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Environment and Behavior published online 20 December 2013
DOI: 10.1177/0013916513515239

Environment and Behavior
201X, Vol XX(X) 1–25

DOI: 10.1177/0013916513515239
eab.sagepub.com
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Exploring Beliefs About Bottled Water and Intentions to Reduce Consumption: The Dual-Effect of Social Norm Activation and Persuasive Information

Sander van der Linden[1,2]

Abstract

Mass consumption of bottled water is contributing to a multitude of environmental problems, including water wastage, pollution, and climate change. The aim of this study is to advance a social-psychological understanding of how to effectively reduce bottled water consumption. An online survey experiment was conducted among students of a Dutch public university to explore outcome beliefs about drinking less bottled water while testing three strategies for behavioral change. Respondents (N = 454) were randomly allocated to four different conditions (an information-only, social norm-only, a combination of both, or a control group). It was hypothesized that the combination (i.e., norm-induced information provision) would be most persuasive and elicit the greatest reduction in intentions to buy bottled water. Results were consistent with this hypothesis. Findings also show that while beliefs about health, taste, water quality, lifestyle, the environment, and perceived alternatives are all correlated with bottled water consumption, belief strength varies significantly based on rate of consumption.

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Keywords
sustainable consumption, behavior change, social influence, persuasion, experiment, communication, pro-environmental behavior

Bottled water is often referred to as one of capitalism's greatest mysteries: "The packaging and selling of something that is already freely available" (Queiroz, Rosenberg, Heller, Zhouri, & Silva, 2012, p. 328). Indeed, while in many countries perfectly safe water from the tap is offered at little or no cost (Wilk, 2006), the consumption of bottled water around the world has exploded in the past decade, increasing vastly and steadily (Beverage Marketing Corporation [BMC], 2012). In the United States alone, more than 30 billion bottles of commercially produced water are sold every year (Gleick, 2010). On average, it takes about 3 liters of regular water to produce 1 liter of bottled water (Pacific Institute [PI], 2007), at 2011 consumption rates, that amounts to a wastage of over a 100 billion liters of water a year. This is happening at a time when scarcity of fresh water—one of the earth's most treasured natural resources—is becoming a rapidly increasing concern, currently affecting every continent in the world (Food and Agricultural Organization [FAO], 2007) and likely to be exacerbated by climate change (Bates, Kundzewicz, Wu, & Palutikof, 2008). In fact, the latest report on global water usage already speaks of a "global water crisis" (Gleick, 2011).

Access to fresh water is also becoming a salient issue for the general public as concerns over drinking water were ranked highest among a total of eight environmental issues in a recent poll (Gallup, 2010). Yet, managing the demand for water requires more than just knowledge of how people use water: It also requires extensive knowledge about the behavioral aspects of water consumption, as knowledge of the psychological determinants of water conservation will help governments identify more efficient and more effective strategies for behavioral change (Gregory & Di Leo, 2003; Syme, Nancarrow, & Seligman, 2000).

Environmental Psychology and Water Conservation

In light of these challenges, *water conservation* is becoming an imminent issue on both the academic research as well as the public policy agenda (Russell & Fielding, 2010). Yet, despite an urgent need for more research in this area, the subject of water conservation has traditionally received relatively little attention in the applied social and environmental psychology literature (Corral-Verdugo, Bechtel, & Fraijo-Sing, 2003; Trumbo, Markee,

O'Keefe, & Park, 1999); this continues to ring true today, especially when compared with the growing field of energy conservation (Russell & Fielding, 2010). Nonetheless, existing studies have identified a plethora of psychological predictors of both household as well as individual water conservation intentions and behaviors, including environmental knowledge, values, attitudes, perceived behavioral control, social norms, moral norms, habits, and personal involvement as well as a host of economic, socio-demographic, and dwelling characteristics. For recent comprehensive and extensive surveys of this literature, see Jorgensen, Graymore, and O'Toole (2009), Russell and Fielding (2010), as well as Dolnicar, Hurlimann, and Grün (2012).

Yet, previous research has nearly solely investigated *residential* water use, predominantly studying the potential of water conservation resulting from daily behaviors such as gardening, cooking, washing, and showering (e.g., Aitken, McMahon, Wearing, & Finlayson, 1994; De Oliver, 1999; Gregory & Di Leo, 2003; Lam, 1999, 2006; Trumbo & O'Keefe, 2005). While there undoubtedly is potential for conservation in this area, the aforementioned behaviors are all, to some degree, necessary for (daily) human functioning.

Bottled Water Consumption

In contrast to residential water use, the applied psychology literature has largely (if not completely) neglected bottled water consumption and to this extent, only few researchers have recognized a distinction between residential water use and the consumption of water outside of the household (e.g., Gilg & Barr, 2006). This is peculiar because the consumption of bottled water is particularly troubling compared to other forms of water usage due to the multidimensionality of associated consequences. Water bottles are often made out of polyethylene terephthalate (PET). While PET is recyclable, only a third of all water bottles produced in the United States were actually recycled in 2012 (National Association for Pet Container Resources [NAPCOR], 2013) and thus a majority of the waste is going to landfills if not ending up as litter on land, in rivers, and oceans (Olson, 1999). The production of bottled water is also highly inefficient, wasting tremendous amounts of water in the process (PI, 2007). Furthermore, in 2011, it took more than 2.5 million tons of carbon dioxide (CO2) to produce the amount of bottled water required for U.S. consumption—as energy is needed for packaging, transportation, and refrigeration (Gleick & Cooley, 2009). Thus, next to not only wasting a valuable resource, the production and consumption of bottled water also has a significant and damaging impact on the natural environment and contributes to climate change.

