



# “Pattern Matters”: a Latent Class Analysis of Internet Use and Users’ Attitudes Toward Homosexuality in China

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Accepted: 20 December 2021

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## Abstract

**Introduction** Studies have identified an association between Internet use frequency and users’ attitudes toward homosexuality. According to the uses and gratifications perspective, users are diverse in their needs and expectations for using mass media and communication technologies and such diversity might also be involved in their attitudes toward sexual minority people. However, limited research has been conducted to examine this association. This study aimed to develop a typology to illustrate distinct patterns of Internet use patterns and to examine the variation in attitudes towards homosexuality as a function of Internet use patterns.

**Methods** By using a subsample ( $n = 1021$ ) aged 18–37 years from the Chinese General Social Survey collected in 2017, we performed latent class analysis to identify distinct subgroups of online activity engagement. Multiple ordered logistic regression was used to explore the relationships between the profiles of Internet use and attitudes toward homosexuality.

**Results** The latent class analysis yielded a typology which classified the Internet users into active participators, pragmatic users, entertainment users, and idle users. Controlling for demographic, socioeconomic, and confounding factors as well as weekly hours spent on the Internet, the multivariate analyses indicated that idle users were less likely to accept homosexuality than active participators and pragmatic users were.

**Conclusions** This study suggests that Internet users’ attitudes toward homosexuality is associated with not only their frequency of Internet use but also their patterns of engagement in online activities. These findings add to the knowledge about the drivers of societal attitudes toward homosexuality and can inform policies to promote inclusion and diversity.

**Keywords** Internet use · Typology · Latent class analysis · Attitude toward homosexuality · Young adults · China

## Introduction

China, which houses the largest sexual minority population worldwide (Wang et al., 2020), has undergone a series of institutional changes with regard to homosexuality, marked by the decriminalization of homosexual activities in 1997 and the removal of homosexuality and bisexuality from the *Chinese Classification of Mental Disorders 3* in 2001. Nonetheless, societal discrimination against sexual minorities persists (Wang et al., 2019). A national cross-sectional survey ( $N = 28,454$ ) conducted by the United Nations Development

Programme (UNDP) in China indicated that nearly one-third of respondents were reluctant to have interaction with sexual minorities (UNDP, 2016), indicating strong public opposition to homosexuality. Heterosexist bias also prevails in China’s political, medical, and societal spheres (Wong, 2015), and this bias has rendered sexual minorities in China invisible and marginalized (Wang et al., 2019). Considering the stigma-rooted constraints faced by sexual minorities, investigations into and actions to change public attitudes toward homosexuality must be urgently conducted.

Studies conducted in Chinese society have identified various factors that shape public attitudes toward homosexuality. Among these factors, higher education level, higher income, younger age, and lower religious beliefs are associated with greater acceptance of homosexuality (e.g., Cheng et al., 2016; Feng et al., 2012; Ho & Hu, 2016; Zhou & Hu, 2020). Aside from these sociodemographic correlates, research has shown that the use of traditional media, such as television,

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newspapers, and magazines, is linked to negative attitude toward homosexuality in China (Hu & Li, 2019; Tu & Lee, 2014). Moreover, in the current digital era, the Chinese public's exposure to Internet information is found to be associated with the positive attitude toward homosexuality (Jin & Wan, 2020; Xie & Peng, 2017; Zhang et al., 2020). Emerging evidence has also highlighted interpersonal contact with sexual minorities through online social media as an effective vehicle for fostering heterosexual individuals' tolerance and understanding of homosexuality (Wu et al., 2018). However, current literature on the influences of Internet use on the attitudes toward homosexuality has been mainly focused on Internet use frequency without considering the intricate relationship between the purposes of Internet use and user attitudes toward homosexuality. An examination of this relationship can not only deepen understanding of the effects of Internet use on public attitudes toward sexual minorities but also enable recommendations for reducing stigma through Internet use.

### Internet Use and Attitudes toward Homosexuality

Formation of and changes in public attitudes by the Internet is complicated yet worth exploration in the Chinese context. On the one hand, media censorship in China is in place to monitor and suppress the dissemination of information that is deemed controversial or threatening the stability of state, such as invoking collective actions (King et al., 2014; Shao, 2018). On the Internet, the access to information is also selected and censored, especially on topics related to homosexuality that are not flavored by mainstream media (Huang, 2018). On the other hand, Internet and social media have become venues for sexual minorities to promote information publicity, increase social visibility, and advocate for equal rights (Dhoest, 2016; Liao, 2019). Given the increased accessibility and affordability of communication, the Internet affords the users greater opportunities to know about and interact with the lesbian, gay, bisexual, and transgender (LGBT) community (Yang, 2019).

Research has documented cohort differences in the pattern and attitudinal implications of Internet use. More than 50% of all Internet users in China in 2017 were born between 1980 and 1999 (China Internet Network Information Center, 2018). The younger cohort has shown more diverse purposes of and higher exposure to Internet use than their older counterparts (Barrantes & Vargas, 2019; Tzavela et al., 2017). Therefore, data collected from young people may better represent the current user profiles in China and allow us to uncover the heterogeneity of Internet use behavior. Furthermore, previous studies have demonstrated that young age and Internet exposure together contribute to the acceptance of homosexuality (Xie & Peng, 2017). To precisely discern the role of Internet use behavior in the

attitudes toward homosexuality, this study only focused on the younger cohort born between 1980 and 1999 (e.g., aged 18–37 years).

