



Promoting water intake. The persuasiveness of a messaging intervention based on anticipated negative affective reactions and self-monitoring



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ABSTRACT

The present research focused on water intake (WI) in young adults. Study 1 (N = 272) was a correlational study and showed affective attitude, perceived behavioural control, past behaviour and anticipated negative affective reactions (ANAR) to predict WI intentions. It also showed intentions, instrumental attitude, perceived behavioural control, and past behaviour to predict WI prospectively. In addition, ANAR moderates the relationship between intention and future water intake (WI). Study 2 (N = 197) was an experimental study and showed that daily text messages targeting ANAR plus a self-monitoring manipulation increased WI immediately after the intervention although this effect did not persist one month later. Mediation analysis indicated the intervention impacted WI via sequentially changing ANAR and intention.

1. Introduction

Excessive sugar-sweetened beverages intake is a well publicised public health concern. Several studies have reported a significant correlation between sugar-sweetened beverage consumption and health issues such as obesity, diabetes, cardiovascular disease and poor oral health (e.g., Vartanian, Schwartz, & Brownell, 2007). Previous studies have examined both correlates of sugar-sweetened beverage consumption and interventions to reduce such consumption (e.g., Zoellner et al., 2017). However, rather than simply eliminate this behaviour it may be more effective to replace it with a healthier behaviour such as water intake (WI) (Cooper, Heron, & Heward, 2007). Therefore the present research looks at ways to promote WI. In this regards, health institutions and experts recommend to consume at least 8 glasses of water a day, that is at least 1.9L of water a day (McCartney, 2011). Only one study has looked at the possibility to promote WI as a mean to reduce sugar-sweetened beverage consumption (Tate et al., 2012), a gap the present research was designed to fill.

1.1. Theory of planned behaviour for predicting drinking behaviour

Since behavioural interventions guided by theory are found to be more effective in changing behaviours (Painter, Borba, Hynes, Mays, & Glanz, 2008), we based our research on the theory of planned behaviour (TPB; Ajzen, 1991). The TPB helps to identify key determinants of

different behaviors (e.g., Giampietri, Verneau, Del Giudice, Carfora, & Finco, 2018) such as healthy eating (e.g., Carfora, Caso, & Conner, 2016a) and drinking behaviour (e.g., McDermott et al., 2015), that can form the basis of effective interventions.

TPB holds that intentions are the most proximal predictors of executing a behaviour, and that in turn intentions are explained by three constructs: attitudes towards the behaviour, subjective norms (which are related to the perceived social pressure in relation to perform a specific behaviour) and perceived behavioural control (PBC) over the behaviour. We were only able to locate one TPB study focused on drinking non-sugared mineral water (Astrom & Rise, 1996). Their findings showed that intention to drink non-sugared mineral water ($R^2 = 0.48$ among girls and 0.37 among boys) was best explained by PBC, followed by attitude; while, subjective norm was a significant predictor of intention only in boys. Behaviour ($R^2 = 0.25$ in all sample) was significantly explained by intention and PBC. Relatedly, Zoellner, Estabrooks, Davy, Chen, and You (2012) showed that intentions had the strongest influence on sugar-sweetened beverages intake in adults - independently explaining 51% of variance in behaviour - and was in turn explained by attitude, subjective norm, and PBC. Similar findings were reported by Kassem and Lee (2004) in a youth sample.

The present research expanded on previous work by examining the impact of past behaviour and anticipated negative affective reactions (ANAR) and test an intervention to change WI in young adults. Numerous studies now show that past behaviour adds to predictions of

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intention and behaviour in the TPB (e.g., see McEachan, Conner, Taylor, & Lawton, 2011 for a meta-analysis). Controlling for past behaviour in analyses allows for examination of the predictors of behaviour change. ANAR have been shown to be additional predictors of intentions to engage in healthy behaviours and to add to the TPB more generally (Conner, Godin, Sheeran, & Germain, 2013). Anticipated negative affective reactions refer to the anticipated negative feelings (e.g., guilty, angry, fear, regret ...) perceived when a person thinks that in the future he/she would not engage in a given behaviour. Perugini and Bagozzi (2001) showed how anticipated emotions, which refer to the perceived consequences of a goal achievement and a goal failure, increase the predictive validity of the TPB model. Some scholars have applied the above consideration on the role of ANAR in the domain of healthy choice. Rivis, Sheeran and Armitage (2009) report a meta-analysis of anticipated affect in the context of the TPB and concluded that anticipated affect directly impacts on intentions controlling for TPB variables and moral norms. Particularly, most of the studies on the role of ANAR in predicting intentions and behaviour focus on the role of anticipated regret. For example, Caso, Carfora, and Conner (2016) show the important role of anticipated regret, controlling for past behaviour, in determining intention to eat an adequate amount of fruit and vegetable. Rivis, Brewer, DeFrank, and Gilkey (2016) report the most comprehensive meta-analysis of anticipated regret and show it is strongly associated both with intentions and healthy behaviours, as well as Sandberg and Conner (2008) report a meta-analysis of the predictive role of anticipated regret in predicting intentions and behaviour in the TPB. Since ANAR were shown to be important factors in determining individuals' intentions and behaviours, recent studies are focused on the ANAR manipulation to change healthy behaviours. (e.g., Carfora, Caso, & Conner, 2017b).

