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# Does message framing affect changes in behavioural intentions in people with psoriasis? A randomized exploratory study examining health risk communication

C. Keyworth[a], P. A. Nelson[b,c], C. Bundy[d], S. R. Pye[e], C. E. M. Griffiths[b,c,f] and L. Cordingley[c,g]

[a]Manchester Centre for Health Psychology, Division of Psychology and Mental Health, Faculty of Biology, Medicine and Health, School of Health Sciences, The University of Manchester, Manchester, UK; [b]Centre for Dermatology Research, Manchester Academic Health Science Centre, The University of Manchester, Manchester, UK; [c]NIHR Manchester Biomedical Research Centre, The University of Manchester, Manchester, UK; [d]School of Healthcare Sciences, Cardiff University, Cardiff, UK; [e]Division of Population Health, Health Services Research & Primary Care, Manchester Academic Health Science Centre, The University of Manchester, Manchester, UK; [f]Salford Royal NHS Foundation Trust, Manchester, UK; [g]Division of Musculoskeletal and Dermatological Research, Manchester Academic Health Science Centre, The University of Manchester, Manchester, UK

**ABSTRACT**

Message framing is important in health communication research to encourage behaviour change. Psoriasis, a long-term inflammatory skin condition, has additional comorbidities including high levels of anxiety and cardiovascular disease (CVD), making message framing particularly important. This experimental study aimed to: (1) identify whether health messages about psoriasis presented as either gain- or loss-framed were more effective for prompting changes in behavioural intentions (BI), (2) examine whether BI were driven by a desire to improve psoriasis or reduce CVD risk; (3) examine emotional reactions to message frame; and (4) examine predictors of BI. A two by two experiment examined the effects on BI of message frame (loss vs. gain) and message focus (psoriasis symptom reduction vs. CVD risk reduction). Participants with psoriasis ($n$ = 217) were randomly allocated to one of four evidence-based health messages related to either smoking, alcohol, diet or physical activity, using an online questionnaire. BI was the primary outcome. Analysis of variance tests and hierarchical multiple regression analyses were conducted. A significant *frame* by *focus* interaction was found for BI to reduce alcohol intake ($p$ = .023); loss-framed messages were more effective for CVD risk reduction information, whilst gain-framed messages were more effective for psoriasis symptom reduction information. Message framing effects were not found for BI for increased physical activity and improving diet. High CVD risk was a significant predictor of increased BI for both alcohol reduction ($\beta$ = .290, $p$ < .01) and increased physical activity ($\beta$ = –.231, $p$ < .001). Message framing may be an important factor to consider depending on the health benefit emphasised

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**CONTACT** C. Keyworth chris.keyworth@manchester.ac.uk

(disease symptom reduction or CVD risk reduction) and patient-stated priorities. Condition-specific health messages in psoriasis populations may increase the likelihood of message effectiveness for alcohol reduction.

## Introduction

Psoriasis is a complex, long-term, inflammatory skin condition affecting around 2% of the population (Parisi et al., 2013). Severe psoriasis has been associated with cardiovascular disease (CVD) however the independent risk factor for this group is co-morbid inflammatory arthritis (Parisi et al., 2015). Of perhaps greater importance is that people with psoriasis are more likely to engage in unhealthy behaviours such as excessive alcohol intake, smoking, being over-weight and sedentary than those without psoriasis (Hayes & Koo, 2010; Naldi et al., 2005; Parisi et al., 2015; Samarasekera et al., 2013). This contributes to psoriasis onset, severity, and consequently increases the risk of CVD (National Institute for Health & Care Excellence, [NICE], 2010; Yusuf et al., 2004). Despite this, risk factors are often undetected (Rutter et al., 2016) or sub-optimally managed (Nelson et al., 2016). People are unaware of the links between health behaviours and psoriasis exacerbation, and they do not receive the necessary behaviour change support consistent with clinical guidelines (Nelson et al., 2013).

Effective health risk communication methods are crucial for CVD risk reduction (Bonner et al., 2014; Keyworth, Nelson, Chew-Graham et al., 2015). Condition-specific information may improve risk perceptions and promote more informed decision-making about behaviour change (Nelson et al., 2017; Waldron et al., 2011). To date, no studies have examined the effectiveness of psoriasis-specific health information in prompting changes in behavioural intentions.

