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Creating a water-saver self-identity reduces water use in residence halls

Robyn K. Mallett [a, *], Kala J. Melchiori [b]

[a] Loyola University Chicago, Department of Psychology, 1032 W. Sheridan Rd., Chicago, IL 60660-5385, United States
[b] James Madison University, United States

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ABSTRACT

Water scarcity is a pressing social problem. Attempts to increase conservation that focus on education or attitudes produce limited success. Installing efficient appliances reduces water use, but can be costly. Drawing from research that links identity to pro-social behavior, we reduce water use by creating a conservation self-identity using an existing collective identity. Students in apartment-style residence halls (n = 303) experienced a "water saver" identity-building campaign, received retrofitted fixtures that limited water use, received both, or received neither intervention. Appliance retrofits reduced actual water consumption. By itself, the identity-building campaign also reduced actual water use, but only for those who successfully internalized a water-saver self-identity. In isolation, the identity-building campaign produced as much actual water conservation as installing retrofits. Interestingly, combining retrofits and the identity-building campaign cancelled out conservation efforts, producing no change in water use. Thus, residents may exhibit reactance when interventions simultaneously target structural and personal factors.

1. Introduction

Water scarcity is a pressing social problem. Droughts on the West Coast of the United States (US) and around the world threaten quality of life. Although many regions currently have ample water, the rate of water consumption is not sustainable. The average person needs about 13 gallons of water per day to prepare food and maintain proper hydration, sanitation, and hygiene (Gleick, 1996). Yet the average US citizen uses 98 gallons of water per day (Kenny et al., 2009). Many US citizens are unaware of their water waste, underestimating the water used in everyday activities by at least half (Attari, 2014). Therefore, we must identify barriers that people face for water conservation and determine how to effectively motivate residents, even in water-rich regions, to conserve water.

Decades of research shows that attempts to regulate conservation behavior using information and encouraging attitude change have been largely ineffective (Bamberg & Moser, 2007; McKenzie-Mohr, 2000). Given the difficulty in changing habits and instilling repetitive behavior (Kempton, Darley, & Stern, 1992), our first hypothesis is that it may be easier to change the environment and limit access to water using appliance retrofits. Retrofits change the context of behavior so that, by default, people use less water.

However, there are potential problems with installing retrofits or installing efficient appliances. Although there are long-term benefits (e.g., lower utility bills), the upfront cost of installing retrofits or buying new appliances may be high. Moreover, individual behavior may override the contextual change. Specifically, people may alter their behavior to make up for low water flow (e.g., take longer showers to overcome low flow). Alternatively, people may believe that they do not need to conserve water because the appliance is conserving for them.

We explore an untested way to regulate conservation behavior by employing psychological research on identity. People have multiple identities, spanning the spectrum from the personal to the group level (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). A self-identity is a label that a person uses to describe the self with regards to a specific behavior (Cook, Kerr, & Moore, 2002). Self-identities encourage people to embrace group values and personally engage in normative group behavior. For example, having a green self-identity is related to self-reported consumer behavior, waste reduction, and water and energy conservation (Whitmarsh & O'Neill, 2010). Indeed, adopting an environmental identity mediates the association between values or attitudes and behavior, explaining variance beyond factors typically considered in the theory of planned behavior (Fielding, McDonald, & Louis, 2008; van der Werff, Steg, & Keizer, 2013).

In comparison, a collective identity is a label that a person uses to describe membership in a social group (Brewer & Gardner, 1996). Stemming from our fundamental need to belong (Baumeister & Leary, 1995), people draw on collective identities to guide their behavior and maintain their connection to a valued social group. Collective identities promote a depersonalized self; instead of relying on individual goals to guide behavior, people motivated to fulfill collective identities behave as deindividuated exemplars of their social group (Turner et al., 1987). Cultivating a collective identity not only satisfies an individual's belonging needs, but also benefits a group's collective welfare—especially when groups are in competition for resources (Brewer & Gardner, 1996).

