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Who would (not) use all-gender toilets… and why? A study on university students in Taiwan

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ABSTRACT

The installation of—and the debates surrounding—all-gender toilets (AGTs) are growing worldwide, but few empirical studies exist regarding the attitudes and behaviors of prospective AGT users. This paper fills the research gap by using a multi-methods approach to investigate how prospective users perceive and use AGTs at National Sun Yat-sen University in Taiwan. Through a survey of 729 university students and a two-week-long on-site observation, the study provides substantive evidence regarding AGTs users. The survey shows that the majority of both male and female respondents endorsed and would actually use AGTs. The presumed opposition to AGTs by mainstream users might have been overestimated. On average, only 9.23% of the respondents disagreed with the installation of AGTs, and only 7.37% never used the AGT next to their classroom. Female students were less likely to endorse and to use AGTs, and were more concerned about privacy, safety and hygiene issues in AGTs. On the other hand, some women would endorse the installation of AGTs even if they don't personally use them. Societies may be able to accommodate these diverse users by allowing for the coexistence of all-gender and gender-segregated toilets. This research contributes to existing gender and toilet literature by providing a cross-examined assessment of prospective respondents' attitudes and behaviors vis-à-vis the AGTs in an actual AGT setting instead of a hypothetical scenario. We encourage future research to target a more diversified pool of respondents to explore the myriad factors associated with mainstream users' attitudes toward and use of AGTs.

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Introduction

With the rising awareness of LGBT rights worldwide, the 'toilet battle' has attracted considerable public and media attention in recent years. In Taiwan, for example, the first ruling of a transgender job discrimination case took place in 2011, in which a transgender woman working as IT engineer in a hospital for 4 years decided to wear women's dress to work. She was forbidden to use women's toilet by her supervisor and eventually fired in two months (Lee 2016). A similar case occurred in Japan in 2015, where a transgender bureaucrat launched a landmark ¥18 million discrimination lawsuit against the government, claiming the trade ministry refused to let her use the female toilets and harassed her about her sex change (Osaki 2015).

In the United States, North Carolina passed the House Bill 2 (HB2) in March 2016 that requires transgender people to use the public toilets corresponding to the sex on their birth certificate. The passage resulted in boycotts of the state by sports leagues, businesses, and events promoters (McGee 2016; Sanders and Stryker 2016). The fallout compelled the state government to repeal the Bill a year later, with the hope of undoing the harm done to North Carolina's reputation and economy. In July 2019, furthermore, a federal judge in North Carolina approved a settlement that prohibits the state government from banning transgender people from using bathrooms in state buildings that match their gender identity (Levin 2019). This controversy further shows that public toilet regulation has emerged as a wicked policy problem and may unleash severe economic downturn.

Note, however, that in these spotlighted policy battles, the binary segregation of public toilets has remained largely in place throughout the world: restroom users still need to choose either a 'men's room' or a 'women's room.'

All-gender toilets (hereafter, AGTs)—also called gender-neutral, gender-inclusive, or unisex toilets—seem to have the potential to challenge this binarism and are increasingly popular not only in well-known gender-equal countries such as Sweden and Denmark (McGee 2016), but also in the United States, Europe, and some Asian countries. A growing number of US cities, such as Philadelphia and Seattle, have even passed local ordinances that require all public spaces to designate single-stalled toilets as all-gender (Lorenzetti 2015).

Nevertheless, suspicion of and outright opposition to AGTs have been voiced by not only religious conservatives endorsing traditional gender norms, but also women's-rights activists concerned about safety and privacy issues (Greed 2003; Jeffreys 2014). The assumptions about users' perceptions and usage of AGTs, though, are seldom examined in actual AGT settings, and/or rest on selective references, news articles or interviews (Jeffreys 2014; Greed 2003, 2019; Ramster, Greed, and Bichard 2018). The little empirical research that addresses AGTs, moreover, focuses mainly on the experiences

of transgender people who are the direct 'victims' of sex-segregated toilets (Brunskell-Evans and Moore 2018; Cavanagh 2010; Davies, Vipond, and King 2019; Levi and Redman 2010). Few studies focus on 'mainstream' people's approach to AGTs, hence Ramster, Greed, and Bichard (2018, 108) argue that 'more research is needed to explore how opening up a facility featuring urinals or partitioned cubicles to all genders affects people's ability to use it and how it affects their sense of privacy, comfort and dignity.'

Our paper, in light of this research gap, strengthens the empirical grounds for future normative discussions about the issue. We focus on the 'prospective users' of AGTs—in our case, university students whose classrooms are located near an AGT. We use 'prospective users' to describe them because there is a degree of likelihood that they will use the AGT. If they avoid using the AGT, it shall be a determined choice. It is thus valuable to study their attitudes and behaviors because their reaction to an AGT occur in an *actual* AGT setting instead of a *hypothetical* scenario. Our purpose is not only to explore the students' attitudes and behaviors vis-à-vis the AGTs, but also the factors influencing these attitudes and behaviors.

To fulfill our research goals, we used the College of Management of National Sun Yat-sen University (hereafter NSYSU) in Taiwan as our research field. Taiwan is one of the few Asian countries where the LGBT movement has been quite active for almost two decades, and is the first Asian country to legalize same-sex marriage, an event that took place in May 2019. As early as May 4th, 2009, LGBT societies in some universities were proposing the idea of AGTs, which drew extensive media coverage because of two cross-dressing activists who had worn skirts and pretended to be urinating in front of a men's urinal. Access to AGTs gradually became a central agenda of Taiwan's LGBT movement, and was sometimes mentioned in the governmental Gender Mainstreaming agenda. In 2011, Shih Hsin University, in Taipei, transformed two men's toilets into all-gender (termed Gender-Friendly Toilets), attracting considerable media attention in the process. Thereafter, when a handful of existing university restrooms needed to be remodelled, one or two 'token' AGTs were installed, chiefly for the purpose of gaining credit on the given institutions' Gender Equity Education Evaluation report launched by the Ministry of Education in Taiwan since 2006 (Ministry of Education, Taiwan 2008).

