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The Effect of Strategic Message Selection on Residents' Intent to Conserve Water in the Landscape

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Abstract

Changing individuals' behaviors is a critical challenge for Extension professionals who encourage good irrigation practices and technologies for landscape water conservation. Multiple messages were used to influence two predictors of behavioral intent informed by the theory of planned behavior, Florida residents' (N = 1,063) attitude and perceived behavioral control. Individuals were randomly assigned to one of four treatment groups, each receiving a different strategically framed message. This article contributes to the literature on landscape water consumption behaviors by (a) demonstrating that messages can be used to positively affect both attitude and perceived behavioral control and (b) identifying specific message frames that may be used to realize greater impact. Two gain-framed message treatments both significantly increased participants' attitude and perceived behavioral control, and one of the loss-framed messages significantly increased participants' attitude. Results are discussed with practical application to promotion of landscape water-conservation behaviors and implications for future research.

Keywords: attitudes; behavior change; irrigation; landscape water conservation; message framing; pro-environmental behavior; social marketing; theory of planned behavior

As resources are depleted and demand rises with an ever-growing population, water has quickly become one of the most contentious global issues facing our society (Levy & Sidel, 2011). Therefore, a focus on landscape water conservation is vital, and numerous Extension professionals focus on this challenge. The largest component of the public-supply water withdrawn goes toward indoor and outdoor domestic usage (Maupin et al., 2014), which makes reaching the residential audience highly important. As urban populations continue to grow and increase pressure on limited fresh-water supplies, concern regarding water has escalated and resulted in a pressing need to

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change individual behaviors toward the adoption of water conservation practices (Kjelgren, Rupp, & Kilgren, 2000; Richetin, Perugini, Mondani, & Hurling, 2014).

Four key states in the U.S. make approximately 35% of all public-supply withdrawals: California, Florida, New York, and Texas (Maupin et al., 2014). Freshwater demands in Florida are projected to increase by 28% by 2030 (EPA, 2014), and traditional solutions, such as treating groundwater, will not meet the demand in the future (Florida DEP, 2014). More than 60% of a Florida household's total water consumption might be directed at the landscape (Haley, Dukes, & Miller, 2007). Typical residential landscape plants often receive more water than is required to perform at a satisfactory level, and this water applied in excess presents an opportunity for conservation (Kjelgren et al., 2000; St. Hilaire et al., 2008).

Practices that Extension professionals promote to encourage water conservation include appropriate irrigation scheduling, reducing turfgrass, harvesting rainwater, and installing soil moisture sensors (SMS) and evapotranspiration controllers (ET) that prevent an irrigation system from operating when not needed (Haley et al., 2007; St. Hilaire et al., 2008; Tsai, Cohen, & Vogel, 2011). By adopting some of the available practices and technologies, residents could save more than 60% of the amount of water previously applied through irrigation without sacrificing landscape quality (Haley & Dukes, 2012; Haley et al., 2007).

To help their target audience achieve water savings, Extension professionals are working to encourage landscape water conservation among residents who use landscape irrigation. Educational mass-media campaigns are frequently used despite the fact that education alone has demonstrated minimal effects on long-term water conservation (Frisk & Larson, 2011; Kjelgren et al., 2000; Syme, Nancarrow, & Seligman, 2000) and other environmental behaviors (Kollmuss & Agyeman, 2002). Because people must take action in order to save water, "[s]uccessfully conserving water on a short- or long-term basis in amenity landscapes means changing the behavior of large numbers of people" (Kjelgren et al., 2000, p. 1040). Mass-media campaigns often are ineffective because of a "mismatch of the campaign information and the specific characteristics of the receiver" (Dancker, Staats, Wilke, & Engelen, 2001, p. 230).

