

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

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

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3 Running head: MESSAGE FRAME, TEMPORAL FOCUS, AUTONOMY
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7 Persuading people to drink less alcohol: the role of message framing, temporal focus and
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48 Alcohol Use
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We examined how autonomy moderated the effect on drinking behaviour of gain- and loss-framed messages about the short- vs. long-term consequences of alcohol use. For low-autonomy individuals, the loss-framed health message was associated with lower alcohol consumption than was the gain-framed message, but only if the short-term outcomes were conveyed.

Message Frame, Temporal Focus, Autonomy

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

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2
3 25 Health appeals are often used to motivate and encourage people to reduce their
4
5 26 consumption of alcohol. Both the framing of information in such appeals and the
6
7 27 dispositional characteristics of message recipients need to be carefully considered,
8
9 28 however, in an assessment of the likely persuasive impact of such information.

10
11 29 *Message framing*

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14 30 'Gain-framed' information in health messages might address the benefits of a
15
16 31 health-beneficial behaviour or 'loss-framed' information might focus on the costs of
17
18 32 not carrying out that behaviour (for reviews see Rothman *et al.*, 2006; O'Keefe and
19
20 33 Jensen, 2007; Gallagher and Updegraff, 2012). Rothman and Salovey (1997) argued
21
22 34 that gain-framed messages would be most persuasive when encouraging a 'protection'
23
24 35 behaviour (e.g., fruit and vegetable consumption) that individuals perceive to be
25
26 36 minimally risky to perform, and which is very likely to result in a healthy outcome. In
27
28 37 contrast, loss-framed messages would typically be more persuasive when encouraging
29
30 38 a 'detection' behaviour (e.g., mammography) that involves the possibility that one
31
32 39 might discover a life-changing health problem.

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36 40 In line with these expectations, gain-framed messages have been found to be
37
38 41 more effective in promoting 'low risk' illness protection behaviours such as physical
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40 42 exercise (Latimer *et al.*, 2008), and condom use (Kiene *et al.*, 2005). In contrast, loss-
41
42 43 framed messages have been shown to be effective in promoting 'risky' illness
43
44 44 detection behaviours such as breast self-examination (Abood *et al.*, 2005) and cervical
45
46 45 cancer screening (Rivers *et al.*, 2005).

47
48 46 Although there is supporting evidence for these message framing hypotheses,
49
50 47 there are also mixed findings. Some studies have reported no effect of message
51
52 48 framing (e.g., Brug, *et al.*, 2003; Jones, *et al.*, 2004) and others have found effects in
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54 49 the opposite direction to that predicted by Rothman and Salovey (O'Connor *et al.*,
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Message Frame, Temporal Focus, Autonomy

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3 50 1996; Williams *et al.*, 2001). Moreover, researchers have found that a range of
4
5 51 contextual and dispositional variables can moderate the persuasive effects of loss- and
6
7 52 gain-framed messages (see Covey, 2014, for a review).
8

9
10 53 Little research has explored the effects of gain and loss framed messages on
11
12 54 alcohol consumption (although see Gerend and Cullen, 2008; Bernstein *et al.*, 2015;
13
14 55 de Graaf *et al.*, 2015). Research investigating the impact of contextual variables
15
16 56 alongside pre-existing characteristic of the message recipient is also limited, leaving
17
18 57 open important questions related to the effectiveness of message framing. This paper
19
20 58 presents the results of an experimental study which suggests that the effects of (loss
21
22 59 vs. gain) message framing may be moderated by the temporal focus of the outcomes
23
24 60 of behaviour (i.e. are the outcomes short-term or long-term?) and message recipients'
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26 61 level of autonomy prior to exposure to health information.
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63 *Temporal focus of outcomes*

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

76 There are mixed findings in the literature, however. Some studies have found
77 message framing effects in the context of alcohol consumption (Gerend and Cullen,
78 2008; de Graaf *et al.*, 2015). However, in a recent study using email communications
79 to disseminate gain- and loss-framed messages about the short- vs. long-term
80 consequences of alcohol use to college students with high levels of alcohol
81 consumption, Bernstein *et al.* (2015) found no main effects of message frame or
82 temporal context, or any interaction between the two. This suggests that further
83 research is needed to elucidate the impacts of loss- and gain-frame messages and
84 temporal context in the domain of alcohol consumption, and to further investigate the
85 interactions between message framing (loss vs. gain) and temporal context (short-term
86 vs. long-term).

