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Exploring beliefs about bottled water and intentions to reduce consumption: The dual-effect of social norm activation and persuasive information.

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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 examine outcome-beliefs about drinking less bottled water while subsequently testing three strategies for behavioural 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 elicits the greatest change in intention. 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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1.0 Introduction

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 et al., 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 last decade, increasing vastly and steadily (BMC, 2012). In the United States alone, over thirty billion bottles of commercially produced water are sold every year (Gleick, 2010). On average, it takes about 3 litres of regular water to produce 1 litre of bottled water (PI, 2006), at 2011 consumption rates, that amounts to a wastage of over a 100 billion litres 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 (FAO, 2007) and likely to be exacerbated by climate change (Bates et al., 2008). In fact, the latest report on global water usage 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 8 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 behavioural aspects of water consumption, as knowledge of the psychological determinants of water conservation will help governments identify more efficient and more effective strategies for behavioural change (Syme, Nancarrow and Seligman, 2000; Gregory and Di Leo, 2003).

1.1. *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 public policy agenda (Russell and 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 (Trumbo et al., 1999; Corral-Verdugo, Bechtel and Fraijo-Sing, 2003), this continues to ring true today, especially when compared to the growing field of energy conservation (Russell and Fielding, 2010). Nonetheless, existing studies have identified a plethora of psychological predictors of both household as well as individual water conservation intentions and behaviours, including: environmental knowledge, values, attitudes, perceived behavioural control, social norms, moral norms, habits, 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 behaviours like gardening, cooking, washing and showering (e.g., Aitken, 1994; De Oliver, 1999; Lam 1999, 2006; Gregory and Di Leo, 2003; Trumbo and O'Keefe, 2005). While there undoubtedly is potential for conservation in this area, the aforementioned behaviours are all, to some degree, necessary for (daily) human functioning.

1.2. *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., Gild and 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. For example, because the majority of the bottles are made out of PET (polyethylene terephthalate), they often cannot be recycled and thus most of the waste goes to landfills (Olson, 1999), if not ending up as litter on land, in rivers and oceans. The production of bottled water is also highly inefficient, wasting tremendous amounts of water in the process (PI, 2006). Furthermore, in 2011, it took more than 2.5 million tons of carbon dioxide (CO₂) to produce the amount of bottled water required for US consumption - as energy is needed for packaging, transportation and refrigeration (Gleick and 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 and 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., Olson, 1999; Lalumandier and Ayers, 2000; Saleh et al., 2001; Raj, 2005; Ahmad and Bajahlan, 2008; Saleh et al., 2008). In summary, bottled water consumption is a viable candidate for water conservation, since the negative environmental and societal impacts associated with its use can be avoided by drinking tap water instead (Saylor, Prokopy and 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 last 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, odour and sight) and (2) *quality and health risk* concerns, followed by mediating factors such as; (3) *convenience*, (4) *price considerations*, (5) *lifestyle* and (6) *environmental concerns* (c.f., Jardine et al., 1999; Lavellois et al., 1999; Anadu and Harding, 2000; Ferrier, 2001; Doria, 2006, 2010; Wilks, 2006; Doria, Pidgeon and Hunter, 2009; Ward et al., 2009; Gleick, 2010; Gorelick et al., 2011; Hu, Morton and Mahler, 2011; Saylor, Propoky and Amberg, 2011; O'Donnell and Rice, 2012). Yet, while these studies have successfully explored the motives that lead people to buy bottled water, no study has investigated the beliefs that people hold about the positive and negative outcomes of reducing their bottled water consumption.