An important, but as yet untested, way to increase water conservation is to build a new conservation self-identity using an existing collective identity. Doing so may encourage people to incorporate conservation behavior into their personal sense of self. Conservation is a pro-social behavior, requiring one to limit consumption in favor of

* Corresponding author.
Email address: rmallett@luc.edu (R.K. Mallett)

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protecting a commonly shared resource (Hardin, 1968). Recent research reveals that associating the self with a valued personal identity (e.g., being a helper) increases pro-social behavior (Bryan, Master, & Walton, 2014). The present research draws from that work by testing whether using an existing collective identity (i.e., identification with one's university) to create a new conservation self-identity (i.e., water-saver) reduces personal water use. Thus, our second hypothesis is that adopting a water-saver self-identity will reduce water use; it may do so just as well as directly regulating behavior through appliance retrofits.

The present intervention creates messages that encourage individuals to cultivate a "water-saver" self-identity. Instead of focusing on the desired behavior (i.e., save water), we link the behavior to an identity (e.g., be water-savers). This unique approach of using a self-relevant noun when describing the desired action promotes the behavior by implying the type of person one would be by performing it. Walton and Banaji (2004) found that people who describe their preferences using nouns (e.g., I am a *recycler*) see those inclinations as stronger, more stable, and more resilient than when they describe their preferences using verbs (e.g., I *recycle*). Effective identity-strengthening messages contain nouns that embody the actor's character and signal that an attribute represents an essential piece of one's identity (Gelman, Hollander, Star, & Heyman, 2000).

We extend existing research by testing whether knowledge that a group to which they belong incorporates water conservation as an essential element of its collective identity is enough to trigger personal water conservation. Therefore, hypothesis 3a is that linking one's university identity with water conservation may be enough to prompt members of an eco-friendly university community to conserve water.

However, the impact that this knowledge has on personal behavior may be further enhanced if individuals take the additional step of incorporating conservation into a self-identity. Recent research shows that linking the desired behavior to one's personal identity increases internalization of the prosocial behavior (Bryan et al., 2014). People want to see themselves as competent, morally appropriate individuals. When people engage in moral behavior, they are able to strengthen the link between the positive behavior and their desired identity. For example, a survey that encouraged people to "be a voter" caused more people to vote the next day than simply telling people "to vote" (Bryan, Walton, Rogers, & Dweck, 2011). Accordingly, hypothesis 3b is that our identity-building campaign will affect water use by changing one's self-identity. If the behavior is incorporated into a self-identity, then personally engaging in water conservation has direct implications for the type of person one would be by performing the behavior.

There is a difference between simply promoting water conservation norms at the group level and incorporating conservation into one's self-identity. Prosocial group norms focus on promoting the desired behavior—in this case, saving water. In contrast, incorporating conservation behavior into one's identity links the behavior to the self—one becomes a water-saver. It is a subtle difference, but Walton and colleagues have shown that shifting the focus produces a dramatic change in behavior (e.g., Walton & Banaji, 2004). Making the prosocial behavior identity-relevant increases the likelihood that people will perform it, beyond that of simply highlighting the prosocial group norm.

The present research tests the extent to which an intervention that targets the situation (i.e., water-saving appliance retrofits) and the person (i.e., identity) shapes self-reported and actual water use in university residence halls (see Fig. 1). This is the first research to directly compare the impact of structural retrofits versus an identity-building campaign on conservation behavior. Applying retrofits to water features such as toilets and showers should decrease water use by reducing the amount of water coming out of an appliance (hypothesis 1). Incorporating water conservation into one's self-identity should also reduce water use (hypothesis 2). We have no theoretical reason to expect that appliance retrofits will interact with the identity-building campaign to further reduce water use. Importantly, we measure both self-reported and actual water use. Finally, we explore the mechanism by which this change occurs by testing whether creating a water-saver identity changes behavior through adoption of a collective or self-identity (hypotheses 3a and 3b).

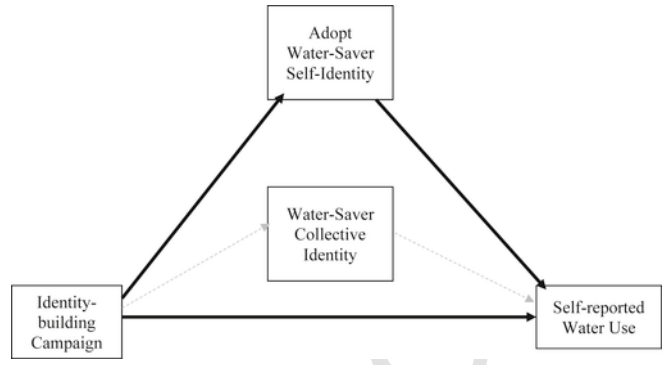

Fig. 1. The identity-building campaign will indirectly affect self-reported water use through adoption of a water-saver self-identity. Solid lines represent predicted significant paths. Dashed lines represent predicted non-significant paths.

