Running head: MESSAGE FRAME, TEMPORAL FOCUS, AUTONOMY

Persuading people to drink less alcohol: the role of message framing, temporal focus and autonomy

Susan Churchill[1] Louisa Pavey[2] Donna Jessop[3] and Paul Sparks[4]

[1]University of Chichester, College Lane, Chichester, West Sussex, PO19 6PE
[2] Kingston University, Penrhyn Rd, Kingston upon Thames, Surrey KT1 2EE
[3] University of Sussex, Brighton BN1 9RH

*Requests for reprints should be addressed to Dr Susan Churchill, Department of Psychology and Counselling, University of Chichester, Bishop Otter Campus, Chichester, West Sussex, UK (e-mail: s.churchill@chi.ac.uk).

Abstract

Aims: Health information can be used to try to persuade people to follow safe drinking recommendations. Both the framing of information and the dispositional characteristics of message recipients need to be considered, however. An online study was conducted to examine how level of autonomy moderated the effect on drinking behaviour of gain- and loss-framed messages about the short- vs. long-term consequences of alcohol use. *Methods*: At Time 1, participants (N = 335) provided demographic information and completed a measure of autonomy. At Time 2, participants reported baseline alcohol use and read a gain-framed or loss-framed health message which highlighted either short- or long-term outcomes of alcohol consumption. Alcohol consumption was reported 7-days later. *Results*: The results showed a significant three-way interaction between message framing (loss vs. gain), temporal focus (short-term vs. long-term), and autonomy. For low-autonomy (but not high-autonomy) individuals, the loss-framed health message was associated with lower levels of alcohol consumption than was the gain-framed message, but only if the short-term outcomes were conveyed. *Conclusions*: The current research provides evidence that the interaction between message framing and temporal focus may depend on a person's level of autonomy, which has implications for health promotion and the construction of effective health communication messages.

Keywords: Persuasive Communication; Message Framing, Temporal Focus, Autonomy, Alcohol Use

Health appeals are often used to motivate and encourage people to reduce their consumption of alcohol. Both the framing of information in such appeals and the dispositional characteristics of message recipients need to be carefully considered, however, in an assessment of the likely persuasive impact of such information.

Message framing

'Gain-framed' information in health messages might address the benefits of a health-beneficial behaviour or 'loss-framed' information might focus on the costs of not carrying out that behaviour (for reviews see Rothman *et al*., 2006; O'Keefe and Jensen, 2007; Gallagher and Updegraff, 2012). Rothman and Salovey (1997) argued that gain-framed messages would be most persuasive when encouraging a 'protection' behaviour (e.g., fruit and vegetable consumption) that individuals perceive to be minimally risky to perform, and which is very likely to result in a healthy outcome. In contrast, loss-framed messages would typically be more persuasive when encouraging a 'detection' behaviour (e.g., mammography) that involves the possibility that one might discover a life-changing health problem.

In line with these expectations, gain-framed messages have been found to be more effective in promoting 'low risk' illness protection behaviours such as physical exercise (Latimer *et al*., 2008), and condom use (Kiene *et al*., 2005). In contrast, loss-framed messages have been shown to be effective in promoting 'risky' illness detection behaviours such as breast self-examination (Abood *et al.*, 2005) and cervical cancer screening (Rivers *et al*., 2005).

Although there is supporting evidence for these message framing hypotheses, there are also mixed findings. Some studies have reported no effect of message framing (e.g., Brug, *et al*., 2003; Jones, *et al*., 2004) and others have found effects in the opposite direction to that predicted by Rothman and Salovey (O'Connor *et al*.,

1996; Williams *et al*., 2001). Moreover, researchers have found that a range of contextual and dispositional variables can moderate the persuasive effects of loss- and gain-framed messages (see Covey, 2014, for a review).

Little research has explored the effects of gain and loss framed messages on alcohol consumption (although see Gerend and Cullen, 2008; Bernstein *et al*., 2015; de Graaf *et al*., 2015). Research investigating the impact of contextual variables alongside pre-existing characteristic of the message recipient is also limited, leaving open important questions related to the effectiveness of message framing. This paper presents the results of an experimental study which suggests that the effects of (loss vs. gain) message framing may be moderated by the temporal focus of the outcomes of behaviour (i.e. are the outcomes short-term or long-term?) and message recipients' level of autonomy prior to exposure to health information.

Temporal focus of outcomes

Temporal message framing is the application of a time frame to information about a potential health-related outcome (e.g., cardiovascular disease) to make the risk to health seem either more proximal or more distant in time. Research has shown that the temporal context in which alcohol outcomes are presented can moderate peoples' responses to gain- and loss-framed messages. Gerend and Cullen (2008) investigated the effects of message framing (loss vs. gain) and temporal focus (short- vs. long-term consequences) on student drinking behaviour. Results showed significant main effects for both temporal focus and message frame, and a significant message frame x temporal focus interaction, such that participants in the gain frame / short-term consequences condition reported consuming fewer units of alcohol compared to participants in the other three conditions. For messages which focussed on the long-term outcomes of alcohol use, there was no differential effect of loss vs. gain-framing.