Researchers have documented the influence of Internet exposure on the tolerance of homosexuality. In a cross-national multilevel analysis, Ayoub and Garretson (2017) identified the liberating effect of media pervasiveness and press freedom and found that increasing Internet access can explain the global rise in support for sexual minorities. Some studies have operationalized Internet use as a dichotomous variable by asking participants whether they used the Internet during the past year (Xie & Peng, 2017; Zhang et al., 2020) and other studies have examined the frequency of Internet use as a correlate of user attitudes (Chi & Hawk, 2016; Hu & Li, 2019; Liu et al., 2020; Tu & Lee, 2014). Moreover, some research has explored the mediating mechanisms of the association between frequency of Internet use and users' attitudes. For example, Wu et al. (2018) found that prolonged Internet use increases the likelihood of contacting LGBT people and acquiring information related to LGBT issues online, which in turn promotes tolerance of homosexuality. In the study by Nguyen and Blum (2014), a shift in one's conservative ideas was a mediator of the relationship between frequent Internet exposure and acceptance of homosexuality. While these findings provide an explanation for the link between Internet exposure and users' attitudes, they tend to regard media audiences as passive recipients in the process of information dissemination. Another limitation of these analyses involves considering users to be a homogenous group so that the discrepancy in people's attitudes can be primarily attributed to the difference in the frequency of Internet exposure.

### Typology of Internet Use

The Internet use has turned highly user-oriented (deLisle et al., 2016). The increase in Internet platforms and functions has provided users with numerous methods to meet their diverse needs, such as those related to information retrieval, information transmission, and conversation capabilities (Flanagin & Metzger, 2001). The ever-expanding Internet space in the past three decades in China has not only enriched the patterns of communication and interpersonal relations but also created and fulfilled diverse purposes (Piia & Wang, 2011). Nowadays Chinese Internet users used the Internet to access information, seek entertainment and leisure time activities (Zhou et al., 2014), and engage in a variety of innovative, expressive, and sometimes provocative communication activities (Tai, 2015). These new trends in mass media and Internet use hence demand a novel perspective to account for the interactive nature of and increased engagement with mass media. The uses and gratifications (U&G) paradigm, which considers

users to be active agents, offers an audience-centered perspective to understand users' characteristics, media attributes, media experiences, and consequences of media use in relation to gratifications (Rubin, 2009; Severin & Tankard, 1997).

When applied in empirical research, the U&G perspective prompts the exploration of the psychological and functional needs of users using the same mass media (Katz et al., 1973; Rubin, 2009). For example, the U&G framework guided research to distinguish between ritualized and instrumental use with regard to different media use orientations (Rubin, 1984, 2009). Ritualized users intend to gain simple experiences in media use and thus are less active and goal-oriented than instrumental users are. Compared with ritualized users, instrumental users appear to be more active and purposeful in devoting greater attention to the information and content of a medium (Rubin, 2009; Stafford et al., 2004). Using the Internet to meet different needs and gratifications thus reflects a user's attitudes and expectations toward various online activities (Chen, 2011; Rubin, 2009). Studies have also applied the U&G perspective to analyze the motivations of Internet users (e.g., Kaur et al., 2020; Raza et al., 2020). Moreover, many studies have used the U&G framework to examine the relationship between social media U&G and audiences' political attitudes (Al-Kandari & Hasanen, 2012; Rathnayake & Winter, 2017).

Given that users utilize the Internet for various purposes, a person-centered analysis, such as latent class analysis (LCA), is instrumental for developing a typology of user profiles and characterizing different usage patterns without ignoring simultaneous engagement in different online activities (Ma, 2018; Van Boekel et al., 2017). Eynon and Malmberg (2011) applied latent profile analysis and labeled the least frequent Internet users as *peripherals*. Users who preferred to use the Internet for instrumental purposes (i.e., communication, entertainment, and information-seeking) were termed *normatives*. Users who exhibited above average results across all domains of Internet use were called *all-rounders*, and users who frequently used the Internet for all activities were termed *active participators*. Considering various patterns of engaging in online activities, Ma (2018) conducted latent group analysis to label young Internet users in Hong Kong as non-active Internet users, active social media users, all-round active Internet users, or moderately active Internet users. Ma (2018) also observed different psychological states among the different latent groups. As such, coinciding the person-centered approach, latent class or profile analysis can be used to classify distinct categories of mass media use and explain their meanings and differences.

Notably, patterns of online engagement provide more nuanced information than does the frequency of Internet use. Scott et al. (2017) identified three user profiles to represent those who minimally, moderately, and highly engaged in

social media, through latent profile analysis. Scott et al. (2017) also distinguished between engagement in Internet use and frequency of Internet use and indicated that engagement is more suitable than frequency is for evaluating young social media users. It becomes obvious that the concurrent examination of the frequency and patterns of Internet use allows for an accurate understanding of the implications of Internet use on user attitudes.

## The Present Study

Although a positive association has been established between individuals' frequency of Internet use and their acceptance of homosexuality, limited research has explored the association between the patterns of Internet activities and users' attitudes. This study investigated two research questions: (1) are there different profiles of young Internet users in contemporary China? (2) do the different profiles of young Internet users have distinct attitudes toward homosexuality? Considering the variations in users' U&G of online activities, a person-centered strategy is recommended to distinguish distinct categories of individuals sharing similar attributes and to identify between-group differences in user attitudes (Meeusen et al., 2018; Wang & Wang, 2020). In particular, the present study focused on young Internet users born between 1980 and 1999. We also collected information about demographics, socioeconomic covariates, confounding factors, and weekly hours of Internet use, all of which are related to individuals' attitudes regarding homosexuality.

## Methods

### Data and Sample

The data for this study were extracted from the 2017 Chinese General Social Survey (CGSS), which is a cross-sectional nationally representative survey that began in 2003. The CGSS used a stratified multistage probability sampling design to select counties, communities, and households randomly according to economic status, urbanization levels, and county-level population density. Within each selected household, adults aged 18 years and older were randomly selected. Details of the CGSS sampling and data collection methods were described in the study of Bian and Li (2012). In contrast to prior waves, the 2017 survey added a section to collect information on the Internet use of a subsample of 2,430 respondents (total  $N = 12,582$ ). This subsample is proportional to the original total sample in terms of compositions of provinces, regions, municipalities, and age. Following the previously established literature review, this study selected the respondents born between 1980 and 1999 (i.e., aged 18–37 years). The final analytical sample of this study

comprised 1,021 individuals. In this sample, missing values were observed for less than 5% of the respondents. Because no systematic patterns of missing values were found (Appendix 1), we used listwise deletion to handle missing values.

