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Title: Brief report: Improving social norms interventions: Rank-framing increases excessive alcohol drinkers' information-seeking

The work was conducted at: Department of Surgery and Cancer, Imperial College London

Authors: Michael J. Taylor PhD^{1,2}, Ivo Vlaev PhD^{1,3}, John Maltby PhD⁴, Gordon D. A. Brown PhD⁵ & Alex M. Wood PhD⁶

¹Department of Surgery and Cancer, Imperial College London

²Division of Medical Sciences and Graduate Entry Medicine, University of Nottingham

³Warwick Business School, University of Warwick

⁴College of Medicine, Biological Sciences and Psychology, University of Leicester

⁵Department of Psychology, University of Warwick

⁶Behavioural Science Centre, Stirling Management School, University of Stirling

Corresponding author details

Name: Michael Taylor

Email: mtaylor3@imperial.ac.uk **Telephone:** +44 (0) 7761 582 852

Address: Division of Surgery, Department of Surgery and Cancer, 10th Floor QEQM Building, St Mary's Hospital, South Wharf Road, London, W2 1NY

Competing Interest Statement

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Abstract

Objective: Two types of social norm message frame for encouraging seeking of alcohol-related health information by excessive drinkers were compared: (a) how much the average person actually drinks, and (b) how their drinking ranks amongst others. It was hypothesized, in accordance with recent evidence of how the brain represents value, that frame (b) would be more effective than frame (a). This is the first test comparing these frames in any domain of social norms research.

Methods: United Kingdom university students with excessive alcohol intake ($n = 101$, 66 female) were sent four weekly messages containing one of four types of information depending upon the experimental condition to which each participant was randomly allocated: (1) Official alcohol consumption guidelines; (2) how their alcohol consumption compared to official guidelines; (3) how their consumption compared to the sample mean; or (4) how their consumption ranked amongst the sample. They then had the opportunity to request up to 3 types of alcohol-related health information.

Results: Participants informed of how their consumption ranked were more likely to request information ($p < .01$, $OR = 6.0$) and tended to request a greater number of types of information ($p < .01$, $Wald = 7.17$) than those in other conditions.

Conclusions: Informing excessive drinkers of how their alcohol consumption ranked was more effective in eliciting their seeking of alcohol-related health information than informing them of how their consumption compared to the mean. Research investigating the effectiveness of this message frame in social norms interventions more generally is needed.

Key words for article: Rank; social norms; public health; alcohol consumption; information seeking

Excessive alcohol consumption is a serious public health concern. Excessive drinkers typically underestimate their consumption relative to that of others, and social norm message interventions aim to reduce consumption by correcting these misperceptions by telling people how their drinking actually compares to that of others. These are used both as single, low-intensity interventions and as part of wider intervention packages (Moreira et al., 2009; Walters & Neighbors, 2005). Framing of relative drinking involves: (a) Telling people how much they drink relative to the average person (e.g., you drink 10 units and the average person drinks 5 units; Moreira et al., 2009); (b) telling people how their drinking ranks amongst others (e.g., you are in the top 10% of drinkers; Chan et al., 2007; Dimeff et al., 1999); or both (a) and (b) (Neighbors et al., 2004). We present the first direct test of the relative effectiveness of the two types of frame.

Theories from behavioral economics predict that messages will be most likely to elicit behavior change when information is presented in way that is consistent with how it is mentally processed (Thaler & Sunstein, 2008). A large body of recent work suggests, in line with recent models of judgment (Stewart et al., 2006; Vlaev et al., 2011), that people are influenced by their perception of their rank relative to others, not by their perception of how they differ from the average. This effect has been demonstrated across a variety of health domains, including alcohol consumption (Maltby et al., 2012; Melrose et al., 2013; Wood et al., 2012). We extend this literature to interventional design through the first direct test in any domain of whether rank framing is superior to mean framing in a social norms intervention, which the earlier work tentatively suggested but did not test. Our aim was to encourage seeking of alcohol-related health information by excessive drinkers, to enable them to become better informed of services that could help them reduce their alcohol intake. It was hypothesized that informing excessive drinkers of the rank of their alcohol consumption would be more effective in eliciting their seeking of alcohol-related information than

informing them of how their consumption compared to the sample mean.