2. Method

2.1. Participants

All (N = 715) undergraduates living in apartment-style residence halls at a private Midwestern university were recruited via email to participate in the study; 303 (42.38%) completed the survey. All participants received a $5 gift card. The average age was 20.04 years (SD = 2.24). Reflecting composition of the student body, participants were predominately White (n = 202; 33 Asian, 29 Hispanic/Latino, 20 reported multiple groups, 10 Black, 9 American Indian and Native Hawaiian) and female (n = 209; 91 male, 2 transgender, 1 did not answer). Participants reported spending most of their lives in suburban areas (n = 226; 47 urban, 29 rural, 1 did not answer), and most were from the US Midwest (n = 250; 19 West, 5 Northeast, 13 South, 2 Alaska/Hawaii, and 14 non-US natives).

2.2. Design

We used a 2(retrofit: no, yes) × 2(identity-building campaign: no, yes) between-subjects design. We manipulated the two independent variables at the level of residence hall such that all students living in the hall were either exposed to the identity-building campaign or not and the residence hall either received water appliance retrofits or did not.

2.3. Procedure

Participants lived in apartment-style residence halls that were not different in style or condition depending on experimental condition. For example, the residence halls in each condition had a mixture of studio, one-, and two-bedroom units with one to four residents per unit. All units had a full bathroom and kitchenette.

Appliance retrofits were installed over the winter break, before the identity-building campaign. Retrofits were in place when students began the spring semester. The identity-building campaign started at the beginning of the spring semester. Although the campaign was concentrated during the early part of the semester, resident assistants offered educational opportunities throughout the semester. Invitations to complete the online survey were delivered via email 10 weeks into the semester.

2.4. Materials

2.4.1. Retrofits

Residence halls in the retrofit condition received low-flow toilets, urinals, shower heads, and faucets. The retrofits were installed over the winter break while students were not living in the residence halls. Residence halls that were not in the retrofit condition received no changes to water fixtures during the study period. We measured awareness of changes to water fixtures using the item, "Did you observe any changes to the water fixtures in your apartment?" with response options of *0 = no* and *1 = yes*.

2.4.2. Identity-building campaign

Some students in apartment-style residence halls were exposed to a media campaign featuring stickers on free dish soap and toothpaste, posters, a water conservation pledge, and residence hall-wide programming. The posters and stickers used a slogan describing members of the university community as water-savers to link the presumably valued collective identity with the desired pro-social behavior. Some messages invoked the school identity by featuring a picture of a well-known and beloved campus staff member conserving water (e.g., turning off the water while she brushed her teeth). Others simply used the school mascot when linking the collective identity to conservation. The other half of the students did not receive the media campaign in their residence hall.

We measured the extent to which students perceived conservation as part of the collective identity using two items on a scale from 1 *strongly disagree* to 7 *strongly agree*: [school name] students conserve natural resources; [school name] students care about protecting the environment ($r = 0.76$, $p < 0.001$, $M = 5.08$, $SD = 1.26$). We measured the extent to which students incorporated conservation into their self-identity using the item, "It is personally important to me to conserve natural resources" using a scale from 1 *strongly disagree* to 7 *strongly agree* ($M = 5.29$, $SD = 1.38$).

2.4.3. Time showering

We multiplied the average length of their showers in minutes by the number of showers they took in a week to create a *minutes showering* variable. Higher numbers indicate greater water use.

2.4.4. Water conservation

Participants also reported if they turned off the water while brushing their teeth and washing dishes using a scale 1 *never* to 4 *always*. We averaged these two items, with higher scores reflecting more water conservation.