## Measures

### Dependent Variable

The respondents' attitude toward homosexuality was measured using the following ordinal-level question: "What are your opinions on homosexual relations?" Responses were given on a 5-point Likert scale (1 = always wrong, 2 = mostly wrong, 3 = neither right nor wrong, 4 = sometimes right, and 5 = always right). A higher score indicated a higher acceptance of homosexuality. The use of a single-item question has shown adequate validity in measuring the attitudes, beliefs, and behavior patterns toward homosexuality among diverse populations in a cross-national survey (Gromadzki, 2019).

### Independent Variables

Six ordinal-level questions covering different purposes of Internet use over the past year were used as the independent variables. On a 5-point Likert scale ranging from 1 (never) to 5 (always), the respondents reported their frequency of online activities, including online communication (e.g., communication through email, QQ, WeChat, or Skype), information acquisition (e.g., searching for information search or browsing the news), online entertainment (e.g., playing games, listening to music, or watching videos), online trading (e.g., online transfers, payments, or shopping), self-presentation (e.g., present oneself or recording or sharing feelings on online platforms), and online social actions (e.g., defending legitimate rights or seeking justice for others through the Internet). A higher score indicated a higher frequency of Internet use in the aforementioned domains.

### Confounders

Confounders such as traditional media use, hours of Internet use per week, and attitude toward freedom were modeled in this study because research has suggested that these factors influence attitudes toward homosexuality (Hu & Li, 2019; Xie & Peng, 2017). In this study, traditional media included newspapers, magazines, broadcast media, and television. The respondents reported their frequency of using each media source on a 5-point Likert scale ranging from 1 (never) to 5 (very often). A mean score was calculated for the four aforementioned media sources, and a higher mean value indicated a higher frequency of using traditional media. In addition, the respondents reported how

many hours they spent online per week. Finally, their attitudes toward freedom were assessed using two questions: "To what extent do you agree that the government should not interfere with individual criticisms of it?" and "To what extent do you agree that the government should not interfere in personal reproduction?" Responses to the aforementioned questions were given on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

### Covariates

On the basis of prior evidence (Wu et al., 2018; Zhang et al., 2020), demographic variables and socioeconomic status were controlled for in this study. The demographic variables included age (in years), gender (1 = female and 0 = male), religious belief (1 = with belief and 0 = without belief), ethnicity (1 = ethnic Han and 0 = others),<sup>1</sup> household registration (hukou) status (1 = rural hukou and 0 = urban hukou), marital status (1 = married and 0 = unmarried), and educational level (1 = junior high school or below, 2 = high school or associate degree, and 3 = undergraduate degree or above). The socioeconomic status was assessed using two factors: subjective social status and annual income level. Subjective social status was measured using the participants' self-rating of their overall social status rank (range: 1–10) compared with others. A higher score indicated a higher self-rated socioeconomic status. Income was measured by splitting the respondents' self-reported annual income into quartiles. Because nonresponses were observed in income, we used the strategy of Xie and Peng (2017) to create a new category for those who answered "don't know," "refuse to answer," and "not applicable"; thus, annual income was a five-level variable.

### Analyses

LCA was performed using Mplus 8.3 (Muthén & Muthén, 2017) to explore the underlying patterns of Internet use because people may use the Internet for multiple and distinct purposes and certain similarities might exist among Internet users. LCA is a statistical model-based approach that can be used to classify individuals into distinct subgroups (i.e., latent classes) according to their responses to a set of categorically or ordinally scored observed variables (see Hancock & Samuelsen, 2008; Wang & Wang, 2020). Given that the original distribution of Internet use was highly skewed in this study (Appendix 2), we collapsed the 5-point Likert scale for frequency of online activities

<sup>1</sup> There are 56 officially recognized ethnic groups in China. The largest group is Han, accounting for around 91% of the country's total population according to the seventh national census in 2020.

into three levels (i.e., low, medium, and high) by combining “never” and “seldom” into the “low” category and “often” and “always” into the “high” category; thus, those who selected “sometimes” comprised the “medium” category.

To determine the appropriate number of latent classes, several model fit indices, including the Bayesian information criterion (BIC), the Vuong–Lo–Mendell–Rubin (VLMR) test, the bootstrap likelihood ratio test (BLRT) (Lo et al., 2001; Nylund et al., 2007), and entropy were examined concurrently to select an optimal LCA model. As suggested by Lo et al. (2001), a significant  $p$  value in the VLMR test or BLRT indicates that an estimated latent class model (i.e.,  $k$  classes) fits better than a model with one less class (i.e.,  $k - 1$  classes). Furthermore, the Monte Carlo simulation results of Nylund et al. (2007) suggest that a better LCA model has a smaller BIC value. Finally, a higher entropy value indicates a higher accuracy of classifying respondents into subgroups (Wang & Wang, 2020). Collins and Lanza (2010) suggested that an appropriate LCA model should be selected according to the model interpretability. That is, each class should be distinguishable from the others; the class sample size should not be excessively small; and a meaningful label should be assigned to each latent class.

After identifying the latent classes of Internet use, we used bivariate analysis (chi-square analysis, analysis of variance (ANOVA), and ordered logistic regression) to examine the associations among attitude toward homosexuality, Internet use, covariates, and confounders. To determine the relationship between attitude toward homosexuality and membership in a latent class, multiple ordered logistic regression was used to adjust for the covariates and confounders. The respondents were oversampled to ensure that the target sample size and probability of respondents being selected varied among households; thus, the sampling weight was computed for each person in the sample (Bian & Li, 2012). We also conducted a series of regression diagnostic tests to assess the quality of the analyses. For example, the Brant test of coefficients was performed for the multivariable model to examine the parallel assumption of ordered logistic regression (Brant, 1990). The variance inflation factor (VIF) was used to examine multicollinearity. All analyses except those for the LCA models were conducted using Stata 15.0.