There are mixed findings in the literature, however. Some studies have found message framing effects in the context of alcohol consumption (Gerend and Cullen, 2008; de Graaf *et al*., 2015). However, in a recent study using email communications to disseminate gain- and loss-framed messages about the short- vs. long-term consequences of alcohol use to college students with high levels of alcohol consumption, Bernstein *et al.* (2015) found no main effects of message frame or temporal context, or any interaction between the two. This suggests that further research is needed to elucidate the impacts of loss- and gain-frame messages and temporal context in the domain of alcohol consumption, and to further investigate the interactions between message framing (loss vs. gain) and temporal context (short-term vs. long-term).

Autonomy

It is possible that the persuasive effects of message framing (in terms of gains vs. losses) and temporal focus (in terms of short-term vs. long-term outcomes) may be moderated by individual difference characteristics. One variable that may reasonably be expected to influence the effect of temporal focus within loss- and gain-framed messages is the extent to which people feel a sense of freedom to act in accordance with their internalised standards and values rather than feel an obligation to act as a result of influence from others.

Self-determination theory (Deci and Ryan, 1985; 2000) describes autonomy in terms of a person's basic psychological need to perceive their behaviour as freely chosen and under volitional control. Research has shown that greater autonomy is associated with increased motivation, greater likelihood of adherence to recommended health behaviours, and higher levels of psychological well-being (e.g., Hagger *et al*., 2006; Chatzisarantis and Hagger, 2009; Williams *et al*., 2009).

Perceived autonomy over behavioural choice is argued to be empowering, providing people with a sense of agency and control over behaviour (Hagger *et al*., 2014).

Churchill and Pavey (2013) showed that individual differences in autonomy moderated the persuasive effects of loss- and gain-framed messages regarding fruit and vegetable consumption, such that gain-framed information was maximally persuasive for those higher in autonomy. These authors argued that this finding may be due to an autonomous individual construing the behaviour as in accordance with their interests and values and, therefore, as 'less risky' (Pavey and Churchill, 2014, p. 2). A further study examining the effectiveness of messages aimed at reducing high-calorie snack food consumption showed that the same effect occurred when autonomy was experimentally manipulated, with participants who were autonomy primed eating fewer high-calorie snacks after being presented with information about the benefits of reduced snack consumption (Pavey and Churchill, 2014). This study also showed that when feelings of heteronomy (pressure and coercion) were primed, loss framed information was more effective in promoting the avoidance of high-calorie snacks than was gain-framed information. The authors contend that this could be due to these low autonomy participants perceiving the behaviour as more risky, with the loss frame thus persuading them to adopt the recommended health behaviour. Loss-framed messages have been suggested to be most effective when people's risk perceptions are high (Rothman and Salovey, 1997; Rothman *et al*., 2006).

People who feel autonomous and self-determined in their lives have been shown to process personally relevant health-risk information less defensively than do those low in autonomy (Pavey and Sparks, 2010) and see recommended behaviour in health communications as 'non-threatening' because it is perceived to emanate from the self and be consistent with intrinsic goals (Hagger *et al*., 2014). Hence, autonomy

might be expected to increase positive affective and behavioural responses in autonomy supportive contexts (e.g., gain-framed information about an action, which allows individuals to freely decide whether or not they want to engage in that action), which can in turn lead to positive changes in motivation and behaviour. For highly autonomous individuals it is likely therefore that a short-term focus within gain-framed information will lead to even greater motivation to adhere to the recommended health behaviour than would a long-term frame, due to the steeper discounting of positive (gain frame) consequences.

The Current Study

The current study expands previous research by assessing the interactive effects of message framing (loss vs. gain), temporal focus (short-term vs. long-term) and autonomy in the domain of alcohol consumption. Excessive alcohol consumption is a prominent risk factor in premature death and chronic diseases such as liver cirrhosis, pancreatitis, cardiovascular disease, stroke, and some cancers (see World Health Organization, 2014). Excessive alcohol consumption is also associated with an increased risk of physical assault and injuries, suicidal ideation and attempts, impaired driving, interpersonal problems, and academic under achievement (e.g., Boles and Miotto, 2003; Ness *et al*., 2013). It is therefore important to examine how health information can best be framed to ensure it is effective in persuading individuals to confine their alcohol consumption to recommended limits.

One further construct that has been shown to influence the persuasive effects of short- and long-term temporal framing in health messages concerns the consideration of future consequences (CFC; Strathman *et al*., 1994), a stable individual difference variable that reflects the extent to which a person considers the short- or long-term outcomes of his/her current behaviour. Individual differences in

CFC can be assessed by the Consideration of Future Consequences (CFC) Scale (Strathman *et al*., 1994). Given associations found in previous research between CFC and temporal message framing, we used the CFC scale as a covariate in our analyses in the current study.