Moreover, the general public is generally not aware of the fact that harmful toxic chemicals such as antimony can leach from PET bottles (Shotyk, Krachler, & Chen, 2006) and accordingly, numerous contamination incidents have been reported (Gleick, 2004). In addition, bottled water companies do not have to adhere to the same quality control and accountability standards as public drinking water sources (Olson, 1999). In fact, a significant amount of studies, conducted in a wide range of countries have consistently indicated that just because water comes out of a bottle, this is no guarantee whatsoever that it is any safer or cleaner than water from the tap (e.g., Ahmad & Bajahlan, 2009; Lalumandier & Ayers, 2000; Olson, 1999; Raj, 2005; Saleh et al., 2008; Saleh, Ewane, Jones, & Wilson, 2001). In summary, bottled water consumption is a viable candidate for water conservation, as the negative environmental and societal impacts associated with its use can be avoided by drinking tap water instead (Saylor, Propoky, & Amberg, 2011).

A survey of the literature on consumer (risk) preferences suggests that bottled water use is not so much driven by brand loyalty but rather by differences in beliefs and perceptions about water (Gorelick et al., 2011) and to some extent a function of location (e.g., home versus work) or intended use (direct or indirect consumption). In the past decade, a variety of quantitative and qualitative studies across various disciplines have provided convergent validity for the idea that consumer decisions to purchase bottled water are predominantly driven by (1) *organoleptics* (i.e., sensorial information about taste, odor, and sight) and (2) *quality and health* concerns, followed by mediating factors such as (3) *convenience*, (4) *price considerations*, (5) *lifestyle*, and (6) *environmental concerns* (cf. Anadu & Harding, 2000; Doria, 2006, 2010; Doria, Pidgeon, & Hunter, 2005; Ferrier, 2001; Gleick, 2010; Gorelick et al., 2011; Hu, Morton, & Mahler, 2011; Jardine, Gibson, & Hrudey, 1999; Levallois, Grondin, & Gingras, 1999; O'Donnell & Rice, 2012; Saylor et al., 2011; Ward et al., 2009; Wilk, 2006). Yet, while these studies have successfully explored the motives that lead people to purchase bottled water, no study has investigated the beliefs that people hold about the positive and negative outcomes of reducing their bottled water consumption.

Reducing Bottled Water Consumption

It is surprising that no published study to date has effectively explored how to potentially reduce bottled water consumption. Given the lack of empirical evidence, it seems appropriate to draw on insights from the broader conservation psychology literature. Voluntary water conservation is often promoted through public information campaigns, yet concrete empirical evidence for the effectiveness of "save water" campaigns is scarce and remains mostly

inconclusive (Syme et al., 2000). In fact, a recent meta-review of 87 experimental studies conducted in the field of environmental behavior reports less than a handful of studies related to water conservation (Osbaldiston & Schott, 2012). An early study by Kantola, Syme, and Nesdale (1983) found that showing students various informational films about saving water altered existing beliefs and led to greater conservation intentions. Similarly, a recent experiment by Fielding et al. (2013) also concluded that information provision led to significant water savings.

In contrast, Johnson (2002) found that although people seem to be open to learning more about the quality of their drinking water, providing people with comparative information about utility-provided (vs. bottled) water does not seem to significantly affect behavioral outcomes. Both Johnson and Saylor et al. (2011) comment that simply providing people with information might not be sufficient to elicit significant changes in behavior. While evidence appears to be mixed in the context of water conservation, increasing criticism has been expressed more generally toward traditional information-based campaigns on the grounds that increased knowledge and understanding of environmental issues often does not ultimately lead to a change in behavior (e.g., Abrahamse, Steg, Vlek, & Rothengatter, 2005; Kollmuss & Agyeman, 2002; Stern, 1999). Instead, a great deal of focus has shifted toward the underestimated role of social norms (e.g., Cialdini, Kallgren, & Reno, 1991; Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007) and numerous (field) experiments have demonstrated the potential of leveraging social pressure in the context of environmental behavior (e.g., Cialdini, 2003; De Groot, Abrahamse, & Jones, 2013; Griskevicius, Cialdini, & Goldstein, 2008; Smith et al., 2012).

While knowledge and social norms have both been identified as important antecedents of water consumption (e.g., Jorgensen et al., 2009), it has been suggested (e.g., Doria, 2010) that *interpersonal* information (e.g., from friends and peers) might have a stronger influence on perceptions and behavior than *impersonal* information (i.e., information-based media campaigns). Yet, no evidence is provided to support the supposed superiority of either approach. In fact, a serious lack of direct comparative experimental evidence more generally leaves little clues as to "what works" in the context of water conservation (Fielding et al., 2013) and even more so in the context of bottled water, where survey research has been largely descriptive (Doria, 2006).