The Role of Messages in Encouraging Water Conservation

There are considerable challenges to changing individual behaviors, such as encouraging individuals to adopt new water-saving practices and technologies (Gilg & Barr, 2006; Syme et al., 2000). One reason changing behaviors is so difficult is that individuals may not believe their actions can make a difference or may not think they will personally benefit from the change (Kronrod, Grinstein, & Wathier, 2012). The use of salient, tailored messages has been recognized as a strategy for engaging individuals in environmentally responsible behavior change (Dancker et al., 2001; Scannell & Gifford, 2011). In their study of garage workers, Dancker et al. (2001) found that messages tailored to individuals' behavior routines resulted in positive environmental behavior change. The authors found that general, non-tailored messages were "hardly more effective than no message" (Dancker et al., 2001, p. 230). In a study using messages to encourage water conservation practices while washing hands, Richetin et al. (2014) found messages that appealed to individuals' normative beliefs were more effective in eliciting the desired environmental behavior. Various communication strategies may be considered by Extension professionals, and failing to appropriately design communication messages can lead to ineffective or misleading campaigns (Goodwin, Chiarelli, & Irani, 2011; Kronrod et al., 2012; Syme et al., 2000). For this reason, it is extremely important to test messages to determine whether the desired behavior change will be achieved.

Brownlee, Hallo, Moore, Powell, and Wright (2014) asserted that little is known about factors that impact a target audience's water conservation attitudes, and Syme et al. (2000) acknowledged a dearth of research demonstrating the effect of campaigns on water conservation attitudes and behaviors. From a study conducted to explore perceptions toward behavior-change

strategies such as social marketing, Warner (2014) reported that Extension key leaders saw an organizational need for improved message development that would lead to behavior change. National initiatives emphasize the need to identify "the types of knowledge, skills, environment, and support systems that facilitate decision-making and adoption processes by individuals and groups" (Doerfert, 2011, p. 8) and identify factors that constrain effective communication and educational efforts to various target audiences.

The purpose of this study was to explore how messages may be used to encourage the adoption of good irrigation practices among residents. The Theory of Planned Behavior (TPB) and framing theory (i.e., framing) were applied to message testing in the current study.

Theoretical Framework

The TPB (Figure 1) describes intent to engage in a behavior as a function of an individual's attitude toward the behavior, their subjective norms, and perceived behavioral control (Ajzen, 1991). *Attitude* refers to the value that is associated with performing a behavior (Ajzen, 1991), and the value could be positive or negative. Individuals are more likely to perform a behavior if they view it with a positive attitude (Ajzen, 1991). *Perceived behavioral control* (PBC) is defined as an individual's perceptions of how easy or difficult the behavior will be for them (Ajzen, 1991). If individuals are confident they can perform a behavior and have the skills and resources needed to adopt it, they are more likely to engage in the behavior. *Subjective norms* refer to whether the people who are important to an individual approve of the behavior and expect it to be performed (Ajzen, 1991). Attitude, PBC, and subjective norms affect an individual's *intention* to perform a behavior, and the greater one's intentions are, the greater his/her likelihood of engaging in the behavior (Ajzen, 1991).