87 *Autonomy*

Message Frame, Temporal Focus, Autonomy

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3 88 It is possible that the persuasive effects of message framing (in terms of gains
4
5 89 vs. losses) and temporal focus (in terms of short-term vs. long-term outcomes) may be
6
7 90 moderated by individual difference characteristics. One variable that may reasonably
8
9 91 be expected to influence the effect of temporal focus within loss- and gain-framed
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11 92 messages is the extent to which people feel a sense of freedom to act in accordance
12
13 93 with their internalised standards and values rather than feel an obligation to act as a
14
15 94 result of influence from others.

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17
18 95 Self-determination theory (Deci and Ryan, 1985; 2000) describes autonomy in
19
20 96 terms of a person's basic psychological need to perceive their behaviour as freely
21
22 97 chosen and under volitional control. Research has shown that greater autonomy is
23
24 98 associated with increased motivation, greater likelihood of adherence to
25
26 99 recommended health behaviours, and higher levels of psychological well-being (e.g.,
27
28 100 Hagger *et al.*, 2006; Chatzisarantis and Hagger, 2009; Williams *et al.*, 2009).
29
30 101 Perceived autonomy over behavioural choice is argued to be empowering, providing
31
32 102 people with a sense of agency and control over behaviour (Hagger *et al.*, 2014).

33
34
35 103 Churchill and Pavey (2013) showed that individual differences in autonomy
36
37 104 moderated the persuasive effects of loss- and gain-framed messages regarding fruit
38
39 105 and vegetable consumption, such that gain-framed information was maximally
40
41 106 persuasive for those higher in autonomy. These authors argued that this finding may
42
43 107 be due to an autonomous individual construing the behaviour as in accordance with
44
45 108 their interests and values and, therefore, as 'less risky' (Pavey and Churchill, 2014, p.
46
47 109 2). A further study examining the effectiveness of messages aimed at reducing high-
48
49 110 calorie snack food consumption showed that the same effect occurred when autonomy
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51 111 was experimentally manipulated, with participants who were autonomy primed eating
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53 112 fewer high-calorie snacks after being presented with information about the benefits of
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3 113 reduced snack consumption (Pavey and Churchill, 2014). This study also showed that
4
5 114 when feelings of heteronomy (pressure and coercion) were primed, loss framed
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7 115 information was more effective in promoting the avoidance of high-calorie snacks
8
9 116 than was gain-framed information. The authors contend that this could be due to these
10
11 117 low autonomy participants perceiving the behaviour as more risky, with the loss frame
12
13 118 thus persuading them to adopt the recommended health behaviour. Loss-framed
14
15 119 messages have been suggested to be most effective when people's risk perceptions are
16
17 120 high (Rothman and Salovey, 1997; Rothman *et al.*, 2006).

20
21 121 People who feel autonomous and self-determined in their lives have been
22
23 122 shown to process personally relevant health-risk information less defensively than do
24
25 123 those low in autonomy (Pavey and Sparks, 2010) and see recommended behaviour in
26
27 124 health communications as 'non-threatening' because it is perceived to emanate from
28
29 125 the self and be consistent with intrinsic goals (Hagger *et al.*, 2014). Hence, autonomy
30
31 126 might be expected to increase positive affective and behavioural responses in
32
33 127 autonomy supportive contexts (e.g., gain-framed information about an action, which
34
35 128 allows individuals to freely decide whether or not they want to engage in that action),
36
37 129 which can in turn lead to positive changes in motivation and behaviour. For highly
38
39 130 autonomous individuals it is likely therefore that a short-term focus within gain-
40
41 131 framed information will lead to even greater motivation to adhere to the
42
43 132 recommended health behaviour than would a long-term frame, due to the steeper
44
45 133 discounting of positive (gain frame) consequences.

