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Social Outlook Mediates the Impact of Pornography on Sexual Orientation in Conservative But Not Progressive Regions: A 'Social Contagion' Paradox

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Abstract

Beliefs regarding the causes of nonheterosexuality are linked to acceptance of sexual diversity, pro-diversity aligning with 'nature' explanations and anti-diversity with 'nurture' explanations. The latter includes the idea that nonheterosexuality is socially contagious and will spread if prohibitions are relaxed. We focus on the concern in China that consuming female-oriented male-male erotica ('danmei' or 'Boy's Love') may result in its audience eschewing heterosexuality. This provides a case study to test if pornography can impact sexual orientation and, if so, to understand better how, for whom, and under what conditions. We posit that the effect of pornography on sexual orientation, if it exists, is mediated by audience members' social outlook and will be evident only in regions with low acceptance of sexual diversity. We employ the statistical modelling technique of Conditional Process Analysis, comparing results using data from our Sinophone (N = 2128) and Anglophone (N = 2001) audience surveys representing, respectively, conservative and progressive contexts. As hypothesised, the model was supported by the Sinophone and not the Anglophone data. We conclude that regions with low acceptance of diverse sexualities paradoxically create phenomena which look like the socially-contagious processes they are trying to stem.

INTRODUCTION

There is a growing body of research on the impact of pornography on viewers. This is an important, and increasingly relevant, topic given easy access to sexually explicit material of all kinds on the internet. However, the impact of pornography on sexual orientation has not yet been subject to systematic research. We are in the unique position of having large data sets from a Sinophone and an Anglophone survey [1] providing us a case study to test if pornography can impact sexual orientation and, if so, to understand better how, for whom, and under what conditions. The impetus for our study is the concern expressed in the Chinese academic literature that consuming female-oriented male-male erotica may result in its audience eschewing heterosexuality.

Known in China as 'danmei,' and globally as 'Boys' Love' (BL) or 'yaoi,' female-oriented male-male erotica portrays romantic and sexual relationships between men. It is female-oriented because the majority of creators and consumers are young women [2,3]. The main media include manga, graphic novels, anime, novella, online series and, most successfully in China, online TV drama. Original material is created professionally and semi-professionally, alongside a huge amount of derivative fan works. The genre first appeared in the early 1970s in Japanese girls' manga and American fan fiction, the latter imagining a romantic relationship between the characters *Kirk* and *Spock* in the TV series *Star Trek.* Today it is one of the largest erotic subcultures for women. Despite a blanket ban on sexually explicit materials, state censorship of nonheterosexual themes, forced website closures, and prosecutions [4], danmei is ubiquitous on the Chinese internet. Its popularity is such that 'danmei-lite' eroticised male friendship is a common marketing strategy in Chinese popular culture because it draws a large female audience.

Cook [5] provides a comprehensive overview of research on the causes of human sexual orientation, concluding that while "there is still much that is not known, the peer reviewed scientific literature clearly shows that a combination of genetic and environmental factors contribute to sexual orientation, with approximately one third of variance currently attributed to the former" (p. 1). Although the larger proportion of sexual orientation appears to have an environmental cause, social and non-social environment must be distinguished. Social environment includes possible influences such as sexual seduction, childhood relationship with caregivers, and having a nonheterosexual parent or parents. Non-social environment includes factors such as fraternal birth order and hormonal intra-uterine environment. In this regard, Cook [5] states that "much of the known environmental influence appears to be intra-

uterine and there is no currently convincing evidence that social environment plays a significant part" (p. 1).

Interestingly, however, evidence for the influence of non-social environment on sexual orientation is stronger for males than for females, possibly reflecting differences in sensitivity to social environment. This might be supported by the finding that women's sexual identifications and attractions tend to be more fluid or changeable over life course and context than that of men [6,7]. It may be also that sexual orientation in women is just less categorical than it is in men [8]. Hence, despite evidence for substantial genetic and non-social environment influence on human, particularly male, sexual orientation, much is still unknown and, as in any field, the strength of the evidence and what the evidence means are open to debate. Moreover, the cause of sexual orientation is particularly controversial because sexual behaviour and identity is bound-up with political, religious, and social ideologies, often held with a high degree of emotional investment, through which the scientific research is filtered and the gaps in knowledge plugged. Importantly, the way in which information about the causes of sexual orientation is received tends to be biased towards the person's pre-existing value system such that, in an experiment of attempted attitude change, Suhay and Garretson [9] report "in response to the 'born gay' treatment, liberals became more likely to say people are born gay (effect sizes of 10%–20% of the scale), but conservatives did not; in response to the 'not born gay' treatment, conservatives became more likely to say people are not born gay (effect sizes of 20%–30% of the scale), but liberals did not. Both high-interest conservatives and liberals resisted 'inconvenient' information" (p. 694).

As implicated in the findings of Suhay and Garretson [9] above, beliefs regarding the causes of nonheterosexuality are linked to general acceptance of sexual diversity. Pro-diversity attitudes tend to align with 'nature' (i.e., 'born-like-this') explanations and anti-diversity attitudes with 'nurture' (i.e., social environment), explanations, the latter including that nonheterosexuality is socially contagious, subject to sexual recruitment, and will spread if moral and legal prohibitions are relaxed [8]. Country-level acceptance of people with diverse sexual orientations has been measured annually since 1981 on the Global Acceptance Index (GAI). This index assigns each county a score between 1 and 10 to represent average societal attitude as expressed in public beliefs and legal rights. In the latest report [10], the global mean GAI is 4.6 with 175 countries ranked by score. Here it is relevant to consider the rank and GAI of the Chinese-speaking regions of Southeast Asia, i.e., the Greater China Area, and the English-speaking regions of the developed world: China = 100 (3.69), Macau = 89 (4.01), Taiwan = 42 (5.74), Hong Kong = 32 (6.38), United States of America (USA) = 23 (7.42), Australia = 11 (8.03), New Zealand = 10 (8.23), United Kingdom (UK) = 9 (8.34), and Canada = 5 (9.02). This indicates China to be below the global mean GAI and all the Sinophone regions to be lower than all the Anglophone regions, three of the latter in the top 10 countries for positive societal attitude toward people of diverse sexual orientations.