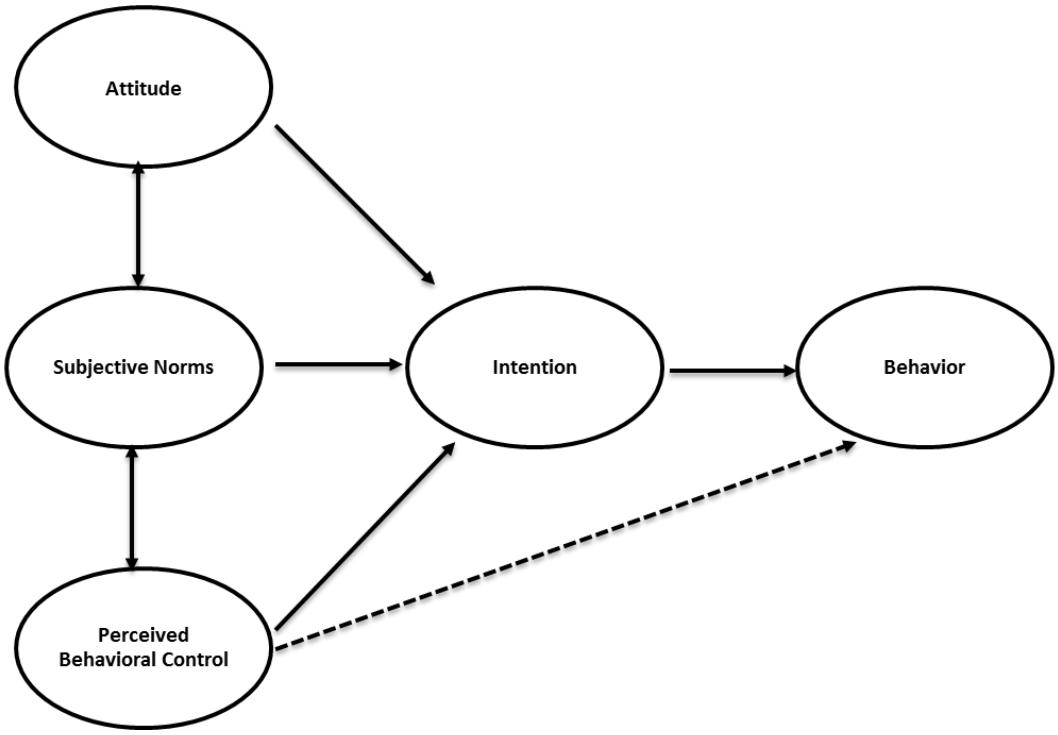

Figure 1. Theory of Planned Behavior. Adapted from "The Theory Of Planned Behavior" by I. Ajzen, 1991, *Organizational Behavior And Human Decision Processes, 50,* p. 182. Copyright 1991 by Academic Press, Inc.

Using the TPB, Lam (1999) found significant influences of PBC and attitude on the intent to conserve water. Likewise, Shaw et al. (2011) found a relationship between subjective norms and intent to install a rain garden to benefit local water resources, and Trumbo and O'Keefe (2005) reported that PBC was the most significant factor in individuals' intent to conserve water. Because attitude, PBC, and subjective norms are strongly related to behaviors, strategies that influence these factors may result in practice changes. One strategy that may influence these factors is framing.

Framing Applied to Water Conservation Practices

Framing is the act of presenting specific elements of some issue or topic and communicating in ways that evoke specific reactions among a target audience (Entman, 1993). The manner in which a message is framed can have a powerful influence on how it is interpreted by target audiences, even though its meaning is not changed (Edelman, 1993, Entman, 1993; Loroz, 2007; Scheufele, 1999; Scheufele & Tewksbury, 2007). Given different presentations of the same decision-making scenarios, individuals may interpret the meaning of an issue differently and make different choices as a result (Scheufele & Tewksbury, 2007). Framing is a way to make water conservation topics more salient among target audience members by presenting "a kaleidoscope of potential realities, and of which can be readily evoked by altering the ways in which observations are framed and categorized" (Edelman, 1993, p. 232).

Extension professionals may frame a communication message using gain-, nongain-, loss-, and non-loss- as well as value- framed messages (Brewer & Gross, 2005; Detweiler, Bedell, Pronin, & Rothman, 1999; Kahneman & Tversky, 1984; Shah, Domke, & Wackman, 1996; Shen & Edwards, 2005). *Gain frames* are messages positioned to communicate the benefits or advantages associated with adopting a specific behavior while *loss frames* communicate the potential disadvantages or negative effects of not making a behavior change (Detweiler et al., 1999). Value framing is another way to position messages because many people consider issues in terms of their beliefs, and appealing to specific values is a way to shape individual opinions and attitudes (Ball-Rokeach et al., 1990; Brewer & Gross, 2005). Research has shown that there is greater opportunity to more effectively impact target audiences when value framing is used (Shah et al., 1996; Shen & Edwards, 2005). Examples of value frames include *financial, social, personal,* and *environmental* frames.

Detweiler et al. (1999) reported people responded differently to messages depending on how they were framed. The researchers measured attitudes and intent to apply sunscreen before and after participants received one of four randomly assigned message frames (Detweiler et al., 1999). The two gain-framed messages were more effective in encouraging sunscreen use, and the influence was most robust among individuals who had no previous intent to apply sunscreen (Detweiler et al., 1999).

Obermiller (1995) conducted studies to explore framing effects on four environmentally responsible behaviors: recycling; waste reduction; water conservation; and energy conservation. The study employed two distinct frames to influence conservation behaviors, and identified differences in reactions caused by the way communication was presented. One frame emphasized the severity of the environmental problem while the other highlighted the potential impact of an individual's actions over the issue (Obermiller, 1995). The environmental frame was more effective for the issues with lower salience among study participants (recycling and waste reduction) while the personal appeal was more impactful for issues of high salience (energy and water conservation).