The present research (Study 1) tested the predictive power of the TPB plus past behaviour and ANAR on intention and future behaviour in relation to the WI using a longitudinal design. Study 1 followed other research (e.g., Abraham & Sheeran, 2004) in examining the extent to which ANAR moderated the impact of intentions on behaviour.

1.2. Intervention for increasing water intake

The present research (Study 2) also aimed to use the TPB as a basis for promoting WI. Previous research had tried to directly reduce sugar-sweetened beverages intake (e.g., Zoellner et al., 2012). A review by Daniels and Popkin (2010) suggests that consuming water in place of sugar-sweetened beverages, fruit juice, and milk has health benefits associated with reduced energy intake. In this regards, Tate et al. (2012) conduct a RCT study, which promoted non-caloric beverage substitution as the primary weight-loss strategy in overweight adults. Their study shows that the replacement of caloric beverages with non-caloric beverages as a weight-loss strategy results in average weight losses of 2%–2.5%. However, in the literature there is a need for more evidence regarding the effectiveness of interventions aimed at promoting an adequate WI. Therefore, the present research aimed to promote WI as a means to reduce energy intake. Study 2 extends Study 1 by assessing the impact of targeting ANAR as a means to increase WI in an intervention study. We also took the opportunity in Study 2 to explore the extent to which any intervention effects were mediated via TPB components and ANAR. Given the intervention targeted ANAR we particularly expected mediated effects via this variable although we were open to whether this might be a direct effects or one further mediated by intentions (i.e., serial mediation via ANAR and then intentions onto behaviour). Study 2 also used a manipulation of self-monitoring to promote WI.

According with past studies (e.g., Bagozzi, 1992; Naughton, McCarthy, & McCarthy, 2015; Scholz, Nagy, Göhner, Luszczynska, & Kliegel, 2009), a new behaviour can be adopted when individuals' scrutinise their actions to verify if they are concretely engaged in the pursuit of a goal. This evaluation process supports people to plan future

effort and commitment to achieve the goal (Bagozzi, 1992). In a review of self-monitoring, Harkin et al. (2016) report that prompting recording of behaviour as a means to increase self-monitoring is an effective behaviour change technique. In the healthy choice domain, some studies use self-monitoring to promote healthy eating behaviours (e.g., Caso & Carfora, 2017). For example, Scholz et al. (2009) show that change in behaviour is significantly associated with self-regulation activities including dietary planning and self-monitoring. In the domain of the messaging intervention to promote healthy practices, a study on the use of text messaging for monitoring sugar-sweetened beverages, physical activity, and screen time in children (Shapiro et al., 2008) show efficacy in reducing attrition and increasing acceptability and adherence to the treatment in children. Moreover, a recent study demonstrates the power of supporting a reduction of red meat intake through daily reminders combined with daily written self-monitoring (Carfora, Caso, & Conner, 2017a, 2017b). Finally, in literature on the healthy practices, the first attempt to combine self-monitoring and the elicitation of ANAR by a messaging intervention (Carfora et al., 2017b) have reported promising results.

2. The present research

In summary, the present research reports two studies. Study 1 was a longitudinal study that tested whether the TPB plus ANAR predicted intentions to drink at least 2 L of water a day and prospective behaviour (Time 2 – T2), controlling for past behaviour (Time 1 – T1). Moreover, we tested if ANAR moderated the relationship between intention and future behaviour (T2). Study 2 used a RCT design to test the effects of self-monitoring and daily text messages (eliciting ANAR) compared to control condition on WI in young adults.

In the Study 1, our main hypotheses were that ANAR was both an important predictor of intention and moderated the relationship between intention and future behaviour. Confirming these hypotheses was useful to the design of the intervention study proposed in the Study 2. Consistent with past studies (e.g., Carfora, Caso, Sparks, & Conner, 2017), which showed that both self-monitoring and ANAR were effective in promoting behavioural changes, here we expected that the SM-ANAR group, which self-monitored WI and received SMS that daily elicited ANAR, would be more effective in producing significant changes in WI over time.

3. Study 1: predictors of water intake

3.1. Material and method

3.1.1. Participants and procedures

In November 2016, a total of 350 emails were sent to a convenience sample of Italian university students recruited from a list of available students that had agreed to participate in university research to receive a training credit. In the email it was explained that the research addressed healthy eating and that participation comprised of fill out two questionnaires one month from each other. Since the present research focused on young adults, inclusion criteria were being aged between 18 and 25 years old. At T1 those who agreed to be involved in the research (N = 311; age mean = 20.41, SD = 1.51; Females = 188, Men = 123) filled out an online TPB questionnaire plus measures of ANAR and past behaviour over the last month. One month later (T2) participants were asked to re-fill out the same questionnaire. A total of 272 students (87.46% of the initial sample) fully completed the second questionnaire (mean age = 20.41; SD = 1.54; Females = 177; Males = 95). Those who fully completed both questionnaires (T1 and T2) at time points were entered in the following statistical analyses. The analyses focused on predicting intentions at T1 from other variables at the same time point and behaviour at T2 from variables measured at T1.

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