The concern expressed in the Chinese academic research regarding the potential of danmei to influence readers towards nonheterosexuality is commensurate with the region's low rank and score on the GAI. Possibly the earliest such article is Sun and Mei's [11] study of online romance literature in which they conclude that danmei might have a corrupting effect through stimulating teenagers' sexual desire and promoting homosexuality. Two years later, Wu and Sun [12] published a case study of a high school student who had been provided counselling after her parents and teachers objected to a romantic relationship she had establish with a female classmate. The student suggested she had become homosexual through being influenced unconsciously by danmei. A series of academic publications followed criticizing the way in which danmei can create dissatisfaction with heterosexual relationships in its female audience, promote tolerance of homosexuality and sexual experimentation, and mislead young people regarding appropriate gender norms and values related to love and marriage [13-15].

Recent Chinese research reveals escalating attention to the potential of danmei to influence readers towards nonheterosexuality. Xu [16,17], explores views about danmei culture online and on a university campus, raising concern about its entrenchment among college students and potential to promote misunderstanding of readers' own sexuality, particularly with regard to encouraging homosexuality. Hu [18], recommends greater regulation of danmei to protect young people from harmful information and does so within the context of noting homosexual activity as a major source of HIV transmission, warnings over the increasing number of homosexual-identifying college students, and success of online danmei TV dramas. Finally, Li et al.[19], raise concern about the mental health of teenagers due to the influence of popular culture and online fandom, particularly danmei TV dramas, comics, and animations. The researchers recommend stronger regulation of online material, family guidance on youth entertainment, school education regarding appropriate views about online culture, and mental health support for students which, in this context, implies stabilisation of heterosexuality.

In the current article, we test if there is evidence supporting the concern in China that consuming danmei may result in its audience eschewing heterosexuality and explore possible mechanisms accounting for this effect if it is found. To do so, we employ the statistical modelling technique of Conditional Process Analysis (CPA).

CPA is a confirmatory causal inference approach to tests of mediation [20] conducted most commonly on cross-sectional observational designs with associative data [21]. CPA provides a test of the viability of carefully-theorised mechanisms posited to account for the effect of a putative 'causal' variable (X) on a putative 'outcome' variable (Y) via the *indirect effect* of at least one mediator variable (M). A mediator is intermediate in the causal chain or process relating an independent to a dependent variable, accounting for all or part of the relation between

those variables. Hence, the mediator is both a dependent and independent variable. Mediation is important to study in order to illuminate the mechanism of effects. Also of interest are moderator variables. Moderation occurs when the slope of the relationship between the causal variable and an outcome variable varies in terms of strength and/or direction across levels of a third, moderator, variable [22]. Moderation producing *conditional indirect effects* can involve any stage of the mediated path and/or produce *conditional direct effects* on the direct path. Hence, CPA is a test of *how* (mediators) a *causal* variable impacts an *outcome* variable and under *what conditions* (moderators).

In a CPA, theoretic rationale must be provided for hypotheses which specify both causal order and direction. Full mediation is rare in the social sciences because the phenomena of interest likely have multiple causes [22], although a single variable may play an important role in transmitting the effect of an independent/causal variable [21]. Hence, we propose a partial mediation model in which both an indirect and a direct effect is posited (Figures 1,2). In reporting the development of our hypotheses, and of our analysis, we follow the detailed recommendations of [21].

Definition of Key Variables

Our hypotheses involve four key variables: *Fandom Intensity*, *Sexual Orientation, Social Outlook,* and *Gender*.

Fandom Intensity

The surveys include the question: *How intensely are you a BL fan?* with a 5-point Likert-scale response where *not at all* = 1, *a bit* = 2, *quite* = 3, *a lot* = 4, and *extremely* = 5. Hence, *Fandom Intensity* is a continuous variable ranging 1-5 (low-to-high).

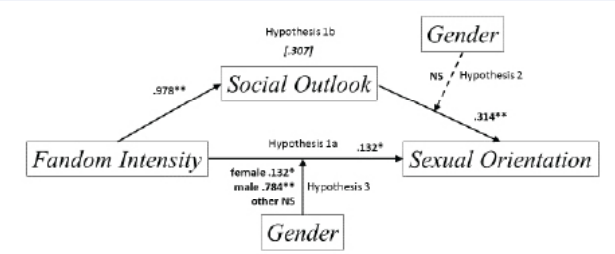

Figure 1 Sinophone conditional process analysis model. Note. *p = .002; **p < .001

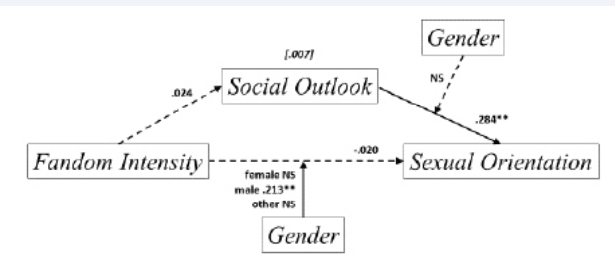

Figure 2 Anglophone conditional process analysis model. Note. **p < .001

Sexual Orientation

The surveys include the question: *What is your sexual orientation?* Response options in the Anglophone survey are: *heterosexual*, *bisexual*, *homosexual/lesbian/gay, polysexual/pansexual, not sure,* and *other* (*please specify*). Piloting suggested that response option *polysexual/pansexual* was difficult to translate and to convey to a Chinese audience so was omitted from the Sinophone survey. In the present article, *Sexual Orientation* is utilised as a dichotomous variable coded *heterosexual* = 1 and *nonheterosexual* = 2 (i.e., all response options other than *heterosexual*).