Thompson and Stoutemyer (1991) explored the effect of various frames on water conservation by randomly assigning households to one of two treatments. A personal frame highlighting the potential impacts of individual actions was more effective than a financial appeal in encouraging sustained water conservation practices in lower- and middle- class households (Thompson & Stoutemyer, 1991). A lack of behavior change among the upper-class households indicated a difference among potential target audiences. The authors concluded that understanding

participants' preexisting attitudes and values is important, and may be used to guide the application of different approaches to encouraging water conservation (Thompson & Stoutemyer, 1991).

The Current Study

Framing research explores the different effects that may be caused by presenting information in different ways (Loroz, 2007). The need to improve the impact of water conservation campaigns through research has been well documented (Syme et al., 2000), and the current study explored the potential impact of message frames to encourage irrigation water conservation practices. The current study tested specific messages with residents who use irrigation in their landscapes. This target audience represented a specific opportunity to conserve water because of the likelihood that they may over apply water through irrigation practices. As water availability becomes a greater priority, it is essential that Extension professionals and other natural resource leaders examine ways to increase the effectiveness of their efforts to encourage landscape water conservation among target audiences (Syme et al., 2000).

This study applied framing and the TPB elements of attitude and PBC to communicating about landscape irrigation water conservation behaviors (Figure 2), considering *attitude toward good irrigation practices, normative beliefs about good irrigation practices,* and *perceived behavioral control over good irrigation practices* as indicators of the *intent to engage in good irrigation practices.* Attitude and PBC were used as dependent variables while message frames were the independent variable. Subjective norms were beyond the scope of this study.

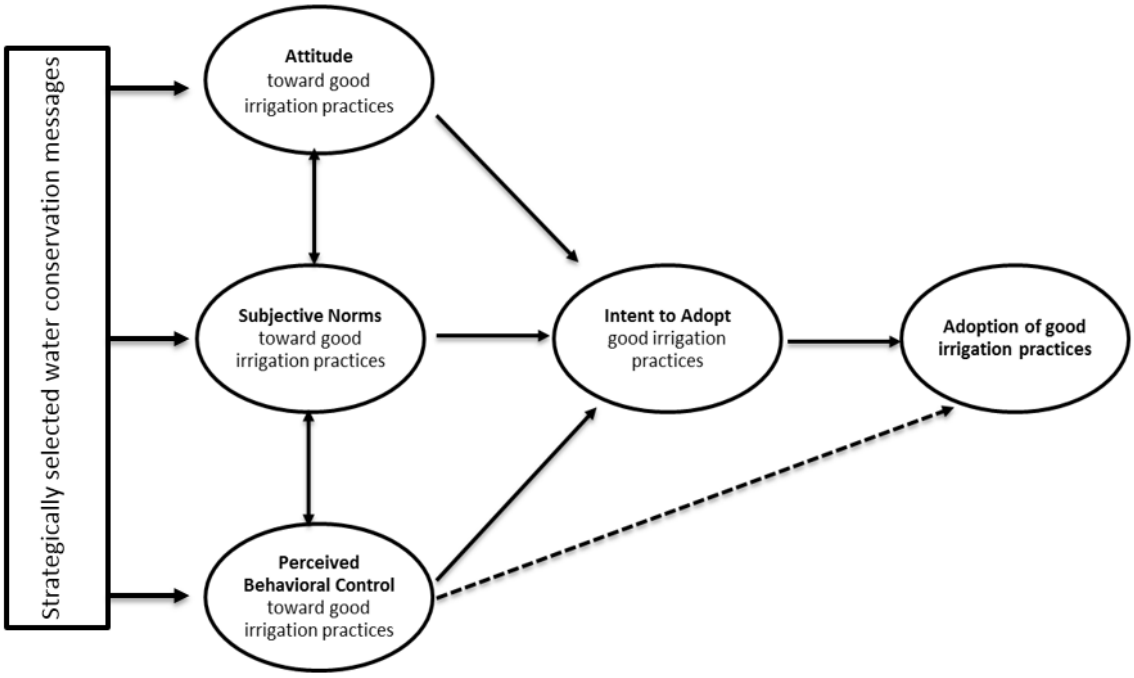

Figure 2. Framing and the Theory of Planned Behavior Applied to the Adoption of Good Irrigation Practices. Adapted from "The Theory Of Planned Behavior" by I. Ajzen, 1991, *Organizational Behavior And Human Decision Processes, 50,* p. 182.