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49 134 *The Current Study*

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51 135 The current study expands previous research by assessing the interactive
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53 136 effects of message framing (loss vs. gain), temporal focus (short-term vs. long-term)
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55 137 and autonomy in the domain of alcohol consumption. Excessive alcohol consumption
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3 138 is a prominent risk factor in premature death and chronic diseases such as liver
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5 139 cirrhosis, pancreatitis, cardiovascular disease, stroke, and some cancers (see World
6
7 140 Health Organization, 2014). Excessive alcohol consumption is also associated with
8
9 141 an increased risk of physical assault and injuries, suicidal ideation and attempts,
10
11 142 impaired driving, interpersonal problems, and academic under achievement (e.g.,
12
13 143 Boles and Miotto, 2003; Ness *et al.*, 2013). It is therefore important to examine how
14
15 144 health information can best be framed to ensure it is effective in persuading
16
17 145 individuals to confine their alcohol consumption to recommended limits.

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21 146 One further construct that has been shown to influence the persuasive effects
22
23 147 of short- and long-term temporal framing in health messages concerns the
24
25 148 consideration of future consequences (CFC; Strathman *et al.*, 1994), a stable
26
27 149 individual difference variable that reflects the extent to which a person considers the
28
29 150 short- or long-term outcomes of his/her current behaviour. Individual differences in
30
31 151 CFC can be assessed by the Consideration of Future Consequences (CFC) Scale
32
33 152 (Strathman *et al.*, 1994). Given associations found in previous research between CFC
34
35 153 and temporal message framing, we used the CFC scale as a covariate in our analyses
36
37 154 in the current study.

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156 **Method**

157 **Participants**

158 Four hundred and fifty-nine students at three UK universities completed the
159 Time 1 measures¹. Twenty-five participants at Time 2 and 24 participants at Time 3
160 failed to respond, representing an overall attrition rate of 11%. Since research
161 indicates that systematic processing of persuasive communication is only likely to
162 occur when the presented information is personally relevant (e.g., Hovland, 1959), we

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3 163 removed participants reporting no alcohol consumption at baseline ($n = 79$). Thus, our
4
5 164 analyses were conducted on 335 participants who reported alcohol consumption at
6
7 165 baseline and completed all three phases of data collection. Participants (80% female)
8
9
10 166 were aged between 18 and 56 years ($M = 20.95$; $SD = 4.35$).

11 167 **Materials**

12 168 *Time 1*

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17 169 At Time 1, participants completed a questionnaire including the following
18
19 170 sections.

20
21 171 *Demographic information.* Participants were asked to indicate their age,
22
23 172 gender and student status.

24
25
26 173 *Autonomy.* Individual differences in autonomy were measured using the 9-
27
28 174 item Autonomy Subscale of the Basic Needs Satisfaction Scale (Deci and Ryan,
29
30 175 2000). An example item is, 'I feel that my choices are based on my true interests and
31
32 176 values' (*not at all true for me* [1] to *very true for me* [7]), $\alpha = .80$.

33
34
35 177 *Consideration of Future Consequences (CFC).* Participants' tendency to
36
37 178 consider the short vs. long-term consequences of behaviour was assessed using the
38
39 179 12-item CFC scale (Strathman *et al.*, 1994). Example items are "I often consider how
40
41 180 things might be in the future and try to influence those things with my day to day
42
43 181 behavior" and "I only act to satisfy immediate concerns, figuring the future will take
44
45 182 care of itself". Participants were required to indicate to what extent each item was
46
47 183 characteristic of themselves on a 5-point Likert-type scale (*extremely uncharacteristic*
48
49 184 [1] to *extremely characteristic* [5]), $\alpha = .83$. Higher scores indicate greater
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51
52 185 consideration of future consequences.