Social Outlook

A variable *Social Outlook* was created from responses to two survey questions: *How acceptable are male-male sexual relationships to you in real life?* And *how acceptable are female-female sexual relationships to you in real life?* The response to each question was provided on a 5-point Likert scale where *never* = 1, *sometimes* = 2, *often* = 3, *very often* = 4, and *extensively* = 5. There was a positive correlation between the two questions within the Sinophone sample, $r(2126) = .675$, $p < .001$, large effect, and within the Anglophone sample, $r(1999) = .727$, $p < .001$, large effect. A score for *Social Outlook* was calculated for each participant by adding together their score on the two questions creating a continuous variable of range 2-10 in which lower scores indicate a more conservative and higher scores a more progressive social outlook in the sexual sphere. Hence, *Social Outlook* is a continuous variable ranging 2-10 (*conservative*-to-*progressive*).

Gender

The surveys include the question: *What is your gender?* with the response options *male*, *female* and *other* (*please specify*). Hence, *Gender* is a multicategorical variable coded *female* = 1, *male* = 2 and *other-gendered* = 3.

Hypothesis 1a (Partial Mediation Direct Effect)

To test if there is evidence supporting the concern in China, documented above, that consuming danmei may result in its audience eschewing heterosexuality, we hypothesise that, for the Sinophone sample, *Fandom Intensity* has direct causal effect on *Sexual Orientation* such that higher *Fandom Intensity* results in more likely nonheterosexual *Sexual Orientation*.

Hypothesis 1b (Partial Mediation Indirect Effect)

We also posit an indirect effect, i.e., a mediation mechanism, hypothesising that *Social Outlook* is an important reason that the effect of *Fandom Intensity* is transmitted onto *Sexual Orientation* for the Sinophone sample such that more progressive *Social Outlook* results in more likely nonheterosexual *Sexual Orientation*. The suggested mediation mechanism occurs in two stages. In stage 1 *Fandom Intensity* has a causal effect on *Social Outlook* such that higher *Fandom Intensity* results in a more progressive *Social Outlook.* This mechanism is suggested because danmei presents a

more sympathetic picture of sexual diversity than is found in the socially conservative outlook of mainstream Chinese culture [4]. Danmei therefore provides a more progressive counter-narrative to readers who engage intensely with the material.

In stage 2 *Social Outlook* has a causal effect on *Sexual Orientation* such that more progressive *Social Outlook* results in more likely nonheterosexual *Sexual Orientation*. This mechanism is suggested for two reasons. First, people with a conservative social outlook tend to be less accepting of sexual diversity than are people with a progressive social outlook [23]. This makes it less likely that people with a conservative social outlook will acknowledge personal experience of same-sex attraction [24]. Second, research suggests that young people who are not socially conservative can be influenced to report being less exclusively heterosexual via exposure to continuous theories of sexual orientation [24]. Engagement with danmei may have a similar effect through exposure to sexual diversity which is suppressed in mainstream Chinese culture. Note that, in contrast to the direct effect, the indirect mediation mechanism suggests that *Fandom Intensity* has a causal effect on the *report* of *Sexual Orientation* via an attitude of relative acceptance of, and openness about, nonheterosexuality for the Sinophone sample.

Hypotheses 2 and 3 refine our exploration of the posited direct and indirect effects through considering the possible moderating influence of gender.

Hypothesis 2 (Moderation of Indirect Effect)

Bettinsoli et al.[25] report that, globally, lesbians are more socially-accepted than are gay men. Moreover, Wang et al.,[26] found that, in a Chinese sample, perceived discrimination was higher in homosexual men than in lesbians, alongside lower willingness in homosexual men to disclose their sexual orientation. Hence, we hypothesise that, for the Sinophone sample, *Gender* will moderate the stage 2 effect of *Social Outlook* on *Sexual Orientation* such that, given similar *Social Outlook*, women are most likely than are men to report if they have a nonheterosexual *Sexual Orientation*.

Hypothesis 3 (Moderation of Direct Effect)

Research demonstrates that women's sexual orientation can be relatively fluid over time and context [7]. Moreover, that danmei/BL may influence female readers towards lesbianism has some case study support [12,27]. However, a major reason that young people are influenced by pornography is because some use it for sexual education [28]. As a male-male erotica, danmei would seem particularly relevant in this way to men because it portrays activities they might try in real life, thereby for some, validating a nonheterosexual orientation. Hence, we hypothesise that, for the Sinophone sample, *Gender* will moderate the direct effect of *Fandom Intensity* on *Sexual Orientation* such that, given similar *Fandom Intensity*, men are most likely to have a nonheterosexual *Sexual Orientation*.