The purpose of this study was to identify how strategic message frames impacted residential irrigators' attitude and PBC toward conserving water through good irrigation practices. This research was guided by the following questions:

Research Question 1: Do strategic messages influence attitude toward irrigation water conservation?

Research Question 2: Do strategic messages influence perceived behavioral control over irrigation water conservation?

Research Question 3: Are all message treatments effective in changing attitude toward irrigation water conservation?

Research Question 4: Are all message treatments effective in changing perceived behavioral control over irrigation water conservation?

Methods

A purposive sample of 1,063 individuals who used irrigation and had control over their property's irrigation system was used for this study. Respondents were recruited through a web-based survey sampling company using a non-probability sampling frame. A non-probability sampling frame was used for recruitment because the target population is relatively undefined. As the use of landscape irrigation is not thoroughly documented and its users are unknown, random sampling of this population was not possible. An early stage of the pilot test attempted to use census matching (data not presented) and revealed that the target population differs from the overall state population. Non-probability samples are not representative of the population (Bryman, 2008), however this type of sampling is commonly used to make estimates about a population (Baker et al., 2013). In this study the sampling procedures were conducted as a way to explore and establish a baseline of individuals who have control over their property's irrigation system. Non-probability samples require adjustments for nonrandom selection and nonresponse and should be recognized as a limitation, however previous literature reveals non-probability samples yield results as good as and sometimes better than probability-based samples (Abate, 1998; Twyman, 2008; Vavreck & Rivers, 2008) especially when targeting a very specific audience that is difficult to reach.

The invitation to participate in the study included a statement of informed consent, approximate length of survey, and potential risk and benefits. Potential respondents who agreed to participate proceeded to a series of questions to determine their eligibility in the study. To meet eligibility criteria, respondents must have been at least 18 years of age, a current Florida resident, owned or rented a property with landscaping, and had an irrigation system over which they controlled.

Message Treatment Selection

The messages used in this study were informed by a pilot test. Pilot-study participants (N = 249) were required to meet the same criteria as the full-study participants, and were not eligible for participation in the full study if they participated in the pilot test. The results revealed that messages framed to appeal to personal and social values were significant (data not presented) and these value frames were used as both gain and loss messages in the full study (Table 1).

Table 1

Strategic Messages Tested in a Study to Determine Change in Florida Residents' Attitude and Perceived Behavioral Control Toward Landscape Irrigation Conservation Practices

Message Frame	Strategic Message
Gain Personal	By conserving water through good irrigation practices you will waste less water throughout your lifetime
Loss Personal	By wasting water through poor irrigation practices you will waste more water throughout your lifetime
Gain Social	By conserving water through good irrigation practices you will be seen as a role model in the fight to ensure that water is available for future generations
Loss Social	By wasting water through poor irrigation practices you will not be seen as a role model in the fight to ensure that water is available for future generations

Intervention: Gain Personal, Loss Personal, Gain Social, and Loss Social Messages

The four strategic messages identified in the pilot study were designated as treatments and tested to determine whether presenting information in messaging frames would affect residents who use landscape irrigation. A researcher-developed survey instrument measured the effect of strategic messages on attitude and PBC, two indicators of intent to adopt irrigation conservation practices. Respondents randomly received one of four message interventions. The instrument incorporated semantic differential scales to measure attitude toward good irrigation practices and PBC over these behaviors both before and after the intervention. A semantic differential scale presents two words on opposite ends of a bipolar scale. This type of scale is useful when the intent of research is to capture respondents' reactions to concepts (Jonas, 2007). Both attitude and PBC were measured through participants' completion of the phrase *implementing good irrigation practices is…*. The six paired response items for attitude included: *good* and *bad*; *important* and *unimportant*; *foolish* and *wise*; *beneficial* and *harmful*; *positive* and *negative*; and *unnecessary* and *necessary*. The five paired response items for PBC included: *possible for me* and *not possible for me; easy for me* and *not easy for me; in my control* and *not in my control; up to me* and *not up to me;* and *practical for me* and *not practical for me*. Both attitude and PBC scales ranged from 1 (low) to 5 (high).