53 186 *Time 2*

Message Frame, Temporal Focus, Autonomy

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3 187 *Baseline alcohol consumption.* Following Armitage *et al* (2014), an adapted
4
5 188 version of the timeline follow-back technique (Sobell and Sobell, 1992) was used to
6
7 189 assess alcohol consumption. Participants were asked to report the types of drinks (i.e.,
8
9 190 beer, wine, spirits), size of measures (i.e., small glass, can, pint, single or double
10
11 191 measure), and number of each of these drinks they had consumed on each day of the
12
13 192 previous week. Each day of the week was presented on a separate line in the online
14
15 193 survey, and space was given to write a description. Units of alcohol were calculated
16
17 194 for each participant and summed to provide a measure of baseline alcohol
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19 195 consumption, with higher scores indicating higher levels of alcohol consumption.
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21
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23 196 *Message frame and temporal focus manipulations:* Identical information about
24
25 197 the risks associated with alcohol consumption was presented in each message, but
26
27 198 each message was represented in a semantically different way (i.e., Gain-frame/Short-
28
29 199 term, Loss-frame/Short-term, Gain-frame/Long-term, and Loss-frame/Long-term).
30
31 200 Thus, for some participants the gains to be achieved from reducing alcohol use were
32
33 201 indicated, whereas for others the losses that might be incurred from not reducing
34
35 202 alcohol use were indicated. Crossed with this, some participants received information
36
37 203 about outcomes framed in the long-term, and other participants received information
38
39 204 about outcomes framed in the short-term. The exact wording of the messages is
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41 205 detailed in Table 1.
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45 206 [Table 1 near here]
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48 207 The Time 2 questionnaire also included self-report measures of cognitions (e.g.,
49
50 208 intentions, attitudes, perceived behavioural control) that are not reported here, since
51
52 209 they revealed no effects of the experimental manipulations.
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55 210 *Time 3*
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3 211 *Alcohol consumption.* Alcohol consumption was measured using the same
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5 212 measure as at Time 2.
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7
8 213 **Design and procedure**
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10 214 The study employed a 2 (Message framing [loss, gain]) x 2 (Temporal focus
11
12 215 [short-term, long-term]) x Autonomy [continuous index]) design, involving three
13
14 216 waves of data collection over a two week period. An email message was sent to
15
16
17 217 students who were required to participate in research as part of their degree
18
19 218 programme. The message requested students to participate in an online three-phase
20
21 219 research study about alcohol consumption in exchange for course credits, and
22
23 220 contained a link to the Time 1 questionnaire. Students who included their e-mail
24
25 221 addresses at Time 1 were contacted 7 days after completion of Time 1 measures and
26
27
28 222 invited to complete the second phase of the study. At Time 2, each participant was
29
30 223 randomly allocated to receive one of the four messages arising from the experimental
31
32 224 design: Gain-frame/Short-term ($n = 90$), Loss-frame/Short-term ($n = 74$), Gain-
33
34 225 frame/Long-term ($n = 95$), and Loss-frame/Long-term ($n = 76$). Allocation was based
35
36 226 on a computer-generated numbers list². Participants completed the Time 3 measure of
37
38 227 alcohol consumption 7-days later. The study was approved by the Ethics Committees
39
40 228 at the participating Universities.
41
42

43
44 229 **Data Analysis**
45

46 230 Table 2 summarises the descriptive statistics of the sample. Chi-square
47
48 231 analysis and ANOVAs revealed no pre-intervention differences between conditions
49
50 232 on any of the baseline variables assessed prior to the message framing manipulation
51
52 233 (i.e., gender, age, baseline alcohol consumption, CFC and autonomy; all $ps > .13$).
53

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55 234 [Table 2 near here]
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Message Frame, Temporal Focus, Autonomy

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3 235 Chi-square analysis and one-way ANOVAs further revealed no significant
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5 236 differences between Time 3 responders and non-responders on these variables (all ps
6
7 237 $> .09$). Bivariate correlations between Time 3 alcohol consumption, baseline alcohol
8
9 238 consumption, CFC, autonomy, and age, are provided in Table 3.

10
11
12 239 [Table 3 near here]