Hypothesis 4

We hypothesise that the moderated mediation model proposed for the Sinophone sample will not be confirmed for the Anglophone sample. Unlike the Chinese research, research on BL in Anglophone countries to our knowledge reports no concern over the impact of BL on the sexual orientation of its audience. This is likely due to the relatively high acceptance of sexual diversity in these regions as indicated by GAI ranks and scores. The main Anglophone countries represented in our sample are the USA and UK in which there is, at least, some (patchy) anti-discrimination legislation [29], (contested) initiatives on sexual diversity education [28], and (regulated) legal access to diverse sexually-explicit material [30]. Hence, young adults in our Anglophone sample are likely to have encountered pro-diversity narratives in multiple contexts diluting any direct causal effect BL *Fandom Intensity* may have on *Sexual Orientation* (i.e., contra hypothesis 1a). Moreover, research indicates the USA and UK to be low concealment contexts for people of minority sexuality [31] and that Americans are likely to reveal nonheterosexuality in a survey if the information appears relevant [32]. Hence, for the Anglophone sample, BL fans are likely to report their *Sexual Orientation* irrespective of any potential indirect causal effect of the *Social Outlook* to which they otherwise subscribe (i.e., contra hypothesis 1b).

MATERIALS AND METHODS

Ethical approval was obtained from the School of Psychology Ethics Committee, University of Leeks, UK. In the reported statistics a significance level of $p < .05$ was set and effect size is provided, e.g., Cramer's *V* (Chi-square) and *r* (Mann–Whitney), where a trivial effect is less than .1, a small effect .1 to .29, a medium effect .3 to .49, and a large effect .5 and above.

Data Collection

The 43-question survey has five sections: demographics, BL materials, feelings about BL, social relationships, and other erotic materials. Responses are, in the main, on a five-point Likert-scale and some questions include an open-text response box. The English-language version opened in November 2014. It was promoted via relevant internet forums, social network websites, and by e-mailing anime and manga clubs. This involved on multiple occasions undertaking google searches for websites listing anime and manga conventions and fandom sites and posting a link to the survey on available forums, and emailing directly general and university anime and manga clubs across the UK, USA, Canada, Australia and New Zealand.

The version in simplified Chinese opened in March 2015. The link was promoted on Chinese danmei fan forums with the permission of the webmaster, and owners of danmei-themed social media accounts. Danmei authors were also contacted with a request to promote the survey and managers of manga societies in Chinese universities emailed and asked to forward the survey link to members. The second author also contacted academics in her network at six universities in southern and southwestern China asking them to circulate the survey link to their students. Leaflets advertising the survey were also distributed with products from an online Chinese BL shop. Finally, the second author attended

seven manga events in southern and southwestern China during 2015-2017 to distribute a paper copy of the survey for immediate completion and transferred responses (N = 200) to the online version for analysis. Data were collected until 1st June 2022.

Describing the Samples

The Sinophone survey N = 2128 and the Anglophone survey N = 2001, the latter including only participants who noted their first language to be English. Fritz and MacKinnon [6] report an empirically-estimated minimum sample size of N = 562 for mediation models to detect a small effect on both the direct and indirect paths at .8 power.

Country of residence reported in the Sinophone sample is overwhelmingly Mainland China (86%), with a smaller proportion in Hong Kong (13%), and in the Anglophone sample is mostly the USA (65%) and UK (20%). A chi-square test of independence showed the two samples differed significantly on *Gender*, x^2 (2, N = 4129) = 204.32, p < .001, with a small effect size (V = .222), the Sinophone sample including more *females* (88% –v- 73.2%), less *males* (11.1% –v- 17.4%), and less *other-gendered* people (0.9% –v- 9.4%). A chi-square test of independence showed the two samples differed significantly on *Sexual Orientation*, x^2 (1, N = 4129) = 506.28, p < .001, with a medium effect size (V = .350), the Sinophone sample including more *heterosexual* people overall (65% –v- 30%), more *heterosexual males* (58.1% –v- 11.2%), *heterosexual females* (66.4% –v- 38.0%) and *heterosexual other-gendered* people (15% –v- 2.1%). A Mann-Whitney test showed the two samples differed significantly on *age* (U = 1552365.50, N_1 = 2128 N_2 = 2001, p < .001 two-tailed) with a small effect size (r = .145), mean *age* higher for the Anglophone sample (23.14 years –v- 20.02 years).

A Mann-Whitney test showed the two samples differed significantly on *Fandom Intensity* (U = 1783641.50, N_1 = 2128 N_2 = 2001, p < .001 two-tailed) with a small effect size (r = .145). Mean *Fandom Intensity* is higher for the Anglophone sample (3.78 –v- 3.33) and increases linearly from low-to-high, while the Sinophone sample has a bimodal distribution (*a bit* = 2; *extremely* = 5) (Figure 3). A Mann-Whitney test showed the two samples differed significantly on *acceptance of male-male relationships in real life* (U = 1184504.50, N_1 = 2128 N_2 = 2001, p < .001 two-tailed) with a medium effect size (r = .458), mean acceptance higher for the Anglophone sample (4.80 –v- 3.82). A Mann-Whitney test also showed the two samples differed significantly on *acceptance of female-female relationships in real life* (U = 1045153.50, N_1 = 2128 N_2 = 2001, p < .001 two-tailed) with a large effect size (r = .500), mean acceptance higher for the Anglophone sample (4.72 –v- 3.50). Consequently, a Mann-Whitney test showed the two samples differed significantly on *Social Outlook* which combines the response of the former two variables (U = 969447.50 , N_1 = 2128 N_2 = 2001, p < .001 two-tailed) with a large effect size (r = .525), the mean higher for the Anglophone sample (9.52 –v- 7.32).