Method

Participants ($N = 146$; 95 female) aged 18-46 ($M = 21.06$, $SD = 3.50$) were recruited from a university in London and a university in central England through email and university social media; the study was described as an investigation of the effects of intervention messages upon behaviors relating to alcohol. The study protocol was granted ethical approval from the relevant institutional review boards in both universities.

The AUDIT-C, a previously validated (Bush et al., 1998) three-item screening tool, was used to measure harmful drinking. The scale had high internal consistency in our study (Cronbach's $\alpha = .82$). Research has revealed an optimal cut-off of ≥ 5 for indicating harmful drinking (Rumpf et al., 2002), with sensitivity at .74 and specificity at .83.

Participants completed a short baseline questionnaire, which contained the AUDIT-C items, which they accessed directly through a link from the recruitment emails or social media posts. Participants also reported the number of alcohol units they consumed per week to enable formulation of simple, transparent messages informing participants of how their alcohol consumption compared to that of their peers. A saliently placed chart, which indicated the number of units in popular drinks, was embedded in the questionnaire. At this stage, MJT randomly allocated participants, without stratification, to one of four conditions, using Microsoft Excel™-generated numbers to list participants in random order and assign numbers down the list of 1-4 in repeated integral sequence, with the number indicating message framing condition (Supplementary Figure 1 displays participant flow).

INSERT TABLE 1 HERE

The mean number of units-per-week consumed by the 146 participants who completed the baseline questionnaire was 10.22 ($SD = 10.98$) for males and 9.12 ($SD = 9.98$) for females; the average AUDIT-C score was 5.82 for males ($SD = 2.83$) and 5.68 for females

($SD = 3.08$). No significant difference between males and females was revealed in AUDIT-C scores ($Z = -.12, p = .91$) or units-per-week ($Z = -.73, p = .46$). Forty-five participants had an AUDIT-C score lower than 5, indicating non-harmful drinking, and were excluded from the remainder of the study because the message intervention was aimed at excessive drinkers. The remaining 101 (66 female) participants ($n = 29$ in Condition 1, $n = 27$ in Condition 2, $n = 23$ in Condition 3, $n = 22$ in Condition 4; see Table 1 for sample characteristics) were sent four weekly email messages that started with the words: “Before taking part in this study you were drinking more alcohol than is recommended by health experts” (social norm messages that do not convey disapproval of unhealthy behaviors can inadvertently encourage them; Schultz et al, 2007). This preceded a message framed in one of four ways according to experimental condition (see Table 2); those in Condition 1 (Absolute only) were sent messages that simply stated the official guidelines for alcohol consumption; those in Condition 2 (Absolute comparison) received messages comparing their alcohol consumption to official guidelines; those in Condition 3 (Mean comparison) received messages comparing their reported units-per-week to the mean number of units-per-week consumed by others of the same gender in the sample, and those in Condition 4 (Rank comparison) were informed of how their consumption in units-per-week ranked compared to others of the same gender in the sample.

INSERT TABLE 2 HERE

Seventy-eight of the 101 participants (50 female, aged 18-47 [$M = 21.21, SD = 4.19$], $n = 20$ in Condition 1, $n = 21$ in Condition 2, $n = 17$ in Condition 3, $n = 20$ in Condition 4) completed a follow-up questionnaire one month after baseline. Attrition was not significantly different between conditions ($\chi^2(3) = .36, p = .31$). In the questionnaire, participants reported their alcohol consumption in the preceding week and had the option to request information regarding: (1) Experts’ recommendations regarding alcohol consumption; (2) links to

websites containing useful information about alcohol consumption; and (3) contact details of services for people who are worried about their own or about someone else's drinking. This questionnaire included the item 'How many emails regarding this study have you received since filling in the initial questionnaire?'. All reported having received intervention emails and 73% reporting having received at least 3 ($M = 3.03$, $SD = 1.1$). There were no differences between conditions in terms of how many messages participants reported having received ($X^2 = .35$, $p = .95$). All must have opened and read the fourth email because the link to the second questionnaire was embedded in its text.