## Results

### Sample Characteristics

Table 1 presents the descriptive statistics of the research sample. The average age of the sample was 27.66 years ( $SD = 5.47$  years). The sample contained marginally more men than women (54.59% vs. 45.41%). Most of the respondents were ethnic Han (91.19%) and nonreligious (90.58%)

and held an urban hukou (71.32%). Approximately 60% of the respondents were married, and approximately 30% had an undergraduate degree. The respondents rated their socioeconomic status to be marginally lower than the mid-value of the scale ( $M = 4.34$ ,  $SD = 1.52$ ). In addition, the respondents reported a moderate level of traditional media use ( $M = 2.13$ ,  $SD = 0.62$ ). The average weekly Internet use time was 23.55 h ( $SD = 20.89$ ). More than half of the respondents strongly or somewhat disagreed with the personal freedom to criticize the government and the personal freedom of reproduction. Approximately half of the respondents expressed that homosexual behaviors were always wrong, and approximately 1 in 10 respondents accepted such behavior.

### Profiles of Internet Use

Table 2 presents the results of latent class enumeration for the one-class to six-class models. We selected the four-class model as the best LCA model because it had the lowest BIC value, significant  $p$  value in the VLMR test and BLRT, relatively high entropy value, and easy interpretability. We plotted a graph of the four-class LCA model to aid interpretation. In this graph (see Fig. 1), the horizontal axis indicates the six Internet use activities and the vertical axis indicates the propensity of engaging in these activities. As displayed in Fig. 1, class 1 had a high probability for every aspect of Internet use (39.1–99.5%). Therefore, we labeled this group of respondents as *active participators*. Subsequently, we labeled the respondents in class 2 as *pragmatic users* because they exhibited high engagement in Internet activities such as communication (86.1%), information acquisition (77.3%), entertainment (73.4%), and trading (67.6%) but relatively low engagement in self-presentation (27.6%) and online social actions (5.6%), which indicates that they were protective of their identity and personal visibility. The respondents in classes 3 and 4 exhibited lower Internet use intensity than those in classes 1 and 2 in every aspect. The respondents in class 3 exhibited, among the six aspects of Internet use, a probability of engaging in information acquisition (10%) and online entertainment (19%). The respondents in class 4 exhibited the lowest probability of engaging in all six aspects. We labeled the respondents in classes 3 and 4 as *entertainment users* and *idle users*, respectively.

### Bivariate Analyses

Table 3 presents information on the demographics, socioeconomic status, and confounders for the different Internet use profiles. Overall, compared with idle and entertainment users, active participators and pragmatic users were younger, were more likely to live in urban areas, had higher education levels, and were less likely to be married.

**Table 1** Research sample characteristics

Variables	Weighted <i>M</i> ( <i>SD</i> ) or unweighted <i>n</i> (weighted %)
<b>Dependent variable</b>	
Attitude toward homosexuality	
Always wrong	540 (53.32%)
Mostly wrong	77 (7.31%)
Neither right or wrong	267 (28.17%)
Sometimes right	81 (8.04%)
Always right	35 (3.16%)
<b>Demographics</b>	
Age (18–37)	27.66 (5.47)
Gender	
Male	501 (54.59%)
Female	520 (45.41%)
Ethnicity	
Ethnic Han	940 (91.19%)
Others	81 (8.81%)
Religious belief	
With belief	86 (9.42%)
Without belief	935 (90.58%)
Household registration status	
Urban hukou	764 (71.32%)
Rural hukou	257 (28.68%)
Marital status	
Married	597 (58.79%)
Not married	424 (41.21%)
Educational level	
Junior high school or below	301 (29.28%)
High school or associate degree	437 (43.41%)
Undergraduate degree or above	283 (27.30%)
<b>Socioeconomic status</b>	
Subjective social status	4.34 (1.52)
Annual income (RMB)	
1st quartile (0 - 10,000)	278 (29.57%)
2nd quartile (10,000 - 30,000)	237 (23.57%)
3rd quartile (30,000 - 70,000)	269 (24.44%)
4th quartile (70,000 - 2,000,000)	174 (15.44%)
Others (“Inapplicable,” “Refused to answer,” “Don’t know”)	63 (6.98%)
<b>Confounders</b>	
Traditional media use	2.13 (0.62)
Average hours of Internet use per week	23.55 (20.89)
Personal freedom to criticize the government	
Strongly disagree	116 (11.87%)
Somewhat disagree	319 (40.24%)
Neutral	202 (19.34%)
Somewhat agree	224 (21.65%)
Strongly agree	65 (6.90%)
Personal freedom to reproduction	
Strongly disagree	140 (14.40%)
Somewhat disagree	427 (41.64%)
Neutral	108 (10.17%)
Somewhat agree	251 (24.20%)
Strongly agree	92 (9.59%)