The survey instrument was validated by a panel of experts in irrigation water conservation technologies and practices, agricultural education and communications, housing and community development, and survey design. The expert panel's comments and revisions were incorporated into the final version of the instrument. Some of the items were randomly reversed to reduce response-set bias (Weems & Onwuegbuzie, 2001). Respondents were randomly assigned to one of four treatment groups. Prior to receiving the treatment, each respondents' baseline attitude and PBC were measured. Each respondents' attitude and PBC were measured again after they received the treatment.

Instrument Reliability. The instrument's reliability, as measured by Cronbach's alpha (Table 2) was determined to be acceptable for research (Fraenkel & Wallen, 2008). Cronbach's alpha is considered a suitable measure of reliability when scales are used for research (Santos, 1999), and .70 and greater is considered to be an acceptable reliability score (Fraenkel & Wallen, 2008). Following data collection, previously reversed items were restored and grand means were calculated by averaging the means within each construct. The full study data were analyzed using paired *t*-tests.

Table 2

Scale Reliability for Attitude and PBC in a Study to Determine Change in Florida Residents' Attitude and Perceived Behavioral Control Toward Landscape Irrigation Conservation Practices

Scale	Number of Items	Cronbach's Alpha
Pre-Attitude	6	0.89
Pre-PBC	5	0.89
Post-Attitude	6	0.91
Post-PBC	5	0.90

Results

Descriptive statistics (Table 3) revealed that of the 1,063 respondents, there were more women than men. Slightly more than half had at least a 4-year degree while slightly fewer than half had a 2-year degree or less. Homeowners' Association (HOA) members comprised approximately half of all respondents. The majority of all respondents owned their home.

Table 3

Characteristics of Florida Residents Who Use Irrigation in the Home Landscape (N=1,063)

Characteristic	*n*	*%*
Sex		
Female	610	57.4
Male	453	42.6
Race		
African American	61	5.7
Asian	36	3.4
Caucasian/White (Non–Hispanic)	948	89.2
Native American	19	1.8
Hispanic Ethnicity	101	10.6
Home Owners' Association (HOA)		
Belong to an HOA	524	49.3
Do Not Belong to HOA	539	50.7
Irrigation Water Source		
City (municipal)	542	51.0
Irrigation Well	295	27.8
Reclaimed Water	167	15.7
Other	37	3.5
I don't know	22	2.1
Live Within City Limits		
Within City or Town Limits	729	68.6
Outside of City or Town Limits	334	31.4

Research Question 1: Do Strategic Messages Influence Attitude Toward Irrigation Water Conservation?

Research Question 1 sought to identify whether strategic messages influence attitude. A paired *t*-test for equality of means revealed a statistically significant difference between Pre-Attitude and Post-Attitude indicating that strategic messages had a positive influence on respondents' attitude (Table 4). Prior to receiving a treatment message, the overall mean for all respondents was 4.72 (*SD* = .49) on a five-point scale. After receiving a treatment message, the mean attitude increased to 4.76 (*SD* = .49).

Table 4

Strategic Messages Influence on Attitude in a Study to Determine Change in Florida Residents' Attitude and Perceived Behavioral Control Toward Landscape Irrigation Conservation Practices (N = 1,063)

Pre-Attitude		Post-Attitude				
M	*SD*	*M*	*SD*	*p*	*t*	*d*
4.72	.49	4.76	.49	.00*	-3.95	.08

Note. * $p < .001$
Scale: 1 (low) to 5 (high).

Research Question 2: Do Strategic Messages Influence Perceived Behavioral Control Over Irrigation Water Conservation?

Research Question 2 sought to identify whether strategic messages influenced PBC. Paired *t*-tests revealed the strategic messages positively influenced respondents PBC (Table 5). Prior to receiving a treatment message, the overall PBC mean for all respondents was 4.39 (*SD* = .68) on a five-point scale. After receiving the treatment message, PBC increased to 4.44 (*SD* = .69).

Table 5

Strategic Message Influence on PBC in a Study to Determine Change in Florida Residents' Attitude and Perceived Behavioral Control Toward Landscape Irrigation Conservation Practices (N = 1,063)

Pre-PBC		Post-PBC				
M	*SD*	*M*	*SD*	*p*	*t*	*d*
4.39	.68	4.44	.69	.00*	-3.83	.08

Note. * $p < .001$
Scale: 1 (low) to 5 (high).

Research Question 3: Are All Message Treatments Effective in Changing Attitude Toward Irrigation Water Conservation?

