro-women]; Table 2).

Despite these group differences, there appeared to be a systematic shift towards associating the same gender (more than the other gender) with romantic love at the implicit level among heterosexual and bisexual women, creating a disparity between implicit romantic orientation and sexual identity among them. This was apparent in that the contrast scores of implicit romantic orientation were not statistically significantly smaller than 0 (the mid-point of the measurement scale indicating no preference for women or men) among heterosexual women in exploratory one-sample  $t$  tests, and the contrast scores among bisexual women were significantly larger than 0,  $ps < .05$  (Table 2). Further exploratory inspections with one-sample  $t$  tests on pro-men and pro-women scores of implicit romantic orientation indicated that heterosexual women were likely to link both men and women with romantic love in implicit measures, while bisexual women were likely to link women, but not men, with romantic love in implicit measures,  $ps < .05$  (Table 2). No similar systematic shift was observed in the contrast scores of implicit sexual orientation among women (Table 2).

**Table 2** Descriptive Statistics and Comparisons of Explicit and Implicit Sexual Orientation and Romantic Orientation

	Women			Men		
	Heterosexual <i>M (SD)</i>	Bisexual <i>M (SD)</i>	Lesbian/gay <i>M (SD)</i>	Heterosexual <i>M (SD)</i>	Bisexual <i>M (SD)</i>	Lesbian/gay <i>M (SD)</i>
Explicit sexual orientation	0.42 <sup>a</sup> (0.55)	2.77 (1.54)	5.38 <sup>a</sup> (0.73)	0.25 <sup>a</sup> (0.70)	3.80 <sup>a</sup> (1.51)	5.75 <sup>a</sup> (0.36)
Explicit romantic orientation	1.26 <sup>a</sup> (1.02)	3.47 <sup>a</sup> (1.51)	5.57 <sup>a</sup> (0.58)	0.86 <sup>a</sup> (0.98)	3.38 (1.34)	5.29 <sup>a</sup> (0.62)
Implicit sexual orientation (pro-men)	0.87 <sup>b</sup> (0.57)	0.97 <sup>b</sup> (0.50)	0.69 <sup>b</sup> (0.54)	0.26 <sup>b</sup> (0.51)	1.09 <sup>b</sup> (0.56)	1.02 <sup>b</sup> (0.59)
Implicit sexual orientation (pro-women)	0.72 <sup>b</sup> (0.57)	1.03 <sup>b</sup> (0.53)	1.25 <sup>b</sup> (0.57)	0.84 <sup>b</sup> (0.65)	1.01 <sup>b</sup> (0.54)	0.51 <sup>b</sup> (0.52)
Implicit sexual orientation (contrast)	-0.15 <sup>b</sup> (0.51)	0.06 (0.47)	0.58 <sup>b</sup> (0.63)	-0.58 <sup>b</sup> (0.64)	0.08 (0.60)	0.50 <sup>b</sup> (0.60)
Implicit romantic orientation (pro-men)	0.20 <sup>b</sup> (0.31)	-0.01 (0.32)	-0.23 <sup>b</sup> (0.37)	0.02 (0.35)	0.13 (0.43)	0.38 <sup>b</sup> (0.38)
Implicit romantic orientation (pro-women)	0.11 <sup>b</sup> (0.34)	0.31 <sup>b</sup> (0.34)	0.30 <sup>b</sup> (0.34)	0.33 <sup>b</sup> (0.29)	0.10 (0.32)	-0.16 <sup>b</sup> (0.32)
Implicit romantic orientation (contrast)	-0.08 (0.46)	0.32 <sup>b</sup> (0.53)	0.54 <sup>b</sup> (0.54)	-0.30 <sup>b</sup> (0.48)	0.03 (0.54)	0.54 <sup>b</sup> (0.47)
	Heterosexual vs. lesbian/gay	Hetero- sexual vs. bisexual	Bisexual vs. lesbian/gay	Heterosexual vs. lesbian/gay	Hetero- sexual vs. bisexual	Bisexual vs. lesbian/gay
	<i>d</i>	<i>d</i>	<i>d</i>	<i>d</i>	<i>d</i>	<i>d</i>
Explicit sexual orientation	-8.29***	-2.27***	-1.96***	-9.51***	-3.36***	-1.92***
Explicit romantic orientation	-4.60***	-1.81***	-1.67***	-5.30***	-2.25***	-1.95***
Implicit sexual orientation (pro-men)	0.33	-0.18	0.55*	-1.40***	-1.58***	0.12
Implicit sexual orientation (pro-women)	-0.93***	-0.55***	-0.41	0.54**	-0.28	0.94***
Implicit sexual orientation (contrast)	-1.35***	-0.42*	-0.99***	-1.74***	-1.05***	-0.71***
Implicit romantic orientation (pro-men)	1.31***	0.65***	0.65	-0.98***	-0.29	-0.62
Implicit romantic orientation (pro-women)	-0.56	-0.57**	0.01	1.59***	0.74*	0.82**
Implicit romantic orientation (contrast)	-1.29***	-0.81***	-0.41	-1.79***	-0.66	-1.03***