### *Theoretical framework*

Message framing theory suggests that message effectiveness is influenced by the *type* of behaviour promoted and the *framing* of the health message (Rothman et al., 2006). Gain-frame messages emphasise the *benefits* of behaviour change ('quitting smoking lowers your risk of lung cancer'), and loss-frame messages emphasise the *costs* of failure to act ('by not quitting smoking, you increase your risk of lung cancer'). The theory suggests that: (1) gain-frame messages are more persuasive for prevention behaviours ('low risk' behaviours) such as increasing physical activity (Latimer et al., 2008), and (2) loss-frame messages are more persuasive for 'detection' behaviours ('high risk' behaviours) such as promoting mammography use (Abood et al., 2005).

However systematic reviews identified inconsistent results (Gallagher & Updegraff, 2012; O'Keefe & Jensen, 2007, 2009), and other important mechanisms may influence message effectiveness. Emotional reactions to health messages may act as a barrier to accurate risk perception (Naqvi et al., 2006; Quartz, 2009; Ten Hoor et al., 2012), and self-efficacy, an important motivational factor for behaviour change (Armitage & Conner, 2001) may increase the impact of risk information on health behaviours (Sheeran et al., 2014).

Considering *immediate* versus *future* health consequences is recognised as a central characteristic in tailored health communication messages (Morris et al., 2016; O'Connor

et al., 2009). Whether an individual is concerned about their immediate health (for example their physical appearance), or reducing future health risks (reducing risk of future health conditions) is an important area for research in appearance-related conditions. Messages tailored around these considerations have been shown to be effective in contexts such as skin cancer (Thomas et al., 2011) and safe-sun practices (Aspden et al., 2015). To-date no studies have examined whether people with psoriasis are driven to protect their *immediate* health (prevention of psoriasis flares) or their *future* health (CVD risk).

This exploratory study addressed four specific research questions:

(1) Are *gain*- or *loss*-framed messages more effective for prompting changes in behavioural intentions?
(2) Are behavioural intentions driven by a desire to *improve psoriasis symptoms* (i.e. immediate consequences; psoriasis skin flare reduction) or *reduce CVD risk* (i.e. reduce long-term health risks; CVD prevention)?
(3) To what extent do differently framed health messages produce emotional responses?
(4) What are the predictors are behavioural intentions in people with psoriasis?

## Methods

### Participants

People with psoriasis were invited to take part in an online questionnaire via advertisements placed on a patient organisation website (the Psoriasis Association), a University intranet site, in community locations (such as local supermarkets), and through the use of social networking websites (Twitter and Facebook). There were no geographical restrictions on patient participation. Ethical approval was obtained from the relevant university ethics committee (reference: 13118).

### Design

A 2 (message frame: loss vs. gain) by 2 (message focus: psoriasis symptom reduction vs. CVD risk reduction) between-participants design was used.

### Materials

Health messages were constructed using clinical guidelines for CVD (NICE, 2010) and psoriasis (NICE, 2012), using information about the effects of health behaviour change on either psoriasis symptoms or CVD risk (presented in Figure 1). Using this methodology allows for tight experimental control, allowing the researcher to specifically identify which messages are effective for prompting behavioural change (de Bruijn et al., 2014; French et al., 2004; Wright et al., 2006).

### Measures

Intention to follow the advice offered to reduce risk or promote symptom management was the primary outcome, measured on a 7-point scale (1–7; possible range 3–21) in line

Scenario 1: Gain-frame /CVD risk reduction:

Research shows that risk factors for cardiova scular disease include smoking, having a poor diet, having insufficient physical activity, and drinking excessive amounts of alcohol. By making changes to your lifestyle, you [lower] your risk of cardiovascular disease.

Scenario 2: Loss-frame / CVD risk reduction:

Research shows that risk factors for cardiova scular disease include smoking, having a poor diet, having insufficient physical activity, and drinking excessive amounts of alcohol. By [not] making changes to your lifestyle, you [increase] your risk of cardiovascular disease.

Scenario 3: Gain-frame / psoriasis symptom reduction:

Research shows that living an unhealthy lifestyle such as smoking, having a poor diet, having insufficient physical activity, and drinking excessive amounts of alcohol may contribute to skin flare-ups. By making changes to your lifestyle, you [increase] the likelihood of having fewer psoriasis flare-ups and healthier looking skin.

Scenario 4: Loss-frame / psoriasis symptom reduction:

Research shows that living an unhealthy lifestyle such as smoking, having a poor diet, having insufficient physical activity, and drinking excessive amounts of alcohol may contribute to skin flare-ups. By [not] making changes to your lifestyle, you [reduce] the likelihood of having fewer psoriasis flare- up and healthier looking skin.