Paired *t*-tests revealed there was a statistically significant increase in attitude for Gain Personal, Loss Personal, and Gain Social treatment groups (Table 6). Although there was an increase in attitude mean for Loss Social, this increase was not statistically significant.

Table 6

Message Frame Influence on Attitude in a Study to Determine Change in Florida Residents' Attitude and Perceived Behavioral Control Toward Landscape Irrigation Conservation Practices (N = 1,063)

	Pre-Attitude		Post-Attitude		*p*	*t*	*d*
	M	*SD*	*M*	*SD*			
Gain Personal (*n* = 260)	4.67	.57	4.73	.55	.01**	-2.96	.10
Loss Personal (*n* = 266)	4.75	.44	4.79	.44	.03**	-1.80	.09
Gain Social (*n* = 265)	4.73	.46	4.77	.49	.03**	-3.59	.09
Loss Social (*n* = 265)	4.74	.47	4.76	.50	.44	.27	

Note. ** $p < .05$. Pre-Attitude and Post-Attitude are calculated based on $n = 1056$ responses. Scale: 1 (low) to 5 (high).

Research Question 4: Are All Message Treatments Effective in Changing Perceived Behavioral Control over Irrigation Water Conservation?

Paired *t*-tests revealed both gain-framed messages were effective in impacting PBC (Table 7). Respondents who received either of the gain-framed messages had a statistically significant increase in PBC. Although there was an increase in PBC among the Loss-Personal treatment group, the increase was not statistically significant.

Table 7

Message Frame Influence on Perceived Behavioral Control in a Study to Determine Change in Florida Residents' Attitude and Perceived Behavioral Control Toward Landscape Irrigation Conservation Practices (N = 1,063)

	Pre-PBC		Post-PBC		*p*	*t*	*d*
	M	*SD*	*M*	*SD*			
Gain Personal (*n* = 260)	4.36	.67	4.44	.67	.00*	-2.96	.12
Loss Personal (*n* = 266)	4.39	.71	4.44	.70	.07	-1.80	
Gain Social (*n* = 265)	4.41	.65	4.49	.65	.00*	-3.59	.13
Loss Social (*n* = 265)	4.40	.67	4.39	.75	.79	.27	

Note. * $p < .001$. Pre-PBC and Post-PBC are calculated based on $n = 1056$ responses. Scale: 1 (low) to 5 (high).

Conclusion

The results of the study confirmed the presentation of strategic messages does have an impact on attitude and PBC among individuals who use irrigation in their home landscape. The Gain-Personal and Gain-Social treatments resulted in statistically significantly increases in both post-attitude and post-PBC mean scores. The Loss-Personal treatment resulted in a statistically significant increase in post-attitude score only.

Gain-framed messages have been described as "far more motivating" (Detweiler et al., 1999, p. 195) than their loss-framed counterparts. In the current study, individuals with control over their home irrigation system were more likely to have an increased attitude and PBC after receiving a message framed as a gain. These results are consistent with other studies which have reported that messages framed as gains are generally more effective than messages framed as losses (Detweiler et al., 1999).

Other research has demonstrated that loss-framed messages can be more effective for specific situations and issues (Idson, Liberman, & Higgins, 2000), such as when an individual would personally feel the negative impact of not changing a behavior (Davis, 1995). However, the effectiveness of the loss-framed message depends on the vulnerability of the individuals. This study demonstrated the Loss-Personal frame treatment resulted in a statistically significant increase in attitude, but not PBC. The Loss-Social treatment did not result in a statistically significant difference for either measure.

A major challenge to persuading Extension clients to adopt environmentally responsible practices is that individuals often do not believe they will benefit from a behavior change or that they can personally contribute to resolving the problem (Kronrod et al., 2012). Thompson and Stoutemyer (1991) found that an appeal to personal actions more effectively encouraged water conservation than one appealing to a financial frame.

With a statistically significant increase in both attitude and PBC, it was concluded that gain frames are more effective overall than loss frames when communicating about irrigation conservation practices. Both personal and social frames may be effective in encouraging residential audiences to adopt water conservation practices and technologies.