Instead of contrasting different approaches, van der Linden (in press) proposes that cognitive, normative, and experiential factors should be integrated as much as possible in the design of (environmental) communication messages, as information tends to be more persuasive when it appeals to multiple aspects of human behavior. Indeed, there is good evidence for the idea that normative and cognitive information share complex interdependencies (e.g.,

Werner, Sansone, & Brown, 2008), especially in the context of consumer behavior (Ryan, 1982). Yet, the process of social influence and particularly its relation to informational processing is still not well understood (Göckeritz et al., 2010). Dolan and Metcalfe (2012) comment that little is known about the interaction between social norms and information provision and that past research may have overstated the influence of social norms relative to the role of knowledge in behavioral change. There are currently no known studies that have experimentally investigated the relative advantage of combining the activation of social norms with the provision of (persuasive) information in the context of bottled water consumption (and very few in the context of environmental behavior more generally). One example is the study by Dolan and Metcalfe, who, based on a large-scale energy conservation experiment, concluded that providing information alongside social norm messages is key to the success of behavioral change interventions. Yet, the authors do not seem to advance any substantial theoretical insight that could potentially explain why the combination condition proved superior. The current article argues that making social norms salient while providing information is potentially more effective because it draws on a number of important underlying psychological processes.

To start with, whether or not information is persuasive depends to a large extent on how that information is processed. Following the elaboration likelihood model (Petty & Cacioppo, 1986), Bator and Cialdini (2000) suggest that pro-environmental communication campaigns should focus on a central route to persuasion, as centrally processed information is more likely to elicit lasting changes in behavioral outcomes. The authors suggest that one way to motivate (more) central processing is to make social norms salient in the message. Indeed, it has been suggested that information provision is likely to be more effective if it reminds people that there are norms supporting the desired behavior (e.g., Stern, 1999). In fact, there is now substantial evidence that social norms can moderate the attitude–behavior relationship (e.g., Lam, 2006; Smith & Louis, 2007). Because individual beliefs are often a function of the social group to which an individual belongs, an informational message is expected to be more persuasive if the right in-group source and context are provided (Van Knippenberg & Wilke, 1992). This is so because in-group references tend to receive a positive bias and hence a greater level of perceived credibility (Clark & Maass, 1988). Indeed, Mackie, Worth, and Asuncion (1990) as well as Van Knippenberg, Lossie, and Wilke (1994) have shown that persuasive messages from "in-group members" elicit more systematic processing and increase the overall validity and persuasiveness of the communication.Thus, the interplay between activating social norms and the provision of persuasive information is likely to increase central processing of

the message content. Particularly because social support from relevant in-group members increases motivation to mentally evaluate the arguments presented—making it easier for individuals to fit new information into existing belief structures. At the same time, persuasive informational arguments to buy less bottled water make it easier to support the advocated positive group norm. In short, it is hypothesized that the combination (dual) condition is likely to cause the greatest reduction in intentions to purchase bottled water.

The Present Research

The aim of the current article is to establish an applied social-psychological understanding of how to reduce bottled water consumption. The first part of the study is mainly exploratory and investigates participants' beliefs about bottled water. While previous research has identified beliefs that underlie consumer decisions to purchase bottled water, so far, no study has looked at relevant *outcome-beliefs* that are associated with *reducing* bottled water consumption and particularly to what extent these beliefs might differ as a function of an individual's consumption rate. Attaining a better understanding of the beliefs that people hold with regard to reducing their bottled water consumption will help future research identify and design persuasive message strategies. In the second part of the study, viable ways for changing behavioral intentions are explored experimentally. Four conditions are tested, namely (a) *persuasive information*, (b) *activating social norms*, (c) a *combination of both*, and (d) a *control group*. Consistent with the above discussion, it is hypothesized that a strategy that combines social-norm activation with the provision of persuasive information is likely to elicit the greatest reduction in intentions to purchase bottled water

Method

Participants

The current study surveyed students of a Dutch public university in October and November of 2012. A university-wide e-mail was sent out and a total of $N = 454$ responses were gathered. After screening out respondents who do not consume bottled water at all ($n = 53$), a total of $n = 401$ valid responses remained. The general sample characteristics are as follows: undergraduates (41%), graduates (47%), and postgraduates (12%). In addition, a substantial majority of the respondents were female (70%) compared to male (30%).[1]

Procedure

Students received an e-mail in which they were asked to click on a web-link that directed them to the study. Four separate surveys were used. The web-link was programmed so that respondents were randomly assigned to either the control or to one of the three treatment group versions of the questionnaire. The survey administered to the *information-only* condition (n = 93) included a traditional 1-page (persuasive) information-based article about bottled water consumption. The article was titled "The Truth About Bottled Water" (see online appendix). Because research has indicated that *university affiliation* is a strong in-group norm (e.g., Mackie et al., 1990; Smith et al., 2012), the survey administered to the *social norm-only* condition (n = 103) falsely informed students about a recent university-wide survey reporting that 65% of the university's *student body* (referent group) is currently making strong efforts to reduce their bottled water consumption (*descriptive norm*). The message also approved of and stressed the desirability of the behavior by highlighting that reducing bottled water consumption is congruent with the university's dedication to "*sustainability*" through a *student-driven* approach (*prescriptive norm*). Ensuring that descriptive and prescriptive norms are aligned and made salient is important for social norms to affect behavior in the desired direction (Cialdini, 2003; Smith et al., 2012).