*M* mean, *SD* standard deviation

**Table 2** Latent class analysis results for Internet use

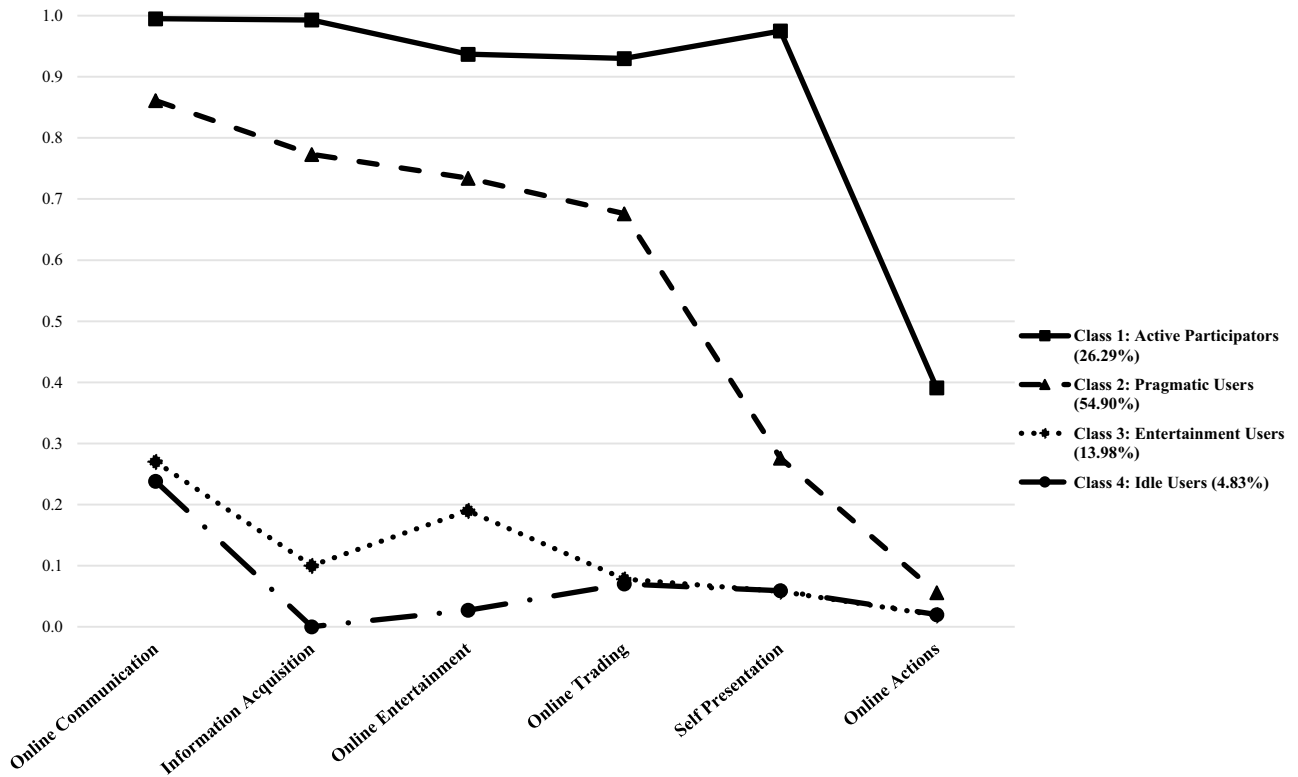
Latent class	$\chi^2$ (df)	BIC	VLMR-LRT	BLRT	Entropy
1	2592.358***(714)	10,812.608	-	-	-
2	1114.889***(701)	10,007.562	885.274***	895.104***	0.785
3	998.934***(689)	9896.574	198.837	201.045	0.801
4	846.991***(674)	9845.642	139.443**	140.991**	0.790
5	757.359**(662)	9870.579	64.406	65.121	0.711
6	717.202*(649)	9911.537	48.561	49.100	0.727

df degrees of freedom, BIC Bayesian information criterion, VLMR-LRT Vuong–Lo–Mendell–Rubin adjusted likelihood ratio test, BLRT bootstrap likelihood ratio test

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

Furthermore, compared with entertainment users, active participators and pragmatic users had higher socioeconomic status because they had higher subjective social status and income (higher proportion of scores in the third and fourth income quartiles). Differences were also observed in confounders across the four types of Internet use profiles. Idle users had the highest scores for traditional media use (e.g., newspapers and television), whereas active participators and pragmatic users reported higher Internet use time than did the other groups. No intergroup differences were observed in gender, ethnicity, or attitude toward freedom.

Model 1 (Table 4) shows the bivariate associations among Internet use profiles, covariates, and confounders on the basis of simple ordered logistic regression. We changed the reference groups of Internet use profiles to examine comprehensively the correlation between Internet use and attitude toward homosexuality. The results indicated that compared with idle and entertainment users, active participators ( $uOR = 2.98$ ) and pragmatic users ( $uOR = 1.66–2.26$ ) were more likely to accept homosexuality. Compared with active users, pragmatic users ( $uOR = 0.76$ ) and entertainment users ( $uOR = 0.46$ ) were less likely to accept homosexuality.



Note. Numbers on the vertical axis indicate the probability of engagement in each Internet activity. The percentages were weighted for each latent class.

**Fig. 1** Latent class analysis results for Internet use. Numbers on the vertical axis indicate the probability of engagement in each Internet activity. The percentages were weighted for each latent class