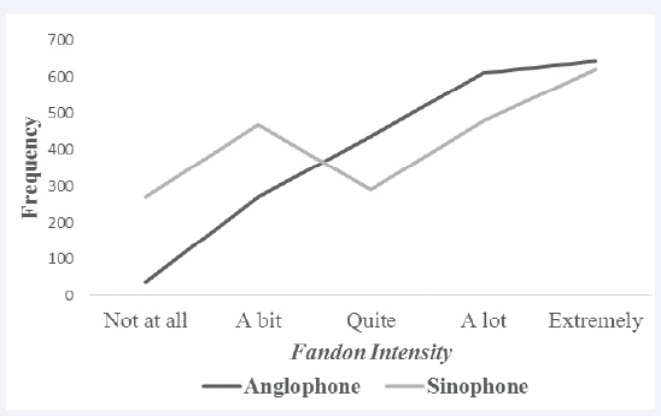

Figure 3 Sinophone and Anglophone Fandom Intensity score frequency.

Data Analysis

Data were analysed using CPA with the PROCESS Procedure for SPSS Version 4.1 [30]. PROCESS integrates mediation and moderation into a unified statistical model. Significance was set to .05 because only three paths, two with the same moderator, were tested for each sample. Hence, PROCESS model 15 was selected which tests one mediator and one moderator for a posited causal association X to Y and stage 2 mediation path W to Y. The variables in our model are: *Fandom Intensity* (X, cause, continuous variable); *Sexual Orientation* (Y, outcome, dichotomous variable); *Social Outlook* (M, mediator, continuous variable); and *Gender* (W, moderator, multicategorical variable). This means that PROCESS was set to test a binary outcome (Y) and a multicategorical moderator (W).

As often recommended, the two predictor variables *Fandom Intensity* and *Social Outlook* were mean centred prior to analysis to reduce multicollinearity and improve interpretation [34]. Because the outcome variable is dichotomous, PROCESS utilises a log-odds metric. Hence, a 'pseudo R^2' goodness-of-fit index is employed to assess the predictive capacity of the logistic regression model, developed as an analog of the R^2 used in least-squares regression. Smith and McKenna [35] describe the 'McFadden' [36] as "perhaps the most straightforward of such pseudo R^2 indices in the sense of reflecting both the criterion being minimized in logistic regression estimation and the variance-accounted-for by the logistic regression model" (p. 18). Moreover, they cite Menard [37] as finding it preferable to four other indices "due to both its conceptual similarity to OLS [ordinary least squares regression] R^2 (as used in linear regression), and due its relative independence of the base rate of the binary outcome variable" (p. 18).

RESULTS

Hypotheses 1a&b

The overall Sinophone model is significant (p < .001) and there is no interaction between the casual variable and the mediator variable given that the relevant likelihood ratio test is not significant (x^2 = .399, df= 1, p = .527). The model explains 14.5% of variance in *Sexual Orientation* as indicated by the McFadden pseudo-R^2 measure (Figure 1; Table 1). This index closes-in on 1 the better the fit of the model. In terms of benchmarking, Smith

Table 1: Conditional process analysis tests of posited mechanisms: Comparing Sinophone and Anglophone samples

Mechanism	Variables		Sinophone N = 2128				Anglophone N = 2001			
			coeff β	SE	p	95% CI	coeff β	SE	p	95% CI
Outcome variable *Social Outlook*: model summary			R = .524, R^2 = .274, p < .001				R = .020, R^2 = .001, p = .373			
cause→outcome (indirect effect stage 1)	*Fandom Intensity→Social Outlook*		.978	.034	.001	.911 – 1.046	.024	.027	.373	-.029 – .076
Outcome variable *Sexual Orientation*: model summary			McFadden pseudo R^2 = .145, p < .001				McFadden pseudo R^2 = .132, p < .001			
Total effect (direct effect+indirect effect)			.439[a]				-.013[a]			
cause→outcome (direct effect)	*Fandom Intensity→Sexual Orientation*		.132	.043	.002	.047 – .218	-.020	.053	.704	-.124 – .084
moderation (conditional direct effects)	*Gender*	Interaction 1 *female-v-male*	.651	.155	.001	.347 – .955	1.296	.220	.001	.865 – 1.727
		Interaction 2 *female-v-other*	.328	.452	.468	-.559 – 1.215	-.086	.511	.866	-1.087 – .914
conditional direct effect at moderator value	*Fandom Intensity→Sexual Orientation*	*female*	.132[a]	.043	.002	.047 – .218	-.020[a]	.053	.704	-.124 – .084
		male	.784[a]	.149	.001	.492 – 1.075	1.276[a]	.213	.001	.857 – 1.694
		other	.461[a]	.450	.306	-.422 – 1.343	-.107[a]	.508	.834	-1.102 – .889
mediation (indirect effect stage 2)	*Social Outlook→Sexual Orientation*		.314	.028	.001	.260 – .369	.284	.044	.001	.197 – .372
	*Mediation stage 1*stage 2 (indirect effect)*		*.307*				*.007*			
index of moderated mediation	*Gender*	*female–v-male*	.093[b]	.086[c]	NS	-.059 – .284[c]	-.005[b]	.009[c]	NS	-.024 – .009[c]
		female–v- other	.045[b]	5.424[c]	NS	-2.308 – 14.577[c]	.007[b]	.268[c]	NS	-.381 – .174[c]

and McKenna [35] found the McFadden index to "yield lower estimates than their OLS R^2 counterparts [...] suggest(ing) that the use of guidelines intended for interpretation of the latter (e.g., Cohen, 1988) may not be appropriate for interpreting pseudo R^2 values [and] perhaps a unique (and less stringent) set of guidelines may be appropriate" (pp. 24-25). This appears to concur with McFadden's [38] original evaluation that values of .2 to .4 represent an excellent fit. Interpreting 'excellent fit' as 'large effect,' and taking into account that mediation effects are usually small [20], we might consider a McFadden pseudo R^2 of .145 analogous to a low-medium effect size.