In the *combined* condition (n = 116), the survey first primed students with the social norm message before proceeding to the information article. The survey administered to the control group (n = 80) was identical except for the fact that it did not feature any kind of treatment. The duration of the survey was about 10 to 15 minutes and the structure was as follows: Respondents were first asked to report their past level of bottled water consumption, followed by a few questions about their background and beliefs toward reducing bottled water consumption. The respondents were then subsequently subjected to the treatment conditions, followed by a series of unrelated questions (and manipulation checks) and finally asked for their intention to buy bottled water in the future. The chosen design allowed for the maximum distance (time lapsed) between the pre-test (past behavior) and post-test (intention) measures.

Measures

Outcome beliefs. The belief-based measures were presented as seven single-item statements describing a range of potential outcomes related to reducing bottled water consumption. The content of the statements was based on previous research about bottled water as well as on the results of a free elicitation exercise that was part of a short pilot study conducted in 2010. Using a 7-point scale, respondents were asked to rate the likelihood (1 = *extremely*

unlikely, 7 = *extremely likely*) of each outcome (e.g., "reducing my bottled water consumption will *not* affect my intake of high quality water). Because the main point of interest is to analyze differences in belief scores (and not to predict or represent more complex psychological constructs), single-item measures were deemed sufficient—which is in line with empirical evaluations of the validity of single-item measures in this context (e.g., Bergkvist & Rossiter, 2007; Gardner, Cummings, Dunham, & Pierce, 1998).

Intention. The dependent variable used in this study is an individual's (self-reported) intention to purchase bottled water. While the predictive validity of the intention–behavior relationship depends on many factors, there is some evidence to suggest that purchasing intentions are best conceptualized as a "behavioral measure" (Douglas & Wind, 1971). Thus, instead of having respondents indicate their level of consumption on a 1 to 7 type scale or using other vague, global indicators such as "yes, I intend to reduce my bottled water consumption," respondents were asked to estimate the actual *number of water bottles* that they intend on purchasing. The extra cognitive activity required to recall past and predict future consumption is likely to avoid simple yea/nay saying (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) and thereby improve the validity of both the past consumption as well as the intention measure. A 4-week period was used—"In the next 4 weeks, how many bottles of water do you intend to purchase?"

Materials

Respondents who were allocated to the social-norm only condition were presented with the following message:

> Following a recent university-wide survey, your university is pleased to report that over 65% of current students are actively reducing their consumption of bottled water. This excellent contribution is part of the university's continued effort to make the university more sustainable through a student-driven approach.

Respondents in the information-only condition received a traditional (persuasive) information article. Technical language was avoided to ensure that the message was well understood by the respective audience. Given that beliefs about health, taste, quality, convenience, and the environment appear to be particularly salient, this formed the basis of the (informational) treatment that was designed for the current experiment (see online appendix). The treatment targeted specific beliefs by highlighting that bottled water is not any safer or

healthier than tap water, that the production and consumption of bottled water is wasteful and harmful to the environment, and that various alternatives exist to the consumption of bottled water. To get a sense of how people are likely to respond to the information provided (whether sources are perceived as credible, information is written in clear and unambiguous language, etc.) several treatment (variations) were tested during the pilot study in 2010. Some of the test questions included, what aspects about the information presented did you find the most and/or least convincing and why? And do you think that you will change your behavior after having read the information? Insights from the pilot study were used to finalize the treatments (see online appendix).

Results

Among all respondents, total (mean) consumption of bottled water amounted to roughly 10 bottles ($M = 10.45$, $SD = 14.44$) per month. As the standard deviation indicates, monthly consumption rates varied widely among respondents (min = 1, max = 100 bottles)[2] with most values clustering on the lower end of the distribution tail (right skew). To ensure that the results are robust, past consumption values that fell beyond three standard deviations of the mean ($n = 9$ observations in total) were identified as "extreme values" (i.e., statistical outliers) and therefore excluded from the analysis.

Exploring Outcome Beliefs About Buying Less Bottled Water

Prior to administering any treatment, participants were asked (voluntarily) to fill out some questions related to their beliefs about reducing bottled water consumption. Bivariate correlations were calculated for those who responded (80% or $n = 312$).[3] A glance at Table 1 highlights that nearly all attitudinal as well as perceived control beliefs are significantly correlated with bottled water consumption. In fact, outcome beliefs about *health concerns, taste, quality, the environment, lifestyle*, and *available alternatives* are all significantly correlated to self-reported bottled water consumption, ranging from ($r = .15$, $p < .01$) to ($r = .41$, $p < .001$)—where beliefs about the environment show the lowest correlation and beliefs about potential barriers (e.g., lifestyle adjustments) the highest correlation. Surprisingly, beliefs about saving money are *not* significantly correlated with intentions to buy less bottled water. To further investigate differences in underlying beliefs between consumers who reported to purchase a relatively small amount of bottled water versus those who reported to purchase a lot, a median split on past

Table 1. Bivariate Correlations and Mean Outcome-Belief Scores by Consumption Group.

