Out of Place: Socioeconomic Status, Use of Public Space, and Belonging in Higher Education

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Funded by:

- National Science Foundation
- University of Virginia

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Date re-submitted: 16 March 2020

Abstract

Those from low socioeconomic status (SES) often lack access to public space and, when they have access, they are often discouraged from using public space. Scholars from human geography and related fields have argued that this limits engagement in civic life and undermines sense of belonging in one's community. In the present work, we consider whether lower-SES students face this predicament in higher education, particularly at elite public institutions. Across four studies, we find that, compared with higher-SES students, lower-SES students use public space on campus less—iconic public space in particular—and this can mediate the relationship between SES and sense of belonging at the University. We also find that experimentally increasing students' use of public space can reduce and even close SES gaps in felt belonging. Taken together, the present studies suggest that use of public space matters for belonging and for understanding gaps in belonging. This work contributes to our understanding of SES disparities in higher education. More generally, it illustrates the importance of public space.

Keywords: intergroup relations, social disparities, SES, sense of place, public space

"Today more than ever, the class struggle is inscribed in space"

-- Henri Lefebvre (1991)

Public spaces have never been truly public. They have always been exclusionary and inequitable. For instance, in the past, laws and institutional policies regulated who could and could not use public spaces. Black people were not allowed to use public schools, public transportation, restrooms, drinking fountains, and other public spaces used by white people (Black Codes; Jim Crow laws). They were not even allowed on sidewalks if it inconvenienced white passersby (e.g., Richmond Code, 1857). Likewise, women were denied entry to public universities (Public Law 92-318, 1972) and other public establishments such as sports clubs. Today, many public spaces remain exclusionary (Cresswell, 1996; Loukaitou-Sideris & Ehrenfeucht, 2009; Mitchell, 2003; Soja, 2010).

In the present work, we consider whether public spaces on university campuses remain exclusionary and at what cost. We draw on two general insights from other disciplines, most notably, sociology, human geography and urban studies. The first is the insight that socioeconomic status (SES) in our society strictly dictates access to and use of space. Put simply, relative to high-SES individuals, low-SES individuals have less access to space. The second is the insight that space—and public space in particular—is central to democracy and sense of belonging in one's community. Building from these insights, we examine the role of public space on sense of belonging in the context of higher education. We predict that, compared with higher-SES students, lower-SES students use public space on campus less and this, in turn, reduces their belonging at the University.[1] The present research thus serves three aims: 1) it provides further evidence for the importance of physical space, and public space in particular; 2) it considers the

[1] Although we focus on SES, we would make similar predictions for race; we would predict that, compared with white students, students of color use public space on campus less and this, in turn, reduces their belonging at the University. In the main text, we focus on SES; however, in supplementary materials, we provide analyses by race.

central and causal role of public space on sense of belonging; and 3) it uncovers a heretofore-unexamined factor that promotes socioeconomic disparities in higher education; namely, it suggests that use of public space on campus matters for sense of belonging at one's institution.

SES and Physical Space: High-SES individuals Have More Access to Space

In our society, SES clearly dictates access to and use of *private space*—space used exclusively by some person or some people, and for which all others much have permission or invitation to use. Relative to low-SES individuals, high-SES individuals are more likely to own a home, they are more likely to live in wealthy rather than mixed-income neighborhoods, and they are more likely to move because they want to, not because they must (Briggs & Keys, 2009; Geist & McManus, 2008; Logan & Stults, 2010; Oakley & Burchfield, 2009; Quillian, 2003; Pew Research Center, 2012; Reardon & Bischoff, 2011; South & Crowder, 1997). What is perhaps less obvious is that SES continues to dictate access to and use of *public space*—space for which one needs no permission or invitation, explicit or otherwise. This is true for many reasons.

First, residential segregation and restrictions on mobility have clear implications for use of public space. Neighborhood disparities lead to unequal local revenues, which in turn affect quality of local services such as public schools, parks, and other public spaces (Byrne & Wolch, 2009; Greenstein, Sabatini, & Smolka, 2000; Rich, 2014; see Fiel, 2013 for a review). Compared with wealthy neighborhoods, poorer neighborhoods have lower-quality public spaces—underfunded schools, run-down parks, unkempt roads, etc. The physical disorder in such public spaces, in conjunction with the social disorder that often accompanies it, can create fear among residents and restricts residents' use of public spaces. Indeed, this insight is central to the "Broken Windows" theory of crime, whereby disorder in the physical environment (e.g., graffiti,

broken windows) signals to residents that their neighborhood is unsafe and that they should stay home, away from public spaces (Wilson & Kelling, 1982).

Second, even when low-SES individuals have access to the same public space as high-SES individuals (e.g., a centrally located pedestrian mall), they may not use the space. Research in human geography and related fields has documented various forms of social control that discourage the poor from using public space (More, 2002; More & Stevens, 2000; Scott & Munson, 1994). At the extreme, anti-vagrancy laws keep (homeless) people from sleeping, resting, or even loitering in public space such as city streets and parks (Mitchell, 2003). At a lesser extreme, explicit and implicit rules keep low-SES individuals from using public space. For instance, once public parks became accessible via public transportation, park managers instituted rules of conduct and dress codes to encourage high-SES norms and to attract high-SES patrons, while discouraging low-SES patrons from using the parks (Baldwin, 1999; Byrne & Wolch, 2009; Cosgrove, 1995; Rosenzweig & Blackmar, 1992; Schuyler, 1986; Taylor, 1999; Thompson, 1998*).* Many parks then and now prohibit loud music, barbecuing, and team sports. These are all rules that disproportionately discourage low-SES patrons from using parks, not because high-SES patrons do not like loud music, barbecuing, and team sports, but because high-SES patrons can privatize those leisure activities. They can have parties at their houses, and they can play sports at their members-only gyms.

Third, even when low-SES individuals have access to the same public spaces *and* are not discouraged from using public spaces, they may still feel "out of place" in such spaces. Public space is increasingly funded by wealthy donors (Kohn, 2004; Loughran, 2014; Low & Smith, 2013; Mitchell, 2003). Perhaps not surprisingly, then, many of these spaces are designed with high-SES patrons in mind. For instance, the High Line, a new public park in New York City, was

funded by wealthy political and social elites. It includes high-end food vendors and meditation classes, and has attracted billions of dollars in (luxury) real estate investments. Notably missing are amenities that low-SES patrons often seek out, such as areas for exercise, family gatherings, and other social functions (Callahan, 2014; Loughran, 2014; Reichl, 2016; see also Mitchell, 1995).

The High Line is not an isolated case. In Philadelphia, philanthropists are redeveloping the riverfront; in Houston, they are introducing a green corridor. In Tulsa, a billionaire is financing an entire park system. In Salt Lake City, the Church of Latter-Day Saints purchased a block of the downtown. And, across the United States, commercial spaces such as shopping malls are replacing public spaces such as town squares (Kohn, 2004). Low-SES individuals will not be explicitly denied access to these spaces, of course, but one might wonder whether these spaces will feel welcoming to low-SES individuals. One might worry that these spaces will become "playgrounds for the rich," leaving low-SES individuals feeling like spectators or, worse, trespassers (Callahan, 2014).

In the present work, we consider whether lower-SES students face a similar predicament in higher education. We take seriously claims that universities, even public ones, are exclusionary. Indeed, sociologists, economists, and social psychologists have all noted that higher education contributes to SES disparities because of disparities in access (children from lower-SES families are less likely to go to college) and because of disparities in cultural capital (children from lower-SES families are less likely to know the spoken and unspoken "rules" of higher education; e.g., Bernstein, 1974; Bourdieu & Passeron, 1990; Duncan & Murnane, 2001; Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012a; Stevens, 2007; Stuber, 2011). We thus predict that college students from lower-SES families will use public space on campus less

than will higher-SES students, just as low-SES people use public space (even seemingly) intended for high-SES individuals less than do high-SES people. We also consider how use of public space might matter for sense of belonging at the University.