A distinguishing characteristic of the AGTs at the College of Management of NSYSU was the institution's decision to install a reasonable number of AGTs on campus. When the College of Management started planning to remodel the total of 29 toilets in 2015, they decided to have at least one AGT on every floor, resulting in a total of 6 AGTs in the four-story, about 63500-square-meters building. This allocation is reasonable in the sense that if students prefer or need to use an AGT, they do not need to travel from one end to the other of the whole building or even the whole campus to

locate the facility. Such a reasonable distribution of AGTs also increased their visibility, hence providing a more ideal environment in which we—the researchers responsible for the current study—could survey relatively 'aware' users for their opinions on AGTs.

In the rest of the paper, we first present a literature review of both discussions about segregated toilet spaces and discussions about AGTs. Then we introduce our research field and design. In 'Results and analysis' section, we present our findings in four sub-sections: the first two concern our sex-disaggregated descriptive analyses of the study's dependent and independent variables respectively, and the second two concern our regression analyses of the factors influencing respondents' attitudes and behaviors vis-à-vis AGTs. Finally, we conclude with a brief discussion and further suggestions.

Literature review

The topic of whether or not to install AGTs is not new, nor was it first initiated out of a concern for transgender rights. AGTs can be traced back to the late 1980s, when the problem of insufficient women's public toilets came to the forefront. As a pioneering advocate for women's toilet's rights, Banks (1991) highlighted the argument that the difficulty women face in using public restrooms is related to men's intent to deter women from participating in outside activities, that is, to the hostility of a patriarchal society toward women leaving the home. She proposed two strategies to resolve the insufficiency problem: increase the number of women's toilets or construct AGTs for common use.

At about the same time, in tracing the history of public toilets in the UK, Cavanagh and Ware (1990) also addressed the advantages of AGTs. Although their book focused on both the factors contributing to women's greater need of public toilets and respective design principles, the authors pointed out that as physically disabled people and young children are often cared for by people of the opposite sex, AGTs would much better suit their needs than would traditional toilets. At this stage, the needs of trans-people were not yet acknowledged, but the utility of AGTs was identified.

Clara Greed, a British scholar long dedicated to researching the issue of inclusive public facilities, has also been concerned with the numerical inadequacy of women's toilets (1995, 2003, 2019). She argued for proper provisions of toilets for women and 'disenabled people,' by which she meant not only the officially defined disabled groups, but also the incontinent, the elderly, pregnant women, and people who take care of children. Trans-people, however, were not on the list in her early work. Greed did not endorse the idea of creating AGTs as a solution to insufficient women's toilets and, in fact, asserted that privacy and safety

considerations would render AGTs unacceptable to women across the age spectrum (2003, 76–77).

With trans-people's growing calls for AGTs, however, Greed's cautions against these spaces have lessened in the past decade (Greed and Bichard 2012; Greed 2019). She acknowledged that 'those considered visually and sexually unwelcome in conventional toilets' might need AGTs and pointed out that the UK AGT approach could accommodate this need (Greed and Bichard 2012, 545). Though she still emphasizes the risk of building new AGTs at the expense of women-only toilets (Ramster, Greed, and Bichard 2018), Greed's argument for 'recognising women's concerns while addressing the needs of transgender people' (Greed 2019, 920) reflects the growing recognition and legitimacy of transgender users' experiences and of the idea of the 'nonsexist restroom.' Note that the underlying presumption is usually that women will have more concerns about AGTs than men, as reflected in the subtitle '*Additional problems for women exacerbated by desegregating toilets*' in Greed's recent (2019, 919) essay. Thus, in our study, we explore whether or not—and if so, in what ways—gender plays a role in influencing people's attitudes and behaviors vis-à-vis AGTs.

Many feminists endorsed the idea of AGTs in accordance with rising post-modern feminist and queer theories, which treat the binary division of sex and gender as socially constructed, and which specifically view toilet spaces as a powerful index of social belonging, exclusion, and discipline and as a tool for 'keeping existing social categories in place' (Penner 2012, 543). In her analysis of public toilets as sexed spaces, Browne (2004, 2012), for example, used 'genderism' to describe discrimination against someone who does not conform to gender norms. She argued that women's toilets 'come to exist through the continual maintenance and enforcement of gendered norms' (Browne 2004, 343). Toilets without sexual segregation could lessen the importance of sex and gender as dividers of the social world, so that people would no longer need to assign themselves to sexually specific positions at all times. In this light, gender consciousness will be included as an independent variable in this research.

Advocacy of transgender peoples' rights have rendered AGTs a pressing human-rights issue (Garber, 1993). Levi and Redman (2010) went through many legal cases and found that obstacles to transgender people's access to bathrooms were forcing this segment of the population out of employment and education. The researchers hence argued that 'bathroom inequality is one of the greatest barriers to full integration of transgender people in American life' (133). Cavanagh (2010) elaborated on how the dominant gendered, homophobic, and transphobic discourses that were embodied in toilet spaces were disciplining the users of those spaces and were leading to violence and gender policing against LGBT people. Sanders and Stryker (2016) pointed out that the furor over AGTs is a classic instance in which

'so-called normal citizens are brought into intimate physical proximity with precisely those presumably nonnormal people whose expulsion from or invisibilization within the body politic underpins and enables our society's norms of embodied personhood' (780). Following this line of discussion, it is reasonable to assume that those who are more supportive of LGBT rights would be more likely to endorse the idea of AGTs, and we test this hypothesis in the current research.