	Bivariate correlations	Outcome beliefs	
Extremely unlikely (1)–Extremely likely (7)	Bottled water consumption (N = 312)	Low consumption (n = 166)	High consumption (n = 146)
"Reducing my bottled water consumption will not affect my intake of high quality water."	.30***	5.75*** (0.11)	4.98 (0.14)
"Replacing bottled water with tap water will not have any negative effects on my health."	.32***	6.16*** (0.10)	5.36 (0.15)
"There is no real difference in taste between bottled water and tap water."	.31***	4.73*** (0.15)	3.81 (0.18)
"Reducing my bottled water consumption will save me money."	.05	5.60 (0.13)	5.75 (0.13)
"Reducing my bottled water consumption will benefit the environment."	.15**	5.36 (0.12)	5.16 (0.14)
"Reducing my consumption of bottled water would require a significant adjustment in my lifestyle."	.41***	2.20 (0.12)	**3.38***** (0.15)
"There are currently no viable alternatives to bottled water available."	.26***	2.07 (0.12)	**3.09***** (0.16)

Note. Standard errors are provided in parentheses.
*p < .05. **p < .01. ***p < .001.

consumption (Mdn = 4.0) was performed to create a *low-consumption* (n = 166) and *high-consumption* (n = 146) group (Table 1).

Multivariate Analysis of Variance (MANOVA) was used to test for differences between the two groups. To control for the family wise Type 1 error rate, univariate results were tested using a conservative significance level of $p < .001$. Using Wilks's criteria, a significant multivariate effect was found of consumption group on the belief measures, $F(7, 310) = 9.30$, $p < .001$, Wilks's $\lambda = .82$. Results indicate that respondents who purchase a relatively small amount of bottled water per month (≤4.0) are more likely to believe that reducing their consumption of bottled water will *not* affect their intake of high-quality water and that it will *not* negatively affect their health. In addition, respondents in the low-consumption group were also more likely to

Table 2. Overview of Treatment Conditions and Manipulation Checks.

			Social norm	
			Present	Absent
Information	Present	Informativeness of article	*M* = 5.48 (*SE* = 0.14)	*M* = 5.41 (*SE* = 0.12)
		Agreement with information	*M* = 5.03 (*SE* = 0.12)	*M* = 4.66 (*SE* = 0.16)
		Perceived social pressure	NA	*M* = 3.30 (*SE* = 0.23)
		Mean reduction in number of bottles	*M* = −2.95 (*SE* = 0.43)	*M* = −2.05 (*SE* = 0.40)
	Absent	Informativeness of article	NA	NA
		Agreement with information	NA	NA
		Perceived social pressure	*M* = 4.03 (*SE* = 0.21)	NA
		Mean reduction in number of bottles	*M* = −1.82 (*SE* = 0.32)	*M* = −1.13 (*SE* = 0.30)

Note. The first quadrant (upper left corner) represents the "combination" condition, the second quadrant (upper right corner) represents the "information-only" condition, the third quadrant (lower left corner) represents the "social norm-only" condition, and last, the fourth quadrant (lower right corner) represents the "control group."

believe that there is *no* real difference in taste between bottled and tap water. Respondents in the high-consumption group on the other hand were more likely to believe that reducing their bottled water consumption would require a *significant* adjustment in their lifestyle and that *no* real viable alternatives to bottled water exist. Both groups deemed it equally likely that reducing consumption would save money and help the environment.

The Message Experiment: Manipulation Checks

To provide support for the effectiveness of the treatment conditions, several manipulations checks were performed. Table 2 aims to provide a quick overview of the different treatment groups and manipulation checks. Because respondent in the control group and the social norm-only condition did not receive the information article, different manipulation checks were performed independently between the treatment groups. As discussed, previous research has suggested that information is perceived to be more persuasive when the

right in-group norm is provided. Accordingly, it was hypothesized that if activating a social norm would *not* add to the overall persuasiveness of the information-message, participants in both the information-only and the combined condition would express a similar amount of agreement with the information presented. Yet, this was not the case: Respondents in the combination condition expressed significantly stronger *agreement* with the *content of the article* than respondents in the information-only condition ($M = 5.03 > M = 4.66$), $t(207) = 1.92$, $p = .028$, one-tailed. The groups did however not differ in their assessment of how informative they believed the article to be (i.e., both groups found the article to be equally informative). Another manipulation check was performed to test whether the social-norm treatment was effective. Respondents were asked to rate the extent (1-7 scale) to which their friends and peers think that they should reduce their bottled water consumption. Results indicate that respondents in the *social norm-only* condition perceived significantly *more* social pressure than participants in the information-only condition ($M = 4.03 > M = 3.30$), $t(207)$, $p = .01$, one-tailed. Taken together, these results suggest that the treatment manipulations were effective.