1.3. *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, Nancarrow and Seligman, 2000). In fact, a recent meta-review of 87 experimental studies conducted in the field of environmental behaviour reports less than a handful of studies related to water conservation (Osbaldiston and 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 significantly affect behavioural outcomes. Both Johnson (2002) and Saylor et al. (2011) comment that simply providing people with information might not be sufficient to elicit significant changes in behaviour. While evidence appears to be mixed in the context of water conservation, increasing criticism has been expressed more generally towards traditional information-based campaigns on the grounds that increased knowledge and understanding of environmental issues often does not ultimately lead to a change in behaviour (e.g., Stern, 1999; Kollmus and Agyeman, 2002; Abrahamse et al., 2005). Instead, a great deal of focus has shifted towards the

underestimated role of social norms (e.g., Cialdini, Reno and Kallgren, 1991; Schultz et al., 2007; Nolan et al., 2008) and numerous (field) experiments have demonstrated the potential of leveraging social pressure in the context of environmental behaviour (e.g., Cialdini, 2003; Griskevicius, Cialdini and Goldstein, 2008; Smith et al., 2012; De Groot, Abrahamse and Jones, 2013).

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, 2005; 2010) that *interpersonal* information (e.g., from friends and peers) might have a stronger influence on perceptions and behaviour 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 in nature (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 is designed to appeal to multiple aspects of human behaviour. Indeed, there is good evidence for the idea that normative and cognitive information share complex interdependencies (e.g., Werner, Sansone and Brown, 2008), especially in the context of consumer behaviour (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 behavioural 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 behaviour more generally). One example is the study by Dolan and Metcalfe (2012), who, based on a large-scale energy conservation experiment, concluded that providing information alongside social norm messages is key to the success of behavioural 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 paper 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 and Cacioppo, 1987), 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 behavioural 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 behaviour (e.g., Stern, 1999). In fact, there is now substantial evidence that social norms can moderate the attitude-behaviour relationship (e.g., Lam, 2006; Smith and 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 is provided (Van Knippenberg and Wilke, 1992). This is so because in-group references tend to receive a positive bias and hence a greater level of perceived credibility (Clark and Maas, 1988). Indeed, both 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. Drawing on these research findings, the current paper proposes the following theoretical framework (figure 1):

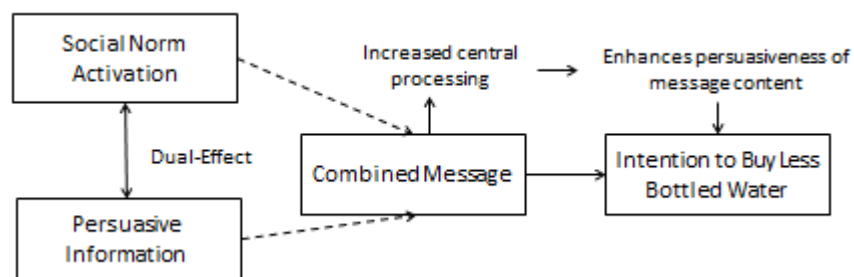


Figure 1: Theoretical Framework: The Dual-Effect of Social Norm Activation and Persuasive Information on Intentions to Reduce Bottled Water Consumption.

The interplay between activating social norms and the provision of persuasive information is likely to increase central processing of the message content. As described above, social support from relevant in-group members enhances the perceived credibility and 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. Thus, the *dual-effect* of the combination condition is expected to elicit more central processing, increase the overall persuasiveness of the message content and thereby decrease intentions to purchase bottled water.

1.4 *Research Aim*

The aim of the current paper is to establish an applied social-psychological understanding of how to potentially reduce bottled water consumption. In the first part of the study, participant's beliefs about bottled water are investigated. While previous research has explored 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. In the second part of the study viable ways for behavioural change are explored experimentally. Four conditions are tested, namely: (a) *persuasive information*, (b) *activating social norms*, (c) a *combination of both* or (d) a *control group*. Consistent with the above discussion, it is hypothesized that a strategy which combines social norm activation with the provision of persuasive information is likely to elicit the greatest change in intentions to reduce bottled water consumption.

2.0 Method

2.1 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 that 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 large majority of the respondents were female (70%) compared to male (30%)³.