Method

Participants

Four hundred and fifty-nine students at three UK universities completed the Time 1 measures [1]. Twenty-five participants at Time 2 and 24 participants at Time 3 failed to respond, representing an overall attrition rate of 11%. Since research indicates that systematic processing of persuasive communication is only likely to occur when the presented information is personally relevant (e.g., Hovland, 1959), we removed participants reporting no alcohol consumption at baseline (n = 79). Thus, our analyses were conducted on 335 participants who reported alcohol consumption at baseline and completed all three phases of data collection. Participants (80% female) were aged between18 and 56 years (M = 20.95; SD = 4.35).

Materials

Time 1

At Time 1, participants completed a questionnaire including the following sections.

Demographic information. Participants were asked to indicate their age, gender and student status.

Autonomy. Individual differences in autonomy were measured using the 9-item Autonomy Subscale of the Basic Needs Satisfaction Scale (Deci and Ryan,

2000). An example item is, 'I feel that my choices are based on my true interests and values' (*not at all true for me* [1] to *very true for me* [7]), α = .80.

Consideration of Future Consequences (CFC). Participants' tendency to consider the short vs. long-term consequences of behaviour was assessed using the 12-item CFC scale (Strathman *et al*., 1994). Example items are "I often consider how things might be in the future and try to influence those things with my day to day behavior" and "I only act to satisfy immediate concerns, figuring the future will take care of itself". Participants were required to indicate to what extent each item was characteristic of themselves on a 5-point Likert-type scale (*extremely uncharacteristic* [1] to *extremely characteristic* [5]), α = .83. Higher scores indicate greater consideration of future consequences.

Time 2

Baseline alcohol consumption. Following Armitage *et al* (2014), an adapted version of the timeline follow-back technique (Sobell and Sobell, 1992) was used to assess alcohol consumption. Participants were asked to report the types of drinks (i.e., beer, wine, spirits), size of measures (i.e., small glass, can, pint, single or double measure), and number of each of these drinks they had consumed on each day of the previous week. Each day of the week was presented on a separate line in the online survey, and space was given to write a description. Units of alcohol were calculated for each participant and summed to provide a measure of baseline alcohol consumption, with higher scores indicating higher levels of alcohol consumption.

Message frame and temporal focus manipulations: Identical information about the risks associated with alcohol consumption was presented in each message, but each message was represented in a semantically different way (i.e., Gain-frame/Short-term, Loss-frame/Short-term, Gain-frame/Long-term, and Loss-frame/Long-term).

Thus, for some participants the gains to be achieved from reducing alcohol use were indicated, whereas for others the losses that might be incurred from not reducing alcohol use were indicated. Crossed with this, some participants received information about outcomes framed in the long-term, and other participants received information about outcomes framed in the short-term. The exact wording of the messages is detailed in Table 1.

[Table 1 near here]

The Time 2 questionnaire also included self-report measures of cognitions (e.g., intentions, attitudes, perceived behavioural control) that are not reported here, since they revealed no effects of the experimental manipulations.

Time 3

Alcohol consumption. Alcohol consumption was measured using the same measure as at Time 2.

Design and procedure

The study employed a 2 (Message framing [loss, gain]) x 2 (Temporal focus [short-term, long-term]) x Autonomy [continuous index]) design, involving three waves of data collection over a two week period. An email message was sent to students who were required to participate in research as part of their degree programme. The message requested students to participate in an online three-phase research study about alcohol consumption in exchange for course credits, and contained a link to the Time 1 questionnaire. Students who included their e-mail addresses at Time 1 were contacted 7 days after completion of Time 1 measures and invited to complete the second phase of the study. At Time 2, each participant was randomly allocated to receive one of the four messages arising from the experimental

design: Gain-frame/Short-term (*n* = 90), Loss-frame/Short-term (*n* = 74), Gain-frame/Long-term (*n* = 95), and Loss-frame/Long-term (*n* = 76). Allocation was based on a computer-generated numbers list [2]. Participants completed the Time 3 measure of alcohol consumption 7-days later. The study was approved by the Ethics Committees at the participating Universities.

Data Analysis

Table 2 summarises the descriptive statistics of the sample. Chi-square analysis and ANOVAs revealed no pre-intervention differences between conditions on any of the baseline variables assessed prior to the message framing manipulation (i.e., gender, age, baseline alcohol consumption, CFC and autonomy; all *p*s > .13).

[Table 2 near here]

Chi-square analysis and one-way ANOVAs further revealed no significant differences between Time 3 responders and non-responders on these variables (all *p*s > .09). Bivariate correlations between Time 3 alcohol consumption, baseline alcohol consumption, CFC, autonomy, and age, are provided in Table 3.