There are other arguments questioning and resisting the AGT proposal, and we examine them empirically herein. The first and most evident argument against AGTs hinges on women's safety (Cavanagh 2010; Jeffreys 2014; Levi and Redman 2010; Overall 2007; Ramster, Greed, and Bichard 2018; Rothblatt 1995; Sanders and Stryker 2016). Consider, for example, an argument put forward by Jeffreys (2014):

> [T]oilets for women were set up to enable women and girls to enter public space safely in systems of male domination, in which the female sex caste is subjugated and made vulnerable to sexual assault and harassment on the basis of sex. (50).

The main counterargument to the safety concerns voiced in the above quote is that rape, peeping, and other forms of abuse also occur in women-only toilets, so the solution to the safety problem is to strengthen security designs, including location, lighting, and loop cameras (Overall 2007; Sanders and Stryker 2016). In addition, many believe that AGTs can be even safer than women-only toilets because a greater number of people will enter and exit this space than a conventional space, hence discouraging rapists and other abusers (Rothblatt 1995). An AGT 'reduces risks of predation associated with being alone and out of sight' (Sanders and Stryker 2016, 783). Although no sexual assault or harassment cases have surfaced in relation to the new AGTs at our study's research site, we test the respondents' perceptions of safety to assess this concern.

Two additional and oft-raised concerns, hygiene and privacy, have discouraged some people from supporting AGTs (Barcan 2010; Greed 2019). These concerns usually reflect socially constructed gender expectations and practical gender needs. For example, women are characterized as more vulnerable to malodorous or dirty environments than are men (Cavanagh 2010, 154) and sometimes feel shame about the pads or tampons that they use during their menstrual periods (Overall 2007; Greed 2019). Barcan (2010) specifically pointed out that 'the shames of smell and sound' as well as the 'sensory disgust at men's supposedly less congenial urinary habits' are crucial reasons for Australian women's rejection of AGTs.

We define the feelings of shame or embarrassment for being heard or seen by the opposite sex in toilet space as a reflection of people's need for privacy. Privacy is highly related to the gendered personal boundary between heterosexual men and women. It is distinguished from concerns about safety

in this research, as the latter factor refers to intentional sexual advances like peeking or sexual assault.

Some of these practical concerns could be dealt with through design, management, and technology (Case 2010; Overall 2007; Rothblatt 1995; Sanders and Stryker 2016). For example, Overall (2007) and Sanders and Stryker (2016) emphasize that the design of toilet stalls is crucial to the sense of privacy and safety, suggesting that stalls should 'extend from floor to ceiling, so that the individual is completely enclosed' (Overall 2007, 80). The hygiene concern is certainly as much an imaginary concern as a matter of education, cleanliness, and management (Barcan 2010; Cavanagh 2010). At any rate, we will examine users' attitudes toward the above-mentioned concerns, which often serve as ammunition against AGTs.

In this literature review, we have summarized the historical development of and the main debates surrounding AGTs, as covered in English-language studies. As mentioned earlier, very little survey research exists on mainstream restroom users' expectations, let alone experiences of using AGTs. The only exception we found is a 2014 publication by Lüddemann, who presents survey results on AGT users in the Alice Salomon University of Applied Sciences (ASH) in Berlin. The survey was conducted by a group of students one year after the installation of AGTs on campus, and involved 353 respondents—most of them students at the ASH. The survey yielded three main findings (cited from Huesmann 2016):

1. 202 out of 353 (57.2%) respondents thought that AGTs make sense as a standard practice.
2. 168 (47.6%) thought that the AGTs in their university were reasonable.
3. 81% of the female respondents and 75% of the male respondents used AGTs. 100% of students who identified their sex or gender as 'other' used AGTs.

The research interest of Lüddemann's paper is largely identical to that of our paper. The former's finding that more female than male students used AGTs is nonetheless surprising, and was contrary to the assumption that female users would have more concerns about using AGTs as mentioned earlier (e.g. Ramster, Greed, and Bichard 2018). We therefore will address the contrary with evidence from our research and figure out what gender differences might be in terms of using AGTs.

Research design

To address the main question of who would or would not use an AGT, we have striven to answer three pertinent interrelated sets of research questions:

1. What are university students' perceptions and behaviors vis-à-vis AGTs? Do the students support or oppose AGTs? Do they use AGTs?
2. What are the attitudes of prospective AGT users toward the various concerns about AGTs?
3. What factors are related to the students' attitudes? What factors influence the students' use or non-use of AGTs?

Our study's survey questionnaire has enabled us to examine our research questions and to develop two regression models with which we have explored the factors influencing university students' attitudes and behaviors vis-à-vis AGTs. These two models are the logistic regression model whose dependent variable is AGT attitudes (Model 1) and the ordered logistic regression model whose dependent variable is AGT behaviors (Model 2).

Drawing on the above-mentioned literature, we included in our current study six independent variables: biological sex, gender-equality consciousness, attitudes toward LGBTs, concerns about safety, concerns about privacy, and concerns about hygiene. Table 1 shows the summary of indicators and measurements. We also included two control variables in the analysis models. The first one is 'gender course(s) taken,' as students who took gender course(s) might be aware of the 'political correctness' of AGTs, and would show more support. The second control variable is 'first-year studentship,' as we assumed that first-year students would be less familiar with the rationale of installing

Table 1. Summary of Indicator Measurements.