All regression coefficients are positive meaning that, in line with hypothesis 1a, *Fandom Intensity* has direct causal effect on *Sexual Orientation* such that higher *Fandom Intensity* results in more likely nonheterosexual *Sexual Orientation*. The indirect effect, captured in the product of the coefficient for the first-stage and second stage paths (IE = .307: Holland et al [21], is 2.3 the size of the direct effect (DE = .132). Hence, the model fulfils the partial mediation requirement that the product of coefficients linking X to M and M to Y be substantially nonzero and that the direct path is not trivially different from zero [21]. This indicates that, in line with hypothesis 1b, much of the effect of *Fandom Intensity* on *Sexual Orientation* is transmitted via *Social Outlook*, while a direct effect (hypothesis 1a) still operates and other factors are unaccounted for in the model.

Hypothesis 2

The Index of Moderated Mediation is the most direct test for evidence of moderated mediation [39]. The Index quantifies the association between an indirect effect and a moderator followed by an inference via bootstrap confidence intervals as to whether or not this effect is different from zero without having to assume normal sampling distribution [33]. The Indices of Moderated Mediation were not significant for the Sinophone sample, indicating that the indirect effect did not differ by *Gender*. Specifically, males did not differ significantly from females: Index = .093, BootSE = .086 (95% BootCI: -.059 to .284); and other-gendered people did not differ significantly from females: Index = .045, BootSE = 5.424 (95% BootCI: -2.308 to 14.577). Hence, hypothesis 2, was not upheld: i.e., that *Gender* will moderate the stage 2 effect of *Social Outlook* on *Sexual Orientation* such that, given similar *Social Outlook*, women are most likely to report if they have a nonheterosexual *Sexual Orientation*.

Hypothesis 3

A significant interaction indicates that the direct effect of *Fandom Intensity* on *Sexual Orientation* is not the same for all categories of *Gender*. For the Sinophone sample, Interaction 1 (female –v- male) was significant, β = .651, SE = .155, p < .001, while Interaction 2 (female –v- other) was not significant, β = .328, SE = .452, p = .468. Probing the interaction, for women, the direct effect was significant in the positive direction, DE = .132, SE = .043, p = .002. Similarly, for men, the direct effect was significant in the positive direction, DE = .784, SE = .149, p < .001. However, for other-gendered people, the direct effect was not significant, DE = .461. SE = .450, p = .306. Figure 4 graphs the interaction, showing the change in the expected probability of *Sexual Orientation* by *Fandom Intensity* for *Gender* (female, male, other) at -1 SD and +1 SD from the mean. Hence, hypothesis 3 was upheld in that *Gender* moderates the direct effect of *Fandom Intensity* on *Sexual Orientation* such that, given similar *Fandom Intensity*, men are most likely to have a nonheterosexual *Sexual Orientation* – with the proviso that the effect was not found for other-gendered people.

Hypothesis 4

The overall Anglophone model is significant (p < .001) and there is no interaction between the casual variable and the

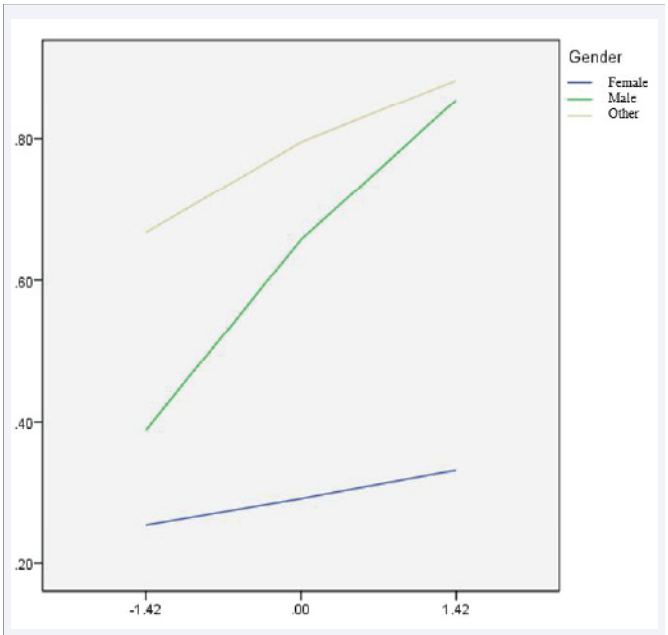

Figure 4 Sinophone sample change in expected probability of Sexual Orientation by Fandom Intensity for Gender (female, male, other) at -1 SD and +1 SD from the mean

mediator variable given that the relevant likelihood ratio test is not significant (x^2 = .375, df= 1, p = .540). The model explains 13.2% of variance in *Sexual Orientation* as indicated by the McFadden pseudo-R^2 measure (Figure 2; Table 1) indicating tentatively a medium-to-low effect size. However, both the indirect effect (IE = .007) and direct effect (DE = -.020, p = .704, 95% CI -.124 to .084) are trivial and the latter is negative and not significant. The Indices of Moderated Mediation also were not significant. Specifically, males did not differ significantly from females: Index = -.005, BootSE = .009 (95% BootCI: -.024 to .009); and other-gendered people did not differ significantly from females: Index = .007, BootSE = .268 (95% BootCI: -.381 to .174). In summary, as hypothesized, the moderated mediation model is not confirmed for the Anglophone sample.