[Table 3 near here]

Hierarchical multiple regression analyses were used to explore the impact of message frame, temporal focus and autonomy on alcohol consumption. To facilitate interpretation of interaction terms, the continuous variables were standardized and categorical variables were dummy coded prior to analysis (cf. Aiken and West, 1991). Gender (males [0], females [1]), age, baseline alcohol consumption and CFC were entered as covariates at step 1. Message framing (loss-frame [0], gain-frame [1]), temporal focus (long-term [0], short-term [1]) and autonomy were entered at step 2 to determine whether the experimental manipulations and autonomy had any independent effect on alcohol consumption. The three two-way interaction terms ([1]

message frame x temporal focus, [2] message frame x autonomy, and [3] temporal focus x autonomy) were entered at step 3, and the 3-way interaction (message frame x temporal focus x autonomy) was entered at step 4. Pending any of these interactions being significant, we planned to use simple slopes analysis detailed by Aiken and West (1991), with high (+1*SD* from the mean) and low (-1*SD* from the mean) levels of autonomy.

Results

Predicting alcohol consumption.

Gender, age, baseline alcohol consumption and CFC entered at step 1, predicted 42% of the variance in Time 3 alcohol consumption, $F(4, 330) = 58.69$, $p < .001$. Inspection of the individual beta weights at this step revealed that baseline alcohol consumption ($b = .64$, $p < .001$) and CFC scores ($b = -.11$, $p = .01$) emerged as significant predictors of behaviour, with those consuming more alcohol in the past and those reporting a propensity to consider the shorter-term (rather than longer-term) consequences of behaviour reporting higher levels of alcohol consumption.

The predictor variables entered at step 2 (Message Frame, Temporal Focus, and Autonomy) failed to contribute significantly to the explained variance in alcohol consumption, $\Delta R^2 = .00$, $\Delta F(3, 327) = 0.08$, $p = .97$. The addition of the two-way interactions (Message Frame x Temporal Focus, Message Frame x Autonomy, Temporal Focus x Autonomy), at step 3, also failed to contribute significantly to the explained variance, $\Delta R^2 = .00$, $\Delta F(3, 324) = 0.48$, $p = .70$. However, the inclusion of the 3-way interaction significantly increased the overall amount of the variance explained by the model, $b = 4.84$, $p = .05$, $\Delta R^2 = .01$, $\Delta F(1, 323) = 3.86$, $p = .05$, and the final model accounted for 43% of the variance in alcohol consumption, $F(11,323) = 21.75$, $p < .001$ (see Table 4).

[Table 4 near here]

Analysis of the three-way interaction showed that the Message Frame x Temporal Focus interaction was significant for low-autonomy individuals (b = 1.53, t = 2.19, p =.03) but not for high-autonomy individuals (b = -1.12, t = -1.62, p = .11). For low autonomy participants who read the loss-framed information, there was a marginally significant effect of temporal focus (b = -.93, t = -1.68, p = .093), such that participants in the short-term focus condition consumed less alcohol than participants in the long-term focus condition. For low autonomy participants who read the gain-framed information there was no significant effect of temporal focus (b = .59, t = 1.39, p = .164), see Figure 1.

[Figure 1 near here]

Discussion

We found supportive evidence for a three-way interaction between message framing, temporal focus, and autonomy, albeit a small effect size. When exposed to information about the costs associated with alcohol use, low-autonomy participants in the short-term focus condition reported lower levels of alcohol consumption than did those in the long-term focus condition. There was no significant interaction between message frame and temporal focus for high-autonomy participants; only those perceiving behaviour to be externally regulated (i.e., low-autonomy participants with lower levels of perceived choice over behaviour) appeared to respond to the manipulation. We did not find a main effect for message framing; our findings were thus consistent with previous research which has found no direct effect of message framing on message persuasiveness (e.g., Bernstein *et al*., 2015; Jones *et al*., 2004). However, the non-significant effect of message framing in the current study is noteworthy, given that the message framing literature implies that one might expect to

find an effect of gain vs. loss framing in studies with relatively short follow-up periods (see Rothman, et al., 2006; Gallagher and Updegraff, 2012). Neither did we find a main effect of temporal focus. Although other research has shown an effect of temporal focus (Gerend and Cullen, 2008), our study demonstrated this only for participants lower in autonomy. We observed no two-way interaction between message frame and autonomy, suggesting that this interaction found in previous research (Churchill and Pavey, 2013; Pavey and Churchill, 2014) may not hold for alcohol consumption when temporal focus is also manipulated. In future research, a 'no temporal focus' condition could be usefully included to attempt to replicate the two-way interaction.

In the current study, when faced with information about the potential negative outcomes associated with alcohol use, low-autonomy participants in the short-term focus condition reported lower levels of alcohol consumption, than did those in the long-term focus condition. Our findings do not match the results of an earlier study in which participants exposed to a message focusing on the short-term consequences of alcohol consumption were more likely to reduce their alcohol consumption if the message was gain- (vs. loss-) framed (Gerend and Cullen, 2008). Hence, our findings emphasize the need to include potentially important individual difference variables when investigating the persuasive effects of temporal framing within gain- and loss-framed messages.