Public Space and Society: Public Spaces Matter to and for People

Public spaces are where democracy happens. Researchers in human geography, sociology, urban planning, and related fields have observed that public spaces provide a forum for voicing public concerns and collective problem-solving. They are a forum for civic engagement. Public spaces provide a place where people can see and be seen by others, a place where social norms are communicated and reinforced. Public spaces are also the place where social norms and laws can be challenged. Most, if not all, successful social movements have included some form of protest in public space (e.g., Mitchell, 2003; Parkinson, 2012; Soja, 2010; Staeheli & Mitchell, 2007).

Public spaces also provide a place for everyday social interactions (Gieryn, 2000; Mitchell, 1995; Tuan, 1979). Because public spaces are inherently social spaces, public spaces have social histories and meanings rooted in the past and carried forward into the future (Gieryn, 2000; Soja, 1996; Tuan, 1979). They acquire "personality" and "character," and people become attached to them (Low & Altman, 1992; see Lewicka, 2011 for a review). They contribute to the collective identity of communities and people's sense of place in their communities (Carr, Francis, Rivlin, & Stone, 1992; Franck & Paxson, 1989; Hummon, 1992; Soja, 2010; Talen, 1999, 2000; Tuan, 1979).

In the parlance of social psychology, public spaces contribute to sense of belonging in one's community. As a result, restrictions on public spaces are likely consequential. They likely undermine people's civic engagement and sense of belonging. Indeed, work in environmental

psychology has found that satisfaction with public space is positively correlated with sense of belonging in one's community (Francis, Giles-Corti, Wood, & Knuiman, 2012). The more people are satisfied with public spaces to which they have access, the more they feel like they belong in their community; the more dissatisfied they are, the more they feel out of place.

The Present Work

Previous work has shown that low-SES individuals have less access to space. Previous work has also shown that public space is important for democracy and sense of belonging. The present work extends this work in several ways. First, it examines whether lower-SES students face this predicament at elite public institutions; that is, it examines whether lower-SES students use less public space on campus and, consequently, feel less belonging at their university. Second, it uses a correlational and experimental approach to test the links among SES, use of public space, and sense of belonging. This is important because previous work has been largely observational, leaving open the possibility that the relationship between use of public space and belonging is illusory, and/or that sense of belonging leads to use of public space, and not vice versa.

In addition, we explore boundary conditions. We consider whether *positive* experiences in *iconic* public spaces are especially likely to increase belonging. By iconic, we mean public spaces that are symbolic of group identity, that are widely recognized as representing a group's identity, its attributes, values, and history (Callahan & Ledgerwood, 2016; Ledgerwood, Liviatan, & Carnevale, 2007). We contend, however, that iconic public spaces are more than just symbolic. They also have what sociologist Leslie Sklair calls "fame" and "aesthetic quality." With respect to fame, iconic public spaces are widely known and recognized, at least to some local community. They also have a certain aesthetic quality, one that makes them beautiful or

worthy of representing the identity of the place. Many if not most university campuses have such spaces. The University of North Carolina at Chapel Hill has an iconic green and iconic monuments such as the Old Well. The Pennsylvania State University has its own iconic green in front of Old Main, an iconic building on its campus. The University of Virginia has an iconic lawn in front of The Rotunda, an iconic building designed by Thomas Jefferson himself.

In our context, we suspect that using iconic public spaces on the University of Virginia's campus, such as Thomas Jefferson's Rotunda on The Lawn, is likely to have a larger impact on belonging. Using non-iconic public spaces, such as the Nameless Field on the outskirt of campus, is likely to have a smaller or no impact on belonging. Moreover, having a positive experience in a public space (e.g., picnicking on The Lawn) is likely to have a larger impact on belonging. Having a negative experience (e.g., being harassed on The Lawn) is likely to have no or even a negative impact on belonging.

In Studies 1-3, then, we test the prediction that, compared with higher-SES students, lower-SES students use public space on campus less, and this mediates the relationship between SES and sense of belonging at the University. In Study 4, we experimentally manipulate use of public space and test whether increasing students' use of public space can close that gap. Taken together, these studies document the links among SES, use of public space, and sense of belonging in the context of education. More generally, this work establishes the importance of public space from a social psychological perspective. All study materials and data can be publicly and openly accessed at

https://osf.io/9ft7s/?view_only=2135210326d94f6196b34f2de6377529

Study 1: Mapping SES Differences in Use of Public Space

In Study 1, we tested our main prediction by measuring students' SES, use of public space on campus, and sense of belonging. Specifically, we measured students' use of public space by mapping their trajectories on campus on a given day using Geographical Information System (GIS) technology. GIS is a system of software and hardware used to capture, manage, analyze, and visualize spatial data. Here, we use GIS in a novel way, to map psychological properties (spaces where students feel they belong) in addition to physical properties (students' actual use of space). This method allowed us to capture and visualize students' use of space on campus. We also measured students' sense of belonging at the University, as well as household income, our measure of SES. We predicted that, compared with higher-SES students, lower-SES students would use less space on campus and identify fewer places where they belong. In turn, we predicted that lower-SES students would feel less belonging at the University.

Method

Participants. We recruited participants around campus. We over-sampled minority students to increase the probability of sampling lower-income students (at our university, as is true elsewhere, minority students are disproportionately lower-income).[2] Three-hundred and twelve undergraduate students completed this study in exchange for candy. Of those, 294 completed both parts of the study (map and survey). And of those, 283 provided household income information. For these participants, 35% reported being male and 46% reported being

[2] This recruitment strategy has two potential issues. First, we did not recruit a random sample. It is thus possible that the students we approached were not representative of their income categories. It is conceivable, for instance, that lower-income White students are under-represented in our sample. Second, participants self-selected into the study. It is conceivable that lower-income students were especially likely to select out of the study. We address the first issue in Studies 2-4. In Study 2, we asked all students from 19 different classes to participate in our study. In Study 3, we have data from all students who completed a pre-screen questionnaire to be eligible in the Department of Psychology's participant pool. We address the second issue in Study 4. In Study 4, participant pool participants signed up for our study not knowing anything about the study (when participants logged on to their participant pool accounts, they saw a list of studies for which they were eligible, they did not know why they were eligible, and study titles were arbitrary letter-number combinations; e.g., Y4). In Study 4, then, self-selection into our study is not an issue.

white. Household incomes ranged from <$35,000 to >$250,000. The mean household income was between the $140,000-$154,999 range and the $155,000-$169,999 range; the median household income was $140,000-$154,999; and, the modal household income was >$250,000. A post-hoc sensitivity analysis using G*Power (Faul, Erdfelder, Lang, & Buckner, 2007) with α set to .05 and power (1-β) set to .80 revealed that our sample size allows us to detect a main effect as small as $f^2 = .028$ (equivalent to $\eta^2 = .029$). In other words, we can detect a small main effect of household income on use of public space and sense of belonging.

Procedure. Participants were given a map of campus and asked to draw their trajectory that day (all the places where they had been). This was our primary measure of use of space. Participants were also asked to circle places on campus where they feel like they belong and places where they feel like they do not belong. Then, they completed a short survey. The survey included six sense of belonging items; specifically, participants rated the following items on a 7-point scale ranging from *extremely untrue* (coded as -3) to *extremely true* (coded as 3). The items were "I feel at home at [the University]", "I belong at [the University]", "Being a student at [the University] says a lot about who I am as a person", "Being a student at [the University] has very little to do with how I feel about myself (reverse coded)", "I like [the University]", and "I feel 'out of place' at [the University] (reverse coded; α = .84). The survey also included demographic questions; namely, gender, race, year in school, and importantly, household income.[3]

Following data collection, the maps were digitized, uploaded, and overlaid in ArcGIS, a GIS software package. We then used ArcGIS to calculate the length of participants' trajectories on central campus across that day in feet. This was our primary measure of public space use; it is

[3] In this study and Study 3, students also answered questions about their sense of belonging in their academic major/s and their felt safety on campus, and circled on the map places where they feel unsafe on campus; these questions were included for a different but related project on gender differences in felt safety and gender disparities in higher education; Science, Technology, Engineering, and Mathematics, specifically. We do not discuss these measures here.

the variable most closely related to use of public space. It is literally the space on campus they used that day. It is also the most objective, inclusive and conservative, as it captures their path of travel that day, irrespective of how they feel about the spaces they used. This allowed us to examine students' use of public space on campus and not beyond (not on adjacent roads or restaurants), and space on campus that requires walking or free public transportation (i.e., University buses or the free trolley). Any difference between lower- and higher-income students, then, is not the result of where they live (e.g., lower-income students often live farther from campus where rents are cheaper) or the result of access to a car or other forms of costly transportation.