**Figure 1.** Health messages randomly assigned to participants.

with published recommendations (Ajzen, 1991; Francis et al., 2004). Three items were used e.g. 'I intend to reduce the amount of alcohol I drink in the next month'. Items were related to intentions to change the following health behaviours: smoking, alcohol, diet, and physical activity. Emotional response was the secondary outcome. Items consisted of two items on a 10-point scale (1–10; possible range 2–20), adapted from the literature (French et al., 2004; Klein, 1997) e.g. 'How concerned are you by reading this information?'. Three items measured self-efficacy (Armitage & Conner, 2001; Wright et al., 2006) measured on a 7-point scale (1–7; possible range 3–21) e.g. 'How confident are you that you can stop smoking in the next month?'

### Procedure

Prior to commencement, detailed information about the association between psoriasis, CVD and health behaviours was presented on the participant information sheet. Participants provided demographic information, current and past severity of psoriasis and were asked about their current health behaviours. Participants were informed about recommended physical activity levels and units of alcohol according to public health guidelines, and were asked to rate whether they met the recommendations (to determine high vs. low risk profile). Participants were randomly allocated to read one of the four health messages after which they answered the post-message items. The questionnaire was piloted-tested (Dillman, 2000) with a small convenience sample ($n$ = 16) of members of an established research user group of people living with psoriasis.

### Sample size and power calculation

In order to test the interaction between the two main effects (message frame: loss vs. gain; and message focus: psoriasis symptom reduction vs. CVD risk reduction), a larger than is feasible sample size would be required. The study was, therefore, powered to detect a standardised difference of 0.5 between the two groups (message frame and message focus) defined by a single main effect. As we wanted to test both main effects, an alpha of 2.5% was used for the test of each separate main effect, thus maintaining an overall alpha of 5%. With 80 participants per main effect (40 per group; 160 in total), the study achieved 80% power to detect differences.

### Analysis

A series of 2 by 2 analysis of variance tests (ANOVAs) were conducted to investigate the main effects of message frame, message focus and the interaction effects on behavioural intentions. Hierarchical multiple regression analyses were used to determine the predictors of behavioural intentions. Effect sizes were calculated using the means and SDs of each experimental group. SPSS v22 was used to conduct the analyses.

At step 1 demographic variables (age and sex) and self-efficacy were added. At step 2 message frame (gain vs. loss), message focus (psoriasis vs. CVD message) and the frame x focus interaction term were added to test for any effect of the wording of health messages on behavioural intentions. At step 3 risk category (according to current health behaviour profile; high vs. low) was added. The adjusted multiple correlations ($R^2$) measured the proportion of the variation in behavioural intentions predicted by the independent variables. Changes in adjusted $R^2$ indicate the amount of variance explained by each step of the model.

## Results

The sample ($n$ = 217; Figure 2) was mostly female (58.1%), White British (82%), and reported having mild (38.2%), moderate (29.5%) or moderately severe (19.4%) psoriasis (Table 1). Descriptive statistics are shown in Table 2. Data are presented for primary variables (behavioural intentions: alcohol, diet, and physical activity) and the secondary variable (emotional response to information). Due to the low numbers of smokers ($n$ = 42) included across