*Note.* Explicit sexual orientation: 0 = exclusively other-gender sexuality, 6 = exclusively same-gender sexuality; explicit romantic orientation: 0 = exclusively other-gender romantic love, 6 = exclusively same-gender romantic love; implicit sexual orientation (pro-men): a larger value indicates a longer viewing time on male models than on nonhuman objects; implicit sexual orientation (pro-women): a larger value indicates a longer viewing time on female models than on nonhuman objects; implicit sexual orientation (contrast): a larger value indicates a longer viewing time on same-gender models than on other-gender models; implicit romantic orientation (pro-men): a larger value indicates a greater tendency to associate men with romantic love than with not love; implicit romantic orientation (pro-women): a larger value indicates a greater tendency to associate women with romantic love than with not love; implicit romantic orientation (contrast): a larger value indicates a greater tendency to associate the same gender than the other gender with romantic love. With two exceptions (on explicit romantic orientation and implicit romantic orientation [contrast]), 2 (gender: male vs. female)  $\times$  3 (sexual identity: heterosexual, bisexual, vs. lesbian/gay) ANOVAs found a significant interaction effect,  $ps < .001$ ,  $\eta_p^2s > .03$  (see Table S4 for findings from ANOVAs).

<sup>a</sup>Differ from 3 (the mid-point) in one-sample *t* tests at  $p < .05$  after Bonferroni adjustment for 12 comparisons, two-tailed. <sup>b</sup>Differ from 0 (the mid-point) in one-sample *t* tests at  $p < .05$  after Bonferroni adjustment for 36 comparisons, two-tailed

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , in independent-samples *t* tests after Bonferroni adjustment for 12 pairwise comparisons among the explicit measures and for 36 pairwise comparisons among the implicit measures, two-tailed

### Correspondence between implicit and explicit measures

Table 3 presents correlations, means, and standard deviations of the focal variables, separately by participant gender. Explicit romantic orientation and explicit sexual orientation were strongly correlated in women,  $r(348) = .87$ ,  $p < .001$ , and in men,  $r(217) = .92$ ,  $p < .001$ , whereas implicit romantic orientation and implicit sexual orientation were moderately correlated in women,  $r(212) = .31$ ,  $p < .001$ , and in men,  $r(140) = .44$ ,  $p < .001$ . The correlations between the

implicit measures and explicit measures were all in the expected positive direction and were of medium-to-large magnitude in women,  $rs = .37-.49$ ,  $dfs = 208-385$ ,  $ps < .001$  and of large magnitude in men,  $rs = .57-.65$ ,  $dfs = 136-249$ ,  $ps < .001$  (Table 3). These findings support construct validity of the measures, including the newly constructed romantic orientation measures.

Next, we constructed two regression models to further examine the correspondence between implicit and explicit measures: The first model used implicit romantic orientation, implicit sexual orientation, and explicit sexual

**Table 3** Zero-Order Correlations, Means, and Standard Deviations of Focal Variables in Women (Below Diagonal) and Men (Above Diagonal)