13
14 240 Hierarchical multiple regression analyses were used to explore the impact of
15
16 241 message frame, temporal focus and autonomy on alcohol consumption. To facilitate
17
18 242 interpretation of interaction terms, the continuous variables were standardized and
19
20 243 categorical variables were dummy coded prior to analysis (cf. Aiken and West, 1991).
21
22 244 Gender (males [0], females [1]), age, baseline alcohol consumption and CFC were
23
24 245 entered as covariates at step 1. Message framing (loss-frame [0], gain-frame [1]),
25
26 246 temporal focus (long-term [0], short-term [1]) and autonomy were entered at step 2 to
27
28 247 determine whether the experimental manipulations and autonomy had any
29
30 248 independent effect on alcohol consumption. The three two-way interaction terms ([1]
31
32 249 message frame x temporal focus, [2] message frame x autonomy, and [3] temporal
33
34 250 focus x autonomy) were entered at step 3, and the 3-way interaction (message frame x
35
36 251 temporal focus x autonomy) was entered at step 4. Pending any of these interactions
37
38 252 being significant, we planned to use simple slopes analysis detailed by Aiken and
39
40 253 West (1991), with high (+1SD from the mean) and low (-1SD from the mean) levels
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42 254 of autonomy.

43 44 45 46 47 255 **Results**

48 49 256 *Predicting alcohol consumption.*

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52 257 Gender, age, baseline alcohol consumption and CFC entered at step 1,
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54 258 predicted 42% of the variance in Time 3 alcohol consumption, $F(4, 330) = 58.69, p <$
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56 259 $.001$. Inspection of the individual beta weights at this step revealed that baseline

Message Frame, Temporal Focus, Autonomy

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3 260 alcohol consumption ($b = .64, p < .001$) and CFC scores ($b = -.11, p = .01$) emerged
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5 261 as significant predictors of behaviour, with those consuming more alcohol in the past
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7 262 and those reporting a propensity to consider the shorter-term (rather than longer-term)
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9 263 consequences of behaviour reporting higher levels of alcohol consumption.

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11 264 The predictor variables entered at step 2 (Message Frame, Temporal Focus,
12
13 265 and Autonomy) failed to contribute significantly to the explained variance in alcohol
14
15 266 consumption, $\Delta R^2 = .00, \Delta F(3, 327) = 0.08, p = .97$. The addition of the two-way
16
17 267 interactions (Message Frame x Temporal Focus, Message Frame x Autonomy,
18
19 268 Temporal Focus x Autonomy), at step 3, also failed to contribute significantly to the
20
21 269 explained variance, $\Delta R^2 = .00, \Delta F(3, 324) = 0.48, p = .70$. However, the inclusion of
22
23 270 the 3-way interaction significantly increased the overall amount of the variance
24
25 271 explained by the model, $b = 4.84, p = .05, \Delta R^2 = .01, \Delta F(1, 323) = 3.86, p = .05$, and
26
27 272 the final model accounted for 43% of the variance in alcohol consumption, $F(11, 323)$
28
29 273 $= 21.75, p < .001$ (see Table 4).

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34 274 [Table 4 near here]

35
36 275 Analysis of the three-way interaction showed that the Message Frame x
37
38 276 Temporal Focus interaction was significant for low-autonomy individuals ($b = 1.53, t$
39
40 277 $= 2.19, p = .03$) but not for high-autonomy individuals ($b = -1.12, t = -1.62, p = .11$).
41
42 278 For low autonomy participants who read the loss-framed information, there was a
43
44 279 marginally significant effect of temporal focus ($b = -.93, t = -1.68, p = .093$), such that
45
46 280 participants in the short-term focus condition consumed less alcohol than participants
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48 281 in the long-term focus condition. For low autonomy participants who read the gain-
49
50 282 framed information there was no significant effect of temporal focus ($b = .59, t =$
51
52 283 $1.39, p = .164$), see Figure 1.

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55 284 [Figure 1 near here]