Lastly, we had research assistants code various aspects of the maps for exploratory purposes. We asked one research assistant, blind to participants' income and other characteristics, to count the number of public spaces students circled; specifically, spaces where participants feel they belong and spaces where participants feel they do not belong. This coder also counted how many times each participant's trajectory touched or crossed a space where the student reported belonging or not belonging. In other words, we identified how many times that day each participant used a space in which they belong or not. We also asked three other research assistants, also blind to participants' income and other characteristics, to determine if any of the circled spaces were of iconic spaces on campus and whether the trajectories crossed or touched any of the iconic spaces. In other words, we identified whether participants feel like they belong (or not) in iconic spaces on campus and whether they used these spaces that day. We designated the Lawn, the Rotunda, the Chapel, a Pavilion Garden, Pavilion VIII, and the Observatory as iconic spaces at the University.[4]

[4] In subsequent studies, we also use the McGregor Room. However, because the latter is a room in a larger building, we could not code its use in the present study.

Results

Primary Analyses: SES and Sense of Belonging. Students' sense of belonging, on average, was above the midpoint, $M = 1.22$ (on a scale from -3 to 3), $SD = 1.15$. To examine whether SES predicts sense of belonging, we regressed sense of belonging on household income. Results revealed a significant effect, $B = .27$, $SE = .07$, $t\ (280) = 3.98$, $p < .0001$, $\eta^2 = .05$, 95% CI [.014, .112]. As expected, lower-income students reported less belonging at the University.

Primary Analyses: SES and Use of Space. Next, we examined whether SES predicted use of space. Specifically, we examined students' trajectories across the day. On average, participants traveled/walked 8,949 feet (1.69 miles). We regressed trajectory lengths on household income. As hypothesized, results revealed a main effect of household income, $B = 843.29$, $t\ (280) = 4.01$, $p < 0001$, $\eta^2 = .05$, 95% CI [.014, .113]. Lower-income students had shorter trajectories—they used less space on campus—than did their higher-income peers.

Primary Analyses: Use of Space and Sense of Belonging. We then examined whether students' use of space on campus was related to their sense of belonging at the University. We regressed sense of belonging onto trajectory length. Contrary to prediction, trajectory length did not predict sense of belonging, $B = .00003$, $t\ (279) = 1.42$, $p = .157$, $\eta^2 = .007$, 95% CI [0, .039], and thus cannot mediate the relationship between income and belonging.

Secondary Analyses: Felt belonging in Public Space and Iconic Public Space. One possibility for why use of space did not predict sense of belonging is that our "use of space" variable (i.e., length of trajectories) does not capture students' experience in public space, be it positive or negative. It also does not differentiate between types of public spaces, iconic or not. Here, then, we explore whether using public space where one belongs (i.e., use of space that is likely to feel positive and welcoming) and use of iconic public space specifically predict

belonging at the University. Admittedly, these variables begin to look and sound very similar to our outcome measure, sense of belonging at the University. Still, these variables provide useful hints about use of public space and, specifically, students' experience using public space on campus.

First, we looked at the number of spaces students identified as spaces where they feel they belong vs. do not belong. On average, students identified about 2 spaces where they belong (M = 1.93, SD = 1.56) and 1 space where they do not (M = 1.01, SD = 1.10). We regressed the number of spaces students identified as spaces where they feel they belong and spaces where they feel they do not belong on household income with type of space as a repeated measure variable. Results revealed a main effect of space type, F (1, 281) = 73.00, $p < .0001$, $\eta^2 = .02$, whereby participants, on average, reported more spaces where they belong than do not. Results revealed no main effect of household income, F (1, 281) = .57, $p = .452$, $\eta^2 = .001$, and no interaction, F (1, 281) = 1.10, $p = .296$ $\eta^2 = .002$. These findings suggest that higher- and lower-income students reported roughly equal numbers of spaces on campus where they feel they belong and do not belong. We suspect, however, that higher- and lower-income students did not report the same spaces; we suspect that higher-income students reported more iconic spaces than did lower-income students.

To examine this possibility, we regressed the number of *iconic* spaces students identified as spaces where they belong vs. do not belong on household income with type of space as a repeated measure. Results revealed a main effect of space type, F (1, 280) =71.97, $p < .0001$ $\eta^2 = .01$; again, participants, on average, reported more iconic spaces where they belong than do not. Results revealed no main effect of household income, F (1, 280) = 3.47, $p = .064$, $\eta^2 = .006$, but did reveal an interaction, F (1, 280) = 5.41, $p = .02$ $\eta^2 = .01$. Univariate analyses revealed no

main effect of household income on number of iconic spaces where participant do not belong, *B* = -.03, *SE* = .03, *t* (280) = -1.02, *p* = .308, η^2 = .004, 95% CI [0, .031], but a significant main effect of household income on number of iconic spaces where they do belong, *B* = .20, *SE* = .09, *t* (280) = 2.19, *p* = .029, η^2 = .02, 95% CI [.000, .058]. Lower-income participants reported fewer iconic spaces as spaces where they belong.

We also regressed the number of times students *used* iconic spaces where they belong vs. do not belong, again with type of space as a repeated measure. Results again revealed a main effect of space type, *F* (1, 281) = 37.11, *p* < .0001, η^2 = .003; participants, on average, used more iconic spaces where they feel they belong than do not. Analyses also revealed a marginal main effect of household income, *F* (1, 281) = 3.83, *p* =.052, η^2 = .007, moderated by space type, *F* (1, 281) = 4.94, *p* = .027, η^2 = .009. Univariate analyses revealed no main effect of household income on use of iconic public spaces where participants feel they do not belong, *B* = -.006, *SE* = .01, *p* = .559, η^2 = .001, 95% CI [0, .022], but a significant main effect of household income on use of iconic public spaces where participants do feel they belong, *B* = .08, *SE* = .04, *t* (281) = 2.18, *p* = .030, η^2 = .02, 95% CI [0, .057]. In other words, lower-income students were less likely to use iconic public spaces (e.g., the Lawn) where they feel they belong.

The number of *iconic* spaces students identified and used, in turn, predicted sense of belonging, *B* = .09, *SE* = .04, *t* (279) = 1.94, *p* = .053, η^2 = .01, 95% CI [0, .052] and *B* = .26, *SE* = .11, *t* (280) = 2.32, *p* = .021, η^2 = .02, 95% CI [.0002, .061], respectively, even when controlling for the number of *non-iconic* spaces and use of these spaces, *B* = .07, *SE* = .04, *t* (278) = 1.74, *p* = .083, η^2 = .01, 95% CI [0, .52] and *B* = .25, *SE* = .11, *t* (279) = 2.25, *p* = .025, η^2 = .02, 95% CI [.0002, .061]. Moreover, use of iconic spaces where one belongs partly mediated the relationship between income and belonging at the University; specifically, we

tested whether use of iconic spaces where one belongs mediated the relationship between SES and sense of belonging using the PROCESS macro (Model 4; Hayes, 2013). To conduct the bootstrapping analysis, we drew 10,000 random samples with replacement to estimate the size of the indirect effect of income on sense of belonging through use of space (i.e., the average of most-used, favorite, and study spaces). The bootstrap analysis yielded a 95% confidence interval that did not include 0, 95% CI [.0004, .0082].

Discussion

Study 1 findings show that, relative to higher-SES students, lower-SES students use public space less. They also feel less belonging at the University. Our primary analyses, however, did not provide evidence of mediation; they did not show that use of public space in general mediates the relationship between SES and belonging.