	1	2	3	4	5	6	<i>n</i>	<i>M</i>	<i>SD</i>
1. Explicit sexual orientation	—	.92***	.65***	.57***	-.46***	-.45***	287	2.91	2.59
2. Explicit romantic orientation	.87***	—	.60***	.57***	-.44***	-.49***	219	2.97	2.17
3. Implicit sexual orientation (contrast)	.45***	.37***	—	.44***	-.22***	-.25***	252	-0.06	0.78
4. Implicit romantic orientation (contrast)	.47***	.49***	.31***	—	-.35***	-.33***	142	0.10	0.61
5. Attitudes towards LGB individuals	-.32***	-.29***	-.09	-.25***	—	.51***	232	1.86	0.75
6. Values on family continuity	-.40***	-.38***	-.23***	-.19**	.30***	—	228	2.10	1.25
<i>n</i>	448	350	387	215	370	362			
<i>M</i>	1.91	2.62	0.03	0.15	1.61	1.73			
<i>SD</i>	2.06	1.98	0.58	0.55	0.58	0.97			

*Note.* Explicit sexual orientation: 0 = exclusively other-gender sexuality, 6 = exclusively same-gender sexuality; explicit romantic orientation: 0 = exclusively other-gender romantic love, 6 = exclusively same-gender romantic love; implicit sexual orientation (contrast): range -2.16 to 2.67, a larger value indicates a longer viewing time on same-gender models than on other-gender models; implicit romantic orientation (contrast): range -1.64 to 1.98, a larger value indicates a greater tendency to associate the same gender than the other gender with romantic love; attitudes towards LGB individuals: range 1-5, a larger value indicates more negative attitudes towards LGB individuals; values on family continuity: range 1-5, a larger value indicates greater importance placed on maintaining family continuity.

\*\**p* < .01, \*\*\**p* < .001.

orientation to predict explicit romantic orientation (H2a), and the second model used implicit romantic orientation, implicit sexual orientation, and explicit romantic orientation to predict explicit sexual orientation (H2b). All predictors were entered at once. Partially supporting H2a, after controlling for explicit sexual orientation, implicit romantic orientation predicted explicit romantic orientation significantly in women,  $\beta = .10$ , 95% CI [.02, .19],  $p = .012$ , but not in men,  $\beta = .07$ , 95% CI [-0.00, .14],  $p = .065$ , while implicit sexual orientation did not statistically significantly

predict explicit romantic orientation in either gender,  $ps > .30$  (Table 4). Further, supporting H2b, after controlling for explicit romantic orientation, implicit sexual orientation predicted explicit sexual orientation significantly in women,  $\beta = .11$ , 95% CI [.04, .19],  $p = .004$ , and in men,  $\beta = .18$ , 95% CI [.11, .25],  $p < .001$ , while implicit romantic orientation did not statistically significantly predict explicit sexual orientation in either gender,  $ps > .11$  (Table 4).

**Table 4** Ordinary Least Squares Regressions

	Explicit sexual orientation		Explicit romantic orientation		Attitudes towards LGB individuals		Values on family continuity	
	$\beta$ (95% CI)	<i>p</i>	$\beta$ (95% CI)	<i>p</i>	$\beta$ (95% CI)	<i>p</i>	$\beta$ (95% CI)	<i>p</i>
<b>Women</b>								
Implicit sexual orientation (contrast)	.11 (.04, .19)	.004	-.01 (-.09, .07)	.838	.01 (-.13, .14)	.941	-.13 (-.27, .01)	.072
Implicit romantic orientation (contrast)	.07 (-0.02, .15)	.117	.10 (.02, .19)	.012	-.25 (-.39, -.11)	< .001	-.15 (-.29, -.01)	.035
Explicit sexual orientation	—	—	.80 (.72, .89)	< .001	—	—	—	—
Explicit romantic orientation	.78 (.70, .86)	< .001	—	—	—	—	—	—
<i>n</i>	209		209		214		212	
<i>R</i> <sup>2</sup>	.74		.74		.06		.05	
<b>Men</b>								
Implicit sexual orientation (contrast)	.18 (.11, .25)	< .001	-.04 (-.13, .04)	.305	-.07 (-.24, .10)	.441	-.17 (-0.34, 0.00)	.055
Implicit romantic orientation (contrast)	.03 (-.04, .10)	.442	.07 (-.00, .14)	.065	-.32 (-.49, -.14)	< .001	-.26 (-.43, -.08)	.005
Explicit sexual orientation	—	—	.92 (.83, 1.02)	< .001	—	—	—	—
Explicit romantic orientation	.80 (.72, .88)	< .001	—	—	—	—	—	—
<i>n</i>	138		138		142		140	
<i>R</i> <sup>2</sup>	.89		.87		.12		.13	

*Note.* Explicit sexual orientation and explicit romantic orientation were not added in the two models predicting attitudes towards LGB individuals and values on family continuity to avoid multicollinearity.

