

December 2020

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Recommended Citation

Warner, L. A., Turner, S., & Lundy, L. (2021). Comparing Linkages Between Descriptive Norms and Current and Intended Outdoor Water Conservation. *Journal of Extension*, 58(6). Retrieved from <https://tigerprints.clemson.edu/joe/vol58/iss6/16>

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Comparing Linkages Between Descriptive Norms and Current and Intended Outdoor Water Conservation

Abstract

The study presented here was used for evaluating how theory of planned behavior variables (attitude, perceived behavioral control, subjective norms) and perceptions of others' outdoor water conservation (descriptive norms) related to individuals' own conservation and intent to conserve. The theory of planned behavior predicted current and intended conservation similarly. Descriptive norms from close-peer and state referent groups improved predictions of current practices but not behavioral intentions. Descriptive norms may be more influential when Extension clients are establishing routines pertaining to outdoor water conservation (e.g., installing a new landscape). Extension professionals should strategically communicate a conservation norm at similar opportune times.

Keywords: [behavioral intent](#), [current practices](#), [descriptive norms](#), [theory of planned behavior](#), [outdoor water conservation](#)

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Introduction

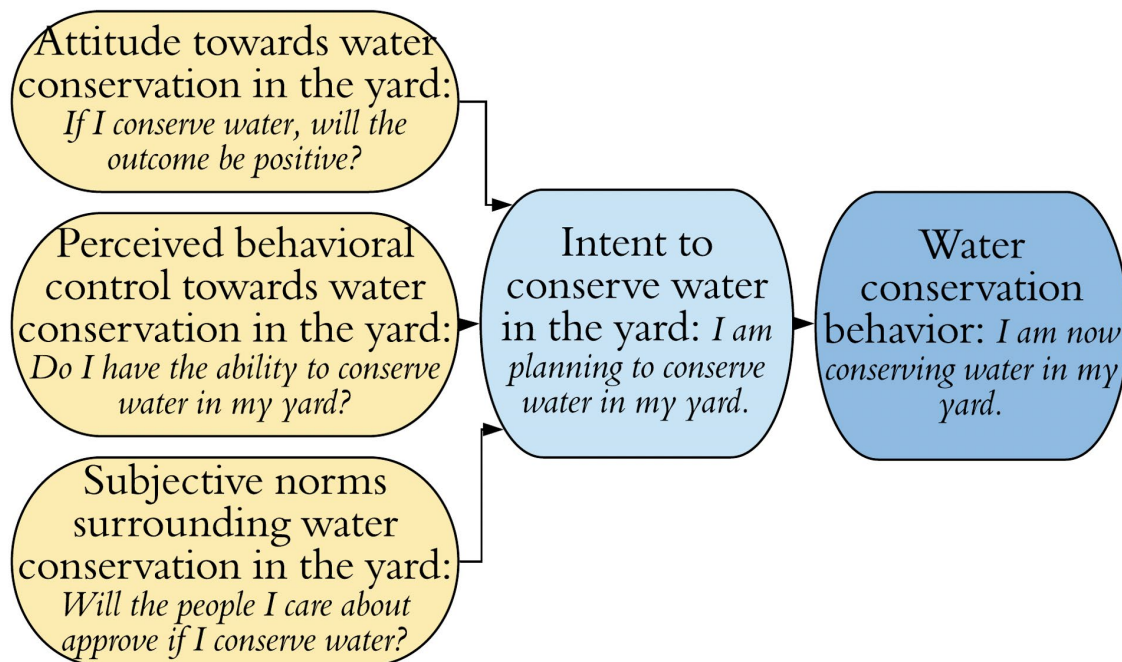
Cooperative Extension improves people's lives by providing research-based knowledge to strengthen families', communities', and agriculture enterprises' social, economic, and environmental well-being (U.S. Department of Agriculture, n.d.). Extension professionals provide participants with valuable information regarding specific subject areas, such as food, nutrition, water conservation, and natural resources, that may influence or change their behavior and help them solve problems (U.S. Department of Agriculture, n.d.). Outdoor landscape water conservation is one subject area that deservedly receives much attention from Extension professionals who focus on water resources given that 9 billion gal of water are applied daily as irrigation to U.S. yards (Environmental Protection Agency, 2013; Warner & Hobbs, 2020). Extension provides education and support and otherwise helps residents adopt the many available water conservation technologies and practices, such as installing rain shutoff devices and calibrating irrigation sprinklers. The study presented here was conducted to better understand factors that relate to Extension audience adoption of these water conservation practices and behaviors.