Social Norms, Persuasive Information, and Intentions to Reduce Bottled Water Consumption

Figure 1 indicates that the largest reduction is indeed observed in the treatment that *combined* the activation of social norms with persuasive messaging ($M = -2.95$, $SE = .43$), followed by the *information-only message* ($M = -2.05$, $SE = .40$) and the *social norm-only* condition ($M = -1.82$, $SE = .32$). The modest reduction observed in the *control group* ($M = -1.13$, $SE = .30$) is likely attributable to either random error, social desirability bias, or perhaps a combination of both. Because the average level of bottled water consumption in the sample is not particularly high, a somewhat more informative approach is to express the absolute (mean) differences as a percentage of past consumption. For example, in the combined treatment, the absolute difference ($M = -2.95$) actually represents an intended reduction in consumption of 27.90% or a *net effect* of (27.90% − 8.95%) = 18.95%, which is almost twice as large as the net effect of the information-only condition (19.95% − 8.95%) = 11%.

To test whether the observed differences are statistically significant, an analysis of covariance (ANCOVA) was conducted with "past consumption" as the covariate.[4] Results indicate a significant main effect for the treatment levels, $F(3, 387) = 4.93$, $MSE = 13.05$, $p < .01$, $\eta_p^2 = .04$. Post hoc comparisons (on the adjusted marginal means) using the Tukey HSD test[5] revealed a significant difference ($p < .01$) between the *combined treatment* ($M = -2.95$, *SE*

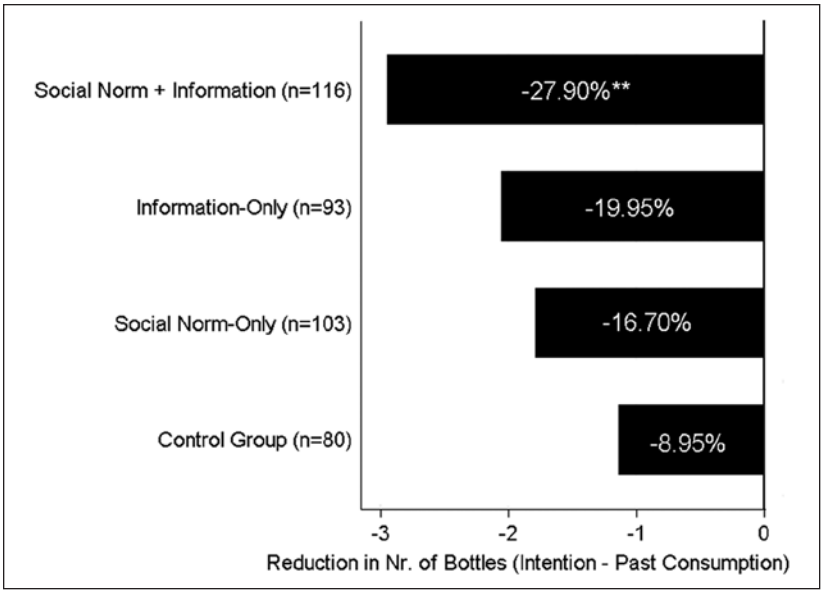

Figure 1. Mean reduction in self-reported bottled water consumption by treatment group and as a percentage of past consumption.
*$p < .05$. **$p < .01$. ***$p < .001$.

= .43) and the control group ($M = -1.13$, $SE = .30$). None of the other group comparisons revealed a significant difference at conventional levels. A visual representation of the main results is provided in Figure 1. Because the hypothesis was that on average, the combined condition should elicit the greatest reduction in intentions to buy bottled water, a planned comparison between the combined treatment and the *average* of all other conditions ($M = -1.67$, $SE = .21$) was also carried out, revealing a significant difference $F(1, 388) = 8.19$, $p < .01$.

The ANCOVA also indicated a significant interaction effect between the treatment levels and past consumption, $F(3, 384) = 21.64$, $MSE = 11.25$, $p < .01$. The presence of an interaction effect (i.e., heterogeneous regression slopes) implies that the effect of the experimental treatment on intention is non-linear (i.e., it is dependent on level of past consumption). The ANCOVA assumption of covariate and treatment independence is not a statistical requirement—it does, however, make the interpretation somewhat less straightforward as the interaction term must be modeled explicitly (Rutherford, 1992). While *pick-a-point* (low, moderate, high) is a popular approach, a mathematically more precise way to probe the interaction is the