It has been contended that short-term message frames are maximally effective within loss-framed messages because the presented threats to health are made imminent and likely, enhancing feelings of vulnerability to a health condition and encouraging preventative measures to avoid any potential negative outcomes (see Chandran and Menon, 2004). Although we did not directly measure participants' risk

perceptions in the current study, our findings may be due to the short-term frame increasing perceptions of risk in the loss-frame message condition for low-autonomy participants, who are thought to already construe a higher risk in conducting the health behavior due to potential threats to their autonomy (see Churchill and Pavey, 2013; Pavey and Churchill, 2014). Further research is needed to test this proposal, and in particular to examine whether the fit between the beliefs of low-autonomy individuals and short-term loss-framed messages result in increased risk perceptions, heightened concern and greater adherence to the recommended health behaviour.

The results of the current study suggest that to provide people with health information that is maximally effective, health-related information should be tailored not only to how the presented information is framed (loss vs. gain) and the temporal focus (short-term vs. long-term) in which the health risks are presented, but also to individual characteristics such as autonomy. This could have important practical applications for health promotion efforts which seek to engender health behaviour change. For example, health information about the costs of health damaging behaviour such as excessive alcohol use could frame the temporal focus of the advice given and whether autonomy is made salient. Heteronomy-related words (e.g., must, should) could be introduced into loss-framed information about the immediate health risks associated with unhealthy lifestyle choices to ensure that the style of language is matched to the message frame and temporal focus of the presented information. Health professionals could assess people's level of autonomy and deliver tailored health information based on level of autonomy. For those who consider that their behaviour is externally regulated (i.e., low-autonomy participants, who typically have the poorest health behaviours), health professionals imparting information about the

negative outcomes associated with continuing health-damaging behaviour may find it more effective to refer to health outcomes in shorter-term time frames.

Our findings need to be consider in relation to certain limitations. When reporting alcohol use post intervention, participants may be susceptible to processes associated with self-deception and self-enhancement (Chan, 2009). Hence, a potential limitation is the use of a self-report measure of alcohol consumption. Under-reporting of health damaging behaviours such as alcohol use is problematic, although this should have occurred similarly across the experimental conditions. Nevertheless, future research may replicate the study using a more reliable measure of alcohol consumption (e.g., a daily alcohol consumption diary). It is also important to note that the findings of this study may be limited by the reliance on a self-report measure of autonomy, which relies on the insight and honesty of the research participants. Thus, it may be constructive to investigate whether the findings of the current study can be replicated using assessments of autonomy that do not rely on self-report, such as autonomy manipulated via a priming task (see Levesque and Pelletier, 2003; Pavey and Churchill, 2014). It should also be noted that no manipulation check data were collected to confirm that the participants experienced the conditions as intended. Finally, it may be that the online delivery of the study influenced the results, in that mode of delivery of health information (e.g. whether delivered in text or in speech, in person or anonymously) may be important in influencing persuasive effects.

Future research should endeavor to examine whether the findings are replicated for other health protective behaviours. Such research could usefully include an assessment of the interplay between autonomy and temporally focused loss- and gain-framed messages encouraging the reduction or cessation of other health-damaging behaviours, such as smoking, and for detection behaviours (e.g.,

mammogram). Given the effectiveness of short-term focus within loss-framed information for those low on autonomy in the current study, we would predict that a short-term frame would also amplify the effect of loss-framed messages for detection behaviour among this group, offering a profitable area for future research.

The results of the current study suggest in order to provide people with health information about alcohol use that is effective, loss- and gain-framed persuasive appeals should consider both the temporal context in which the information about health-related outcomes is presented and individual difference variables such as level of autonomy.

References

Abood DA, Black DR, Coster DC. (2005) Loss-framed minimal intervention increases mammography use. *Women Health ISS* **15**:258–6.

Aiken L, West RR. (1991) *Multiple regression: Testing and interpreting interactions.* Newbury Park, CA: Sage.

Armitage CJ, Rowe R, Arden MA, Harris PR. (2014) A brief psychological intervention that reduces adolescent alcohol consumption. *J Consult Clin Psychol* **82**:546.

Bernstein MH, Wood MD, Erickson LR. (2016) The effectiveness of message framing and temporal context on college student alcohol use and problems: a selective e-mail intervention. *Alcohol Alcoholism* **51**:106-116.

Boles SM, Miotto K. (2003) Substance abuse and violence: A review of the literature. *Aggress Violent Beh* **8:**155-174.

Brug J, Ruiter RA, Van Assema P. (2003) The (ir) relevance of framing nutrition education messages. *Nutr Health* **17:**9-20.

