Modeling Determinants of Residential Water Conservation Behaviors to Inform Agricultural Education Programs

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Introduction

Water scarcity is one of the biggest threats to humankind and it is only expected to worsen due to climate change and population growth (Si et al., 2022). The severity of water scarcity is overlooked by many United States consumers as water is often provided for a low cost (Warner et al., 2018). Residential households have the ability to reduce water demands, but determinants of water saving behavior need to be examined to encourage voluntary residential reduction (Koop et al., 2019). Investigating the factors which may mitigate excessive residential water consumption is relevant to the 2016-2020 American Association for Agricultural Education National Research Agenda. Specifically, priority area seven of the research agenda calls for addressing complex problems in natural resource management, especially those related to water.

Theoretical Framework

The Theory of Planned Behavior (TPB; Ajzen, 1991) is frequently used to examine why individuals perform volitional conservation behaviors (e.g., Ho et al., 2014; Howell et al., 2014), including water conservation (e.g., Chaudhary et al., 2017; Si et al., 2022; Warner & Diaz, 2021). TPB is extended in water literature to include additional predictors, often increasing the variance explained by the theoretical model (e.g., Chaudhary et al., 2017; Si et al., 2022; Warner & Diaz, 2021). Motivations for behavioral actions, often grouped as either intrinsic and/or extrinsic motivation (Deci & Ryan, 1980; Stern, 2018), may help further explain residential water conservation behavior because it is unlikely an individual will perform a behavior without motivation (e.g., Li & Wen, 2019). Intrinsic motivation is defined as performing an action for the inherent satisfaction of the activity itself, whereas extrinsic motivation is defined as performing an activity for an external reward to avoid a punishment (Deci & Ryan, 1980; Stern, 2018). Therefore, the purpose of this study was to determine whether intrinsic motivation and/or extrinsic motivation predicted residential water conservation behavior beyond the TPB.

Methods

Data were collected in September 2022 from residents of Florida, Georgia, and Alabama using an online questionnaire ($N = 907$). Non-probability, opt-in sampling methods were used to recruit respondents (Baker et al., 2013). The University of Georgia Institutional Review Board (IRB #00005553) approved the research design.

A researcher-developed TPB instrument was constructed based on recommendations within the literature (Ajzen, 1991). Attitude (A) toward residential water conservation was measured using seven items on a five-point, semantic differential scale ($\alpha = 0.89$). Subjective norms (SN) and Perceived Behavioral Control (PBC) toward water conservation were each measured using five items on a five-point, Likert-type scale ranging from 1 = strongly disagree to 5 = strongly agree ($\alpha = 0.87$, $\alpha = 0.88$, respectively). Self-reported residential conservation intention was measured using five items on a five-point, Likert-type scale from 1 = very unlikely to 5 = very likely ($\alpha = 0.81$). Self-reported residential conservation behavior was measured using three items on a five-point Likert-type scale from 1 = very unlikely to 5 = very likely ($\alpha = 0.79$). Intrinsic motivation (IM) towards water conservation was measured using five items on a 5-point Likert-type scale from 1 = strongly disagree to 5 = strongly agree ($\alpha = 0.90$). Extrinsic motivation (EM) towards

water conservation was measured using three items on a five-point Likert-type scale from 1 = strongly disagree to 5 = strongly agree ($\alpha = .88$).

The proposed model included direct paths from A, SN, and PBC on intention and intention on behavior. IM and EM were treated as mediating variables between intention and behavior. The Sobel test for mediation indicated mediation was present with IM but not with EM; therefore, IM remained a mediator in the model between intention and behavior but EM was only examined as a direct effect on behavior. A structural model was analyzed in R using the Lavaan package to examine the effects of the variables on behavior. Structural model fit indices were deemed acceptable (CFI = .91; TLI = .90; RMSEA = .06; Hooper et al., 2008).

Results

In the model, A (standardized = 0.35, $p < .001$) and SN (standardized = 0.30, $p < .001$) both had a significant direct effect on intention. PCB (standardized = 0.03, $p = .48$) did not have a significant direct effect on intention. The variables explained 31.2% of variance in intention. Intention (standardized = 0.21, $p < .001$) had a significant direct effect on behavior. EM had a significant direct effect on behavior (standardized = -0.47, $p < .001$). Mediation was present in the model. Intention had a significant indirect effect on behavior mediated by IM (standardized = -0.05, $p < .01$). The direct effect of intention on behavior (standardized = 0.20, $p < .001$) increased slightly when IM was present (standardized = 0.21, $p < .001$). IM (standardized = -0.13, $p < .001$) had a significant direct effect on behavior. In total, the TPB model with the inclusion of IM and EM explained 30.7% of variance in behavior.

Conclusions and Recommendations

The results were both expected and unexpected based on existing literature. For example, TPB had direct effects on intention as anticipated; however, these effects were limited to A and SN. The unanticipated results included non-significant effects of PBC on intention, as well as negative effects for both IM and EM on behavior. These observations contradicted previous studies related to environmental intentions (Li & Wen, 2019). It is possible respondents were not motivated to conserve water because residential water has always been available at a low cost; therefore, no rewards or punishments have been considered by the public in relation to water consumption. A potential interpretation of the negative effect of motivation on behavior may be related to the Intention-Action gap (Vermeir & Verbeke, 2006) where individuals desire a behavior, in this case motivation. However, their actions, in this case self-reported behavior, do not manifest.

The results of the present study are novel as they empirically indicate water conservation behaviors may be more effectively influenced through A and SN than through individual, self-directed, motivation. Based on these findings, a recommendation is for agricultural educators to focus water conservation programming on attitudes and subjective norms. Additionally, agricultural educators should work with leaders in communities to initiate conversations around residential water use to create a social norm surrounding water conservation behaviors. For example, programming for homeowners association leadership may help establish norms for other members within a community.

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