For Extension education to be effective, Extension agents need to build their programs on behavior change theories, and one commonly used theory is the theory of planned behavior (TPB; Ajzen, 1991). The TPB states that when an individual believes that engaging in some specific behavior will have a positive outcome

(attitude), trusts that they have the ability to engage in the behavior (perceived behavioral control), and thinks that the people around them will approve (subjective norms), they are likely to intend to engage in the behavior. According to Ajzen, attitude is an individual's evaluation of whether the results of engaging in a behavior will be positive or negative. Perceived behavioral control is a person's perception of the ease or difficulty of performing the behavior of interest. Subjective norms relate to belief about whether most people approve or disapprove of the behavior or to the social pressure to participate. These three characteristics influence behavioral intention, and the stronger the intention to perform the behavior, the more likely the behavior will be performed. When applied to our research, the TPB indicates that people will be more likely to intend to (and ultimately take action to) conserve water in their yards if they have positive attitudes about water conservation, believe they can conserve water, and perceive that people important to them will approve of their conserving water (see Figure 1).

Figure 1.

The Theory of Planned Behavior Applied to Landscape Water Conservation



Adapted from "The Theory of Planned Behavior," by I. Ajzen, 1991, *Organizational Behavior and Human Decision Processes*, 50(2), pp. 179–211 ([https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)).

Subjective norms may be further understood as the sum of injunctive norms, or what people approve of, and descriptive norms, or what people do (Kumar Chaudhary & Warner, 2015; Schultz et al., 2007). Of these norms, descriptive norms in particular may be more powerful influences (Cialdini, 2007). Recently, descriptive norms from some referent (i.e., reference) groups (i.e., close peers, other state residents) and especially close peers were shown to increase the power of the TPB in the context of outdoor water conservation intentions (Warner, 2019; Warner & Hobbs, 2020).

In a recent study, Warner (2019) compared how descriptive normative beliefs related to behavioral intent among people living in communities with homeowners' associations (HOAs) and found that neighborhood

norms were not significantly related to behavioral intent. We found this intriguing given the body of literature documenting the power of descriptive norms on landscape practices and wondered whether it was possible that neighborhood-level descriptive norms had already influenced current practices, rendering them less effective on future behaviors. Therefore the purpose of our study was to explore how the TPB and descriptive norms might relate differently to current and future behaviors.

Objectives

The specific objectives were to evaluate the relationships of attitude, perceived behavioral control, and subjective norms to current and future outdoor water conservation behaviors and then evaluate how adding descriptive norms from four referent groups might increase the TPB's predictive power when considering current and future behaviors.

Methods

The target population was U.S. residents from across the country 18 years of age and older who made decisions about caring for their yards, which was a subsample of individuals ($n = 943$) responding to a larger study. We employed a professional survey sampling company to access the nonprobability sample in 2019 using quota sampling to ensure that region, sex, and age were represented as reflected in the 2010 Census (U.S. Census Bureau, 2012).

Our input variables were the three core TPB variables (attitudes, perceived behavioral control, and subjective norms; Warner, 2019) and four referent group descriptive norms variables (close-peer, neighborhood, state, and national; Warner, 2019; Warner & Hobbs, 2020). The outcome variables were current engagement in water conservation and future intent to engage in water conservation. The outcome variables were operationalized as the sum of water conservation practices in which a respondent was engaged (current behavior) and the average likelihood of the respondent's engaging in these practices in the future (behavioral intent).

We used a series of paired adjectives (i.e., semantic differentials) separated by five response points to measure attitude and perceived behavioral control (e.g., *good* to *bad* and *easy* to *difficult*, respectively). We measured subjective norms and the four descriptive norms variables using a series of four 5-point Likert-type scales. We created indexes (see Table 1) ranging from -2 (negative attitude, low perceived behavioral control, low perception of norms) to 2 (positive attitude, high perceived behavioral control, high perception of norms) for all seven variables. Current landscape water conservation score was the sum of "yes" responses regarding use of 18 different water conservation practices. We created a future conservation behavioral intent index using the mean likelihood of engaging in these 18 practices in the future. The 18 behaviors were