**Table 3** Bivariate analyses of demographics, socioeconomic status, confounders, and Internet use profiles

Variables	Active participators	Pragmatic users	Entertainment users	Idle users	$\chi^2/F$ test
<b>Demographics</b>					
Age (18–37)	29.26 (5.07)	30.63 (5.45)	32.81 (5.59)	32.31 (5.23)	$F = 15.28^{***}$
Gender					
Male	54.61%	54.19%	55.85%	54.98%	$\chi^2 = 0.20$
Female	45.39%	45.81%	44.15%	45.02%	
Ethnicity					
Others	7.96%	8.46%	13.05%	5.36%	$\chi^2 = 4.04$
Ethnic Han	92.04%	91.54%	86.95%	94.64%	
Religious belief					
Without belief	92.76%	91.10%	84.08%	91.64%	$\chi^2 = 8.63^*$
With belief	7.24%	8.90%	15.92%	8.36%	
Household registration status					
Urban <i>hukou</i>	78.47%	74.05%	51.70%	58.00%	$\chi^2 = 52.16^{***}$
Rural <i>hukou</i>	21.53%	25.95%	48.30%	42.00%	
Marital status					
Not married	56.45%	40.04%	20.20%	31.80%	$\chi^2 = 53.91^{***}$
Married	43.55%	59.96%	79.80%	68.20%	
Education level					
Junior high school or below	15.97%	27.37%	60.90%	31.18%	$\chi^2 = 105.31^{***}$
High school or associate degree	47.78%	43.72%	32.91%	46.99%	
Undergraduate degree or above	36.25%	28.91%	6.19%	21.83%	
<b>Socioeconomic status</b>					
Subjective social status	4.48 (1.44)	4.39 (1.61)	3.95 (1.42)	4.28 (1.49)	$F = 3.35^*$
Annual income					
1st quartile	28.15%	27.35%	37.54%	38.63%	$\chi^2 = 39.13^{***}$
2nd quartile	22.21%	20.55%	38.28%	22.94%	
3rd quartile	26.26%	25.85%	15.54%	24.62%	
4th quartile	14.26%	18.38%	7.11%	12.73%	
Others	9.11%	7.87%	1.53%	1.07%	
<b>Confounders</b>					
Traditional media use	2.12 (0.60)	2.18 (0.67)	1.97 (0.61)	2.22 (0.61)	$F = 5.53^{***}$
Average hours of Internet use per week	26.36 (19.08)	24.37 (21.52)	16.41 (17.60)	19.31 (26.46)	$F = 8.12^{***}$
Personal freedom to criticize the government					
Strongly disagree	9.83%	13.23%	12.98%	4.09%	$\chi^2 = 16.94$
Somewhat disagree	32.01%	43.00%	44.64%	40.80%	
Neutral	21.97%	17.77%	19.12%	23.62%	
Somewhat agree	26.66%	19.76%	16.90%	29.84%	
Strongly agree	9.53%	6.24%	6.36%	1.64%	
Personal freedom to reproduction					
Strongly disagree	12.27%	15.52%	16.40%	7.57%	$\chi^2 = 15.41$
Somewhat disagree	39.98%	41.81%	44.13%	41.66%	
Neutral	6.34%	12.16%	7.73%	15.26%	
Somewhat agree	30.12%	20.38%	24.56%	34.45%	
Strongly agree	11.29%	10.13%	7.18%	1.06%	

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$



**Table 4** Bivariate and multivariate ordered logistic regressions for attitudes toward homosexuality

Variables	Model 1 bivariate				Model 2 multivariate			
	<i>uOR</i>	<i>SE</i>	<i>95% CI</i>		<i>aOR</i>	<i>SE</i>	<i>95% CI</i>	
Internet use profiles ( <i>Ref</i> : idle users)								
Active participators	2.98**	1.05	1.50	5.93	2.23*	0.83	1.08	4.63
Pragmatic users	2.26*	0.77	1.15	4.41	2.03*	0.73	1.00	4.11
Entertainment users	1.36	0.51	0.66	2.83	1.91	0.76	0.87	4.16
Internet use profiles ( <i>Ref</i> : active users)								
Pragmatic users	0.76*	0.11	0.58	1.00	0.91	0.14	0.67	1.23
Entertainment users	0.46***	0.09	0.31	0.68	0.85	0.20	0.54	1.36
Internet use profiles ( <i>Ref</i> : entertainment users)								
Pragmatic users	1.66**	0.31	1.15	2.39	1.07	0.23	0.70	1.63
<b>Confounders</b>								
Traditional media use	1.09	0.10	0.90	1.32	0.91	0.10	0.74	1.12
Average hours of Internet use per week	1.02***	0.00	1.01	1.02	1.01**	0.00	1.00	1.02
Personal freedom to criticize the government: strongly disagree								
Somewhat disagree	1.98**	0.44	1.28	3.06	1.58	0.40	0.96	2.58
Neutral	2.09**	0.50	1.30	3.35	1.44	0.40	0.83	2.48
Somewhat agree	2.62***	0.63	1.64	4.18	2.15**	0.59	1.26	3.67
Strongly agree	2.00*	0.63	1.08	3.71	1.80	0.62	0.91	3.55
Personal freedom to reproduction: strongly disagree								
Somewhat disagree	2.52***	0.52	1.69	3.76	1.82*	0.42	1.16	2.85
Neutral	2.12**	0.56	1.27	3.55	1.44	0.43	0.80	2.60
Somewhat agree	2.10**	0.46	1.37	3.24	1.37	0.34	0.84	2.23
Strongly agree	2.36**	0.64	1.39	4.02	1.52	0.46	0.84	2.75
<b>Socioeconomic status</b>								
Subjective social status	1.15**	0.05	1.06	1.24	1.05	0.05	0.96	1.15
Annual income ( <i>Ref</i> : 1st quartile)								
2nd quartile	0.63**	0.11	0.45	0.88	0.88	0.17	0.61	1.28
3rd quartile	0.89	0.15	0.64	1.22	1.02	0.20	0.70	1.50
4th quartile	1.27	0.24	0.88	1.83	1.21	0.28	0.76	1.91
Others	1.10	0.28	0.67	1.80	0.74	0.20	0.43	1.27
<b>Demographics</b>								
Age (18–37)	0.94***	0.01	0.92	0.96	0.97	0.02	0.94	1.01
Female ( <i>Ref</i> : male)	1.24	0.15	0.98	1.57	1.51**	0.21	1.15	1.98
Ethnicity ( <i>Ref</i> : others)	2.03**	0.49	1.27	3.24	1.90*	0.52	1.12	3.25
Religious belief ( <i>Ref</i> : without belief)	0.52**	0.12	0.34	0.81	0.80	0.20	0.49	1.31
Household registration status ( <i>Ref</i> : urban <i>hukou</i> )	0.52***	0.73	0.39	0.68	0.84	0.14	0.60	1.16
Marital status ( <i>Ref</i> : not married)								
Married	0.41***	0.05	0.32	0.52	0.59**	0.11	0.41	0.84
Education level ( <i>Ref</i> : junior high school or below)								
High school or associate degree	1.63**	0.25	1.21	2.20	1.07	0.19	0.75	1.52
Undergraduate degree or above	3.94***	0.66	2.84	5.47	2.24***	0.47	1.48	3.39

*uOR* unadjusted odds ratio, *aOR* adjusted odds ratio, *SE* standard error, *CI* confidence interval

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ , ns = nonsignificant

No difference in attitudes toward homosexuality was found between idle and entertainment users.

Demographics, socioeconomic status, and confounders were associated with attitudes toward homosexuality.