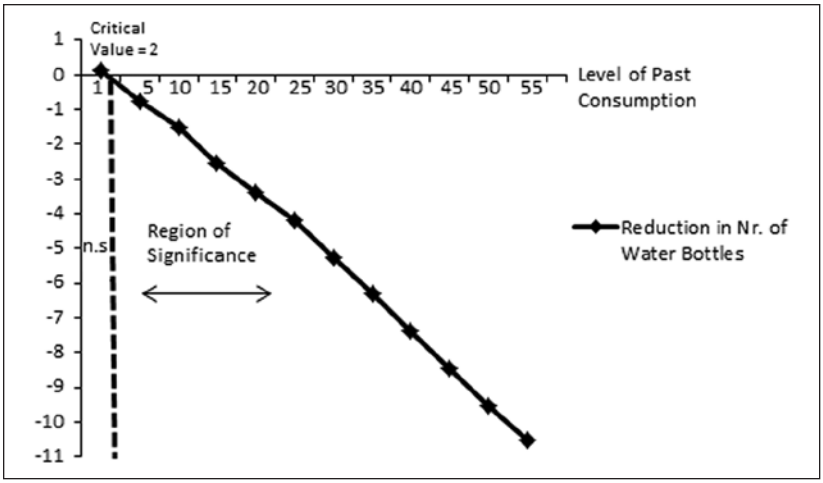

Figure 2. Combined (social norm + information) treatment (vs. control) is effective when level of past consumption is > 2 bottles per month: Johnson-Neyman procedure results.

Johnson-Neyman (J-N) procedure (Hayes & Matthes, 2009; Johnson & Neyman, 1936). The J-N procedure is able to identify regions of significance (or non-significance) for all values of the covariate and thus able to determine for which values of past consumption a significant treatment-group effect exists.

Results of the J-N procedure are presented in Figure 2 and clearly indicate that (a) there are significant differences between the *combined condition* and the *control group* over nearly the whole range of the covariate and (b) that the effect of the treatment steadily increases with increasing values of past consumption. The non-linear effect of the treatment implies that some respondents reduced their intended future consumption by much more than the average while some respondents reduced their intention by less than the average (Figure 2). It is also evident that the treatment effect is not significant for the lowest level of past consumption (one bottle)—this is however not surprising given that there is a floor effect to how much reduction can be achieved here.

Discussion

The primary aim of this article has been to advance a social-psychological understanding of how to reduce bottled water consumption. This was done

through a combined effort of examining students' outcome beliefs about purchasing less bottled water and by empirically testing three potential strategies for changing behavioral intentions with the long-term goal of ultimately changing behavior.

Beliefs About Buying Less Bottled Water: Low Versus High Consumption

Consistent with previous research, the current study indicates that concerns about *health, taste*, and *water quality* are particularly salient while impacts on the *environment* show a lower correlation with bottled water consumption. The current study adds that *perceived barriers* such as lifestyle changes and lack of available alternatives are additional important correlates. Furthermore, when it comes to reducing consumption, important differences exist in beliefs between high and low users. Consumers who purchase a relatively *high* amount of bottled water are more likely to believe that there are *no* real alternatives to bottled water and that reducing their consumption would require a s*ignificant* change in their lifestyle. Consumers who buy a relatively *low* amount of bottled water are *more* likely to believe that the difference in taste between bottled and tap water is *small* and that reducing their consumption will *not* negatively affect their health or intake of high-quality water. In addition, while the present research also finds that although both groups indicated that it is likely that reducing consumption would benefit the environment, the strength of these beliefs did *not* differ significantly between the groups—reinforcing the idea that environmental impacts are a peripheral rather than central concern when it comes to decisions to buy bottled water. Doria (2006) and Saylor et al. (2011) seem to suggest that price considerations may mediate the behavior, depending on the premium that consumers are possibly willing to pay for the perceived health benefits associated with bottled water. Yet, the present study found no correlation between the intention to reduce bottled water consumption and beliefs about saving money. In fact, while both groups deemed it likely that reducing their consumption would save money, those who consume less bottled water are not more likely to be characterized by this belief.

Less Bottled Water: Normative Appeals, Persuasive Information, or Both?

A persuasive information message was designed (see online appendix) with the aim of targeting intentions to reduce bottled water consumption, in line

with the traditional *Knowledge-Attitude-Behavior* (KAB) model. This approach was tested directly against another behavioral change tactic that has gained considerable popularity in recent years; the activation and manipulation of *social norms* as well as against a combination of the two approaches. In fact, it was hypothesized that the dual effect of activating social norms while providing persuasive information would elicit the greatest reduction in intentions to buy bottled water. Findings are largely consistent with this hypothesis. Neither information nor descriptive and prescriptive social norms by themselves were sufficient to elicit a significant change in intentions to reduce bottled water consumption. These results are not entirely surprising, as it is often noted that information by itself is a necessary but clearly not sufficient condition for behavioral change (Anable, Lane, & Kelay, 2006). Similarly, given that public knowledge about the negative environmental impacts of bottled water consumption is still relatively low, solely activating a social norm (without any relevant information) might not be effective either.

Instead, it was the *combination* of social-norm activation and persuasive information that elicited a significant reduction in intentions to buy bottled water (compared to both the control group as well as the *average* of all competing conditions). In fact, the net effect of activating social norms alongside persuasive information was nearly double the effect of providing only information—which is congruent with recent research on energy conservation (e.g., Dolan & Metcalfe, 2012). The manipulation check provided further support for these results. Primarily because if activating a relevant social norm provided no extra credibility, participants in the combined and information-only conditions should express a similar amount of agreement with the arguments presented. Yet, this was not the case: Participants in the *combined* treatment agreed significantly *more* with the *content* of the information article than participants in the information-only condition.