Our secondary analyses, however, shed light on this null finding. These findings provide two additional insights. First, our secondary analyses revealed that higher- and lower-SES students perceive public spaces differently and use public spaces differently. Higher-SES students were more likely to perceive iconic spaces as spaces where they belong. They were also more likely to use these iconic spaces. Or put another way, lower-SES students were less likely to see iconic spaces as spaces they belong and were less likely to use these iconic spaces. These findings provide important context for our subsequent studies. In Study 2, we asked students about their use of space, and coded both the public-ness and iconic-ness of the spaces they use. In Study 3, we directly asked students about their use of iconic public spaces on campus, including the Lawn, Rotunda, and Pavilion Gardens. In Study 4, we experimentally manipulated participants' use of these spaces.

In addition, our secondary analyses revealed that *using iconic* public spaces where one feels they *belong* did predict and mediate SES differences in sense of belonging. Admittedly, this finding seems a bit tautological; using iconic public space where one belongs and belonging at the University share some conceptual overlap. Still, these two constructs differ in important ways. Using public space is a concrete act, grounded in space and time ("this afternoon, I ate in the Gardens and it felt welcoming," "yesterday, I studied in the Rotunda and felt like I belonged there," "this morning, I walked on the Lawn and felt at home there"). Sense of belonging is more general and transcends space and time ("I belong at the University of Virginia" "I like the University of Virginia"). In other words, we think the present data are consistent with the notion that momentary and space-bound experiences of belonging can give rise to a more general sense of belonging.

Study 2: SES, Use of Public Space, and Sense of Belonging

In Study 2, we again measured SES, use of public space, and sense of belonging, but with different measures. Specifically, we included questions about students' use of space that capture their more typical use of campus space. We again predicted that, relative to higher-SES students, lower-SES students would use public spaces on campus less and, in turn, report less belonging at the University. To examine this, we recruited a large sample of students to ensure that lower-SES students were represented in the sample. We asked students to list their favorite spaces on campus, the spaces on campus they study most often, and the spaces on campus they use most often. Research assistants coded whether the spaces students listed were private or public (i.e., a place one could go without permission or invitation). We predicted that, relative to higher-SES students, lower- SES students would prefer and use public spaces on campus less. We also asked students about their sense of belonging at the University. We predicted that, relative to higher-

SES students, lower- SES students would feel less belonging at the University. Moreover, we predicted that use of public space would mediate the relationship between SES and sense of belonging at the University; that is, we predicted that use of public space would predict belonging at the University and partly explain the relationship between SES and belonging. In addition to these predictions, we explored whether features of public space matter; specifically, we examined whether space type—favorite spaces, most-used spaces, and study spaces—matters for sense of belonging. We also examined whether use of *iconic* public space (as opposed to public space more generally) is especially important for sense of belonging.

Method

Participants. One-thousand and ninety-nine undergraduate students completed our survey. Of those, 955 provided household income data.[5] Of those, 56% were women and 35% were racial/ethnic minorities. Household incomes ranged from <$35,000 to >$250,000. The mean household income was between the $155,000-$169,999 range and the $170,000-$184,999 range; the median household income was $110,000-$124,999; and the modal household income was >$250,000. Some participants did not answer all questions and, thus, degrees of freedom change slightly across analyses. A post-hoc sensitivity analysis using G*Power with α set to .05 and power (1-β) set to .80 revealed that our sample size allows us to detect a main effect of f^2 = .008 (equivalent to η^2 = .008). In other words, we can detect a small effect of household income on use of public space and sense of belonging.

Procedure. Researchers went to 19 undergraduate classrooms to conduct the study. At the beginning of each class, the researcher informed participants that we were interested in

[5] This could be cause for concern; one might worry (as we did) that students low in SES might disproportionately not provide household income information. We have some evidence to suggest that is not the case. A t-test revealed that students who reported household income did not differ from students who did not on parental education, t (1050) = -.23, p = .819. Given that parental education is often used as an index of SES, we take these null findings as some evidence that lower-income students did not disproportionately opt to withhold household income.

students' experiences at the University and that the survey was completely voluntary (i.e., the consent process). Participants completed a survey that included the primary variables of interest: 1) favorite space on campus; 2) space on campus where they study most often; 3) the three spaces on campus where they spend the most time; and 4) sense of belonging. In other words, they listed five spaces, each capturing different aspects of their space use. In addition, they completed the same "sense of belonging" measure as in Study 1 ($\alpha = .87$). Participants then provided demographic information, including their race/ethnicity, gender, year in school, and household income, our measure of SES.

Based on our definition of public space (a space one can use without permission or invitation), we coded dorms, dorm rooms, bedrooms, home, and any reference to a friend's/partner's room or house as private (public space = 0). References to dorms and dorms rooms were very clearly references to private space on campus; references to bedrooms, home, and friend's/partner's room or house were possibly references to private space on campus or off campus. All other spaces were coded as public (public space = 1). In addition, another research assistant coded the following seven spaces as iconic: The Lawn, the Rotunda, the McGregor Room, the Chapel, a Pavilion Garden, and Pavilion VIII (iconic = 1); all other spaces were coded as not iconic (iconic = 0).

Results

Primary Analyses: SES and Sense of Belonging. Students' sense of belonging was again relatively high, $M = 1.65$ (on a scale from -3 to 3), $SD = 1.07$. To examine whether SES predicted sense of belonging, we regressed sense of belonging onto income. Results revealed the predicted main effect of household income, $B = .19$, $SE = .03$, $t(938) = 5.56$, $p < .0001$, $\eta^2 = .03$,

95% CI [.014, .057], such that lower-income students felt lower sense of belonging than did higher-income students.

Primary Analyses: SES and Use of Space. On average, 92% of most-used spaces, 93% of favorite spaces, and 50% of study spaces students listed were public spaces. To examine whether SES predicted use of space, we regressed the public space codes for the three most-used spaces, favorite space, and study space on income and treated type of space as a repeated measure. This analysis, then, had one continuous, between-subjects variable (i.e., income) and one categorical, within-subjects variable with 5 levels (i.e., the 5 spaces students listed). Analyses revealed a main effect of space type, F (4, 3420) = 269.34, $p < .0001$, $\eta^2 = .06$, such that students listed more public spaces for most-used and favorite spaces relative to study spaces (i.e., they were more likely to list private spaces for studying). Analyses also revealed the predicted main effect of income, F (1, 855) = 6.63, $p = .010$, $\eta^2 = .002$, such that relative to higher-income students, lower-income students preferred and more often used private spaces; or, put differently, relative to lower-income students, higher-income students preferred and more often used public spaces. The interaction between income and space type (favorite space, most used spaces, study space) was not significant, F (4, 3420) = .93, $p = .448$, $\eta^2 = .0008$, suggesting that this relationship generally held across different types of spaces that students like and use.

Primary Analyses: Use of Space and Sense of Belonging. We also examined whether use of space predicted sense of belonging. To examine this, we created a use of space composite by averaging our use of space measures (i.e., favorite spaces, most used spaces, and study spaces). We then regressed sense of belonging onto the use of space composite. As predicted, use of space significantly and positively predicted sense of belonging, $B = .47$, $SE = .18$, t (937) =

2.59, $p = .0099$, $\eta^2 = .007$, 95% CI [.0004, .022]. In other words, the more students liked and used public space, the greater belonging they felt at the University.

Primary Analyses: Mediation. We next tested whether use of space mediated the relationship between SES and sense of belonging using the PROCESS macro (Model 4; Hayes, 2013). To conduct the bootstrapping analysis, we drew 10,000 random samples with replacement to estimate the size of the indirect effect of income on sense of belonging through use of space (i.e., the average of most-used, favorite, and study spaces). The bootstrap analysis yielded a 95% confidence interval that did not include 0 (95% CI [.0001, .004]), suggesting that use of public space mediated income differences in sense of belonging. The reverse mediation analysis yielded a 95% confidence interval that included 0, (95% CI [0, .0001]), suggesting that sense of belonging did not mediate income differences in use of public space.