Chan D. (2009) So why ask me? Are self-report data really that bad? In Lance CE, Vandenberg RY (eds). *Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences*, 311-338. New York: Routledge.

Chandran S, Menon G. (2004) When a day means more than a year: Effects of temporal framing on judgments of health risk. *J Consum Res* **31:**375-389.

Chatzisarantis NL, Hagger MS. (2009) Effects of an intervention based on self-determination theory on self-reported leisure-time physical activity participation. *Psychol Health* **24:**29-48.

Churchill S, Pavey L. (2013) Promoting fruit and vegetable consumption: the role of message framing and autonomy. *Brit J Health Psych* **18:**610-622.

Covey J. (2014) The role of dispositional factors in moderating message framing effects. *Health Psych* **33:**52-65.

Deci EL, Ryan RM. (1985) The general causality orientations scale: Self-determination in personality. *J Res Pers* **19:**109-134.

Deci EL, Ryan RM. (2000) The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychol Inq* **11:**227–268.

de Graaf A, van den Putte B, de Bruijn GJ. (2015) Effects of issue involvement and framing of a responsible drinking message on attitudes, intentions, and behavior. *J Health Commun* **20:**989-994.

Gallagher KM, Updegraff JA. (2012) Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Ann Behav Med* **43:**101-116.

Gerend MA, & Cullen M. (2008) Effects of message framing and temporal context on college student drinking behavior. *J Exp Soc Psychol* **44:**1167-1173.

Hagger MS, Chatzisarantis NL, Harris J. (2006) The process by which relative autonomous motivation affects intentional behavior: Comparing effects across dieting and exercise behaviors. *Motiv Emotion* **30:**306-320.

Hagger MS, Rentzelas P, Chatzisaranti, NL. (2014) Effects of individualist and collectivist group norms and choice on intrinsic motivation. *Motiv Emotion* **38:**215-223.

Hovland CI. (1959) Reconciling conflicting results derived from experimental and survey studies of attitude change. *Am Psychol* **14:**8.

Jones LW, Sinclair RC, Rhodes RE, Courneya KS. (2004) Promoting exercise behavior: An integration of persuasion theories and the theory of planned behavior. *Brit J Health Psych* **9:**505–521.

Kiene SM, Barta WD, Zelenski JM Cothran DL. (2005) Why are you bringing up condoms *now*? The effect of message content on framing effects of condom use messages. *Health Psychol* **24:**321– 326.

Latimer AE, Rench TA, Rivers SE *et al.* (2008) Promoting participation in physical activity using framed messages: An application of prospect theory. *Brit J Health Psych* **13:**659–681.

Levesque C, Pelletier LG. (2003) On the investigation of primed and chronic autonomous and heteronomous motivational orientations. *Pers Soc Psychol B* **29:**1570–1584.

Ness J, Hawton K, Bergen H *et al.* (2015) Alcohol use and misuse, self-harm and subsequent mortality: an epidemiological and longitudinal study from the multicentre study of self-harm in England. *Emerg Med J* **32:**793-799.

O'Connor AM, Pennie RA, Dales RE. (1996) Framing effects on expectations, decisions, and side effects experienced: the case of influenza immunization. *J Clin Epidemiol* **49:**1271-1276.

O'Keefe DJ, Jensen JD. (2007) The relative persuasiveness of gain-framed loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. *J Health Commun* **12:**623-644.

Pavey L, Churchill S. (2014) Promoting the avoidance of high-calorie snacks: priming autonomy moderates message framing effects. *PloS One*, 9 (7), 1-8

Pavey L, Sparks P. (2010) Autonomy and reactions to health-risk information. *Psychol Health* **25:**855-872

Rivers SE, Salovey P, Pizarro DA, Pizarro J, Schneider TR. (2005) Message framing and pap test utilization among women attending a community health clinic. *J Health Psych* **10:**65-77

Rothman AJ, Bartels RD, Wlaschin J, Salovey P. (2006) The strategic use of gain-and loss-framed messages to promote health behavior: How theory can inform practice. *J Commun* **56:**202–220.

Rothman AJ, Salovey P. (1997) Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychol Bull* **121:**3–19.

Sobell LC, Sobell MB. (1992) Timeline Follow-back: A technique for assessing self-reported alcohol consumption. In Litten RZ, Allen JP. (eds). *Measuring alcohol consumption: Psychosocial and biological methods* (pp. 41–72). Towota, NJ: Humana Press.

Strathman A, Gleicher F, Boninger DS, Edwards CS. (1994) The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *J Pers Soc Psychol* **66:**742-752.

Williams GC, Niemiec CP, Patrick H, Ryan RM, Deci EL. (2009) The importance of supporting autonomy and perceived competence in facilitating long-term tobacco abstinence. *Ann Behav Med* **37:**315-324.

Williams T, Clarke V, Borland R. (2001) Effects of Message Framing on Breast-Cancer-Related Beliefs and Behaviors: The Role of Mediating Factors. *J Appl Soc Psychol* **31:**925-950.