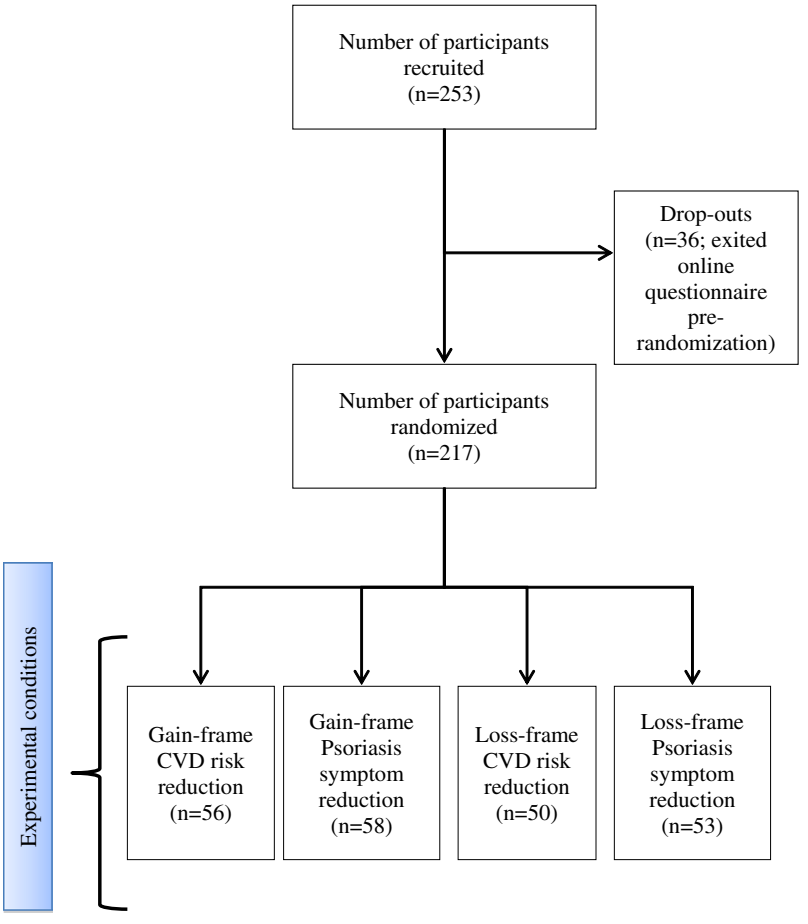


**Figure 2.** Study flow diagram.

the four conditions we excluded behavioural intentions related to the smoking in the final analysis.

The impact of message *frame* and message *focus* on behavioural intentions is presented in Table 3. Results are presented in detail according to each outcome measure.

## *Alcohol behavioural intentions*

Neither main effects for message frame [$F(1, 159) = 2.08$, $p = .15$] nor message focus [$F(1, 159) = 1.45$, $p = .23$] reached statistical significance.

There was a significant message *frame* by message *focus* interaction effect ($p = .023$) indicating when presented with different messages, there was a difference in reported behavioural intentions based on the message frame and focus. When presented with information about *psoriasis symptom reduction*, reported behavioural intentions were significantly higher in the *gain*-frame condition (*mean* = 10.56, standard deviation (SD) = 6.30) compared to the *loss*-frame condition ($M = 7.24$, SD = 4.56). However, when presented with information about *CVD risk reduction*, reported behavioural intentions were higher in

**Table 1.** Demographics of participants randomized.

| Variable | *N* (%) |
|---|---|
| *Gender*[1] | |
| Male | 75 (34.6) |
| Female | 126 (58.1) |
| Did not state | 16 (7.4) |
| *Age*[2] M (SD), Range | 41.23 (14.31), 15–83 |
| 0–19 | 3 (1.4) |
| 20–39 | 94 (43.3) |
| 40–59 | 70 (32.3) |
| 60–79 | 23 (10.6) |
| 80> | 1 (.5) |
| Did not state | 20 (9.2) |
| *Ethnicity* | |
| White British | 178 (82) |
| White Irish | 6 (2.8) |
| Mixed – White/Asian | 2 (.9) |
| Asian or Asian British –Pakistani | 1 (.5) |
| Asian or Asian British – Indian | 5 (2.3) |
| Melanesian | 1 (.5) |
| Mixed – Hispanic European | 1 (.5) |
| White – Dutch | 1 (.5) |
| Other White | 1 (.5) |
| White European | 2 (.9) |
| Welsh | 1 (.5) |
| Chinese | 2 (.9) |
| Did not state | 26 (12) |
| *Age of Pso diagnosis* | |
| <16 | 71 (32.7) |
| 16–22 (early onset) | 54 (24.9) |
| 23–39 | 62 (28.6) |
| 40–57 | 19 (8.8) |
| 57> (late onset) | 5 (2.3) |
| *Self-reported Pso severity* | |
| Current | |
| Mild | 83 (38.2) |
| Mild to moderately severe | 64 (29.5) |
| Moderately severe | 42 (19.4) |
| Moderately severe to severe | 13 (6) |
| Severe | 9 (4.1) |
| Ever | |
| Mild | 18 (8.3) |
| Mild to moderately severe | 24 (11.1) |
| Moderately severe | 49 (22.6) |
| Moderately severe to severe | 70 (32.3) |
| Severe | 49 (22.6) |
| Did not state | 6 (2.8) |
| *Diagnosis of PsoA* | 40 (18.4) |
| *Smoker* | |
| Ever | 113 (52.1) |
| Current | 42 (17) |
| Did not state | 4 (1.8) |
| *Meeting DOH guidelines for physical activity*[3] | |
| Achieve this every week | 86 (39.6) |
| Almost there, but not quite | 54 (24.9) |
| Around half of recommended | 33 (15.2) |
| A long way off recommended | 41 (18.9) |
| Did not state | 3 (1.4) |
| *Typical month, how often do you drink alcohol?* | |
| Never | 29 (13.4) |
| Once a month or less | 43 (19.8) |
| 2 to 4 times a month | 66 (30.4) |
| 2 to 3 times a week | 49 (22.6) |
| 4 or more times a week | 28 (12.9) |