2.4.5. Actual water use

The Water Authority provided actual water use via water meter readings for three years: the two years before our study and our study year. Meter readings were only available for periods of approximately 60 days of water use (e.g., the amount of water used for a building from September 4, 2014–November 3, 2014) and occurred at the level of the residence hall. Units did not have individual meters and the readings were not taken on a daily basis. This measurement is not ideal as sampling at the aggregate level does not reflect precise connections to the individual level (Snijders & Bosker, 1999). That is, the data reflects water use by building and does not correspond to individuals within each building. Thus, it is important to use caution when interpreting the results from our sample of building-level water usage. We analyzed readings for fall (i.e., meter readings from September to November, and from November to December) and spring (i.e., meter readings from February to March, and from April to May) semesters for each residence hall. The identity-building campaign started in late January so the final spring reading represents the post-intervention time period. We adjusted the actual water use variable to account for the number of residents living in the hall by dividing the number of gallons used in the hall by the total number of residents in the hall.

2.4.6. Demographic variables

Participants reported demographic information, including age, gender, race, and geographical origin.

3. Results

3.1. The influence of retrofits and identity-building on water use

As expected, an independent-samples *t*-test showed that residents in apartments that received retrofits reported more awareness of changes to their water fixtures ($M = 0.82$, $SD = 0.03$) than residents in apartments that did not receive retrofits ($M = 0.17$, $SD = 0.03$), $t(29) = 14.46$, $p < 0.001$.

A univariate ANOVA tested whether the retrofits and the identity-building campaign affected self-reports of minutes showering. There was no main effect of the retrofits on minutes showering, $F(1, 297) = 0.45$, $p = 0.50$. There was a main effect of the identity-building campaign, $F(1, 297) = 7.82$, $p = 0.006$. Participants who received the identity-building campaign in their residence halls reported fewer minutes showering ($M = 19.66$, $SD = 11.41$) than participants who did not receive the campaign ($M = 23.43$, $SD = 11.67$). There was no interaction, $F(1, 297) = 0.26$, $p = 0.61$.

A univariate ANOVA tested whether the retrofits and the identity-building campaign affected self-reports of water conservation. There was no main effect of the retrofits on water conservation while brushing teeth and doing dishes, $F(1, 293) = 1.13$, $p = 0.29$. There was a marginally significant main effect of the identity-building campaign, $F(1, 293) = 3.18$, $p = 0.075$. Participants who received the identity-building campaign in their residence halls reported greater water conservation ($M = 2.39$, $SD = 0.81$) than participants who did not receive the campaign ($M = 2.20$, $SD = 0.84$). There was no interaction, $F(1, 293) = 0.78$, $p = 0.34$.

Turning to actual water use, we computed a 2(retrofit: no, yes) × 2(identity-building: no, yes) × 4(time: prior two falls, prior two springs, pre-intervention fall, post-intervention spring) mixed-model ANOVA where retrofit and identity-building were the between-subjects factors and time was the within-subjects factor. To create the "prior two falls" variable, we combined two water bills for each of the two prior fall semesters—utilizing four total bills. We followed the same procedure to calculate the "prior two springs" variable. To measure water use immediately before and after our intervention, we examined two water bills for each of the pre- and post-intervention semesters (e.g., two fall semester and two spring semester bills for each condition).

Considering the between-subjects analysis of actual water use, there was no main effect of retrofit and no main effect of identity-building, $Fs(1, 4) < 0.31$, $ps > 0.61$. There was no interaction between retrofit and identity-building, $F(1, 4) = 3.25$, $p = 0.15$.

Considering the within-subjects analysis, there was a main effect of time, $F(1, 4) = 20.41$, $p = 0.011$, *partial eta-squared* = 0.07. Residents typically used less water in the spring ($M = 2.46$, $SE = 0.17$, $M = 2.19$, $SE = 0.29$; prior two springs, post-intervention spring, respectively) compared to the fall ($M = 3.08$, $SE = 0.17$, $M = 2.03$, $SE = 0.26$; prior two falls, pre-intervention fall, respectively), $F(1, 3) = 41.98$, $p = 0.023$. Simple effects tests showed that prior springs used less water than prior falls ($p = 0.002$) and the pre-intervention fall ($p = 0.01$); the pre-intervention fall did not differ from prior falls ($p = 0.78$), and the post-intervention spring used less water than both prior falls ($p = 0.002$) and the pre-intervention fall ($p = 0.005$). There was no interaction between time and identity-building or between time and retrofit, $Fs(1, 4) < 0.63$, $ps > 0.47$.