2.2 Procedure

Students received an e-mail in which they were kindly 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 one-page (persuasive) information-based article about bottled water consumption. The article was titled '*the truth about bottled water*' (see appendix). Since research has indicated that *university affiliation* is a strong in-group norm (e.g., Mackie, Worth and Asuncion, 1990; Smith et al., 2012) the survey administered to the *social norm-only* condition (n=107) 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 behaviour 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 in order to for norms to affect behaviour in the desired direction (Cialdini, 2003; Smith et al., 2012).

In the *combined* condition (n = 118), the survey first primed students with the social norm message before proceeding to the information article. The survey

³Closer examination of the data did not lead to response-bias concerns. For all main variables used in the analysis (i.e., intention, behavior) post hoc tests revealed no significant gender differences.

administered to the control group (n = 83) 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 prior 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 behaviour) and post-test (intention) measures.

2.3 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 (see section 1.2). Using a seven 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 analyse differences in belief scores (and not to predicting 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., Gardner et al., 1998; Bergkvist and Rossiter, 2007).

Intention

The dependent measure used in this study is an individual's (self-reported) intention to buy bottled water. While the predictive validity of the intention-behaviour relationship depends on many factors, there is some evidence to suggest that purchasing intentions are best conceptualized as a 'behavioural measure' (Douglas and Wind, 1971). Thus, instead of having respondents indicate their level of consumption on a 1-7 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 et al., 2003) and thereby improve the validity of both the past consumption and intention measure. A 4-week period was used - "In the next four weeks, how many bottles of water do you intend to purchase?"

2.4 Materials

Respondents that were allocated to the *social-norm only* condition were primed 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 concerns, 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 (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. In order to get a sense of how people responded to the information provided, several questions were asked in the survey, including; what aspects about the information presented did you find most and / or least convincing and why? To what extent do you agree with the information provided? And how informative did you find this article?

3.0 Results

Among all respondents, total (mean) consumption of bottled water amounted to roughly 10 bottles ($\bar{x} = 10.45$, $SD = 14.44$) per month. As the standard deviation indicates, monthly consumption rates varied widely among respondents (min = 1, max = 100 bottles) with most values clustering on the lower end of the distribution tail (right skew) - high variation in consumption of bottled water between individuals is however not uncommon (e.g., see Saylor, Prokopy and Amberg, 2011)⁴.

3.1 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

⁴ Nonetheless, main results were recalculated on a sample that excluded all past consumption values that fell beyond 3 standard deviations of the mean (9 in total) – exclusion did not significantly affect results.

consumption. Bivariate correlations were calculated for those who responded (80% or n=318). A glance at table 1 highlights that nearly all attitudinal as well as perceived control beliefs are significantly correlated to bottled water consumption. In fact, outcome beliefs about *health concerns, taste, quality, the environment, lifestyle* and *available alternatives* are all significantly correlated to bottled water consumption, ranging from ($r = 0.17, p < 0.01$) to ($r = 0.40, p < 0.001$) where beliefs about the environment show the lowest correlation. Surprisingly, beliefs about saving money are *not* significantly correlated with intentions to buy less bottled water. In order to further investigate differences in underlying beliefs between consumers who generally purchase a relatively small amount of bottled water versus those that purchase a lot, a median split on past consumption ($Md = 4.0$) was performed in order to create a *low-consumption* ($N = 166$) and *high-consumption* ($N = 152$) group (table 1).

Extremely Unlikely (1) – Extremely Likely (7)	Bivariate Correlations	Outcome- Beliefs	
	Bottled Water Consumption (N=318)	Low Consumption (N=166)	High Consumption (N=152)
"Reducing my bottled water consumption will not affect my intake of high quality water..."	0.31***	5.75*** (0.11)	4.97 (0.14)
"Replacing bottled water with tap water will not have any negative effects on my health ..."	0.26***	6.16*** (0.10)	5.36 (0.15)
"There is no real difference in taste between bottled water and tap water..."	0.34***	4.73*** (0.15)	3.73 (0.17)
"Reducing my bottled water consumption will save me money..."	0.02	5.60 (0.13)	5.70 (0.13)
"Reducing my bottled water consumption will benefit the environment...."	0.17**	5.36 (0.12)	5.11 (0.13)
"Reducing my consumption of bottled water would require a significant adjustment in my lifestyle.."	0.40***	2.20 (0.12)	3.43*** (0.15)
"There are currently no viable alternatives to bottled water available.."	0.21***	2.07 (0.12)	3.08*** (0.15)

Table1: Mean outcome-belief scores as a function of consumption-group, * $p < 0.05$, ** $p < 0.01$, * $p < 0.001$.**

Standard errors are provided in parenthesis.