Overall, the respondents tended to disagree with homosexuality if they were older ( $uOR = 0.94$ ), held religious beliefs ( $uOR = 0.52$ ), were married ( $uOR = 0.41$ ), or were living in a rural area ( $uOR = 0.52$ ). By contrast, individuals

who were Han Chinese (compared with ethnic minorities,  $uOR=2.03$ ), had higher education levels ( $uOR=1.63-3.94$ ), and had higher self-rated social status ( $uOR=1.15$ ) were more likely to have an open attitude toward homosexuality. Furthermore, respondents with a higher Internet use time ( $uOR=1.02$ ) and a liberal view on criticizing the government ( $uOR=1.98-2.62$ ) and on reproduction ( $uOR=2.10-2.52$ ) were more likely to have a positive attitude toward homosexuality. Income and gender were not significantly correlated with attitudes toward homosexuality.

### Multivariate Analyses

Model 2 (Table 4) shows the multivariate results of ordered logistic regressions. When demographics, socioeconomic status, and confounders were controlled for, only the differences between active participators and idle users ( $aOR=2.23$ ) and between pragmatic users and idle users ( $aOR=2.03$ ) were significant. Internet use time ( $aOR=1.01$ ), attitudes toward the freedom to criticize the government ( $aOR=2.15$ ), and attitudes toward the freedom to procreate ( $aOR=1.82$ ) were significantly associated with positive attitudes toward homosexuality. Respondents who were female ( $aOR=1.51$ ), were Han Chinese ( $aOR=1.90$ ), and had an undergraduate degree or above ( $aOR=2.24$ ) exhibited relatively high acceptance of homosexuality. By contrast, married respondents exhibited relatively low acceptance of homosexuality ( $aOR=0.59$ ). The model diagnostic tests indicated that the results ( $\chi^2(78)=82.48, p>0.05$ ) of the Brant test were not significant, which indicated that the parallel assumption of ordered logistic regression was satisfied (Brant, 1990). The largest VIF value (Appendix 3) was 5.09, which indicated that multicollinearity was not a severe concern.

### Discussion

This study extends current knowledge on the relationship between engagement in online activities and attitudes toward homosexuality. On the basis of the U&G framework (Rubin, 2009), we developed a typology of Internet use for young Chinese Internet users through LCA. This person-centered analytic technique classifies heterogeneous users into distinct yet internally homogeneous groups (Wang & Wang, 2020). Moreover, LCA not only captures the qualitative differences in users' online engagement but also can be used to predict users' tolerance levels of homosexuality as a function of their Internet use patterns. To the best of our knowledge, this study is the first to use LCA to investigate how the type of Internet use influences users' attitudes toward homosexuality; thus, the findings of this study are novel.

The results of LCA reveal that Internet users' online participation is intricately tied to their demographic, socioeconomic, and other characteristics. The active participators (class 1) in the research sample were predominantly young, highly educated, unmarried, and living in cities. Their extensive exposure to the Internet and active participation in various online activities indicated that they made full use of Internet resources and were deeply engaged in online activities. The active participators exhibited all-rounded purposes in their use of internet and online activities have become an integral part of their lives. By contrast, the idle users (class 4) not only were inactive in the online space but also exhibited a preference for traditional media (e.g., newspapers, magazines, broadcast media, and television). The respondents belonging to class 3, the entertainment users, exhibited distinctive characteristics, including older age; strong religious belief; married status; rural residency; and the lowest education level, social status, and annual income among all the respondents. Among all the respondents, entertainment users reported the lowest frequency of using traditional media and the Internet possibly because their marginalized positions limited their access to and use of mass media. However, when going online, they exhibited a relatively active tendency to engage in online communication, entertainment consumption, and information acquisition compared with those in class 4. Class 2, the pragmatic users, had the largest share of high-income respondents (i.e., those in the fourth income quartile), implying that they were in the middle or upper classes of society. Despite having resources and access to Internet technology, they appeared to have concerns regarding the protection of individual privacy and therefore refrained from presenting themselves in online spaces.

This study found that frequency of Internet use was positively associated with attitudes toward homosexuality in the bivariate and multivariate analyses. This finding is consistent with those of previous relevant studies (e.g., Chi & Hawk, 2016; Liu et al., 2020; Nguyen & Blum, 2014; Wu et al., 2018). However, the negative correlation between traditional media use and people's acceptance of homosexuality identified by prior studies in China (Hu & Li, 2019; Tu & Lee, 2014) was not observed in this study possibly due to the young age of the research sample. This result indicates that for young users in China, the Internet has a stronger influence on public attitudes than do traditional media sources.

The key finding of this study is that the pattern of Internet use identified through LCA is also associated with users' attitudes toward homosexuality. While people's frequency of Internet use varies, we also found that Internet users engage in the Internet for different purposes to meet their various needs, such as a desire for communication,

entertainment, or information. This typology provides empirical support for the U&G theory, which suggests understanding particular media use as an avenue to gratify specific human needs (Katz et al., 1973). To be specific, active participators and pragmatic users had stronger motivations to obtain gratifications from the Internet than idle users. They were actively involved in information acquisition in addition to online communication, entertainment, and trading. Through these diverse activities, they proactively harnessed the online resources to gratify and enrich themselves.

The findings also advance our understanding about the interplay between Internet use and attitudes towards homosexuality. Previous literature regards the exposure to Internet as a modernizing factor and resource (e.g., Chi & Hawk, 2016; Hu & Li, 2019; Liu et al., 2020; Tu & Lee, 2014) whereas little is known about how the engagement in distinct online activities is associated with attitudes toward homosexuality. The profile analysis of this study thus has theoretical implications for discerning the qualitative relationship between the Internet use behaviors and attitudes. Viewed from the U&G perspective that considers communication behavior to be goal-oriented, active participators and pragmatic users appear proactive in their use of the Internet content to meet their needs even under China's media censorship regime. Although same-sex content is subjected to state censorship in traditional media, discussion on sexual minorities has gone vibrant across social media in China (Yang, 2019). Therefore, active participators and pragmatic users might be more likely to be exposed to positive portrayals of sexual minorities (e.g., news on progressive policies regarding sexual minority rights and romantic dramas with same-sex themes) and to develop a positive view of homosexuality. Future research can deepen this investigation by measuring other psychological and behavior factors to account for the association between active and pragmatic use of Internet and tolerant attitudes.