- calibrating sprinklers regularly,
- converting lawn (turfgrass) areas to landscaped beds,
- eliminating irrigated areas in the landscape,
- following local watering restrictions,

grouping plants according to their water needs,

- having drought-tolerant plants in the yard,
- installing smart irrigation controls (such as soil moisture sensors) so that irrigation will not turn on when it is not needed,
- replacing high-volume irrigated areas with low-volume irrigation,
- replacing plants that need a lot of water with drought-tolerant plants,
- seasonally adjusting irrigation times,
- turning off zone(s) or capping irrigation heads for established plants,
- using a rain gauge to monitor rainfall for reducing/skipping irrigation,
- using a rain sensor to turn off irrigation when it is not needed,
- using different irrigation zones/zone run times based on plants' irrigation needs,
- using drip (micro) irrigation in the lawn/landscape,
- using high-efficiency sprinklers in the lawn/landscape,
- using rain barrels or a cistern to collect water for use in the garden/lawn, and
- using reclaimed (recycled) wastewater to irrigate the lawn/landscape.

We used an expert panel and a pilot test to ensure face and content validity and to estimate reliability prior to collecting data. Post hoc Cronbach's alpha exceeded .7 for all indexes (Santos, 1999).

Table 1.
Variables and Example Items and Reliabilities

Variable	Example item and responses	Cronbach's		
		alpha	Range	M (SD)
Attitude	Please indicate your attitude toward the phrase "Using good irrigation practices is..." <i>unnecessary:necessary</i> (5-point semantic differential)	.87	-2 to 2	1.57 (.67)
Perceived behavioral control	Please indicate how you feel about the phrase "Using good irrigation practices is..." <i>practical for me:not practical for me</i> (5-point semantic differential)	.88	-2 to 2	1.39 (.75)

	differential)			
Subjective norms ^a	The people who are important to me expect me to conserve water in my yard (<i>strongly disagree to strongly agree</i>)	.94	-2 to 2	.34 (.95)
Close-peer descriptive norms ^a	The people who are important to me conserve water in their yard (<i>strongly disagree to strongly agree</i>)	.94	-2 to 2	.45 (.89)
Neighborhood descriptive norms ^a	Most of the people in my neighborhood conserve water in their yard (<i>strongly disagree to strongly agree</i>)	.93	-2 to 2	.32 (.92)
State descriptive norms ^a	Most of the people in my state conserve water in their yard (<i>strongly disagree to strongly agree</i>)	.93	-2 to 2	.14 (.84)
National descriptive norms ^a	Most of the people in the United States conserve water in their yard (<i>strongly disagree to strongly agree</i>)	.95	-2 to 2	-.14 (.91)
Current landscape water conservation	I have replaced high-water plants with drought-tolerant plants <i>Yes, no, not applicable</i>	—	0 to 18	5.06 (4.92)
Future landscape water conservation index	Please indicate how unlikely or likely you are to engage in the following water conservation behaviors in the future. Use a rain gauge to monitor rainfall for reducing/skipping irrigation (<i>very unlikely to very likely</i>)	.97	-2 to 2	.08 (1.11)

^a Respondents were instructed to indicate their level of agreement or disagreement with the presented statement; response options were *strongly disagree* (1), *disagree* (2), *neither disagree nor agree* (3), *agree* (4), *strongly agree* (5).

Results

The TPB by itself predicted current and intended conservation behaviors similarly (18% and 20% of the variability, respectively) but predicted intent slightly better (see Table 2). The addition of descriptive norms from four referent groups improved prediction of current behavior slightly more than they improved prediction of intent.

Table 2.

Hierarchical Linear Regression of Theory of Planned Behavior (TPB) and Descriptive Norms Variables on Current Outdoor Water Conservation Behavior and Behavioral Intent

Model	R ²	R ² change	F	p
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Current behavior				
1**	.182	.182	54.306	<.001
2**	.215	.033	28.470	<.001
Behavioral intent				
1**	.200	.200	78.051	<.001
2**	.210	.011	35.533	<.001
**Significant at $p \leq .001$. Model 1 = core TPB variables (attitude, perceived behavioral control, subjective norms). Model 2 = descriptive norms from four referent groups (close-peer, neighborhood, state, national).				

When only the TPB variables were considered, all three were significant predictors of current behaviors, but of the three, only subjective norms predicted intent (see Table 3). When descriptive norms were added to the TPB models, close-peer and state descriptive norms were predictors of current behaviors, whereas none of the descriptive norms variables predicted intent. Subjective norms was the most powerful predictor across all four models.

Table 3.