Secondary Analyses: Iconicity of Public Space. On average, 5% of most-used spaces, 47% of favorite spaces, and 0.4% of study spaces students listed were iconic public spaces. To examine the role of iconicity of public space, we regressed iconicity of favorite, study, and most-used spaces on income, and treated type of space as a repeated measure. Analyses revealed a main effect of space type, F (4, 3408) = 446.26, $p < .0001$, $\eta^2 = .07$, such that students listed more iconic public spaces for favorite spaces relative to most-used and study spaces. It also revealed an effect of income such that lower-income students were less likely to list iconic spaces, F (1, 852) = 13.80, $p = .0002$, $\eta^2 = .004$, and this was moderated by type of space, F (4, 3408) = 3.43, $p = .008$, $\eta^2 = .003$. Univariate analyses revealed that lower-income students were less likely to list iconic spaces as their favorite space, $B = .01$, t (852) = 2.69, $p = .007$, $\eta^2 = .008$, 95% CI [.0006, .025], and their most-used spaces, $B = .004$, t (852) = 2.79, $p = .006$, $\eta^2 = .008$, 95% CI [.0007, .024], but not as their study space, $B = .0006$, t (852) = 1.25, $p = .212$, $\eta^2 = .002$,

95% CI [0, .012], perhaps because many students listed their dorm room or a library as their study space; less than 1% of study spaces were iconic spaces and there was much less variance on that variable. In turn, use of iconic public space (i.e., the average of most-used spaces, favorite space, and study space) predicted sense of belonging, $B = 1.19$, $t\ (937) = 4.66$, $p < .0001$, $\eta^2 = .02$, 95% CI [.008, .045]. The more iconic public spaces students listed, the more they reported belonging at the University.

As before, we tested for mediation using the PROCESS macro (Model 4; Hayes, 2013). We drew 10,000 random samples with replacement to estimate the size of the indirect effect of income on sense of belonging through use of space (i.e., the average iconicity of most-used and favorite spaces although, note, that we get similar results if we used the average iconicity of most-used, favorite, and study spaces). The bootstrap analysis yielded a 95% confidence interval that did not include 0 (95% CI [.001, .007]), suggesting that use of iconic public space mediated income differences in sense of belonging. The reverse mediation analysis also yielded a 95% confidence interval that did not include 0, (95% CI [.0003, .001]), suggesting that sense of belonging mediated income differences in use of iconic public space. In other words, it seems lower-income students may feel like they do not belong in part because they do not use iconic public space, and they may not use iconic public space in part because they do not feel like they belong. Use of iconic public space and sense of belonging may therefore be mutually reinforcing. These analyses provide further evidence that use of *iconic* public space might be especially important for sense of belonging.

A perhaps better test, however, is a mediation test in which both use of public space and use of *iconic* public space specifically are entered into the model. To do this, we used the PROCESS macro (Model 6; Hayes, 2013). We again drew 10,000 random samples with

replacement to estimate the size of the indirect effect of income on sense of belonging through use of public space (i.e., the average of most-used, favorite, and study spaces) and iconic space (i.e., the average iconicity of most-used, favorite, and study spaces). The bootstrap analysis yielded a 95% confidence interval that did not include 0 only for the income—iconic space—belonging path (95% CI [.0009, .006]), but not for the income—public space—belonging path (95% CI [-.0003, .003]. In other words, this analysis suggests that use of *iconic* public space is special; it is this kind of public space that may increase sense of belonging.

Discussion

Study 2 findings replicate Study 1 findings; they show that lower- SES students like and use public space less than do higher- SES students, and that use of space is associated with sense of belonging at the University. In fact, in Study 2, use of space mediated the relationship between SES and belonging. In addition, like Study 1, Study 2 exploratory analyses suggested that use of *iconic* public space might be especially important for belonging. Taken together, Studies 1 and 2 begin to demonstrate the importance of public space in the context of higher education. To our knowledge, this is the first such demonstration.

Study 3: SES, Use of Iconic Public Space, and Sense of belonging

In Study 3, we conceptually replicated and extended Studies 1 and 2. We again recruited a large sample of participants to ensure that lower- SES students were represented in the sample. We asked students about their use of public space and sense of belonging, as in Studies 1 and 2. We measured use of space with a different measure by simply asking students how much they used various iconic public spaces on campus. This measure complements Studies 1 and 2 measures. Our Studies 1 and 2 measures were high in ecological validity in that we asked participants to report their use of actual space on campus. But, Study 1 did not capture students'

typical use of space and Study 2 required coding and interpretation on our part, which may have introduced bias or "noise," and reduced measurement precision. Our Study 3 measure, in contrast, is lower in ecological validity in that it asks participants about specific spaces on campus—some of which students do not frequent. But, it is arguably higher in precision because it does not require coding and/or researcher interpretation.

Additionally, we asked students about their perceptions of these public spaces; specifically, whether they could use these spaces without permission or invitation. These questions are useful for establishing why lower- and higher-SES students are using (or not using) public spaces on campus. One possibility is that lower-SES students do not know public spaces on campus and/or do not realize that these are public spaces. Another possibility, however, is that they do know public spaces on campus and realize that these are public spaces but they lack access to these public spaces (perhaps because of constraints such as an off-campus job) and/or because of negative experiences in these public spaces (perhaps they feel and are unwelcome in those spaces).

We predicted that, compared with higher- SES students, lower- SES students would report using iconic public spaces less, and feel less belonging at the University. We also predicted that use of iconic public space would mediate the relationship between SES and sense of belonging. In addition to these predictions, we explored whether the use of *iconic* public space (as opposed to public space more generally) is especially important for sense of belonging.

Method

Participants. We collected data in two waves. In Wave 1, we collected data from undergraduate students who completed a departmental participant pool pretest survey, 604 of whom provided household income. Of these, 66% were women and 25% were racial/ethnic

minorities. Household incomes ranged from <$35,000 to >$250,000. The mean income was between the $170,000-184,999 range and the $185,000-$199,999 range; the median household income was $185,000-$199,999; and, the modal household income was >$250,000.

In Wave 2, we collected data from 194 undergraduate students. These students were approached out on campus and asked if they were willing to complete a short survey in exchange for candy. They completed the exact same measures as Wave 1 participants. Of the 194 students, 184 reported their household income. Of those who did, 61% were women and 32% were racial/ethnic minorities. Household income ranged from <$35,000 to >$250,000. The mean income was between the $155,000-169,999 range and the $170,000-184,999 range; the median household income was $155,000-169,999; and, the modal household income was >$250,000. Across the two waves of data collection, then, we recruited 788 participants with income data. A post-hoc sensitivity analysis using G*Power with α set to .05 and power (1-β) set to .80 revealed that our sample size allows us to detect a main effect of $f^2 = .01$ (equivalent to $\eta^2 = .01$). In other words, we can detect a small main effect of household income on use of public space and sense of belonging.

Procedure. Participants indicated whether they knew seven iconic, public spaces on campus (i.e., the Chapel, Lawn, McGregor Room, Observatory, Pavilion Gardens, Pavilion 8, and Rotunda). If they knew the spaces, they indicated whether they could use these spaces without restrictions—without permission or an invitation (0=No, 1=Yes). In addition, they reported how often they use these seven spaces (0=Never, 1=Rarely, 2=Sometimes, 3=Often). We averaged these latter responses across spaces to create a use of public space index, $\alpha = .64$. Participants also completed 4 of the 6 sense-of-belonging items from Studies 1 and 2. We shortened the scale for the pretest and out-and-about study format. The items were, “I feel at

home at [the University]," "I belong at [the University]," "Being a student at [the University] says a lot about who I am as a person, and "I like [the University]." Participants again made their responses on a 7-point scale with anchors ranging from e*xtremely untrue* (coded as -3) to *extremely true* (coded as 3), $\alpha = .87$. Lastly, participants answered demographic questions including race, gender, year, and household income, our measure of SES.