## Romantic orientation, sexual orientation, and sociocultural values

Finally, we examined whether romantic orientation associated more strongly with sociocultural values such as attitudes towards LGB individuals and values on family continuity than did sexual orientation, using a series of exploratory analyses (H3). In the correlation matrix, these two sociocultural values correlated moderately with explicit romantic orientation and explicit sexual orientation in both genders,  $r_s = -.29$  to  $-.49$ ,  $d_f s = 210$  to  $368$ ,  $p_s < .001$ , and correlated slightly to moderately with implicit romantic orientation and implicit sexual orientation in both genders,  $r_s = -.09$  to  $-.35$ ,  $d_f s = 138$  to  $364$ ,  $p_s = .103$  to  $< .001$  (Table 3), suggesting that homonegative attitudes and values on family continuity were linked to less same-gender sexuality and less same-gender romantic love at the explicit and implicit levels. Pairwise comparisons of dependent correlations (I. A. Lee & Preacher, 2013) found that implicit romantic orientation correlated more strongly with attitudes towards LGB individuals ( $r(213) = -.25$ ) than did implicit sexual orientation in women ( $r(364) = -.09$ ),  $z = -2.03$ ,  $p = .043$ ; however, no other statistically significant differences were found between sociocultural values and romantic orientation versus sexual orientation in women or men,  $|z|s < 1.66$ ,  $p_s > .098$  (Table S5). These comparisons lent weak support to H3.

In contrast, in regression models that entered all predictors at once, only implicit romantic orientation statistically significantly predicted attitudes towards LGB individuals in women,  $\beta = -.25$ , 95% CI  $[-.39, -.11]$ ,  $p < .001$ , and in men,  $\beta = -.32$ , 95% CI  $[-.49, -.14]$ ,  $p < .001$ , but not implicit sexual orientation,  $p_s > .44$  (Table 4). Moreover, in regression models, implicit romantic orientation statistically significantly predicted values on family continuity in women,  $\beta = -.15$ , 95% CI  $[-.29, -.01]$ ,  $p = .035$ , and in men,  $\beta = -.26$ , 95% CI  $[-.43, -.08]$ ,  $p = .005$ , while implicit sexual orientation did not,  $p_s > .05$  (Table 4). Due to multicollinearity, the independent associations of explicit romantic orientation and explicit sexual orientation with the sociocultural values were not compared in regression models.

## Discussion

We conceptualized and measured romantic orientation separately from sexual orientation and found that the two constructs were similar at the explicit level but different at the implicit level. The similarities lie in that both explicit romantic orientation and explicit sexual orientation strongly related to self-reported sexual identity; that the correlations between explicit romantic orientation and explicit sexual

orientation approached perfection in women and men; and that explicit romantic orientation and explicit sexual orientation correlated in similar direction and magnitude with sociocultural values. Meanwhile, evidence suggests differences between implicit romantic orientation and implicit sexual orientation, as after accounting for the shared component between explicit romantic orientation and explicit sexual orientation, the unique component of explicit romantic orientation correlated exclusively with its corresponding implicit measure (in women), and so did the unique component of explicit sexual orientation (in both genders); and implicit romantic orientation but not implicit sexual orientation related significantly to sociocultural values in regression models.

These findings depict the overlapping yet distinct characteristics of romantic orientation and sexual orientation. They extend prior observations by suggesting that a person's romantic love and sexual desire can deviate not only in one relationship (Garcia et al., 2012; Way, 2011), but also in the gender of their romantic and sexual partners. Our findings echo previous anecdotes from some bisexual individuals who claim to have found having a romantic relationship with one gender appealing but prefer to have sexual contact with another gender (Thompson, 2006), as well as from asexual individuals (we excluded this group from analysis due to its small group size; see Participants) who often report having romantic attraction towards one or more genders but having no sexual attraction (Bogaert, 2015). However, our study further demonstrates that romantic orientation differs from sexual orientation in a wider population, beyond these bisexual and asexual individuals—if we look closer at people's implicit responses.