World Health Organization (2014) *Global status report on alcohol and health – 2014. Available at: http://www.who.int/substance_abuse/publications/global_alcohol_report/en/*

Footnotes

[1] From an original sample of 466, six people's data were removed as only contact details were included. One person's data were deleted because of an excessively high frequency of alcohol consumption (>3 *SD*).

[2]A computer programming error meant that more participants were allocated to the gain vs. loss message frame conditions.

Table 1

	Short-term consequences	Long-term consequences
Gain (Loss)	The **immediate consequences** of alcohol consumption People who reduce (do not reduce) their alcohol consumption, compared to those who do not (do), are at LOWER (HIGHER) RISK of a range of consequences **within days (even hours)** and GAIN (LOSE) many potential HEALTH BENEFITS. For example, you will REDUCE (INCREASE) the likelihood of: • driving accidents • having an unhealthy liver • gaining weight People who reduce (do not reduce) their alcohol consumption are less (more) likely to engage in risky sexual behaviour. This means that they are less (more) at risk for sexually transmitted diseases (STDs), unintended pregnancy and regretted sexual experiences By reducing (not reducing) your alcohol consumption you can lessen (increase) the likelihood of psychological problems that can occur **soon after drinking**, such as: • Impaired judgement • Poorer memory • Difficulty concentrating By reducing (not reducing) your alcohol consumption you can **gain (lose) immediate benefits** such as: • Better mood • Higher self-esteem	The **long-term consequences** of alcohol consumption People who reduce (do not reduce) their alcohol consumption**,** compared to those who do not (do), are at LOWER (HIGHER) RISK of a range of consequences **years into the future** and GAIN (LOSE) many potential HEALTH BENEFITS. For example, you will REDUCE (INCREASE) the likelihood of: • driving accidents • having an unhealthy liver • gaining weight People who reduce (do not reduce) their alcohol consumption are less (more) likely to engage in risky sexual behaviour. This means that they are less (more) at risk for sexually transmitted diseases (STDs), unintended pregnancy and regretted sexual experiences By reducing (not reducing) your alcohol consumption you can lessen (increase) the likelihood of psychological problems that can occur **long after drinking**, such as: • Impaired judgement • Poorer memory • Difficulty concentrating By reducing (not reducing) your alcohol consumption you can **gain (lose) long-term benefits** such as: • Better mood • Higher self-esteem

Table 2: Means and standard deviations of the study variables: pre-intervention by condition.

	Gain-Frame/Short-term Focus *M* (*SD*)	Loss-Frame/Short-term Focus *M* (*SD*)	Gain-Frame/Long-term Focus *M* (*SD*)	Loss-Frame/Long-term Focus *M* (*SD*)	Whole sample *M* (*SD*)
Base alcohol (units/week)	15.62 (14.07)	16.24 (12.79)	18.47(18.68)	17.05(15.37)	17.05(15.37)
Age	21.25 (4.81)	20.92 (4.76)	21.04 (3.87)	20.63 (3.66)	20.97 (4.34)
Autonomy	3.75 (0.69)	3.68 (0.60)	3.77 (0.59)	3.75 (0.59)	3.73 (0.62)
CFC	2.67 (0.59)	2.81 (0.58)	2.76 (0.57)	2.73 (0.59)	2.73 (0.59)

Table 3: Bivariate correlations between variables

	1	2	3	4
1. Alcohol consumption				
2. Baseline alcohol consumption	.64***			
3. Autonomy	.01	.03		
4. CFC	-.19**	.13*	-.15**	
5. Age	-.06	-.11*	-.04	-.09

*$p < .05$; ** $p < 0.01$; *** $p < .001$.

Table 4: Hierarchical Regressions of Alcohol Consumption on Message Framing Manipulations and Autonomy

Variables entered	*b*	*SE*	*t*	Δ*R2*	Δ*F*
Step 1				0.42***	58.69***
Gender	0.05	0.11	0.49		
Age	0.02	0.04	0.51		
Baseline alcohol use	0.64	0.04	14.32***		
CFC	-0.11	0.04	-2.56*		
Step 2				0.00	0.08
Gender	0.05	0.11	0.45		
Age	0.02	0.04	0.50		
Baseline alcohol use	0.64	0.05	14.15***		
CFC	-0.11	0.04	-2.54*		
Message Frame	-0.01	0.09	-0.12		
Temporal Focus	0.04	0.09	0.48		
Autonomy	0.00	0.04	0.01		
Step 3				0.00	0.48
Gender	0.05	0.11	0.41		
Age	0.02	0.04	0.50		
Baseline Alcohol	0.64	0.05	14.11***		
CFC	-0.12	0.05	-2.65**		
Message Frame	-0.11	0.12	-0.88		
Temporal Focus	-0.07	0.13	-0.51		
Autonomy	0.02	0.09	0.20		
MF x TF	0.20	0.09	-0.41		
MF x A	-0.04	0.07	-0.24		
TF x A	0.01	0.09	0.11		
Step 4				0.01*	3.86*
Gender	0.05	0.11	0.43		
Age	0.02	0.04	0.48		
Baseline Alcohol	0.64	0.05	14.22***		
CFC	-0.12	0.05	-2.71**		
Message Frame	-0.11	0.12	-0.89		
Temporal Focus	-0.08	0.13	-0.59		
Autonomy	-0.10	0.10	-0.95		
MF x TF	0.20	0.18	1.16		
MF x A	0.15	0.13	1.43		
TF x A	0.23	0.14	1.61		
MF x TF x A	-0.36	0.18	-1.97*		