With respect to the effect size, a significant interaction term illustrated that the average effect observed for the combination condition is non-linear across level of past consumption. In other words, the observed reduction was much smaller (than the mean) for lower levels of past consumption and much larger (than the mean) for higher levels of past consumption. Intuitively, this observation is non-controversial: The more bottled water someone reports to consume, the higher the potential for changing that person's intention to purchase bottled water in the future. Overall, a viable explanation for these findings is that norm-induced informational messaging draws on two important aspects of human behavior. First, presenting people with "persuasive" information (e.g., that bottled water is not any safer or healthier than tap water) addresses one aspect of behavior (i.e., beliefs and cognition), providing so-called

"social proof" that referent others have accepted this new information and are changing their behavior as well (i.e., providing *social validation*) adds an important additional dimension. In fact, social proof is a form of persuasion in itself (Cialdini, 1993). These findings also support a more general trend suggesting that instead of contrasting different behavioral change tactics, appealing to multiple aspects of human behavior simultaneously is likely to be a more successful approach (e.g., De Groot et al., 2013; Helgeson, van der Linden, & Chabay, 2012; Steg & Vlek, 2009).

Recommendations for Public Communication Campaigns

It is important for future public (awareness) campaigns to address the core beliefs that drive bottled water consumption. These core beliefs include (erroneous) concerns about *health risks, organoleptics* (taste, odor, and sight), and *potential barriers* to changing intentions and behaviors (e.g., perceived lack of alternatives). Communication efforts should target *specific* beliefs about water, where *misconceptions* about health, taste, and quality concerns should be at the forefront of the communication message, as other (e.g., monetary) concerns seem to be rather peripheral, at best. In addition, more effort needs to be geared toward highlighting the negative *environmental* impacts associated with the production and consumption of bottled water. The current study has offered an example of how such information can be framed in a persuasive manner.

It is also important that more focus is applied toward alleviating *perceived barriers*. For example, merely informing consumers that bottled water is not any safer or healthier is of little use if no specific guidelines are offered on how to facilitate behavioral change (e.g., by filtering tap water). Results also indicate that to elicit a significant change in behavioral outcomes, it is important to combine strategies that increase the overall persuasiveness of the message content. Particularly, because neither social norms nor information alone elicited a significant change in behavioral intentions, combining information provision with "social proof" that referent others are changing their behavior as well is likely to offer the highest probability of success.

Limitations and Future Research

The current study is not without limitations. First, beliefs about bottled water were measured only ex ante and as a result, no changes in outcome beliefs could be assessed. In addition, the current study did not consider adding a pre-treatment measure of intention, which could have improved validity of the experimental results by maximizing measurement correspondence between the pre-test and post-test items. Second, the present study did not

measure actual behavior. While the gap between intention and behavior is acknowledged, meta-reviews of experimental studies generally report that changes in intention do engender behavioral change (e.g., Webb & Sheeran, 2006). Yet, some scholars have pointed out that bottled water consumption may have a habitual component (e.g., Ferrier, 2001) - which could potentially decrease the stability of the intention–behavior relationship (Neal, Wood, & Quinn, 2006). Nonetheless, to override existing habits, it is still important to make people cognisant of their behavior and suggest alternative behavioral choices (Gregory & Di Leo, 2003).

Finally, meta-reviews have indicated that effect sizes obtained from student experiments might differ from those observed in the general population (Peterson, 2006). In particular, students have less crystallized attitudes, a less formulated sense of self, and might be more susceptible to social influences (Sears, 1986). Future studies could constructively build on the current research by (a) assessing actual purchasing decisions and behavior (self-reported or observed), (b) testing the results of the current study on non-student populations, and (c) exploring beliefs about bottled water and strategies for behavioral change in other contexts and cultures. Notwithstanding some of the aforementioned limitations, the current study does provide the first preliminary empirical evidence of how to potentially change existing intentions (and behaviors) toward bottled water consumption. Richard Wilk (2006, p. 319) asks, "If we cannot think our way towards a solution to the puzzle of bottled water, to the tragedy of waste and shortage that it demonstrates, then what hope can we ever have for dealing with other kinds of wasteful and unsustainable consumption?"—It has been the aim of this article to provide a first piece toward solving this puzzle.

Acknowledgments

I would like to thank Anthony Leiserowitz, Richard Perkins, Breanne Chryst, and two anonymous reviewers for their useful comments and advice on earlier drafts of this paper.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. Closer examination of the data did not lead to response-bias concerns. For all main variables used in the analysis (i.e., intention, past consumption), post hoc tests revealed no significant gender differences.
2. High variation in consumption of bottled water between individuals is not uncommon (e.g., Saylor, Propoky, & Amberg, 2011).
3. Because this part of the study was mainly exploratory, respondents had the option to only participate in the experiment. Post hoc analysis revealed that participants who chose to answer the questions did not systematically differ in their characteristics or belief structures from those who chose not to answer.
4. Note that using difference scores as the dependent variable is statistically equivalent to using the post-test measure (Bonate, 2000)—the difference score is used here for more intuitive interpretation of results.
5. Standard errors of the mean differences were estimated with 1,000 bootstrap samples.

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