Implications and Recommendations

These findings provide evidence that messages do have the potential to increase attitude and PBC toward using good irrigation practices that may be linked to increased intent to adopt new conservation behaviors and ultimately act. Additionally, these findings demonstrate that the strategic selection of how a water conservation message is presented matters greatly. Without changing the meaning of what is being asked or communicated, appropriately framed messages become more salient to the residential irrigator audience. Therefore, the use of more impactful messages that do increase PBC and attitude is more likely to lead to the intent to engage in landscape water conservation. Extension professionals should utilize these effective message frames in their programs and communications with target audience members. Messages that lead to environmentally responsible behavior changes, such as the adoption of good irrigation practices, ultimately can lead to water conservation.

These research findings provide insights for the development of strategic messages to encourage landscape water conservation. It was concluded that the manner in which a tailored message is presented does make a difference in the way the target audience processes it, which aligns with conclusions of Dancker et al. (2001). Extension professionals might be tempted to overlook their target audience's psychological factors (Syme et al., 2000), but it is critical to incorporate inherent behavioral complexities when developing and implementing water conservation campaigns (Gilg & Barr, 2006). The authors of this study believe that people who communicate with the public can benefit by recognizing the importance of strategically developing

appropriate messages when encouraging landscape water conservation behaviors. Extension professionals can benefit by selecting gain message frames appealing to their target audience members' social and personal values because these messages are more likely to impact attitude and PBC toward water conservation practices.

Extension professionals have indicated a need for training to develop messages that lead to behavior change based on specific audience needs (Warner, 2014). Provision of professional development activities to increase Extension professionals' ability to develop strategic messages might increase the impact of their work. Because message framing does have an impact on attitude and PBC, Extension professionals can benefit by considering the importance of selecting a frame that can effectively influence their target audience. People who design professional development experiences for Extension professionals should raise awareness of the importance of framing messages appropriately. Professional development activities designed to support practitioners in their construction and testing of messages should be provided. Extension professionals should be provided with training on the concept of message framing and should be given opportunities to learn to frame messages in ways that are salient with a target audience's needs and values. It is not suggested that Extension professionals should memorize specific framed messages, but that they be taught to use effective message frames in programming and conversations with clientele. Training can be conducted to increase competencies in audience analysis, relating messages to a target audience's needs, and creating impactful, appropriately designed messages designed to result in behavior change. For example, Extension professionals should learn to examine existing promotional and educational materials and even their own personal communication styles and identify the frames being used. Then, if they find that impactful message frames are not being used, they should thoughtfully modify future materials to incorporate them.

This work contributes toward an unmet need to research strategies that lead to informed decision-making (Doerfert, 2011) and water conservation behavior adoption (Syme et al., 2000). The authors of this research recommend that further study be conducted to explore the impacts of strategic messaging on engagement in landscape water conservation behaviors. Further message testing needs to be conducted and message effects need to be examined in a qualitative setting. The messages that tested well in this study may be further tested for use in gaining audience attention and starting conversations on water conservation, such as on promotional materials. Additional research might explore various message frames' impact on residents' actual adopted water conservation behaviors preceding a campaign. Furthermore, the further study of gain and loss frames, as well as value frames, should be researched in other natural resource contexts to explore the breadth of applicability for these findings.

This study is limited by the use of a non-probability sample, which constrains findings to the Florida residents who have control over their home irrigation system and elected to participate in the study. Notwithstanding the limitation of the sampling technique, this research helps to extend the knowledge about Florida residents that use irrigation in their home landscapes. An additional limitation is that actual engagement in irrigation conservation practices following the intervention was not collected, and there could be a potential gap between intent to conserve and actual landscape water conservation practices (Lam, 1999). Though the change in attitude and PBC was documented, it was beyond the scope of this study to track participants' water use behaviors. Additionally, Cohen's effect size values suggested low practical significance among the messages that resulted in statistically significant differences in PBC and attitude (Cohen, 1988). However, the messages that tested well among this target audience offer a starting point for application and further study.

Efforts are needed to incorporate tailored messages for residents who use irrigation in their home landscapes and have the potential to conserve substantial amounts of water. Gain personal- and gain social-framed messages should be considered as tools to encourage the adoption of landscape water conservation practices and technologies among this audience. Loss personal messages also may have potential for use. Extension professionals can use the findings of this study

to develop targeted interventions using communication materials that focus on increasing target audience members' attitude and PBC toward good irrigation practices. These changes ultimately can create behavior change that leads to crucial conservation of limited water resources.

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