There was a significant 3-way interaction between time, retrofit, and identity-building, $F(1, 4) = 37.89$, $p = 0.004$, *partial eta-squared* = 0.91. Fig. 2 shows fairly consistent water use for each condition in the two years prior to our study, with the fall semesters showing slightly more water use than the spring semesters. Simple effects tests showed that in the prior two years, water use in the control condition, $F(1, 3) = 17.08$, $p = 0.056$, the retrofit only condition, $F(1, 3) = 15.74$, $p = 0.060$, and the identity-only condition, $F(1, 3) = 20.76$, $p = 0.046$, was less in the spring compared to the fall, reflecting the overall time main effect. There were no other differences between conditions in the prior falls or prior springs, $Fs(1, 4) < 1.56$, $ps > 0.28$.

However, when we examined the post-intervention spring semester, we found a cross-over interaction pattern for actual water use (see the far right panel of Fig. 2). Supporting hypothesis 2, simple effects tests showed that both the identity-building only condition, $F(1, 4) = 5.30$, $p = 0.08$, and the retrofit only condition, $F(1, 4) = 5.07$, $p = 0.09$, used less water than the control condition. Both the identity-building only condition, $F(1, 4) = 4.35$, $p = 0.10$, and the retrofit only condition, $F(1, 4) = 4.14$, $p = 0.11$, showed a trend toward using less water than the retrofit plus identity-building condition. All of the conditions except the retrofit plus identity-building condition, $F(1, 43) = 1.29$, $p = 0.46$, used less water in the post-intervention spring semester than they did in the pre-intervention fall semester, control: $F(1, 3) = 17.08$, $p = 0.056$, retrofit-only: $F(1, 3) = 15.74$, $p = 0.060$, identity-building only: $F(1, 4) = 20.76$, $p = 0.046$. Finally, the post-intervention spring semester showed significantly less water use compared to the prior two springs for the identity-building only ($p = 0.011$) and retrofit only conditions ($p = 0.014$).

Translated into gallons saved, we found that in the post-intervention spring semester actual water use showed a marked decrease in the identity-building only and retrofit only conditions. Water use in both conditions was lower than water used by the same residents in the previous semester (452,000 gallons less for the identity-building and 364,000 gallons less for the retrofit only condition). We observed little change in actual water use for residents in the retrofit plus identity-building condition—they only used 84,000 gallons less than the previous semester, which is consistent with the slight drop in spring semester water use observed in previous years.

Interestingly, we observed the same pattern of self-reported water use and actual water use for the identity-building only condition. That is, residents reported that they tried to conserve water and actual water use reflected their effort, but only in the identity-building only condition. Although residents in the retrofit only condition also used less water, self-reports of water use did not acknowledge the change. This discrepancy between self-reported water use and actual water use may reflect the fact that residents did not intentionally change their water use in the retrofit only condition. Thus, in the absence of the identity-building campaign, retrofits have a psychologically invisible effect on water use. This is an important addition to the existing literature which has not directly compared self-reports of water use to actual water use.

3.2. Indirect effects

Next, we examined the mechanism responsible for the decrease in self-reports of water use for participants who received the identity-building campaign. Table 1 shows the correlations between study variables. Structural retrofits had no association with any self-report

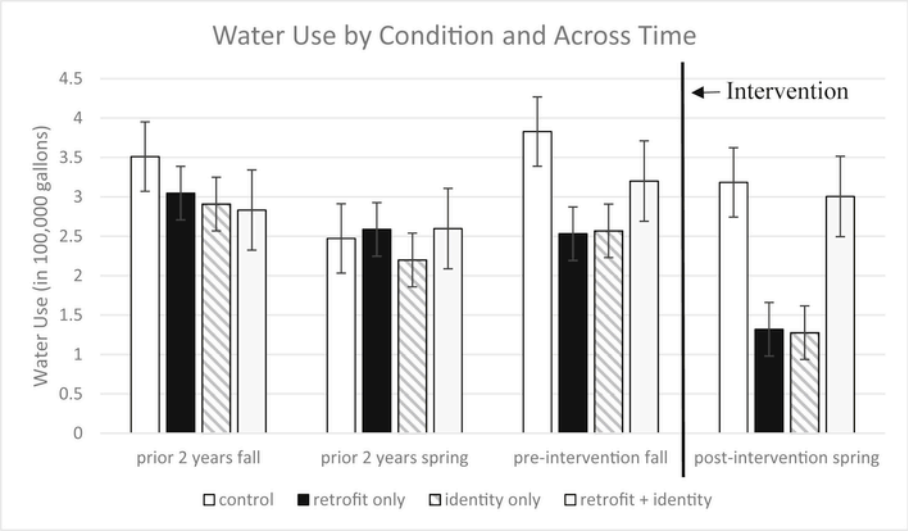

Fig. 2. Retrofits and the water-saver identity-building manipulation independently affected actual water use (adjusted by the number of residents in each hall), but only when employed in isolation.