Variables	Measurement
Dependent Variable (Model 1)	
Attitude	Do you support the installation of AGTs on campus? (Yes = 1)
Dependent Variable (Model 2)	
Behavior	Have you ever used the AGT that is located next to this classroom? (1) Never. (2) Seldom. (3) Sometimes. (4) Often.
Independent Variables	
Sex	Student response to their biological sex (Male = 1)
Gender- equality attitude	Do you agree with the statement 'Men should be in charge of everything outside the home, and women should be in charge of everything inside the home'? (1) I strongly agree. (2) I agree. (3) I'm neutral. (4) I disagree. (5) I strongly disagree.
LGBT-rights attitude	Do you agree with LGBT rights? (1) I strongly agree. (2) I agree. (3) I'm neutral. (4) I disagree. (5) I strongly disagree.
Safety	If using an AGT, I would worry about the possibility of voyeurs and candid cameras. (1) I strongly agree. (2) I agree. (3) I'm neutral. (4) I disagree. (5) I strongly disagree.
Privacy	It is more embarrassing to be heard urinating or farting by users of the opposite sex than by users of the same sex. (1) I strongly agree. (2) I agree. (3) I'm neutral. (4) I disagree. (5) I strongly disagree.
Hygiene	I feel that AGTs are dirtier and smellier (than the toilets I used to use) because of the different practices of users of the opposite sex. (1) I strongly agree. (2) I agree. (3) I'm neutral. (4) I disagree. (5) I strongly disagree.
Control Variables	
Gender courses taken	Have you ever or are you now taking any gender course at this university? (Yes = 1)
1st-year student	What year are you? (1st year = 1)

AGTs, and would show less support of AGTs. We did not add 'gender identity' as a third control variable considering that there would not be enough respondents in the transgender category for statistical analysis. The differences between cisgender and transgender users in their attitudes and behaviors vis-à-vis AGTs, therefore, is not examined in this research.

We conducted two waves of survey to collect the prospective AGT users' attitudes, and executed a two-week on-site observation to record the actual usage of AGTs so as to cross-examine with the survey results. As our research took place in the College of Management, the ratio of male students to female students was relatively balanced. We identified two classrooms, Rm. 3015 and Rm. 3017, both of which are next to an AGT. This site was purposively selected because it not only allowed us to survey the prospective users of AGTs, but was also ideal for direct observation as illustrated below.

The first wave was conducted in November 2016, the 11th and 12th week of the Fall semester, and about 9 months after the AGTs in the College of Management were built and opened to public. The two classrooms hosted 19 weekly fall-semester courses attended by a total of 784 students. After asking for and receiving permission from the instructors, we used each course's 10-minute recess as our opportunity to distribute questionnaires to all the students who agreed to answer the survey. In this way, we were able to collect 463 questionnaires in the first wave. In order to increase the sample size, we followed the same procedure in April 2017, the 10th to 12th week of the Spring semester, but avoided the courses in which many of the enrolled students were those who had joined the survey in the previous wave. In this way we managed to collect another 266 questionnaires, for a total of 729 questionnaires for the formal analysis.

We acknowledge that the five-month time lag between the two waves of data collection seems to be too large to treat the two waves as one survey, and that the growing discussion about gay marriage in the society might have impacted on the responses. Our research design, however, was not able to assess the degree of influences of the changing external environment on respondents of the two waves. It might create a misleading impression if we present the two results separately and interpret the (minor) statistically significant differences as 'changes' over a five-month period, in particular when respondents of the second wave were different from and much fewer than respondents of the first wave. In this light, we decide to still combine the questionnaires collected from the two time points, but provide an Online Appendix, Supplementary material that includes separate analysis of the two waves of data as well as additional robustness tests. At any rate, we acknowledge that the time lag in data collection is a limitation of the research, and we will provide related suggestions in the concluding section.

The on-site observations were conducted two weeks prior to the first wave of survey, namely in November 2016. We chose Rm. 3015 as our

observation field because there is an AGT directly adjacent to it. If students choose to skip the AGT and take a short walk to the gender-segregated Men's or Women's toilets, it is evident that they avoid using AGT deliberately. There is one Men's toilet and one Women's toilet located at short distance to the left of Rm.3015, and another women's toilet located at equally short distance to the right of the classroom (See Figure 1 for the observation site map). It is also important to mention that the AGT next to Rm. 3015 is designed as most AGTs in Taiwan, which contain 6 partitioned cubicles that enclose two sitting toilets, two squat toilets and two urinals respectively.

We assigned three research assistants as a team to observe each recess for each course taking place in Rm. 3015 during a two-week phase covering the daytime of every weekday. We asked the teams to record their observations of three categories of behavior: (1) the number of times 'Rm. 3015' students used the all-gender toilet, (2) the number of times 'Rm. 3015' students used the women's toilets, and (3) the number of times 'Rm. 3015' students used the men's toilet. In total, we recorded 687 instances of toilet usage during the recess. In the following section, we present a detailed analysis of these recorded observations and compare them with our survey results.

Results and analysis

Respondents' attitudes and behaviors vis-à-vis AGTs (dependent variables)

Table 2 shows the frequency distribution of the dependent and independent variables with a Chi-Square Test of Independence for examining the

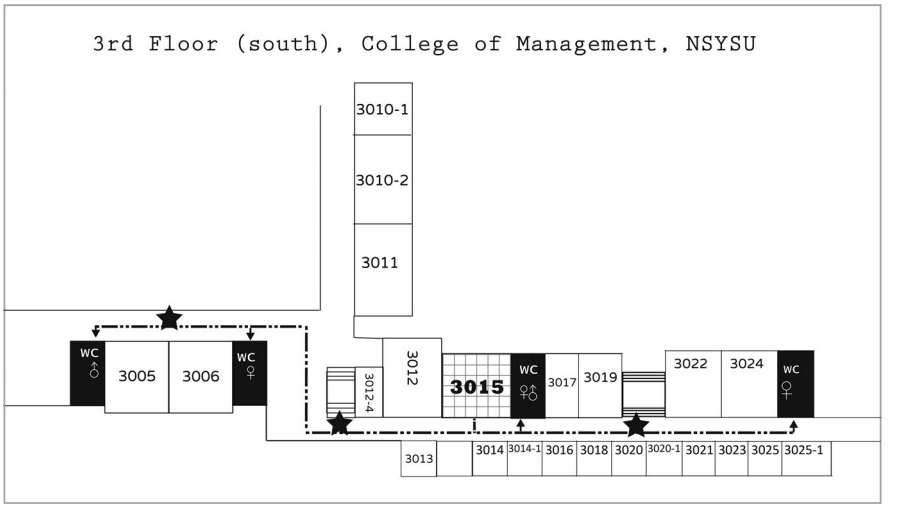

Figure 1. Field observation map. *Source*: This research. The ★ refers to the three spots that our observers stood.