Message Frame, Temporal Focus, Autonomy

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Discussion

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5 286 We found supportive evidence for a three-way interaction between message
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7 287 framing, temporal focus, and autonomy, albeit a small effect size. When exposed to
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9 288 information about the costs associated with alcohol use, low-autonomy participants in
10
11 289 the short-term focus condition reported lower levels of alcohol consumption than did
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13 290 those in the long-term focus condition. There was no significant interaction between
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15 291 message frame and temporal focus for high-autonomy participants; only those
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17 292 perceiving behaviour to be externally regulated (i.e., low-autonomy participants with
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19 293 lower levels of perceived choice over behaviour) appeared to respond to the
20
21 294 manipulation. We did not find a main effect for message framing; our findings were
22
23 295 thus consistent with previous research which has found no direct effect of message
24
25 296 framing on message persuasiveness (e.g., Bernstein *et al.*, 2015; Jones *et al.*, 2004).
26
27 297 However, the non-significant effect of message framing in the current study is
28
29 298 noteworthy, given that the message framing literature implies that one might expect to
30
31 299 find an effect of gain vs. loss framing in studies with relatively short follow-up
32
33 300 periods (see Rothman, et al., 2006; Gallagher and Updegraff, 2012). Neither did we
34
35 301 find a main effect of temporal focus. Although other research has shown an effect of
36
37 302 temporal focus (Gerend and Cullen, 2008), our study demonstrated this only for
38
39 303 participants lower in autonomy. We observed no two-way interaction between
40
41 304 message frame and autonomy, suggesting that this interaction found in previous
42
43 305 research (Churchill and Pavey, 2013; Pavey and Churchill, 2014) may not hold for
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45 306 alcohol consumption when temporal focus is also manipulated. In future research, a
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47 307 'no temporal focus' condition could be usefully included to attempt to replicate the
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49 308 two-way interaction.
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3 309 In the current study, when faced with information about the potential negative
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5 310 outcomes associated with alcohol use, low-autonomy participants in the short-term
6
7 311 focus condition reported lower levels of alcohol consumption, than did those in the
8
9 312 long-term focus condition. Our findings do not match the results of an earlier study in
10
11 313 which participants exposed to a message focusing on the short-term consequences of
12
13 314 alcohol consumption were more likely to reduce their alcohol consumption if the
14
15 315 message was gain- (vs. loss-) framed (Gerend and Cullen, 2008). Hence, our findings
16
17 316 emphasize the need to include potentially important individual difference variables
18
19 317 when investigating the persuasive effects of temporal framing within gain- and loss-
20
21 318 framed messages.
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24

25 319 It has been contended that short-term message frames are maximally effective
26
27 320 within loss-framed messages because the presented threats to health are made
28
29 321 imminent and likely, enhancing feelings of vulnerability to a health condition and
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31 322 encouraging preventative measures to avoid any potential negative outcomes (see
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33 323 Chandran and Menon, 2004). Although we did not directly measure participants' risk
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35 324 perceptions in the current study, our findings may be due to the short-term frame
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37 325 increasing perceptions of risk in the loss-frame message condition for low-autonomy
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39 326 participants, who are thought to already construe a higher risk in conducting the
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41 327 health behavior due to potential threats to their autonomy (see Churchill and Pavey,
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43 328 2013; Pavey and Churchill, 2014). Further research is needed to test this proposal, and
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45 329 in particular to examine whether the fit between the beliefs of low-autonomy
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47 330 individuals and short-term loss-framed messages result in increased risk perceptions,
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49 331 heightened concern and greater adherence to the recommended health behaviour.
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53 332 The results of the current study suggest that to provide people with health
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55 333 information that is maximally effective, health-related information should be tailored
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Message Frame, Temporal Focus, Autonomy