*$p < .05$; ** $p < 0.01$; *** $p < .001$

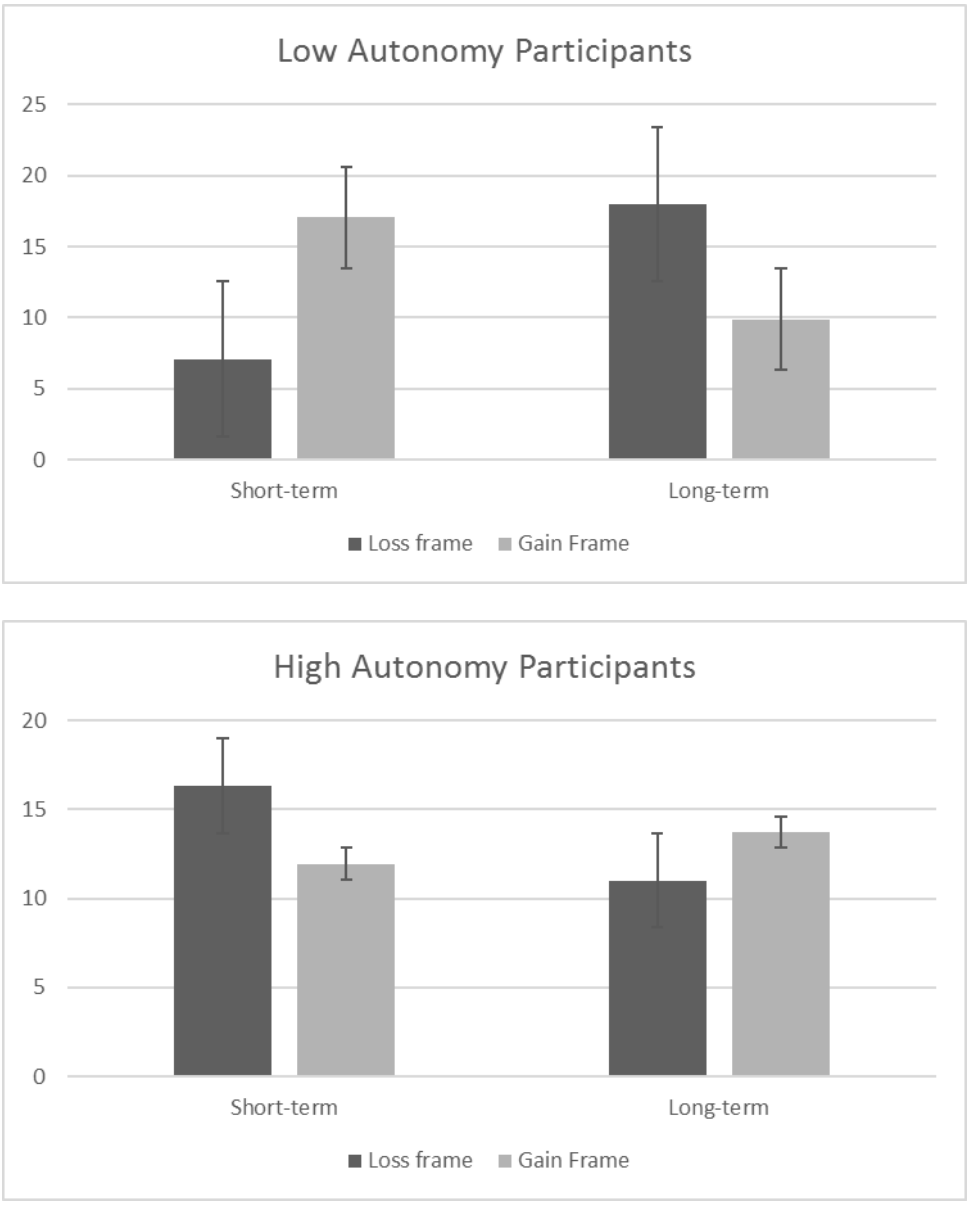

Figure 1. Self-reported alcohol consumption (units of alcohol) as a function of message frame and temporal focus among low autonomy and high autonomy participants, controlling for Gender, age, baseline alcohol use and CFC