Table 2. Frequency distribution of variables and the chi-square test on main variables.

	Dependent Variable			Sig.
Attitude toward AGT Installation	Female% (n)	Male% (n)	Total% (n)	0.000
Don't know/ No opinion	31.21%	21.07%	26.43%	
No	10.84%	7.42%	9.23%	
Yes	57.93%	71.51%	64.34%	
Total	100% (378)	100% (337)	100% (715)	
Use of AGT	Female%	Male%	Total%	0.000
Never	11.02%	3.25%	7.37%	
Seldom	22.31%	12.13%	17.53%	
Sometimes	43.83%	39.65%	41.86%	
Often	22.84%	44.97%	33.24%	
Total	100% (381)	100% (338)	100% (719)	
Independent Variable				Sig.
Gender-equality Attitude	Female%	Male%	Total%	0.000
Strongly agree	1.03%	0.05%	0.83%	
Agree	1.29%	4.42%	2.75%	
Neutral	24.48%	42.47%	32.87%	
Disagree	36.59%	29.20%	33.15%	
Strongly disagree	36.59%	23.30%	30.40%	
Total	100% (388)	100% (339)	100% (727)	
LGBT-rights Attitude	Female%	Male%	Total%	0.001
Strongly agree	36.10%	25.37%	31.08%	
Agree	31.96%	30.97%	31.50%	
Neutral	28.61%	34.81%	31.50%	
Disagree	2.30%	6.19%	4.13%	
Strongly disagree	1.03%	2.65%	1.79%	
Total	100% (388)	100% (339)	100% (727)	
Safety	Female%	Male%	Total%	0.000
Strongly agree	2.95%	1.22%	2.15%	
Agree	20.43%	4.29%	12.89%	
Neutral	31.99%	31.90%	31.95%	
Disagree	32.79%	39.26%	35.82%	
Strongly disagree	11.82%	23.31%	17.19%	
Total	100% (372)	100% (326)	100% (698)	
Privacy	Female%	Male%	Total%	0.000
Strongly agree	11.22%	6.13%	8.86%	
Agree	38.77%	21.16%	30.57%	
Neutral	28.61%	40.49%	34.14%	
Disagree	14.43%	23.00%	18.43%	
Strongly disagree	6.95%	9.81%	8.00%	
Total	100% (374)	100% (326)	100% (700)	
Hygiene	Female%	Male%	Total%	0.005
Strongly agree	4.01%	1.84%	3.00%	
Agree	11.76%	7.05%	9.57%	
Neutral	35.02%	30.06%	32.72%	
Disagree	35.56%	39.97%	37.57%	
Strongly disagree	13.63%	21.16%	17.14%	
Total	100% (374)	100% (326)	100% (700)	

difference between male and female respondents, and Table 3 presents the descriptive statistics of all the variables considered in the analysis.

We begin with the comparison between male and female respondents' AGT attitudes and AGT-usage behaviors. Of the respondents, 64.3% endorsed

Table 3. Descriptive statistics.

Variables	Observation	Mean	Std. Dev.	Min	Max
AGT Usage	729	0.63	0.48	0	1
AGT Attitude	723	3.00	0.90	1	4
Sex	727	0.47	0.50	0	1
Gender-equality attitude	728	3.90	0.90	1	5
LGBT-rights attitude	728	2.14	0.97	1	5
Safety	699	3.53	0.99	1	5
Privacy	701	2.86	1.07	1	5
Hygiene	701	3.56	0.98	1	5
Gender courses	728	0.14	0.35	0	1
First-year student	724	0.26	0.44	0	1

Note: Std. Dev. = Standard Deviation

the installation of AGTs, a figure much higher than that in Lüddemann's study, where only 47.6% supported AGTs in the university. The gender differences in our survey are all statistically significant. Female respondents were considerably less supportive of AGTs than were male ones (57.92% vs. 71.51%), and more women (31.21%) than men (21.07%) chose the answer 'don't know/no opinion' to the question of whether they supported AGTs, thus reflecting more hesitance among female students than among male students toward AGTs.

In terms of behavior, it seems that those respondents who were hesitant about installing AGTs would still use them—though at different frequencies. Of all the respondents, 92.63% had at least once used the AGT next to their classroom, including 88.98% women and 96.75% men. Men appear to have used AGTs more often than women if we compare those respondents who answered 'often' regarding whether or not they had ever used an AGT (22.84% women vs. 44.97% men). Only 7.37% of respondents had never used AGTs, that included 11.02% of the women and 3.25% of the men. The percentage of women who had 'never' used the AGT is close to the percentage of women who opposed installing an AGT (10.84%), whereas men's attitude (9.23% opposed AGTs) and their behavior (3.25% had never used AGTs) is less consistent.

Our on-site observation results validate our survey results in terms of not only AGT usage but also differences between men's and women's behavior as shown in Table 4. Of all the respondents, 86.03% used the AGT next to their classroom, with the remaining 13.97% having chosen to use a gender-segregated toilet matching their sex. The figure 13.97% is compatible with our survey results as it is between the 'never' figure (7.37%) and the 'seldom' figure (17.53%). A sex-disaggregated analysis further shows that

Table 4. On-site observation record of students' choice of different toilets.