Multivariate Analysis of Variance (MANOVA) was used to test for differences between the two groups. In order to control for the family wise type 1 error rate, univariate results were tested using a conservative significance level of $p < 0.001$. Using Wilks criteria, a significant multivariate effect was found of consumption-group on the belief-measures, $F(7, 310) = 10.06$, $p < 0.001$, Wilk's $\lambda = 0.75$. Results indicate that respondents that 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 believe that *no* real difference in taste exists 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.

3.2 *Social Norms, Persuasive Information and Intentions to Buy Less Bottled Water*

To start with, several manipulation checks were performed. With regard to the ‘*persuasiveness*’ of the information provided, about 80% of the respondents that received the article ($n=211$) *somewhat-to-completely* agreed with the arguments presented and about 70% reported to find the article *somewhat-to-very informative*. A manipulation check for the social norm condition asked respondents 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 condition perceived significantly *more* social pressure than participants in the information-only condition ($\bar{x} = 3.45 > \bar{x} = 2.82$, $t(209) = 2.33$, $p < 0.02$, one-tailed). A final manipulation check provided support for the hypothesis that norm-induced information provision is more effective than providing only information, given that in the combined condition (i.e., social norm activation + information) respondents expressed significantly stronger *agreement* with the *content of the article* than

respondents in the information-only condition ($\bar{x} = 5.0 > \bar{x} = 4.65$, $t(209) = 1.79$, $p < 0.04$, one-tailed).

Results (figure 2) indicate that the largest reduction is indeed observed in the treatment that *combined* the activation of social norms with persuasive messaging ($\bar{x} = -2.90$, $SE = 0.35$), followed by the *information-only message* ($\bar{x} = -2.05$, $SE = 0.40$) and the *social norm-only* condition ($\bar{x} = -1.75$, $SE = 0.21$). The modest reduction observed in the *control group* ($\bar{x} = -1.16$, $SE = 0.23$) is likely attributable to either random error, social desirability bias or perhaps a combination of both. Since the average level of consumption in the sample was 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 ($M = -2.90$) actually represents an intended reduction in bottled water consumption of 27.40% or a *net effect* of $(27.40\% - 9.10\%) = 18.30\%$, which is almost twice as large as the net effect of the information-only condition $(19.95\% - 9.10\%) = 10.85\%$.

To test whether the observed differences are statistically significant, an analysis of covariance (ANCOVA) was conducted with 'past consumption' as the covariate⁵. Results indicate a significant main effect for the treatment levels $F(3, 396) = 4.58$, $MSE = 14.65$, $p < 0.01$, $\eta_p^2 = 0.03$. Post hoc comparisons (on the adjusted marginal means) using the Tukey HSD test revealed a significant difference ($p < 0.01$) between the *combined treatment* ($\bar{x} = -2.90$, $SE = 0.48$) and the control group ($\bar{x} = -1.16$, $SE = 0.23$). None of the other group comparisons revealed a significant difference at conventional levels. Since the hypothesis was that on average, the

⁵ Note that using difference scores as the dependent variable is statistically equivalent to using the posttest measure (Bonate, 2000) - the difference score is used here for more intuitive interpretation of results.

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 ($\bar{x} = -1.67$, $SE = 0.21$) was carried out, revealing a significant difference $F(1, 396) = 10.93$, $p < 0.001$.