DISCUSSION

We present a case study of female-oriented male-male erotica to test if pornography can impact sexual orientation. Hypothesis 1a was upheld, i.e., for the Sinophone sample, *Fandom Intensity* has direct causal effect on *Sexual Orientation* such that higher *Fandom Intensity* results in more likely nonheterosexual *Sexual Orientation*. Hence, our study provides evidence supporting the concern in China that consuming danmei may result in its audience eschewing heterosexuality. However, our analysis does not stop there and provides information to understand better how, for whom, and under what conditions through exploring: (i) potential moderation of this effect; (ii) a potential moderated mediation mechanism; and, (iii) contrast with the Anglophone context.

First, in terms of potential moderation of the direct effect, hypothesis 3 was upheld. i.e., the direct effect of *Fandom Intensity* on *Sexual Orientation* is moderated by *Gender* such that the effect is strongest in males. This supports our speculation that danmei can provide men a useful (homo-)sexual education, validating the nonheterosexuality of some. This may be similar to the way in which media role models, particularly on the internet and in books, are reported by lesbian, gay and bisexual people in the USA to have influenced their sexual identity by inspiring pride, giving comfort, and providing a positive viewpoint [39,40]. That danmei fulfils this role for some Chinese men, could be related to its relative accessibility given the blanket ban on sexually explicit material in Mainland China and state disincentives with regard to homosexual themes in popular culture. In fact, the simplest explanation is that nonheterosexual men, and those who are questioning their sexuality, are more likely than are heterosexual men to seek out and to appreciate danmei.

Our model indicates also a significant moderation effect for females on the direct effect of danmei *Fandom Intensity* on *Sexual Orientation*, but of only one sixth the magnitude found for males. Japanese academic and curator Mizoguchi offers insight into a possible mechanism. She states: "I write from the subject position of a fan and a researcher who "became" a lesbian via reception, in my adolescence, of the 'beautiful boy' comics of the 1970s" (2003, p.49). Hence, some women may find in danmei a cross-gender aesthetic with which to identify as an aspect of developing a lesbian identity. Another mechanism may be how danmei can imply that same-gender relationships might be more equal than those women experience with men [15].

Second, in terms of a potential mediation mechanism, hypothesis 1b was upheld, i.e., *Social Outlook* is an important reason that the effect of *Fandom Intensity* is transmitted onto *Sexual Orientation* for the Sinophone sample such that more progressive *Social Outlook* results in more likely nonheterosexual *Sexual Orientation*. There are no consensus benchmarks against which to assess the relative strength of indirect effects. However, they tend to be small in mediation models because they are calculated from the product of at least two coefficients each of which must equal 1 or less Walters [20]. Abelson [41] argues that small effects in a variance-explained framework are often meaningful and Kelley and Preacher [42] state that: "the meaningfulness of an effect is inextricably tied to the particular area, research design, population of interest, and research goal" (p. 146). In fact, according to Holland et al. [21], a meaningful mediation path does not even have to be stronger than the direct path. We therefore have confidence that the mediation effect of *Social Outlook* we found for the Sinophone sample is meaningful and relatively strong given that it is more than twice as large as the direct effect.

The confirmed mediation effect of *Social Outlook* supports our speculation that danmei may encourage a progressive social outlook of relative acceptance of, and personal openness about, nonheterosexuality through exposure and providing a positive narrative. It also supports our speculation that conservatives may be less likely to acknowledge personal experience of same-sex attraction. A possible psychological mechanism is internalised

homophobia [43]. However, research also indicates that many nonheterosexual Chinese maintain conservative values and mask their sexual orientation through 'marriages of convenience' [44] because their identities are "embedded in the complexity of family life and social pressure, the invisibility of 'gay circles', and normative social roles" [45]. And the descriptive statistics of our samples do suggest some under-reporting of nonheterosexuality in the Sinophone group. In a thorough systematic review,Savin-Williams and Vrangalova [46] report that about 93.2% of men and 86.8% of women are completely heterosexual and, although this suggests that both our samples are less heterosexual than the estimated general population, this is much less so for the Sinophone group (65% vs. 30%), especially the men (58% vs. 11%).

Interesting, though, rather than find a moderating effect in favour of women. i.e., hypothesis 2, our results show that *Gender* does *not* exert influence on the indirect effect of *Fandom Intensity* on *Sexual Orientation*, specifically on the effect of *Social Outlook* on *Sexual Orientation*. A possible interpretation is that *Social Outlook* has a relatively low ceiling effect such that, at a certain level of progressiveness, the slight preponderance for women to be open about their nonheterosexuality no longer operates. This interpretation is supported by our Anglophone data which, as a relatively high progressive social context, shows the same patterns of results as the Sinophone on this one pathway.

Third, in terms of contrast with the Anglophone context, hypothesis 4 was upheld, i.e., the moderated mediation model proposed for the Sinophone sample was not confirmed for the Anglophone sample. This supports our speculation that these young adults have encountered enough pro-diversity narratives to dilute any direct causal effect BL *Fandom Intensity* may have on *Sexual Orientation* and the context is perceived as sufficiently accepting that they report their *Sexual Orientation* irrespective of their *Social Outlook*.