Targets	Using AGT	Using gender-segregated toilets	Total
Female students	224 (73.44%)	81 (26.56%)	305
Male students	367 (96.07%)	15 (3.93%)	382
Total	591 (86.03%)	96 (13.97%)	687

26.56% female respondents—compare to only 3.93% male respondents—avoided using AGTs. In this regard, our finding stands in contrast to Lüddemann's finding that a greater percentage of female students than male students had used an AGT (cited from Huesmann 2016), but is consistent with most existing literature and viewpoints (e.g. Greed 2019; Ramster, Greed, and Bichard 2018) that suggest women's hesitancy about using AGTs.

The descriptive statistics show that comparing to men, women were less supportive of, more hesitant about, and less likely to use AGTs. Yet it is imperative to highlight that the majority of women still endorsed and would actually use AGTs. It is also noteworthy that the percentage of men expressing opposition to AGTs (9.23%) in survey was larger than that of avoiding using AGTs (3.93%) in our observation, whereas the percentage of women expressing opposition to AGTs (10.84%) was much smaller than that of avoiding them (26.56%). This contrast shows that men—even disliking the idea of AGTs— would be more likely to use an AGT if it is more convenient, whereas women would persistently avoid using AGTs if they are against or hesitant about the idea. In other words, the availability of gender-segregated toilets matters more to women than to men. The following sections explore the factors underlying the gap between one's attitude and one's behavior.

Respondents' perceptions of the concerns about AGTs (independent variables)

The previous section shows that the female respondents were less supportive of and less likely to use AGTs than were male respondents, but this difference does not mean that women were less supportive of gender equality and LGBT rights than were men. Indeed, Table 2 shows that the female respondents were not only significantly more supportive of gender equality than were their male counterparts (73.18% vs. 52.50% in disagreeing with the statement 'Men should be in charge outside the home, and women should be in charge inside the home'), but also quite a bit more supportive of LGBT rights (68.06% vs. 56.34% in responding in the affirmative to the question 'Do you agree with LGBT rights?'). In the next section we will explore the effect of the two variables in determining users' attitude and behavior vis-à-vis AGTs. Before that, though, we briefly go through three central concerns that the literature raised about AGTs, and examine the attitudes of our respondents toward these concerns.

The first of these concerns is safety, raised by many people questioning the utility of AGTs. To determine whether or not safety was a major concern of the respondents, we asked them to assess their agreement with the statement 'When using an AGT, I would worry about the possibility of voyeurs and candid cameras.' The results show that only 15.04% strongly agreed or agreed with this statement, whereas 53.01% strongly disagreed or

disagreed with it. Gender difference is significant in this respect, as 23.38% of women and 5.51% of men strongly agreed or agreed with the statement. In short, safety was a concern for some women but not for a majority of them, and men were significantly less bothered by this concern.

A second major concern is privacy. We asked respondents to record the extent of their agreement with the statement 'It is more embarrassing to be heard urinating or farting by users of the opposite sex than by users of the same sex.' The results show that this concern weighed more heavily on the minds of both women and men than did the concern about safety: 39.43% of all respondents strongly agreed or agreed with the statement, and only 26.43% strongly disagreed or disagreed with the statement. Gender difference was still significant in terms of privacy perception, as 49.99% of women—in contrast to 27.29% of men—strongly agreed or agreed with the statement.

The last concern examined in this research is AGT hygiene, to which the respondents assigned less importance. On average, only 12.57% strongly agreed or agreed with the hygiene statement 'I feel that the AGT would be dirtier and smellier (than the toilets I used to use) because of the different practices of users of the opposite sex.' A majority (54.71%) strongly disagreed or disagreed with the statement. Gender difference is less significant in the responses to the hygiene statement than in the responses to the previous two indicators, but statistically the female respondents expressed more concern about male-derived hygienic problems (15.77% strongly agreed or agreed) than the male respondents expressed about female-derived hygienic problems (8.89% strongly agreed or agreed).

In short, of the three central AGT concerns, privacy was undoubtedly the most pressing one for both male and female respondents, though there was significant difference between the extent of male respondents' unease and that of female respondents' unease. Respondents expressed far less concern about safety and hygiene than about privacy, but again differences arose between male and female respondents. The safety concern mattered more than hygiene for women, whereas the hygiene concern mattered more than safety for men. Note, however, that the importance assigned by women to all three concerns was greater than that assigned by men. These findings resonate to the qualms that Greed (2019) and Ramster, Greed, and Bichard (2018) raised regarding (some) women's additional concerns about AGTs, and we will discuss the implication in the last section

Factors influencing students' AGT attitudes

To further examine the impact of the above-mentioned factors/concerns on students' attitudes toward AGTs, we performed a logistic regression analysis using the respondents' attitude as the dummy variable. We coded as 1 a

Table 5. Logistic regression model exploring respondents' attitudes toward the installation of AGTs (Model 1).

	Odds Ratio	Std. Err.	
Independent Variables			
Sex	0.727	0.19	**
Gender-equality attitude	−0.025	0.11	
LGBT-rights attitude	−0.662	0.11	**
Safety	0.192	0.11	
Privacy	0.132	0.09	
Hygiene	0.237	0.11	*
Control Variables			
Gender courses	0.261	0.29	
First-year student	0.148	0.2	
Constant	−0.151	0.68	
Number of obs.	695		
Log likelihood	−396.819		
LR Chi2	119.99		
Prob > chi2	0.00		
Pseudo R2	0.131		

Note: Std. Err. = Standard Error; **p < 0.01; *p < 0.05

respondent's agreement or strong agreement with the installation of AGTs. Table 5 presents the results (i.e. Model 1).