One notable discrepancy at the implicit level is that heterosexual women demonstrated a weak implicit sexual preference for men over women but no implicit romantic preference; and bisexual women showed no implicit sexual preference but an implicit romantic preference for women over men (Table 2). Heterosexual and bisexual women's implicit sexual responses were somewhat consistent to the phenomenon of "gender nonspecificity," which refers to the nondiscriminatory sexual arousal patterns to sexual stimuli of both genders (Chivers, 2017). Overall, women's implicit sexual responses aligned to their sexual identity labels in our sample. However, women's implicit romantic responses suggested a systematic shift towards preference for women: Heterosexual women showed a gender nonspecific pattern, which was more aligned to a bisexual identity label; and both bisexual and lesbian women showed an implicit romantic preference for women over men, which was more aligned to a lesbian identity label.

This systematic shift is consistent with previous studies showing that women tend to form intense affectional bonds

with female friends without having sexual contact (Diamond & Dubé, 2002; Thompson, 2006); thus the implicit measure of romantic orientation may capture romantic feelings towards not only romantic partners, but also close friends. Such discordance between sexual desire and romantic love in interpersonal contexts other than romantic relationships may not be detectable using self-reports unless probed directly. Therefore, following the definition of “romantic” by other researchers, future research on explicit romantic orientation should ask about not only narrowly defined romantic relationships, but also passionate friendships.

Another difference in the two implicit constructs lies in their relations to sociocultural values. We found that attitudes towards LGB individuals and traditional values on family continuity were associated with implicit romantic orientation yet not with implicit sexual orientation in regression models (Table 4). This finding may be subject to different interpretations, one being that experience of a positive same-sex romantic relationship would contribute to both liberal attitudes and to implicit same-sex romantic orientation, but not to implicit same-sex sexual orientation. Another interpretation is that sociocultural environments, reflected by liberal attitudes and values, shape implicit romantic orientation, but not implicit sexual orientation. Yet another interpretation is that sociocultural values may directly contribute to implicit romantic orientation, but not implicit sexual orientation.

However, these different associations of sexual and romantic orientation with sociocultural values were found in the implicit measures but not in the explicit measures, which may be explained by several reasons. A less theoretically interesting explanation appears to be that common method bias (Conway & Lance, 2010) may have contributed to this distinction, as the explicit constructs were both assessed by self-reports, while the implicit measures varied in paradigm. However, while the different measurement paradigms may have contributed to the lower correlation between the implicit measures than between the explicit measures, it is insufficient to explain the other findings in this study: The paradigm difference does not explain why the unique component of implicit romantic orientation only predicted explicit romantic orientation but not explicit sexual orientation, or why the unique component of implicit sexual orientation only predicted explicit sexual orientation but not explicit romantic orientation (Table 4); instead, these findings in Table 4 provide evidence of construct validity. Similarly, there is no theoretical reason to expect that the viewing time paradigm for implicit sexual orientation would relate less strongly with sociocultural values than the implicit relational procedure paradigm for implicit romantic orientation (Table 4).

Therefore, the conceptual differences between romantic orientation and sexual orientation and between the implicit and explicit processes offer the most coherent and parsimonious explanation for all findings in our study. Specifically, dual-process theories suggest that the distinction may have resulted from different mental processes (Greenwald & Lai, 2020). For example, self-reports of romantic orientation and sexual orientation involve reflections of past experiences, which often point to romantic love and sexual desire towards the same person, or to sexual or romantic relationships that align with one’s own sexual identity, thus leading to reports of romantic orientation and sexual orientation that are consistent with each other and with sexual identity. In contrast, implicit measures access automatic or unconscious information processing, without analyzing relationship history as described above. Consequently, what would not have been labelled as “romantic” in deliberate reflections, such as same-gender passionate friendships, could be captured by implicit processes. Hence, it is easier to observe discordance between romantic orientation and sexual orientation at the implicit level than at the explicit level.

The idea that romantic orientation can differ from sexual orientation opens several intriguing research areas. The first is what conditions may cause romantic orientation to deviate from sexual orientation at the explicit level, apart from self-report bias. Apart from someone’s past experiences of a differentiation in the genders of their romantic versus sexual partners (such as in same-gender passionate friendships), another possibility is to introduce romantic identity labels such as “heteroromantic” and “biromantic” into people’s deliberate reflections of their romantic experiences, and to save sexual identity labels only for describing sexual experiences.