Results

The baseline questionnaire revealed no significant difference between participants in each condition in amount of units of alcohol consumed per week ($X^2(3) = 3.09$, $p = .38$, $\eta_p^2 = .04$), or AUDIT-C Scores ($X^2(3) = 1.56$, $p = .67$, $\eta_p^2 = .02$). Across conditions, participants who completed the follow-up questionnaire reported having consumed fewer units per week ($Z = -3.18$, $p = .001$ [$M = -2.77$, $SD = 11.92$]) and had lower AUDIT-C scores ($Z = -3.56$, $p < .001$ [$M = -.91$, $SD = 2.15$]) than at baseline. No significant differences in alcohol consumption reduction measured by units ($X^2(3) = 2.21$, $p = .53$, $\eta_p^2 = .05$) or AUDIT-C ($X^2(3) = 2.50$, $p = .48$, $\eta_p^2 = .023$) between conditions were revealed. The 78 participants who completed the second questionnaire did not differ in age ($Z = -.44$, $p = .66$), gender ($X^2 = .32$, $p = .63$), baseline unit consumption ($X^2 = .90$, $p = .37$) or AUDIT-C ($Z = -.42$, $p = .68$) from the 23 who did not. Gender did not influence likelihood of information being requested in the follow-up stage ($X^2 = 4.2$, $p = .60$).

Chi-squared and orthogonal regression tests were used to test for differences in seeking of alcohol related information between conditions. Of participants who completed the 1-month follow-up questionnaire, those in the rank comparison condition (Condition 4) were significantly more likely to request at least one type of the information than those in

Conditions 1 ($X^2(1) = 9.65, p = .006, OR = 6.00$ [All p -values reported in this section were multiplied by 3 to account for the familywise error rate]), 2 ($X^2(1) = 16.08, p = .003, OR = 30.00$), and 3 ($X^2(1) = 11.03, p = .003, OR = 11.25$) (see Supplementary Figure 2). A supplementary test, which focused on the most extreme information seeking, showed that participants in the rank comparison condition were more likely to request contact details for alcohol services than those in conditions 1, 2 and 3 ($X^2(1) = 8.46, p = .004, OR = 9.33$). A further ‘intention to treat’ (ITT) analysis was conducted, where participants who completed the baseline, but not the 1-month follow-up questionnaire were also included in the analysis as participants who did not request information. Again those in the rank comparison condition (4) were significantly more likely to request information than those in Conditions 1 ($X^2(1) = 11.49, p = .003, OR = 7.50$), 2 ($X^2(1) = 18.12, p = .003, OR = 31.20$) and 3 ($X^2(1) = 12.82, p = .003, OR = 12.60$)¹ and were more likely to request contact details for alcohol services than those in the other conditions ($X^2(1) = 10.88, p = .001, OR = 9.33$). Supplementary Table 1 shows the total number of participants who requested information in each condition. There was no difference between the information seeking of participants in Conditions 1-3 whether considering all (ITT) ($X^2(2) = 3.27, p = .69$), or just those who completed the follow-up questionnaire ($X^2(2) = 3.77, p = .71$).

Participants were given a score based on how much information they requested from 0 (none) to 3 (all three types). An ordinal regression revealed that for participants who had completed the 1-month follow-up questionnaire, those in Condition 4 (rank) opted to receive significantly more information than those in Conditions 1 (Estimate = -1.85, SE = .69, Wald

¹ ITT data was recoded, coding non-completers of the follow-up questionnaire as having requested information: Three separate tests each revealed those in Condition 4 (rank) were still more likely to request information than those in Condition 1 ($X^2(1) = 5.37, OR = 3.89, p = .020$), 2 ($X^2(1) = 12.43, OR = 10.06, p = .001$) or 3 ($X^2(1) = 10.02, OR = 8.31, p = .002$).