Table 1
Correlation matrix of study variables.

	Retrofit	Identity campaign	Adopt collective ID	Adopt self ID	Self-reported shower time	Self-reported water conservation	Age	Gender
Retrofit	–							
Identity Campaign	0.07	–						
Adopt Collective ID	−0.10	0.01	–					
Adopt Self ID	−0.05	0.19***	0.22**	–				
Self-reported Shower Time	−0.06	−0.19***	−0.03	−0.18**	–			
Self-reported Water Conservation	−0.06	0.11^{+}	−0.04	−0.20**	0.07	–		
Age	−0.10	−0.06	0.07	0.04	−0.04	0.12*	–	
Gender	0.09	0.02	0.04	0.09	−0.01	−0.06	−0.05	–
Urban	−0.03	−0.02	−0.05	−0.13*	−0.02	0.10	−0.02	0.04

Note: The retrofit variable was coded such that 0 = no retrofits and 1 = retrofits. The identity campaign variable was coded such that 0 = no campaign and 1 = campaign. Gender was coded such that 1 = man, 2 = woman. Urban was coded such that 1 = urban, 2 = suburban/rural. $^{+}p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

variables, therefore we only examine the influence of the identity-building campaign in these analyses.

We use the PROCESS (model 4; Hayes, 2013) macro for SPSS to test for parallel mediation. In parallel mediation, two or more potential mediators may explain the link between the independent and dependent variables. The PROCESS analysis is similar to regression except that all paths are simultaneously estimated, testing whether each variable is an equally powerful mediator. The PROCESS macro uses a bootstrapping approach; we generated 5000 samples with replacement. Doing so provides more robust estimates while helping account for relatively small sample sizes.

We tested the model in Fig. 1 for self-reported water use including time showering and water conservation. Table 2 reports the coefficients and 95% confidence intervals for all effects. Supporting hypothesis 3b, the test of parallel mediation showed that the identity-building campaign indirectly affected self-reported water use through the mediating variable of self-identity and not through the mediating variable of collective identity. Exposure to the identity-building campaign increased incorporation of the water-saver identity into the self. For those who experienced the identity-building campaign, adopting the water-saver self-identity reduced self-reported water use. The identity-building campaign did not indirectly affect self-reported water use through adoption of a collective water-saver identity. That is, the identity-building campaign was not associated with change in how much students thought the school adopted the water-saver identity and the perceived strength of the school's water-saver identity was unrelated to self-reported water use.

Table 2
Results of the test for parallel mediation predicting self-reported water use.

	Time showering			Water conservation		
	Coefficient (SE)	95% LLCI	95% ULCI	Coefficient (SE)	95% LLCI	95% ULCI
Adopt Collective ID						
Campaign	0.05 (0.15)	−0.24	0.33	0.04 (0.15)	−0.24	0.33
Adopt Self ID						
Campaign	0.50 (0.16)**	0.19	0.81	0.48 (0.16)**	0.17	0.79
Water Use						
Adopt Collective ID	0.16 (0.59)	−1.01	1.32	0.02 (0.04)	−0.06	0.09
Adopt Self ID	−1.47 (0.55)**	−2.55	−0.39	−0.14 (0.04)**	−0.21	−0.07
Campaign	−4.59 (1.45)**	−7.46	−1.73	−0.23 (0.09)*	−0.04	−0.41
Indirect Effects						
Adopt Collective ID	0.01 (0.09)	−0.13	0.28	0.001 (0.007)	−0.01	0.02
Adopt Self ID	−0.74 (0.36)*	−1.64	−0.19	−0.07 (0.03)*	−0.14	−0.02

Note: The identity-building campaign variable was coded such that 0 = no campaign and 1 = campaign. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

4. Discussion

Supporting hypothesis 1, appliance retrofits physically limited water use. Supporting hypothesis 2, when implemented in isolation, both retrofits and the identity-building campaign were equally effective at reducing actual water use. The identity-building campaign reduced actual water use presumably through the pathways identified in the model of self-reported water use. That is, supporting hypothesis 3b, adopting a water-saver self-identity led people to incorporate conservation into their sense of self, which then reduced water use.