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3 334 not only to how the presented information is framed (loss vs. gain) and the temporal
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5 335 focus (short-term vs. long-term) in which the health risks are presented, but also to
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7 336 individual characteristics such as autonomy. This could have important practical
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9 337 applications for health promotion efforts which seek to engender health behaviour
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11 338 change. For example, health information about the costs of health damaging
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13 339 behaviour such as excessive alcohol use could frame the temporal focus of the advice
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15 340 given and whether autonomy is made salient. Heteronomy-related words (e.g., must,
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17 341 should) could be introduced into loss-framed information about the immediate health
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19 342 risks associated with unhealthy lifestyle choices to ensure that the style of language is
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21 343 matched to the message frame and temporal focus of the presented information.
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23 344 Health professionals could assess people's level of autonomy and deliver tailored
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25 345 health information based on level of autonomy. For those who consider that their
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27 346 behaviour is externally regulated (i.e., low-autonomy participants, who typically have
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29 347 the poorest health behaviours), health professionals imparting information about the
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31 348 negative outcomes associated with continuing health-damaging behaviour may find it
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33 349 more effective to refer to health outcomes in shorter-term time frames.
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38 350 Our findings need to be consider in relation to certain limitations. When
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40 351 reporting alcohol use post intervention, participants may be susceptible to processes
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42 352 associated with self-deception and self-enhancement (Chan, 2009). Hence, a potential
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44 353 limitation is the use of a self-report measure of alcohol consumption. Under-reporting
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46 354 of health damaging behaviours such as alcohol use is problematic, although this
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48 355 should have occurred similarly across the experimental conditions. Nevertheless,
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50 356 future research may replicate the study using a more reliable measure of alcohol
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52 357 consumption (e.g., a daily alcohol consumption diary). It is also important to note that
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54 358 the findings of this study may be limited by the reliance on a self-report measure of
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3 359 autonomy, which relies on the insight and honesty of the research participants. Thus,
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5 360 it may be constructive to investigate whether the findings of the current study can be
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7 361 replicated using assessments of autonomy that do not rely on self-report, such as
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9 362 autonomy manipulated via a priming task (see Levesque and Pelletier, 2003; Pavey
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11 363 and Churchill, 2014). It should also be noted that no manipulation check data were
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13 364 collected to confirm that the participants experienced the conditions as intended.
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16 365 Finally, it may be that the online delivery of the study influenced the results, in that
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18 366 mode of delivery of health information (e.g. whether delivered in text or in speech, in
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20 367 person or anonymously) may be important in influencing persuasive effects.

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23 368 Future research should endeavor to examine whether the findings are
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25 369 replicated for other health protective behaviours. Such research could usefully include
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27 370 an assessment of the interplay between autonomy and temporally focused loss- and
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29 371 gain-framed messages encouraging the reduction or cessation of other health-
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31 372 damaging behaviours, such as smoking, and for detection behaviours (e.g.,
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33 373 mammogram). Given the effectiveness of short-term focus within loss-framed
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35 374 information for those low on autonomy in the current study, we would predict that a
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37 375 short-term frame would also amplify the effect of loss-framed messages for detection
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39 376 behaviour among this group, offering a profitable area for future research.

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42 377 The results of the current study suggest in order to provide people with health
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44 378 information about alcohol use that is effective, loss- and gain-framed persuasive
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46 379 appeals should consider both the temporal context in which the information about
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48 380 health-related outcomes is presented and individual difference variables such as level
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50 381 of autonomy.

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Message Frame, Temporal Focus, Autonomy

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Message Frame, Temporal Focus, Autonomy

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Footnotes

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5 482 ¹ From an original sample of 466, six people's data were removed as only contact
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7 483 details were included. One person's data were deleted because of an excessively high
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9 484 frequency of alcohol consumption ($>3 SD$).

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11 485 ²A computer programming error meant that more participants were allocated to the
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13 486 gain vs. loss message frame conditions.
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For Peer Review

Table 1

	Short-term consequences	Long-term consequences
Gain (Loss)	<p>The immediate consequences of alcohol consumption</p> <p>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:</p> <ul style="list-style-type: none"> • driving accidents • having an unhealthy liver • gaining weight <p>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</p> <p>By reducing (not reducing) your alcohol consumption you can lessen (increase) the likelihood of psychological problems that can occur soon after drinking, such as:</p> <ul style="list-style-type: none"> • Impaired judgement • Poorer memory • Difficulty concentrating <p>By reducing (not reducing) your alcohol consumption you can gain (lose) immediate benefits such as:</p> <ul style="list-style-type: none"> • Better mood • Higher self-esteem 	<p>The long-term consequences of alcohol consumption</p> <p>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:</p> <ul style="list-style-type: none"> • driving accidents • having an unhealthy liver • gaining weight <p>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</p> <p>By reducing (not reducing) your alcohol consumption you can lessen (increase) the likelihood of psychological problems that can occur long after drinking, such as:</p> <ul style="list-style-type: none"> • Impaired judgement • Poorer memory • Difficulty concentrating <p>By reducing (not reducing) your alcohol consumption you can gain (lose) long-term benefits such as:</p> <ul style="list-style-type: none"> • Better mood • Higher self-esteem

Message Frame, Temporal Focus, Autonomy

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

	Gain-Frame/Short-term	Loss-Frame/Short-term	Gain-Frame/Long-term	Loss-Frame/Long-term	Whole sample
	Focus	Focus	Focus <i>M (SD)</i>	Focus	
	<i>M (SD)</i>	<i>M (SD)</i>		<i>M (SD)</i>	<i>M (SD)</i>
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