= 7.17, $p = .007$), 2 (Estimate = -3.38, SE = 1.11, Wald = 9.34, $p = .002$), and 3 (Estimate = -2.45, SE = .85, Wald = 8.43, $p = .004$). Similarly, the ITT analysis on all participants revealed those in Condition 4 (rank) to opt to receive more information than those in Conditions 1 (Estimate = -1.89, SE = .67, Wald = 7.87, $p = .005$), 2 (Estimate = -3.23, SE = 1.10, Wald = 9.15, $p = .002$), or 3 (Estimate = -2.38, SE = .84, Wald = 8.10, $p = .004$).

Discussion

We demonstrate that a minor reframing of relative information in a social norms intervention greatly increases its effectiveness at promoting help seeking. Social norms interventions have had mixed efficacy, and most involve telling recipients how they compared to the average person (Moreira et al., 2009). Our condition that adopted this approach, not unusually, was as ineffective as simply providing people with recommendations about behavior. However, when people were told the position in which they ranked amongst others, increased information-seeking behavior occurred. Our findings suggest that future social norms interventions might benefit from focusing on telling people how their behavior ranks amongst others, and that in the field more generally, more consideration should be given as to how interventions can be improved through presenting information in ways in which it is naturally processed.

A limitation of this study is that the sample size was relatively small and participant allocation to experimental condition was not informed by baseline characteristics. Also, participants were exclusively from a university population. However, the high prevalence of excessive drinking amongst university students (Moreira et al., 2009) makes this population appropriate to recruit for alcohol intervention studies. Although all participants reported having received the intervention emails, no proof of how many emails were opened was attained. Future studies using email intervention messages should attempt to collect evidence for messages being received. The four email intervention messages received by participants

were all based on baseline data and therefore may not have reflected participants' levels of drinking throughout the intervention. However, strong evidence for the effectiveness of the rank frame compared to the other messages was demonstrated in promoting information seeking. Furthermore, amending the study design according to the above recommendations would be likely to increase rather than decrease the effectiveness of the intervention.

This intervention did not lead to a reduction in participants' alcohol consumption; this is likely to be due to reduction in alcohol use being a complex change requiring multi-component intervention. Future work could investigate whether use of social norms messages with a rank frame are successful in reducing alcohol consumption as a downstream consequence of encouraging excessive drinkers to make contact with appropriate support.

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Table 1

Participant baseline characteristics

Condition	<i>N</i>	Female* (%)	Age*		Alcoholic units consumed per week*		AUDIT-C score*	
			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
			<hr/>					
Participants who completed the baseline questionnaire								
1. Absolute only	29	65.50	20.66	2.18	10.62	8.25	7.17	1.83
2. Absolute comparison	27	81.50	23.00	6.90	14.11	11.76	7.48	1.40
3. Mean comparison	23	56.50	20.13	1.22	16.03	12.38	7.18	1.76
4. Rank Comparison	22	54.50	21.21	4.01	12.59	8.69	7.37	1.72
Total	101	65.30	21.21	4.01	13.22	10.42	7.38	1.72
<hr/>								
Participants who completed both the baseline and the follow-up questionnaires								
1. Absolute only	20	70.00	20.65	2.37	9.85	5.88	7.30	1.92
2. Absolute comparison	21	81.00	22.86	7.32	15.95	12.21	7.62	1.40
3. Mean comparison	17	52.90	20.00	1.00	15.71	11.54	7.76	1.99
4. Rank Comparison	20	50.00	21.05	1.96	12.50	9.11	7.05	1.79
Total	78	64.10	21.21	4.19	13.45	10.09	7.42	1.76

*There were no significant differences between groups at baseline in terms of any of the above-listed variables.