Our findings also show that idle users who used the Internet mainly for online communication, compared to entertainment users who maintained a certain degree of need for information acquisition, exhibited a significantly lower tolerance of homosexuality than active users and pragmatic users. Such pattern suggests that the heavy use of Internet for social networking and communication alone does little to break through one's offline network and could be ineffective in introducing new knowledge and alternative perspectives (Dunbar, 2016). The formation of "echo chambers," in which Internet users only interact with people whose views comply with or reinforce their own (Jamieson & Cappella, 2008), may explain why idle users who used the Internet to communicate with people in their original social circles reported less tolerance of homosexuality.

## Implications for Practice and Policy

This study demonstrates the methodological advantages of LCA. Although Internet use profiles have been increasingly researched (Eynon & Malmberg, 2011; Ma, 2018), only few studies have adopted LCA to determine the underlying structure of highly complex Internet use behaviors. In line with the U&G perspective, the findings of this study show that people spontaneously consume mass media to satisfy various needs and gratifications (Rubin, 2009). The current study exemplified the usefulness of developing a typology of young Chinese Internet users and investigating the intricate relationships among Internet use patterns, socioeconomic positions, and attitudes toward social agenda.

This study also contributes to the emerging literature on the association between people's Internet use behaviors and attitudes toward homosexuality. Prior studies have documented the effects of exposure to Internet technologies but have yet considered the diversity of functions that the Internet offers to users. In the context of the negotiation between state control and explosive growth of mass media in China, the present study supports the finding of prior studies regarding the positive association between frequency of Internet use and acceptance of homosexuality. It further suggests that users who actively utilize the wide range of functions on the Internet are more likely to develop positive attitudes toward homosexuality than are idle users who limit their Internet use to communication purposes. Future research should shift from a variable-centered orientation to a person-centered one for determining the effects of various online activities on users' social interactions and perspectives.

Finally, the findings of this study on the association between Internet use patterns and user attitudes toward homosexuality informed policy makers to promote diversity and inclusion in online space. Campaigns to reduce LGBT stigma have begun to proliferate online and on social media along with promising results (Neubaum et al., 2020; Wu et al., 2018). While existing studies have identified intergroup contact as an essential condition for stigma reduction (Tu & Lee, 2014; Wu et al., 2018), our study findings suggest that additional efforts should be invested to enhance LGBT people's visibility on the Internet. Besides, we should encourage Internet users, especially for idle users, who tend to communicate with people sharing similar characteristics and perspectives, to be exposed to online LGBT-related content and to interact, either online or offline, with LGBT people. Only through this reciprocal interaction can we create intergroup contact experiences to broaden the channels of communication between sexual minorities and the general public and create a friendly communication environment.

Notably, in this study, idle users are also characterized by their less frequent use of Internet to acquire information and a greater tendency to use traditional media. Some

studies have found that the traditional media in Mainland did not encourage discussion about LGBT issues and the news reports frequently revolved around the prevention of HIV/AIDS through same-sex sexual activities (Chang & Ren, 2017; Wang & Ma, 2021). This may explain why traditional media use was associated with lower tolerance of homosexuality in this study (Hu & Li, 2019; Tu & Lee, 2014). Given that an individual's Internet use pattern might be slow and difficult to change (Barrantes & Vargas, 2019), dissemination of LGBT-positive messages and accurate information through traditional media could be an effective strategy to reach idle users and attenuate their intolerance of homosexuality.

## Limitations and Conclusion

This study has several limitations. First, given that the data for this analysis came from only one wave of CGSS that includes questions about the purposes of Internet use, it is beyond this study to observe the shifts in people's Internet use and their attitudes toward homosexuality. Future research should adopt a longitudinal design to examine the changes and long-term associations of Internet use profiles and the attitudes toward homosexuality. Second, this study analyzed a single-item attitude measure toward homosexuality that is only available in the CGSS data. Although Gromadzki (2019) has suggested that the single-item measure of attitude toward homosexuality exhibits adequate validity, this study could not capture other aspects of perceptions, such as people's attitudes toward equal rights for sexual minorities. Future studies are suggested to employ a multiple-item scale, such as Herek's Attitudes toward Lesbians and Gay Men Scale (Yu et al., 2011), to assess Chinese respondents' attitudes towards sexual minority people. Third, this study only investigated public attitudes toward one of sensitive topics in the Chinese context (i.e., homosexuality). Future research may explore other similar outcome variables, such as attitude toward collective actions. Last, this study attempted to explain the differences in attitude toward homosexuality based on the typologies formed from participants' purposes of Internet use. However, the non-significant differences may be attributed to the factors other than the profile characteristics. Future research may consider incorporating other elements, such as content of information searching, to analyze why different types of Internet users exhibit distinct public attitudes.

In conclusion, this study used LCA to classify young Chinese Internet users into four subgroups. Each class was labeled according to the users' needs from, attitudes toward, and expectations of the Internet. The bivariate and multivariate results indicated that prolonged Internet exposure was positively related to attitudes toward homosexuality.

Moreover, compared with idle users, active and pragmatic Internet users held more tolerant attitudes toward homosexuality. This finding suggests that online programs aimed to promote societal acceptance of sexual minority individuals should consider the users' characteristics and their pattern of Internet use.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s13178-021-00680-w>.

**Availability of Data and Material** The data that support the findings of this study are openly available in Chinese General Social Survey 2017 at <http://cnsda.ruc.edu.cn/index.php?r=projects/view&id=94525591>.

## Declarations

**Conflict of Interest** The authors declare no competing interests.

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