Results

Variable Checks across Samples. Although the samples (wave 1 and 2) were quite similar in terms of demographic characteristics, we tested whether they were similar on our other measured variables. They were not. Wave 2 participants, those who completed the study out and about on campus, reported greater belonging, t (794) = 3.32, p = .0001, η^2 = .01, 95% CI [.002, .034], more use of space, t (681) = 6.81, p < .0001, η^2 = .055, 95% CI [.028, .089], and they were less likely to report that they needed permission or an invitation to use public space, t (793) = -7.04, p < .0001 η^2 = .06, 95% CI [.031, .093]. These differences are consistent with our argument that use of public space is associated with sense of belonging. Below, we do not control for sample, but all results hold when controlling for sample.

Public Space Knowledge. To examine whether lower- and higher-income students were equally knowledgeable about public space on campus, we created a mean index of the spaces they knew and a mean index of the spaces they considered public; indices could thus range from zero (no spaces) to one (all seven spaces). Participants knew, on average, 76% of the spaces and they perceived, on average, 51% of them as public. We regressed these indices on household income and found that household income did not predict knowing the spaces, B = -.0002, t (786) = -.02, p = .984, η^2 = 0, 95% CI [0, 0], or perceiving the spaces as public, B = .006, t (786) = .73, p = .466, η^2 = .0007, 95% CI [0, .009]. These findings imply that any income differences in use

of public space, then, is not the result of differences in knowledge about those spaces. On average, all students knew most of the spaces.

SES and Sense of Belonging. Sense of belonging was again relatively high, $M = 1.66$ (on a scale from -3 to 3), $SD = 1.18$. We first regressed sense of belonging on income. As in Studies 1 and 2, income was positively related to sense of belonging, $B = .20$, $SE = .04$, $t\ (784) = 4.89$, $p < .0001$, $\eta^2 = .030$, 95% CI [.011, .057], such that lower-income students reported lower sense of belonging than did higher-income students.

SES and Use of Space. We also regressed use of public space on income and found, as in Studies 1 and 2, that income was positively related to use of public space, $B = .04$, $SE = .02$, $t\ (784) = 2.37$, $p = .018$ $\eta^2 = .007$, 95% CI [.0002, .0234]. Lower-income students reported using public space less than did higher-income students.

Use of Space and Sense of Belonging. Lastly, we regressed sense of belonging on use of public space and, again, found that use of public space was positively related to sense of belonging, $B = .74$, $SE = .08$, $t\ (782) = 8.58$, $p < .0001$, $\eta^2 = .08$, 95% CI [.052, .124]. Using public space more frequently was associated with greater sense of belonging.

Mediation. Next, we tested for mediation. To conduct the bootstrapping analysis, we used the PROCESS macro (Model 4; Hayes, 2013). We drew 10,000 random samples with replacement to estimate the size of the indirect effect of income on sense of belonging through use of space. The bootstrap analysis yielded a 95% confidence interval that did not include 0 (95% CI [.001, .01]), suggesting that use of public space mediates the relationship between income and sense of belonging at the University. The indirect effect of income on use of space through sense of belonging also yielded a 95% confidence interval that did not include 0 (95% CI [.003, .007]), suggesting that sense of belonging also mediates the relationship between

income and use of public space. In other words, replicating Studies 1 and 2, it seems lower-income students may feel like they do not belong in part because they do not use public space, and they may not use public space in part because they do not feel like they belong. This again supports the notion that use of public space and sense of belonging may be mutually reinforcing.

Discussion

Study 3 replicates and extends Studies 1 and 2. Like Studies 1 and 2, but using different measures, it shows that lower-SES students use public space on campus less than do higher-SES students and that this difference in use of public space can account for differences in belonging. Moreover, Study 3 findings suggest that these differences in use of public space are not the result of differences in knowledge about spaces but something else; perhaps lower-SES students lack access (e.g., lower-SES students with jobs off-campus cannot spend as much time on campus) and/or have or anticipate negative experiences in these spaces (e.g., lower-SES students who do not feel like they are welcome at the university and on campus will not spend as much time on campus). In either case, their less-frequent use of public space was related to and mediated their lower sense of belonging.

Study 4: Closing the Socioeconomic Gap in Belonging?

Studies 1-3 provide correlational evidence that SES is associated with use of space, and that use of space mediates the relationship between SES and sense of belonging. The study findings are consistent with our claim that lower-income students use public space on campus less and, as a result, have a lower sense of belonging at the University. Correlational evidence has clear limitations, however. Here, reverse causation is possible, even likely. Indeed, sense of belonging also mediated the relationship between SES and use of public space. Moreover, third variables abound. It could be, for example, that use of public space is a proxy for social

interactions (i.e., the more one uses public space, the more one has social interactions), and that social interactions therefore matter; it could be that lower-income students have a lower sense of belonging at the institution because they do not have social connections with peers and others who are connected to the institution (see Mendoza-Denton & Page-Gould, 2008; Walton & Cohen, 2007).

In Study 4, we thus examined the *causal* effects of use of iconic public space on sense of belonging. We manipulated use of iconic public space and then measured sense of belonging and household income. We predicted that increasing students' use of iconic public space will reduce the belonging gap between lower- and higher-SES students; specifically, we predicted that, in the control condition, SES will be strongly related to belonging; in the experimental condition, that relationship between SES and belonging will be attenuated.

Study 4 also adds to previous studies by using two measures of belonging: the original measure used in Studies 1 and 2, which includes both belonging and identity-related items, and a more conventional measure of belonging. In addition, Study 4 is also high in ecological validity, as it asks students to use iconic public space in the context of their daily life, without an experimenter present.

Method

Participants. We recruited participants from a Department of Psychology participant pool. These participants received course credit for their participation. Because sign-ups were slow, we also recruited via flyers. These participants received payment. Sign-ups were still slow. We suspect the length of the study turned off many students; on average, participants took almost 6 hours to complete the study (5.6 hours for the GPS recording + time for the survey). We ended data collection at the end of the semester. All total, we were able to recruit 78 undergraduate

students. Two did not provide household income for a final sample of 76. Of these, 56% were women and 55% were racial/ethnic minorities. Household incomes ranged from <$35,000 to >$250,000. The mean income was between the $110,000-$124,999 range and the $125,000-$139,999 range; the median household income was $110,000-$124,999; and, the modal household income was $80,000-$94,999.

A post-hoc sensitivity analysis using G*Power with α set to .05 and power (1-β) set to .80 revealed that our sample size allows us to detect a main effect as small as $f^2 = .11$ (equivalent to $\eta^2 = .10$) and an interaction as small as $f^2 = .15$ (equivalent to $\eta^2 = .13$). In other words, we can detect a medium main effect of condition on sense of belonging, and a medium-to-large interaction between condition and household income. We recognize that these are larger effect sizes than those we observed in Studies 1-3 and that this study is underpowered. We thus offer these data as an initial test.

Procedure. Participants came to the lab in the morning. They were told that we were pilot testing a GPS app, specifically MapMyRun, for use in research on students' use of space. Those randomly assigned to the control condition (the *Standard Use of Iconic Public Space* condition) were then told that, in order to test the app, it is important that they use space as they would normally. Those randomly assigned to the experimental condition (the *Increased Use of Iconic Public Space* condition) were told that, in order to test the app, it is important that they use at least one public space on campus. They were then given a list of public spaces on campus (i.e., the Lawn, the Rotunda, the McGregor Room, the Chapel, the Pavilion Garden, and Pavilion VIII) and asked to think of a time that day that they could go to at least one of the spaces. After 5 hours, participants were sent a survey link. This survey consisted of a manipulation check, two

measures of sense of belonging, and demographics. Students were also invited to upload their GPS map and data.

For the manipulation check, we asked participants if they had used the Lawn, the Rotunda, the McGregor Room, the Chapel, the Pavilion Garden, and Pavilion VIII. For sense of belonging, we used our original 6-item measure of belonging from Studies 1 and 2 (referred to below as our "original measure"). We also used a more conventional measure of belonging; specifically, we adapted Mendoza-Denton and colleagues' (2012) measure and asked participants the extent to which these four items were true of them: "I feel like I fit in at [the University]," "I feel welcome at [the University]," "I feel comfortable at [the University," and "I am thrilled to be at [the University]" (referred to below as our "new measure"). Participants responded to items on a 7-point scale with anchors at *extremely untrue* (coded as -3) to *extremely true* (coded as 3). Both belonging scales had high alphas; $\alpha = .90$ and .91, respectively, and they were highly correlated, $r = .85$. Lastly, participants answered demographic questions including race, gender, year, and household income, our measure of SES.