Table 2

Framing of the intervention messages

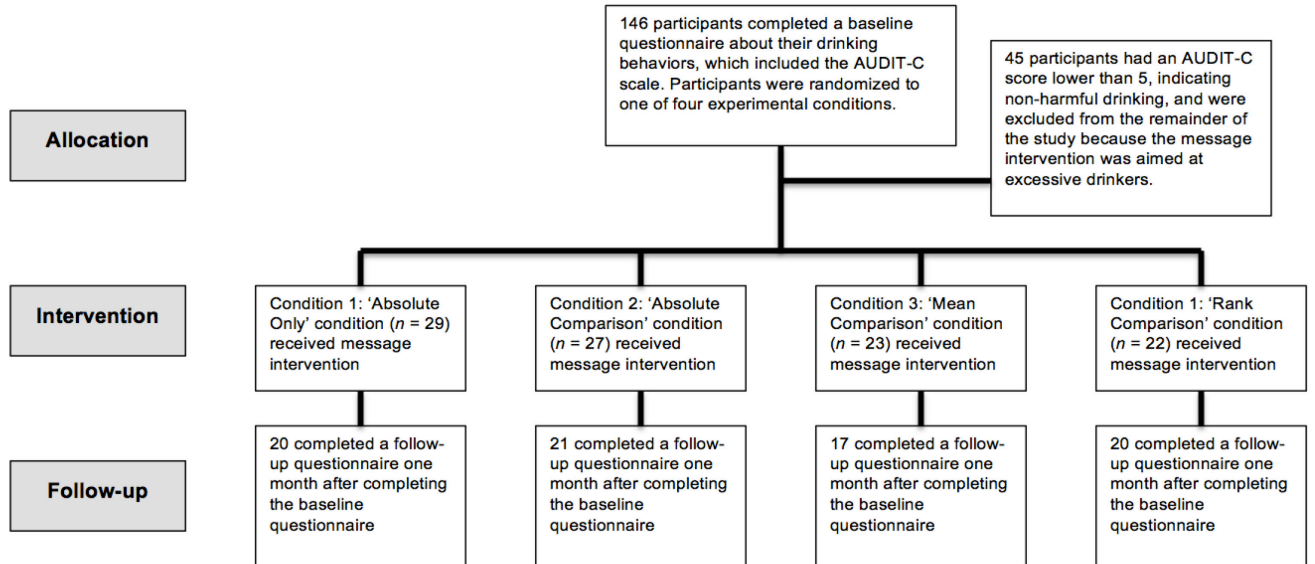
Gender	Wording of the message
Condition 1: Absolute only	
Male	It is recommended that the average male adult drinks less than 21 units per week and less than 3-4 units daily
Female	It is recommended that the average female adult drinks less than 14 units per week and less than 2-3 units daily
Condition 2: Absolute comparison	
Male	You drink X units per week, male adults are recommended to drink less than 21 units per week and less than 3-4 units daily
Female	You drink X units per week, female adults are recommended to drink less than 14 units per week and less than 2-3 units daily
Condition 3: Mean comparison	
Male	You drink X units per week, the average male participant drinks Y units per week
Female	You drink X units per week, the average female participant drinks Y units per week
Condition 4: Rank Comparison	
Male	You drink more units per week than X% of (or Y out of 10) male participants
Female	You drink more units per week than X% of (or Y out of 10) female participants

Supplementary Table 1

Binary information request results

Condition	No (%)	Yes (%)	Total
Only those who completed 1-month follow-up questionnaire			
1. Absolute only	16 (80.0%)	4 (20.0%)	20
2. Absolute comparison	20 (95.2%)	1 (4.8%)	21
3. Mean comparison	15 (88.2%)	2 (11.8%)	17
4. Rank Comparison	8 (40.0%)	12 (60.0%)	20
Total	59 (75.6%)	19 (24.4%)	78
All participants, including those who did and those who did not complete the 1-month follow-up questionnaire (intention to treat)			
1. Absolute only	25 (86.2%)	4 (13.8%)	29
2. Absolute comparison	26 (96.3%)	1 (3.7%)	27
3. Mean comparison	21 (91.3%)	2 (8.7%)	23
4. Rank Comparison	10 (45.5%)	12 (54.5%)	22
Total	82 (81.2%)	19 (18.8%)	101

Supplementary Figure 1: Flow of participation



Supplementary Figure 2: Percentage of participants who requested information by condition.

*Significant difference ($p < .05$) between indicated condition and other conditions based on odds ratio.