Yet one more possibility arises from our findings that having more affirmative attitudes towards LGB individuals and putting a lower weight on family continuity may breed same-gender romantic love among people with other-gender sexual desire. Considering the predominant role that sexual desire plays in romantic love (Diamond, 2003), the influence of sociocultural values on romantic orientation may be stronger in the absence of sexual desire, such as among asexual adults (Bogaert, 2015), or among children and young adolescents whose sexual desire remains low (McClintock & Herdt, 1996). Supporting this view, a prior study found that many heterosexual boys had same-gender passionate friendships in childhood and early adolescence, but such friendships gave way to other-gender romantic and sexual relationships beginning middle adolescence (Way, 2011). Conversely, some sociocultural values may constrain same-gender attracted people from developing same-gender romantic relationships, such as intolerant attitudes towards LGB individuals and more focus on family continuity,

which were suggested by this study and other studies (Ren et al., 2019). In addition, masculine gender roles may prevent some same-gender attracted men's from showing affection and love towards other men (Wester et al., 2005).

The second intriguing research question is whether and how romantic orientation influences sexual orientation when they differ. To begin with, do same-gender passionate friendships among heterosexual people involve sexual contact? The answer may be "yes," as previous correlational research has documented sexual experimentation between same-gender close friends, especially among women (Thompson, 2006), suggesting the bidirectional relation between romantic love and sexual desire (Diamond, 2003). However, it is unknown whether this person-oriented sexual desire extends to other same-gender individuals, that is whether sexual orientation is affected by romantic orientation through same-gender passionate friendships. This question is important because although previous research into sociocultural influences (e.g., parent-child relationships and rearing by sexual minority parents) on sexual orientation has found little support (Bailey et al., 2016), these studies did not examine relational contexts. Studying passionate friendships may uncover another path in the development of sexual orientation, apart from being programmed early in life (Diamond et al., 2017).

Although we did not find consistent gender findings, it is still possible that women experience more disagreement between sexual orientation and romantic orientation than do men. This potential gender difference can arise from several factors, including (a) lower societal negative attitudes towards sexual minority women than towards sexual minority men (Bettinsoli et al., 2020) leading some heterosexual women but few heterosexual men to develop same-gender romantic relationships and (b) lower sex drive among women than men (Baumeister et al., 2001) leading more women than men to initiate romantic relationships with a gender to whom they have no sexual desire. However, more research is needed for these speculations.

The findings of this study are limited by the sample, which comprised primarily young adults who were, at the time of study, single. As speculated above, the discrepancy between romantic orientation and sexual orientation may be greater before puberty and during middle to late adulthood. In addition, being in a stable romantic relationship may decrease the possibility of forming other intense affectional bonds, thereby reducing the gap between romantic orientation and sexual orientation. Further, while the large reduction in sample size involving implicit romantic orientation measure (Methods & Table S1) could have been potentially mitigated by counterbalancing the section orders, the missing data may have undermined the generalizability of the findings to people who are older, residents outside Hong

Kong, single, and heterosexual. Finally, because the sample consisted of cisgender Chinese who were primarily educated youth, the current findings may not generalize to transgender people, to other Asian cultures or to Western cultures, or to nonstudents.

Despite these limitations, our findings corroborate the idea that romantic orientation can differ from sexual orientation, especially in implicit mental processes. Compared to sexual orientation, romantic orientation may be more strongly influenced by sociocultural values, such as attitudes towards LGB individuals and traditional values on family continuity. Relying on our measures of explicit and implicit romantic orientation, our findings advance prior knowledge on the conceptualization of sexual orientation by distinguishing sexual orientation from romantic orientation and implicit mental processes from explicit mental processes. Making such distinctions may have the promise of discovering another path in the development of sexual orientation in sexual minority and heterosexual individuals.

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**Data Availability** The datasets generated during and/or analyzed during the current study are available from the corresponding authors on reasonable request.

## Ethics Declarations

**Ethical Approval** Ethical approval was obtained from the Ethics Committee in the Department of Psychology at the University of Hong Kong.

**Informed Consent** Electronic informed consent was obtained from all participants prior to their participation in the study.

**Conflict of Interest** The authors declare that there are no competing interests.

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