Model 1 shows that 'biological sex' and 'LGBT-rights attitude' are the most significant variables associated with respondents' attitudes toward AGTs installation. Comparing to female respondents, male respondents were associated with a 0.727-times increase in the odds of AGT**s** installation. That is, men's endorsement of AGT installation was significantly greater than women's corresponding endorsement. Those respondents who supported LGBT rights were also more likely to support the installation of AGTs. Gender-equality attitude, on the other hand, was not strongly associated with respondents' attitudes toward AGTs. In other words, respondents who endorsed gender equality did not necessarily endorse AGTs. This ambiguity is reflected in some feminists' hesitation about AGTs, as noted in the literature (e.g. Greed 2003, 2019).

It may raise a question that since women were more supportive of LGBT rights than men as mentioned in the previous section, and since LGBT rights supporters were significantly more likely to endorse AGTs, why were female respondents *less* supportive of AGTS than male ones? We impute this seemingly paradoxical result partially, on one hand, to our over-simplified question—'Do you agree with LGBT rights?'—in that it ignored the possibility of some LGB supporters' skepticism about transgender people's appeals (e.g. Jeffreys 2014). We will address this limitation in the concluding section. On the other hand, the seemingly paradoxical result might also be explained by other mainstream concerns against AGTs—which always bothered women more than men as shown in the previous section.

Hygiene is associated with respondents' endorsement of AGTs based upon reporting tests of statistical significance. The greater the importance a

respondent assigned to hygiene, the less likely the individual would endorse AGTs. Note, from the previous descriptive analysis, that not many respondents assigned great importance to safety and hygiene concerns. Indeed, both male and female respondents assigned much more importance to privacy concern than to the other two, but privacy was not a significant variable to predict people's attitude toward AGTs in our regression analysis. In other words, there are *not* statistically significant difference in terms of privacy and safety concerns between AGT supporters and opposers. Will privacy and safety concerns affect respondents' behavior, then? We will now turn to this question and examine what factors would predict respondents' usage of AGTs.

Factors influencing students' AGT usage

According to the overall results in Table 6 (Model 2), variables that were significantly associated with respondents' AGT attitude were *not necessarily* associated with respondents' AGT behavior. Indeed, Model 2 shows that even one's endorsement of AGTs was only of low significance in predicting one's usage of AGTs. Each single-unit increase in AGT attitude was associated with a 0.157-times increase in the odds of AGT usage, after controlling for the effects of the other variables. More surprisingly, one's attitude toward LGBT rights—a variable significantly associated with one's AGT *attitude*—was not significantly associated with their AGT *usage*. In other words, respondents who endorsed LGBT rights were not more or less likely to use an AGT. The gap between respondents' attitudes and behaviors vis-à-vis AGTs implies

Table 6. Ordered logistic regression model exploring respondents' AGT usage (model 2).

	Odds Ratio	Std. Err.	
Independent Variables			
AGT Attitude	0.157	0.054	*
Sex	0.942	0.161	**
Gender-equality attitude	0.089	0.089	
LGBT-rights attitude	−0.059	0.088	
Safety	0.107	0.093	
Privacy	0.21	0.074	*
Hygiene	0.291	0.09	**
Control Variables			
Gender courses	0.12	0.221	
First-year student	−0.285	0.166	
cut1	0.145	0.591	
cut2	1.707	0.589	
cut3	3.755	0.604	
Number of obs.	689		
Log likelihood	−785.467		
LR Chi2	130.59		
Prob > chi2	0.00		
Pseudo R2	0.0767		

Note: Std. Err. = Standard Error; **p < 0.01; *p < 0.05

again that other variables discouraged even pro-AGT respondents from using AGTs.

Sex, as illustrated in the previous sections, is still the most significant variable associated with respondents' AGT usage. Comparing to female respondents, male respondents were associated with a 0.942-times increase in the odds of AGT usage, after controlling for the effects of the other variables. Another equally strong variable is the concern about hygiene. Each single-unit increase in hygiene was associated with a 0.291-times decrease in the odds of AGT usage, after controlling for the effects of the other variables. As hygiene is relatively easier to be managed through proper maintenance and users' education, this finding implies that there is still room to increase the usage of AGTs through proper management.

The concern about privacy was not a statistically significant predictor of one's attitude toward AGTs, but became significant in predicting one's usage of AGTs. Put in other words, respondents who were more concerned about privacy in an AGT setting were not necessarily more likely to oppose to AGTs, but were significantly less likely to use them. This contrast is revealing when we discuss the legitimacy of AGTs from 'women's perspective' (Greed 2003, 2019) as about half of the female respondents in our research 'agreed' or 'strongly agreed' with the privacy concern. It is worthy to note that many women, though do not personally use AGTs because of their (gendered) boundary preference, still endorsed the installation of AGTs for other users' sake.

The safety concern, finally, was not significantly associated with the respondents' AGT usage. Note that safety concern was neither significantly associated with the respondents' attitude toward AGTs. This non-association might raise eyebrows since safety is literally the most often mentioned and serious rationale against AGTs in existing literature. We speculate that this non-association, on one hand, was caused by the limited validity of our question on safety concern. Our question only mentioned the worry about voyeurs and candid cameras, missing the more threatening concern about sexual assault. We will address this limitation in the next section. On the other hand, the non-association may be viewed as a reflection that both AGT supporters and opposers are likely concerned about the safety issue. This concern should therefore be adequately addressed in the design and operation of AGTs.