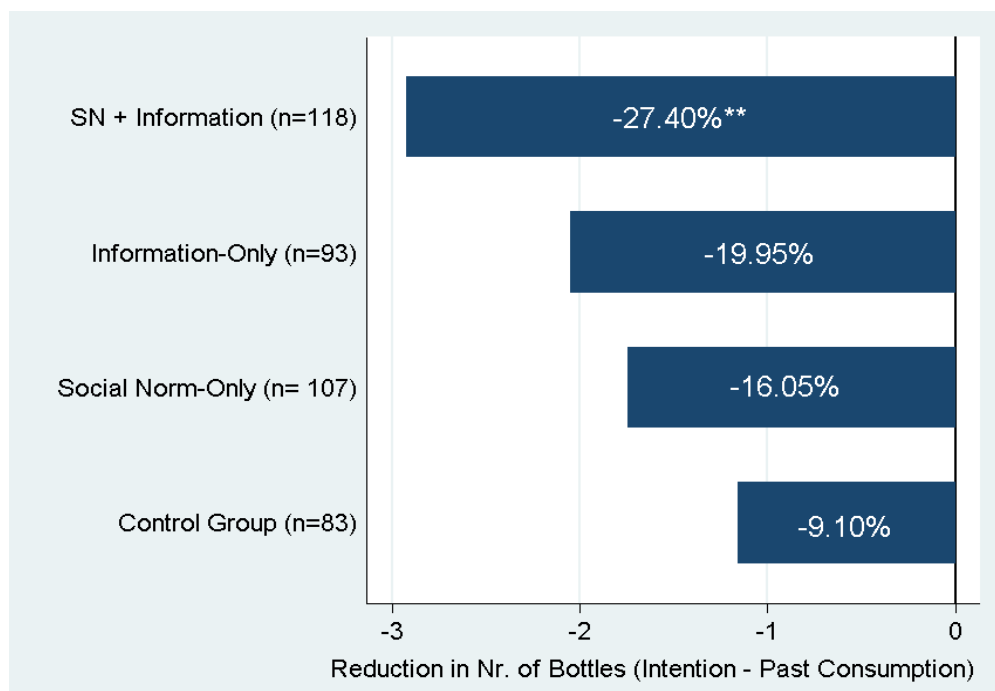


Figure 2: Mean reduction in bottled water consumption by treatment group, * $p < 0.05$, ** $p < 0.01$, * $p < 0.001$.**

The ANCOVA also indicated a significant interaction effect between the treatment-levels and past consumption $F(3, 393) = 17.87$, $MSE = 12.99$, $p < 0.01$. 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 modelled explicitly (Rutherford, 1992). While *pick-a-point* (low, moderate, and high) is a popular approach, a mathematically more precise way to probe the interaction is the

Johnson-Neyman (J-N) procedure (Huitema, 1980; Hayes and Matthes, 2009). 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 3 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. Given that the median level of bottled water consumption in the sample is ($Md = 4.0$) and the average reduction obtained in the combined condition ($M = -2.90$), the non-linear effect of the treatment implies that about half of the sample reduced their consumption by much less than the average and half of the sample reduced their consumption by much more than the average (figure 3). It is also evident that the treatment effect is not significant for the lowest level of past consumption (1) – this is however not surprising, given that there is a floor effect to how much reduction can be achieved here.