A research assistant, blind to hypotheses and condition, entered and coded the GPS data. Specifically, they entered the duration of travel and the total distance traveled from the GPS map output participants sent. They also noted if participants experienced technical difficulties (0=No, 1=Yes); i.e., the app did a poor job of tracking participants' use of indoor space and this created some "glitches" whereby participants' trajectories "jumped" from one location to another as if participants had teleported from one location to another. Note that these glitches do not impact data quality except for the measure of distance traveled. In addition, the research assistant coded whether students went to any of the public spaces we specified (i.e., the Lawn, the Rotunda, etc.; 0=No, 1=Yes). We thus had three measures of participants' use of public space: participants' (1)

self-reported use of iconic public space—whether they used the Lawn, the Rotunda, the McGregor Room, the Chapel, the Pavilion Garden, and Pavilion VIII that day, (2) the research assistant's coding of participants' use of iconic public space—whether participants' GPS map shows that the student went to the Lawn, the Rotunda, the McGregor Room, the Chapel, the Pavilion Garden, and/or Pavilion VIII, and (3) the distance traveled from participants' GPS map, as outputted by the app. The first two measures capture students' use of iconic public space, although note that the first (participants' self-reports) is subject to misreporting. It is possible, for instance, that participants forgot going to the Rotunda or falsely reported going to the Rotunda to "comply" with the experimenter's instructions (in the experimental condition). The third measure captures students' use of space on campus more generally; it is a running tally of the distance they covered over the course of the study. Our manipulation was intended to increase students' use of iconic public space (as captured by measures 1 and 2) and, consequently, perhaps their use of space more generally (as captured by measure 3).

Results

Manipulation checks. First, we tested whether students in the *Increased Use of Iconic Public Space* condition used more public spaces than students in the *Standard Use of Iconic Public Space* condition. We tested this using three data sources: self-report data from the participant survey, GPS data from the app coded by our research assistant, and distance traveled from the app. The latter, as already noted, is imperfect because of glitches but we assumed that glitches were randomly distributed across participants. And in fact, income and/or condition did not predict glitches, $B_{income} = .02$, $t_{income}(66) = .29$, $p_{income} = .769$, $\eta^2 = .0005$, 95% CI [0, .048], $B_{condition} = .0004$, $t_{condition}(66) = .01$, $p_{condition} = .995$, $\eta^2 = 0$, 95% CI [0, 0], $B_{interaction} = .05$, $t_{interaction}(66) = .74$, $p_{interaction} = .464$, $\eta^2 = .008$, 95% CI [0, .095].

We regressed self-reported use of space (whether participants reported going to at least one public space from our list) on condition (-1=*Standard Use of Iconic Public Space*, 1=*Increased Use of Iconic Public Space*) and household income (standardized), and their interaction. This analysis revealed a marginal effect of condition, B = .108, SE = (.058), t (72) = 1.92, p = .058, η^2= .048, 95% CI [.000, .167], such that participants in the *Increased Use of Iconic Public Space* (vs. *Standard Use of Iconic Public Space*) condition were more likely to report going to a public space on our list of public spaces. We then conducted the same analysis on GPS data (whether participants actually went to at least one public space from our list, as coded by our research assistant). This analysis revealed a significant main effect of condition, B = .133, t (72) = 2.76, p = .007, η^2= .096, 95% CI [.007, .230]. Participants in the *Increased Use of Iconic Public Space* condition indeed were more likely to go to at least one public space on our list of public spaces. We then conducted the same analysis on distance traveled and found only a main effect of household income, B_{income} = .999, t_{income} (66) = 2.18, p_{income} = .033, η^2_{income} = .078, 95% CI [.002, .217]; $B_{condition}$ = .824, $t_{condition}$ (66) = .94, $p_{condition}$ = .350, $\eta^2_{condition}$ = .004, 95% CI [.000, .078]; $B_{interaction}$ = -.172, $t_{interaction}$ (66) = -1.38, $p_{interaction}$ = .171, $\eta^2_{interaction}$ = .026, 95% CI [.000, .136]. This replicates Study 1 in which we found that higher-income students used more space—they had longer trajectories across campus during the day—relative to lower-income students. Taken together, these data suggest that our manipulation was successful; it increased use of iconic public space and not use of space more generally.

Primary analyses: Sense of belonging. Students' sense of belonging was again relatively high, $M_{original\ measure}$ = 1.21 (on a scale from -3 to 3), $SD_{original\ measure}$ = 1.15, $M_{new\ measure}$ = 1.46 (on a scale from -3 to 3), $SD_{new\ measure}$ = 1.25. To test whether use of public space increased sense of belonging, particularly for lower-income students, we regressed our sense of

belonging measures on condition (-1= *Standard Use of Iconic Public Space*, 1=*Increased Use of Iconic Public Space*), household income (standardized), and their interaction. We treated the two sense of belonging measures as repeated measures. The analysis revealed only the predicted interaction between condition and household income, F (1, 72) = 5.60, p = .021, η^2 = .07, unmoderated by belonging measure, F (1, 72) = .82, p = .368, η^2 = .0009. The main effects of condition and household income were also non-significant, F (1, 72) = .02, p = .880, η^2 = .04 and F (1, 72) = .90, p = .346, η^2 = .01, respectively.

Because the two measures were highly correlated and because the interaction between condition and household income was not moderated by measure, we created a single belonging measure by averaging all belonging items from both measures (α = .94). Then, to decompose the interaction, we conducted simple slope analyses. We examined income effects by condition, to replicate Studies 1-3 analyses (in the *Standard Use of Iconic Public Space* condition) and then to test whether our experimental manipulation (the *Increased Use of Iconic Public Space* condition) changed that relationship. These analyses revealed a significant effect of income on belonging among participants in the *Standard Use of Iconic Public Space* condition, B = .444, SE = .16, t (72) = 2.70, p = .009, η^2= .092, 95% CI [.006, .225], such that lower-income students reported lower belonging. This is consistent with Studies 1-3. This effect, however, disappeared in the *Increased Use of Iconic Public Space* condition, B = -.17, SE = .21, t (72) = -.83, p = .412, η^2= .009, 95% CI [.000, .093]. Income no longer predicted belonging. See Figure 1 for a graph of the interaction.

Discussion

The present study provides experimental evidence that use of public space can reduce SES gaps in felt belonging. In the *Standard Use of Iconic Public Space* condition, SES predicted

sense of belonging. Lower-SES students felt less belonging than did higher-SES students. This is consistent with Studies 1-3. In the *Increased Use of Iconic Public Space* condition, as predicted, that relationship was reduced and, in fact, eliminated. Note that, in this study, the mean and modal income were lower, and the variance in income was smaller than those in previous studies. Compared with our previous studies, we had fewer high-income students in this study, both in absolute numbers and relative to lower-income students. We should thus exercise a bit more caution when interpreting high-income students' data. That said, we had the full range of incomes in this study, and the smaller variance in this study likely worked against us finding the predicted interaction. The fact that we found the predicted interaction between income and condition is thus telling, we think.

General Discussion

People must use space, but this is no guarantee they will feel welcome in those spaces. In the present research, we find that, compared with higher-SES students, lower-SES students use public space on campus less (Studies 1-3). We also find that use of public space—and *iconic* public space in particular—mediates the relationship between SES and sense of belonging (Studies 1-3). In addition, we provide initial evidence that increasing students' use of iconic public space can close the belonging gap between lower- and higher-SES students (Study 4). Taken together, the present studies suggest that use of public space (or the lack thereof) contributes to SES gaps in felt belonging in higher education.