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

Message Frame, Temporal Focus, Autonomy

Table 4: Hierarchical Regressions of Alcohol Consumption on Message Framing

Manipulations and Autonomy

Variables entered	<i>b</i>	<i>SE</i>	<i>t</i>	ΔR^2	ΔF
<i>Step 1</i>				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*		
<i>Step 2</i>				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		
<i>Step 3</i>				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		
<i>Step 4</i>				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*		

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

Message Frame, Temporal Focus, Autonomy

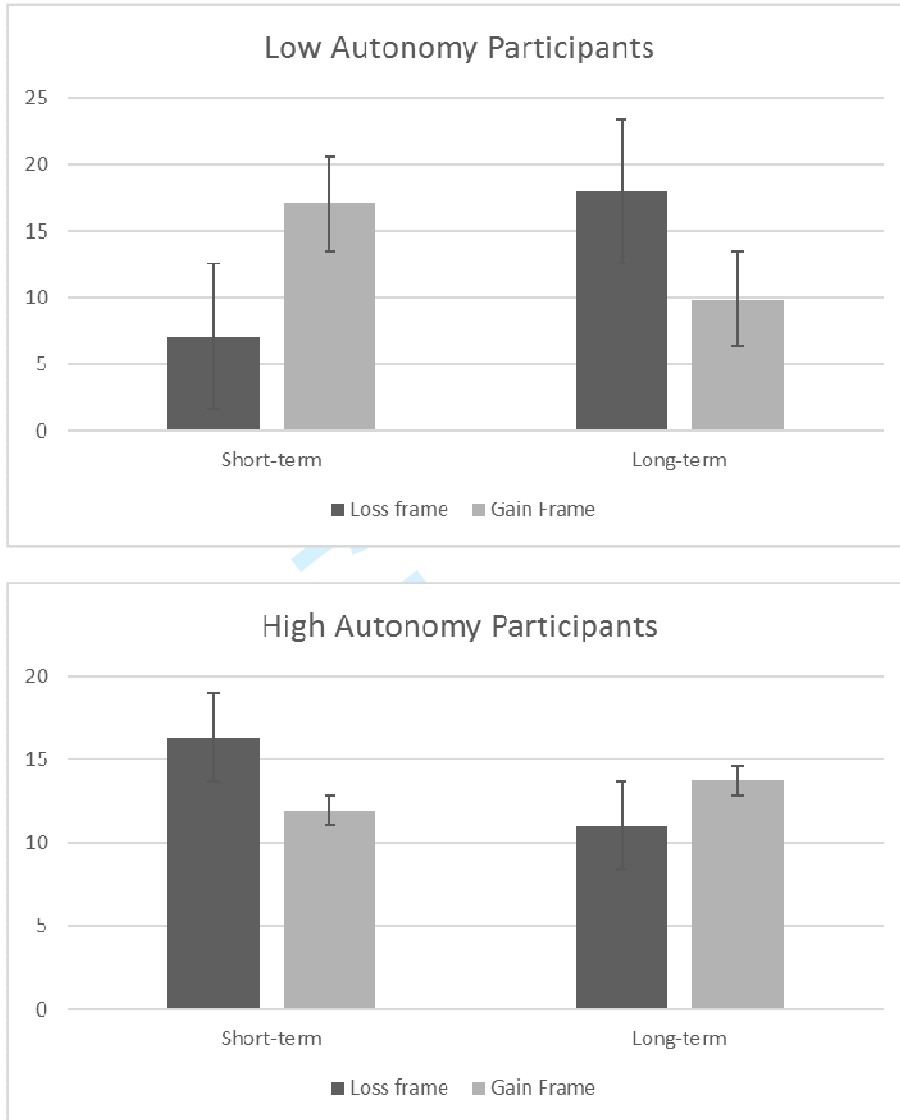


Figure 1. Self-reported alcohol consumption (units of alcohol) as a function of message frame and temporal focus among low autonomy and high autonomy participants, controlling for Gender, age, baseline alcohol use and CFC