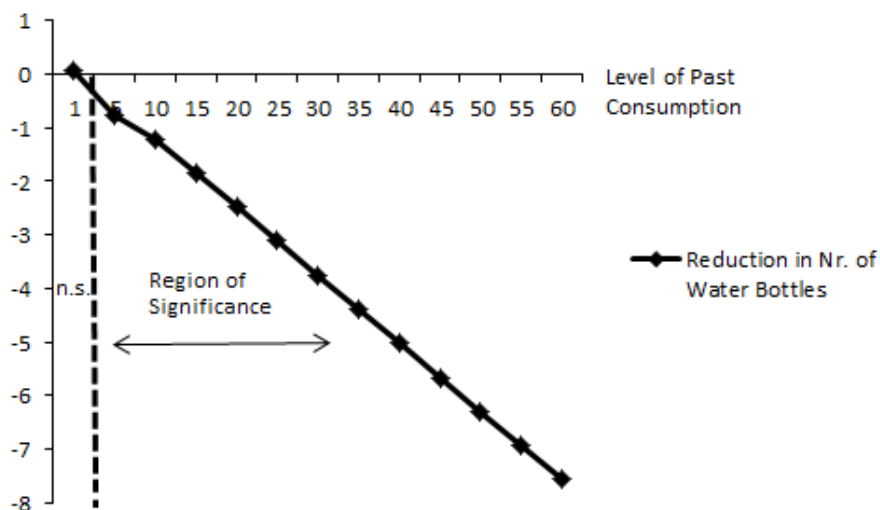


Figure 2: Results of the Johnson-Neyman Procedure: Conditional Effect of the Combined Treatment on Intentions to Reduce Bottled Water Consumption.

4.0 Discussion

The primary aim of this paper has been to advance a social-psychological understanding of how to reduce bottled water consumption. This was done through a combined effort of examining student's outcome-beliefs about purchasing less bottled water and by empirically testing three potential strategies for behavioural change.

4.1. *Beliefs about buying less bottled water: Low vs. 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. In addition, when it comes to reducing consumption, important differences arise 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 *significant* 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.

Both Doria (2006) and Saylor, Propoky and Amberg (2011) seem to suggest

that price considerations may mediate the behaviour, 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 that consume less bottled water are not more likely to be characterized by this belief.

4.2 *Less bottled water: normative appeals, persuasive information or both?*

A persuasive information message was designed (appendix) with the aim of targeting beliefs and intentions to reduce bottled water consumption, in line with the traditional *Knowledge-Attitude-Behaviour* (KAB) model. This approach was tested directly against another behavioural change tactic that has gained considerable popularity in recent years; the activation and manipulation of *social norms* as well as a combination of the two approaches. In fact, it was hypothesized that the dual-effect of social norm activation and information provision would reduce intentions to buy bottled water by eliciting more central and systematic processing of the message content and by enhancing the overall persuasiveness of the message. 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 the intention 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 behavioural change (Anable, Lane and Kelay, 2006). Similarly, solely activating a social norm might be less effective in the context of bottled water consumption given that public knowledge about the negative impacts is

relatively low.

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 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 and 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 would express a similar amount of agreement with the information provided. Yet, this was not the case: participants in the combined treatment agreed more with the arguments presented than participants in the information-only condition. A significant interaction term illustrated that the average effect size 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 bigger (than the mean) for higher levels of past consumption. Intuitively this observation is non-controversial: the more bottled water someone consumes, the higher the potential for behavioural change.

Overall, a viable explanation for these findings is that norm-induced informational messaging draws on two important aspects of human behaviour. Firstly, presenting people with 'persuasive' information (e.g., that bottled water is not any safer or healthier than tap water) addresses one aspect of behaviour (i.e., beliefs and cognition), providing so-called '*social proof*' that referent others have accepted this new information and are changing their behaviour 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 support a more general trend that instead of contrasting different behavioural change tactics, appealing to multiple aspects of human behaviour simultaneously is likely to be a more successful approach (e.g., Steg and Vlek, 2009; Helgeson, van der Linden and Chabay, 2012; De Groot, Abrahamse and Jones, 2013).

4.3 *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), *potential barriers* (e.g., perceived lack of alternatives) as well as stressing the negative *environmental* impacts associated with the production and consumption of bottled water. 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, since other (e.g., monetary) concerns seem to be rather peripheral, at best. The current study has offered an example of how such information can be framed in a persuasive manner.

In addition, it is important that more focus is applied towards 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 behavioural change (e.g., by filtering tap water). Results also indicate that in order to elicit a significant change in behavioural outcomes, it is important to combine strategies that increase the overall persuasiveness of the message content.