Discussion and conclusion

The emergence of AGTs in a growing number of countries has challenged the gender binarism of public toilet space in the past two decades, but empirical studies regarding the attitudes and behaviors of prospective AGT users are still rare. This paper fills the research gap by providing on-site

observation information about students' choice of different toilets and conducting quantitative analysis of how university students perceive and use AGTs in Taiwan. This multi-methods approach, moreover, provides a better assessment of the validity of respondents' survey results through comparing their self-reported behavior with the actual behavioral observation, an approach that is rarely seen in toilet-related research. The results may serve, on one hand, as the reference for the design of AGTs that could accommodate prospective users' concerns. On the other hand, they provide evidence of the acceptability of AGTs by mainstream users that can be utilized by AGT activists to lobby for the institutionalization of AGTs.

The first issue we addressed is prospective users' attitudes toward AGTs. In a nutshell, we found that the majority of university students endorsed AGTs, regardless of sex. Only 9.23% of the respondents clearly disagreed with the installation of AGTs. The opposition to AGTs by mainstream users might have been overestimated. Gender difference was statistically significant regarding users' attitudes, though. Female respondents expressed less support for—and were more indecisive than males toward—AGTs. Our logistic regression analysis further reveals that respondents' attitude toward LGBT rights was strongly and positively related to the respondents' attitudes toward AGTs. The respondents' gender-equality attitudes (gender consciousness), however, had no statistically significant evidence in associating with these individuals' attitudes toward AGTs. This lack of a positive association perhaps reflects the dilemma faced by some feminists, as reflected in the existing literature.

In terms of prospective AGT users' behavior, secondly, male respondents used AGTs more often than female respondents did as expected by existing literature. But even among female students, our survey and observation revealed that the majority of them would still use AGTs. It is also intriguing to find that there were more male students who were against AGT installation (7.42%) than those who actually avoided using an AGT (3.93%). Conversely, there were less female students who were against AGT installation (10.94%) than those who avoided using an AGT (26.43%). This 'I endorse it, but I don't use it' sentiment was also reflected in our findings as variables significantly associated with respondents' AGT attitudes were not necessarily associated with respondents' AGT behaviors. In particular, even those who were more supportive of LGBT rights were not significantly more likely to use AGTs.

This gap between respondents' attitudes and behaviors vis-à-vis AGTs, especially within women, conveys at least two interrelated policy implications. On one hand, we recognize that the existence of traditional sex-segregated toilets matters more to women than to men. This should be taken into consideration when we plan to transform existing sex-segregated toilets into AGTs. On the other hand, we recognize that some women's avoidance of using a AGT does not necessarily imply that they don't endorse it. Societies

may be able to accommodate these diverse users' needs by allowing for the coexistence of three distinct types of public toilets—men's, women's, and all-gender toilets (Kogan 1996, 2007).

The third main issue we explored is the validity of the three oft-raised practical concerns about AGTs: safety, privacy, and hygiene. Although the three concerns differed from one another in their impact on respondents' AGT attitudes and behaviors, it is important to note that the majority of our study's respondents did not have these concerns. Our study's descriptive statistics show that the privacy concern was more prevalent than the safety and hygiene concerns, yet still only 39.3% of respondents (49.9% of women and 27.2% men) agreed that the privacy concern was valid. Female respondents were again significantly more concerned than their male peers about all three concerns.

In terms of the impact of these concerns on respondents' attitudes and behaviors vis-à-vis AGT, furthermore, only hygiene was significantly correlated with respondents' attitudes as well as behaviors vis-à-vis AGTs. The concern about privacy was negatively correlated with respondents' usage of AGTs, but not significantly correlated with respondents' attitudes toward AGTs. We may also develop two policy implications from the above findings. One is that although only 12.57% of the respondents strongly agreed or agreed with the hygiene statement and assumed that AGTs would be dirtier and smellier, they were the ones that more likely to oppose AGTs. In other words, there is room to increase prospective users' acceptance of AGTs through improved hygiene in AGT settings. The other implication is related to the privacy and safety concerns. That these concerns were not significantly correlated with respondents' attitudes toward AGTs does not mean that they are not important. Indeed, it means that these two concerns were valid and shared by both AGT supporters and opposers. It is imperative, therefore, to address these concerns with better AGT design and maintenance.

Finally, we acknowledge at least three limitations of this study that hopefully could be addressed by future research. First, the research site was purposive selected considering the reasonable visibility of AGTs on the campus, and the ideal allocation of the AGT, the classrooms, and the gender-segregated toilets for our observation and survey research. We cannot be sure, however, about the extent to which our findings—drawn mostly from students of the College of Management at NSYSU—are generalizable to other university students in Taiwan or even worldwide users. We encourage future research to target a more diversified pool of respondents, and to explore how demographic and institutional characteristics as well as location (accessibility) and allocation of AGTs may influence prospective users' attitudes and behaviors vis-à-vis AGTs.

Second, as mentioned earlier, the two time points of our survey data collection was five months apart. This time lag might have resulted in bias

in our findings as respondents' attitudes might change with the rising discussion about LGBT rights in Taiwan. Our research was not designed to track changes of the same respondents over time. Neither did we know whether doing surveys in the latter phase of a semester would have impact on students' answers regarding AGTs. We encourage future research to apply a longitudinal study approach to explore whether and how people's attitudes and behaviors vis-à-vis AGTs change over time, especially after the launch of AGTs.

Last but not the least, the validity of our survey questions could have created some bias in our findings. The questions to measure respondents' attitudes toward LGBT rights or their concern about safety, privacy, and hygiene in an AGT setting, for example, were perhaps too simplified. We suggest future research to develop more accurate and valid measurements. We also suggest that in addition to the three mainstream concerns examined in this research, future researchers could include other relevant variables that may influence people's attitudes and/or behaviors vis-à-vis AGTs, such as distance, crowdedness, or the subtle design of an AGT setting, etc.

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