Coefficient Table From Hierarchical Linear Regression Analyses of Theory of Planned Behavior and Descriptive Norms Variables on Current Outdoor Water Conservation Behavior and Behavioral Intent

Predictor	Model 1 (current) B (β)	Model 2 (current) B (β)	Model 1 (intent) B (β)	Model 2 (intent) B (β)
Attitude	-.729 (-.104)*	-.550 (-.079)*	.101 (.064)	.121 (.077)*
Perceived behavioral control	.653 (.104)*	.448 (.071)	.008 (.006)	-.016 (-.011)
Subjective norms	2.019 (.412)**	1.176 (.240)**	.479 (.425)**	.370 (.328)**
Close-peer descriptive norms		.723 (.138)*		.112 (.094)
Neighborhood descriptive norms		-.370 (-.071)		-.049 (-.041)
State descriptive norms		.926 (.171)*		.104 (.084)
National descriptive norms		.209 (.041)		.026 (.022)

*Significant at $p = .05$; **significant at $p \leq .001$. B are unstandardized regression coefficients, and β are standardized regression coefficients.

Conclusions, Implications, and Discussion

We concluded that perceptions of what others are doing (i.e., descriptive norms) are related only to current practices and not future behaviors. It could be that the perceptions of whether others are conserving influence individuals at earlier stages and perhaps as they establish their routines. For example, perceptions of one's friends' conservation habits might come into play while an individual selects irrigation technology when installing a new landscape. It also may be possible that for many, once these routines are established they are

simply continued. This also begs the question, however, that if descriptive norms do not predict future behavioral intent, what does? What happens in the time that homeowners live in their homes and make decisions about water conservation behaviors? What are the intervening variables? These questions are fertile ground for future research.

Warner and Hobbs (2020) found that when descriptive norms from the four referent groups were considered together, only close-peer norms predicted current conservation practices among Florida residents. Although this is fascinating, designing communication messages for placement in close-peer networks presents challenges. How do you find those peer networks, and how can you place relevant messages within them? In the national study reported here, we considered the norms as an addition to the TPB and found that both close-peer and state descriptive norms were predictors of current conservation, which partially aligns with Warner and Hobbs (2020). Another Florida study (Warner, 2019) showed the existence of a negative relationship between state descriptive norms and HOA residents' conservation intent. Our national findings do not align with that result in that we found no relationship between state norms and conservation intent and that the relationship we identified between state descriptive norms and current practices was positive. It may be that the impact of state norms on conservation intent varies across states and is affected by state identity. Florida (Warner, 2019) has a more transient population than many other states, which may explain the variation in the impact of state norms. The variation identified by these studies underscores the importance of evaluating descriptive norms within the target audience at the intended scale of an Extension program.

Our findings imply that descriptive norms are best used as a landscape water conservation behavior change strategy early on but may not be as effective once a household has established their irrigation routine or landscape composition. This conclusion, logically, implies that it is more difficult to make changes to plant materials and irrigation infrastructure once they are installed, making it important for Extension to reach residents as they make initial landscape and irrigation decisions. Descriptive norms would therefore have more value as a behavior change tool when integrated into education and communications before someone has installed their landscape or established irrigation habits. Such education and communication efforts may be targeted toward first-time home buyers, residents in new housing developments, and even developers themselves. Financial incentives for adopting best practices for irrigation or landscape composition might be particularly effective at this stage. In practice, Extension professionals might distribute materials by mail to new homeowners or partner with local real estate agents so that the agents can distribute messages conveying a conservation norm when residents buy new homes. Developers, contractors, and landscape designers and managers also are potential partners as they are positioned to convey this norm and offer residents water-saving choices at the point of decision. Future research may test impact of various message frames in this context, focused on such motivations as cost savings, landscape design, or time to maintain various landscapes. Extension professionals might also consider promoting educational programs through channels used when individuals establish a new residency, such as the utility company or a hardware store.

Future research should take into consideration the variability in this large national sample. Subdividing respondents by location (e.g., state, climate, region, rural, suburban, urban) or housing type (e.g., HOA or urban area) could reveal differences in the relationships identified here. It would also be interesting to examine cultural differences among homeowners to determine whether descriptive norms play a different role for homeowners from various backgrounds. Finally, it would be interesting to choose one neighborhood and examine the network of homeowners and how they communicate about their landscapes and water conservation behaviors. Do neighbors discuss these issues with each other? How are these issues discussed at

HOA meetings? What, if anything, do neighbors notice about the water conservation behaviors of their neighbors? Does that affect their own attitudes or behaviors? How do neighbors discuss these issues on platforms such as Nextdoor (a social media platform for neighborhood communities)?

Author Note

The research reported here was supported by the University of Florida Institute of Food and Agricultural Sciences Center for Landscape Conservation and Ecology.

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