Overall, what do these findings mean? Although the Sinophone mediation model was confirmed, it accounted for only 14.5% of variance in *Sexual Orientation* demonstrating that danmei *Fandom Intensity* is actually a poor causal predictor of *Sexual Orientation*. Currently, the best causal explanations for nonheterosexuality are genetic and nonsocial environmental influences, particularly intra-uterine conditions and, for men, the fraternal-birth-order effect [5]. This suggests that our findings are best interpreted as revealing the meaningful, but relatively limited, differential causal effects of conservative and progressive environments on the validation (direct effect) and report (indirect effect) of pre-existing nonheterosexual orientation, at least for young people engaging with a particular form of pornography. Hence, the link observed in the Chinese literature between danmei readers and nonheterosexuality is probably correct. However, the reason is less likely to be sexual recruitment than that danmei attracts and supports a queer audience which is relatively invisible in mainstream Chinese culture.

The implications of this are important in that the social contagion explanation of sexual diversity has been challenged only through demonstrating that a similar effect of female-oriented male-male erotica on sexual orientation – our pornography case study - does not exist in a pro-diversity environment. Our case study is of China, however the mechanism we identify likely transfers to other low, or even moderately, anti-diversity contexts. This includes, for example, the Philippines (GAI = 6.06; rank = 36), in which context contemporary academic research is funded to explore 'the root cause of increasing homosexual populations,' conclusions bolstering the moral panic that "(t) he challenge now is for our government regulators to prevent distorting mindset for children that leads to a wrong decision in life […] to prevent catastrophic downturn in our population growth and health in the near future" [47].

We now consider some of the strengths and limitations of our study. Statistical modelling using CPA has allowed us to test causal hypotheses not lent to experimental design or to random assignment. Moreover, we have done so in a highly powered study with two large and unique data sets. However, although typical, the mediation effect is not large and this can be the result of poor study design and/or measurement problems [20,48]. Indeed, our surveys were not designed originally to test the hypotheses posited in this article. There may have been interference from intervening variables which were not measured and/or from systematic difference between the samples on unexamined variables such as risk-taking and/or sex drive, particularly given that the Sinophone participants were accessing banned materials.

Our two samples did differ significantly on all key variables tested in our mediation model. We are, however, confident our recruitment procedures were appropriate for each region and that our samples reflect the respective demographics engaging with BL/danmei. To clarify, in a previous study, we undertook a practical test of our concern that recruitment strategies biased our Sinophone sample towards university students [5]. We did so by comparing the number of survey completions during phases of recruitment via Chinese universities with a novel phase of focused recruitment via Anglophone universities. This demonstrated that, while Chinese university recruitment produced a surge in completion rates, Anglophone university recruitment did not. We concluded that our study provided "evidence that a broad demographic of young people in the greater China area is familiar with BL as a casual interest in contrast to Anglophone regions where it is more of an intense and niche pass-time" (p. 579) [3], which also made sense of the significantly lower mean for *Fandom Intensity* and bimodal (i.e., casual –v- avid) distribution of scores in the Sinophone sample and rising linear distribution in the Anglophone [Figure 3]. That the Sinophone sample included significantly less males and other-gendered people can be accounted for by the cultural of conservative patriarchalism in which Chinese men may be particularly averse to engaging a female-oriented genre and there is strong social and political disincentive to embrace non-hegemonic gender identities. Finally, our study factors-in and accounts for the significantly lower proportion of nonheterosexual people in the Sinophone sample. Indeed, our study is premised on the assumption

of differences in *Social Outlook* between the Sinophone and Anglophone regions studied, and in the direction found, although it was non-assumed prima facie that this difference would be so strong in this particular population.

Another possible problem is measurement error, especially in the causal or mediator variables. Measurement error can be minimised by utilising a reasonably large scale. Our causal variable, *Fandom Intensity*, was measured on a relatively contracted scale of 1 to 5. However, in a previous study, we provide evidence of consistency between self-reported fan behaviour and *Fandom Intensity* in the Chinese sample [49]. Moreover, the difference in the pattern of *Fandom Intensity* scores between the Sinophone and Anglophone samples [Figure 3] were explored and explained as described above [49]. Hence, there is evidence for the validity and reliability of our measure of the causal variable. Our mediator variable, *Social Outlook*, was an additive combination of two separate observed variables. Although this produced the relatively extensive scale of 2 to 10, the variable itself may have validity issues. In its favour, however, the scores for the two constituent questions are highly correlated in each sample. Finally, in both samples, there were only a small number of other-gendered people, insufficient to identify even large effects and this likely contributed to the lack of effect found for other-gendered people in relation to hypothesis 3.

CONCLUSION

In conclusion, we present a case study of female-oriented male-male erotica to test if pornography can impact sexual orientation. The value of our study is providing evidence supporting the, otherwise speculative, position that "homosexual orientation does not increase in frequency with social tolerance, although its expression (in behavior and in open identification) may do so" (p. 87), [8]. In essence, regions with low acceptance of diverse sexualities paradoxically may create phenomena which look like the socially-contagious processes they are trying to stem. Serendipitously, our unique data sets have allowed us to identify and evidence this effect.

DECLARATIONS

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Ethics approval: The questionnaire and methodology for this study was approved by the Research Ethics Committee of the School of Psychology, University of Leeds, UK (Ethics approval number: 14-0210, 30th October 2014).

Consent to participate: Ethical approval included the principle that submission of a completed questionnaire to a researcher, or online, constituted participant informed consent. No individual participant is identifiable in this article.

Data availability statement: Outputs of the data analysed in this article are available in Supplementary Materials.

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