These findings contribute to our understanding of SES disparities in higher education. They shed light on yet another reason why students from stigmatized groups may feel out of place at elite universities. From previous work, we know that social connection—having relationships with peers and faculty—can increase belonging at one's institution (Mendoza-

Denton & Page-Gould, 2008; Walton & Cohen, 2007). We also know from previous work that feeling connected to the culture of an institution can enhance belonging. Work by Stephens and colleagues (2012a, 2012b) has shown that lower-SES students often endorse interdependent norms, but institutions of higher education often have independent norms. This mismatch, Stephens and colleagues argue, signals to lower-SES students that they do not belong. We would add that connection to space matters. Using public space—and perhaps iconic public space in particular—can increase belonging.

This process, from use of public space to belonging, can be understood through the lens of psychological theories including self-categorization theory (Turner & Reynolds, 2011). This theory posits that individuals self-categorize—they identify as part of a group—when group identity is salient. We think *iconic* public spaces do just this. Iconic public spaces are symbols of group identity. They are well-known and often beautiful, or at least evocative. They express something about a group's identity, its history and values. In this way, they express something unique about a place, and can make group identity salient. Self-categorization theory also posits that individuals self-categorize when they perceive their behavior as conforming to that of other group members. We think *use* of iconic public spaces could convey this kind of conformity. Picnicking on a green might signal to a student that she enjoys the outdoors. Picnicking on The Lawn at the University of Virginia might also signal to that student that she is a University of Virginia student because University of Virginia students hang out there. As students use public space and iconic public space on campus, these spaces become familiar, part of their everyday lives, and in time, part of their identity. They convey to students that they belong in this space and to this group.

The present work, accordingly, hints at novel interventions to reduce SES gaps in felt belonging. The work suggests that universities should think carefully and critically about its public spaces, and who has access to them. It should ensure that all students feel empowered to use public space on campus although a caveat is in order here; encouraging students to use public space will not guarantee that lower-SES students will have positive experiences in those spaces. Having a negative experience in a public space—being harassed by police, being catcalled by people who pass by, being heckled by peers—surely does not increase sense of belonging and almost surely decreases it. Universities, therefore, should proceed with caution. Universities might also reimagine which public spaces are iconic. Currently, at our institution and we suspect others, iconic spaces are historical. Because institutional histories are often exclusionary, these spaces can feel exclusive, intimidating, and unwelcoming. But that can change. Institutions can commit to new identities and missions, and new spaces to represent them. Institutions can create inclusive iconic public spaces.

The present work dovetails nicely with work demonstrating the importance of the physical context on individuals' success and well-being (Oishi & Graham, 2010; Oishi & Hoffman, 2014; Oishi, Saeki, & Axt, 2015; see also Bonam, Bergsieker, & Eberhardt, 2016). Previous work has shown that physical objects can provide cues as to who belongs in a domain and who does not. For instance, Star Trek posters and soda can pyramids in computer science spaces can signal to women that they do not belong in computer science; replacing these items with nature posters or abstract art and water bottles can signal that they do belong (Cheryan, Plaut, Davies, & Steele, 2009). Likewise, Christmas displays during the holiday season can decrease non-Christian community members' sense of belonging in their community (Schmitt, Davies, Hung, & Wright, 2010). The present work, like this previous work, shows that the

physical environment can affect students' sense of belonging. The present work goes beyond physical cues (e.g., posters, Christmas decorations), however. It considers how use of public space can increase sense of belonging, irrespective of the physical cues within that space. In Study 4, for example, using public spaces on campus—without changing physical cues within those spaces—eliminated the SES gap in belonging. The present work thus adds to our understanding of the ways in which physical space affects human psychology.

The present work also adds to literatures outside of social psychology; most notably, environmental psychology, sociology, human geography, and urban planning. Specifically, it adds to the work on place-identity and sense of place (Proshansky, Fabian & Kaminoff, 1983; Relph, 1997). To date, the extant literature has provided little explanation and even less empirical evidence on *how* place affects individual psychology (Hauge, 2007). Here, we show that use of iconic public space is associated with sense of belonging, and we provide initial evidence that it can increase it. The present work also adds to work on the importance of public space and iconic architecture (Sklair, 2006, 2010). This literature has been largely anecdotal, observational, and theoretical. Here, we show, empirically, that iconic public spaces—including iconic monuments and buildings—likely matter for sense of belonging.

Limitations of the present work offer avenues for future research. One limitation of the work is our focus on a single institution. It will be important to consider and examine the extent to which these findings generalize to other institutions, particularly institutions that vary in their prestige and wealth. That said, we think it is important to remember that other work has made clear that lower-SES students at other institutions feel out of place (e.g., Jury et al., 2017; Ostrove & Long, 2007). In this way, our participants were much like students elsewhere. Moreover, work outside of psychology and outside the context of higher education has made

clear that lower-SES people often cannot access and do not use public space as much as higher-SES people (e.g., Mitchell, 2003; Soja, 2013). In this way, our participants were not unlike community members elsewhere. And finally, previous work outside of social psychology and outside the context of higher education has shown that public space and use of public space, specifically, is related to community identity and engagement (e.g., Francis et al., 2012; Gieryn, 2000; Massey, 2013). We thus think that the effects we documented herein would generalize to other students at other institutions, but that is an empirical question worthy of examination.

Another major limitation of the current work is that Study 4 was under-powered, limiting the extent to which we can make causal claims about use of public space on sense of belonging. Future work should replicate, directly and conceptually, our experiment. For example, one could randomly assign lower- and higher-SES students to do a scavenger hunt, either in public spaces on campus or on an online map of campus. This would reveal whether and how the experience of public spaces—and not merely the salience of public spaces—affects belonging. One could also ask students to use public space on campus and manipulate students' perceptions of the space's iconicity. This would reveal whether and how iconic public space matters for belonging. Still, it is important to note that our current experiment had several strengths. It was high in experimental realism. Students used (more) iconic public space in the context of their daily lives, without an experimenter present. In this way, the experiment provided students with an authentic experience of iconic public space on campus. In addition, the study spanned much of students' day. This meant that, for many of our participants, there was a substantial time delay between public space use (in the early afternoon and, for some participants, in the morning) and survey administration (in the later afternoon or evening). This likely worked against finding the predicted effect. The experiment, in other words, was a conservative test of our hypothesis.

Given this, we are encouraged by the initial experimental findings. They suggest that use of iconic public space can increase sense of belonging, and beyond the immediate moment.

Finally, future work could examine whether individuals from other disadvantaged groups share this experience, whereby their use of iconic public space is constrained and undermines their felt belonging. Certainly, given the current institution's history, students of color might have a similar experience and we have some data to speak to this. In Studies 1-3, we find similar patterns by race; that is, we find that students of color use iconic public space on campus less than do white students and, in turn, this predicts lower sense of belonging at the University. In Study 4, we find a similar pattern of results, but differences are not statistically significant. Recall, however, that this study is under-powered. See Supplemental Materials for a full description of these analyses. Our hunch, then, is that use of public space will be related to multiple identities given the historical and sociocultural context; we suspect that, to the extent that iconic public spaces cater to the mainstream, those who fall outside of it will feel unwelcome in these spaces and, consequently, less belonging in their community. Moreover, future work could examine whether privileged groups (e.g., wealthy White men) still derive a sense of belonging from using public spaces when those spaces become more accessible to other groups. For example, it would be interesting to test whether higher-SES White students feel out of place in iconic spaces (e.g., The Lawn) at an event hosted by the Office of African American Affairs, and whether such an experience would impact their sense of belonging at the University more generally. Though this is beyond the scope of the present work, we would predict that higher-SES White students would likely feel out of place at such an event. Whether this experience would impact their sense of belonging at the University is an open question.

Final Remarks

Maya Angelou once said, “I long, as does every human being, to be at home wherever I find myself” (Tanaka, 2014). At our university, and presumably at other elite public universities, wealthy students seem to have that luxury. They feel at home in the University’s most iconic public spaces. Relative to lower-SES students, they use public space frequently and derive a sense of belonging from it. If we believe that higher education is the great equalizer, that it will reduce SES gaps in attainments and important life outcomes, then lower-SES students ought to have that same luxury. The present work suggests that we might accomplish this, in part, through use of public space.

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