We delivered the identity-building intervention at the collective level. That is, our manipulation attempted to link the students' existing university identity, rather than their personal identity, and the idea of being a water-saver. This is a novel approach to creating an environmentally-friendly identity in that it targets multiple levels of identity. Delivering the message at the collective level may reduce the potential that the message is seen as threatening because it does not directly implicate personal behavior. Rather, it communicates that their group engages in a specific pro-social behavior. However, students had to internalize this message and incorporate water conservation into their self-identity for it to translate to self-reported behavior change.

Importantly, when it came to actual water use, the two interventions were only effective in isolation. The combination of retrofits and the identity-building campaign did not significantly reduce water use. That is, even though retrofits were in place and physically saving water, in the retrofit-plus-identity campaign condition, personal behavior appears to have worked against the retrofits to return actual water use to rates observed in previous years. Perhaps the identity-building campaign drew attention to the involuntary reduction in water use caused by retrofits. Our manipulation check showed that students who received retrofitted water fixtures were aware of the change. This may have produced reactance (Brehm, 1966) in participants who were, for example, forced to use less water while brushing teeth because of the faucet aerator. To exert independence, they may have intentionally left the water running rather than intentionally or passively conserving. Future research should further explore this possibility.

Caution should be used when retrofits are installed in residence halls. By themselves, retrofits will save water. However, if universities also wish to increase student buy-in to the conservation process,

it may be prudent to deliver an identity-building campaign at a different time point than retrofits. For instance, universities may choose to install retrofits over the summer so that new residents moving into residence halls do not know that the fixtures have been altered. Alternatively, universities could conduct an identity-building campaign the previous semester to increase buy-in and behavioral change, and the retrofits may be welcomed.

4.1. Limitations

The present study was conducted at a Midwestern Jesuit institution that has a predominately White, middle- and upper-socioeconomic status population. As members of a social justice-focused Jesuit institution with an explicit emphasis on sustainability initiatives, we encourage replications of our work at non-Jesuit institutions, schools that have a more economically diverse student body, and universities that have not adopted an environmental agenda. One benefit of doing so would allow us to see whether there must be some level of environmental concern present at the collective level for the identity-building campaign to be effective.

Fortunately, we were able to obtain actual water usage for each residence hall, but we were constrained to the measurement units and periods used by the Water Authority. We analyzed the time period that immediately followed our intervention, but there was about a month delay between our intervention and the beginning of the water bill for that cycle. We could have missed behavior change that occurred immediately after the identity-building campaign and retrofits were implemented. However, it is reassuring that we still observed change for a few months after the time delay. Previous interventions that targeted social norms typically find that the effects of normative information wear off after about a month (e.g., Schultz, 1998). Additionally, because we used aggregate level data to assess actual water use, we can only be certain that the differences we observed occurred at the macro level (i.e., across buildings). We cannot make decisive conclusions about links between micro (individual) level and macro (building) level variables. Future research should replicate this intervention and measure individual-level water use across time to increase certainty with regards to connections between what individual level psychological variables and group level variables (i.e., actual water use).

4.2. Conclusion

Our study contributes to a growing literature about identity-based behavior change. Previous research using this new technique examined the benefits of linking a pro-social behavior like voting to one's personal identity. We find similar pro-social benefits for conservation behavior after bridging new self-identity as a water-saver to an existing collective identity. This is the first study to extend this novel form of identity-based behavioral intervention to long-term behavior. Our actual water use variable captured behavior for about three months after the intervention. This is also the first study to compare self-reports of water use to actual water use. Finally, this is the first intervention to target multiple levels of identity to change behavior.

Our intervention saved 1,145,000 gallons of water, or enough water to fill two Olympic-sized swimming pools. Rather than simply encouraging people to save water, institutions interested in water conservation should encourage constituents to see the institution and themselves as water-savers. Structural retrofits are one way to conserve natural resources. Yet retrofits alone are not enough to curb consumption. The present research shows that internalizing a new conservation self-identity that derived from an existing collective identity is a previously untapped pathway to promote environmentally-responsible behavior.

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