Particularly, since neither social norms nor information alone elicited a significant

change, combining information provision with 'social proof' that referent others are changing their behaviour as well is likely to offer the highest probability of success.

4.4 *Limitations and Future Research*

The current study is not without limitations. Firstly, 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 post-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. Secondly, the present study did not measure actual behaviour. While the gap between intention and behaviour is acknowledged, meta-reviews of experimental studies generally report that changes in intention do engender behavioural change (e.g., Webb and Sheeran, 2006). Yet, some scholars have pointed out that bottled water consumption may have a habitual component (e.g., Ferrier, 2001) which could decrease the stability of the intention-behaviour relationship (Neil, Wood and Quinn, 2006). Nonetheless, in order to override existing habits it is still important to make people cognisant of their behaviour and suggest alternative behavioural choices (Gregory and 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 assessing actual purchasing decisions and behaviour and test the results of the current study on non-student populations. To illustrate, a recent field experiment by De Groot,

Abrahamse and Jones (2013) showed that the *combination* of different normative appeals significantly reduced the use of plastic bags in supermarkets. The potential of norm-induced information provision can be explored in a similar fashion. For example, supermarket customers can be made aware that in line with sustainable consumption guidelines, a significant number of shoppers have decided to reduce their consumption of bottled water (followed by information that bottled water is no safer, cleaner or healthier than tap water and that its consumption is harmful to the environment). In sum, the current study provides the first preliminary empirical evidence of how to potentially change existing intentions (and behaviours) 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 paper to provide a first piece towards solving this puzzle.

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Appendix: Experimental Treatments

(A) Information-Only Condition : “The Truth about Bottled Water”

1. Bottled Water is No Healthier Than Tap Water

While many scientific studies have illustrated that bottled water is not necessarily any safer or healthier than tap water, perhaps most convincing evidence comes from a 1999 study by the *National Resources Defense Council* (NRDC) where researchers tested more than 1,000 samples of 103 brands of bottled water. The report *concluded*; “There is **no assurance** that just because water comes out of a bottle, it is any cleaner or safer than water from the tap”. In fact, about 40% of the bottled water brands actually derive their water from the tap! Sometimes further treated, sometimes not. Moreover, other scientific studies have reliably indicated that **toxic chemicals** such as *antimony* can leach from water bottles. In addition, because bottled water companies are not under the same accountability standards as municipal water systems, *they may provide a significantly lower quality of water than the water we typically receive from the tap.*

2. Bottled Water Doesn’t Always Taste Better.

Even though taste might be subjective, an interesting study conducted by CBS, found that; “75% of tested New York City residents actually preferred tap water over bottled water in a blind taste test”.

3. The Production and Consumption of Bottled Water Has Proven To Be Wasteful and Unsustainable.

Due to the use of the *PET* chemical (Polyethylene terephthalate) most bottles cannot be recycled into new ones. Dr. Allen Hershkowitz, a senior scientist at the NRDC comments; “Oil for plastic, oil for shipping and in the end, most of the waste goes to landfills, polluting our living environment”. To illustrate how unsustainable and wasteful bottled water production is, US figures indicate that in 2006, it took on average, 3 liters of regular water to produce 1 liter of bottled water! Not to mention that over 2.5 million tons of *carbon dioxide* (CO₂) was used in the production process (PRI, 2007).

What YOU can do? Many people feel powerless in the face of increasing global problems. Yet, individual local actions such as; **avoiding bottled water** are needed to help curb *mounting pollution*, stop the *depletion of natural resources*, and help counter *climate change*. We can overcome these issues with your help! *The alternative is simple: stop buying bottled water* and drink perfectly safe and healthy water from the tap that is readily available! Still unsatisfied about the taste of your tap water? *Purchase a water filter or simply boil water at home.*

(B) Social Norm-Only Condition

“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”.

(C) Combination Condition (Social Norm + Persuasive Information)

“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”.

In addition, please consider the following information:

– The Truth about Bottled Water –

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