(*Continued*)

**Table 1.** (*Continued*).

| Variable | *N* (%) |
|---|---|
| Did not state | 2 (.9) |
| *Units of alcohol on a typical day* | |
| 1–2 | 49 (22.6) |
| 3–4 | 66 (30.4) |
| 5–6 | 32 (14.7) |
| 7–8 | 20 (9.2) |
| 9+ | 21 (9.7) |
| Did not state | 29 (13.4) |
| *6 or more units on one occasion* | |
| Never | 66 (30.4) |
| Less than monthly | 73 (33.6) |
| Monthly | 25 (11.5) |
| Weekly | 38 (17.5) |
| Daily or almost daily | 9 (4.1) |
| Did not state | 6 (2.8) |

[1]Gender UK psoriasis population characteristics (males 47.7%) according to Springate et al. (2017).
[2]Age Psoriasis UK population characteristics (0–19 years [12.1%), 20–39 years [29.6%], 40–59 years [31.4%], 60–79 years [22.8%], 80 > years [4%]) according to Springate et al. (2017).
[3]The Department of Health recommends adults are moderately active for 2 and a half hours or vigorously active for 75 min each week. For example 30 min on at least 5 days a week.
Pso = Psoriasis; PsoA = Psoriatic Arthritis; DOH = Department of Health.

**Table 2.** Descriptive statistics for all primary and secondary outcome variables.

| | *M* (SD) | | | | | |
|---|---|---|---|---|---|---|
| | Gain-frame | | | Loss-frame | | |
| Variable | Psoriasis symptom reduction *(n = 56)* | CVD risk reduction *(n = 56)* | Overall | Psoriasis symptom reduction *(n = 52)* | CVD risk reduction *(n = 48)* | Overall |
| Behavioural intentions *(Alcohol)* | 10.56 (6.30) | 9.60 (5.33) | 10.00 (5.74) | 7.24 (4.56) | 10.35 (5.15) | 9.15 (5.13) |
| Behavioural intentions *(Diet)* | 13.21 (5.37) | 13.23 (5.55) | 13.22 (5.45) | 12.63 (6.04) | 14.22 (5.78) | 13.53 (5.91) |
| Behavioural intentions *(Physical activity)* | 13.87 (5.27) | 13.62 (5.71) | 13.73 (5.50) | 12.97 (5.19) | 14.43 (4.89) | 13.80 (5.04) |
| Emotional response to information | 8.13 (4.46) | 8.47 (5.34) | 8.32 (4.95) | 7.00 (5.10) | 10.16 (4.91) | 8.76 (5.21) |

the *loss*-frame condition ($M$ = 10.35, SD = 5.15) compared to the *gain*-frame condition ($M$ = 9.60, SD = 5.33), however the effect size ($d$ = .01) was small.

## *Diet behavioural intentions*

Neither of the main effects were statistically significant [message frame: F(1, 193) = .06, $p$ = .80; message focus: F(1, 193) = .97, $p$ = .33], nor was the interaction effect [F(1, 193) = .90, $p$ = .34].

**Table 3.** Results of ANOVA examining effects of message framing and message focus on behavioural intentions and emotional responses to health messages.

| Effect | *df* | *F* | *P* | Partial $n^2$ |
|---|---|---|---|---|
| *Alcohol intention* | | | | |
| Message frame | 1 | 2.081 | .151 | .013 |
| Message focus | 1 | 1.453 | .230 | .009 |
| Message frame X message focus interaction | 1 | 5.241 | .023* | .032 |
| Total | 163 | | | |
| *Diet intention* | | | | |
| Message frame | 1 | .062 | .804 | .000 |
| Message focus | 1 | .966 | .327 | .005 |
| Message frame X message focus interaction | 1 | .903 | .343 | .005 |
| Total | 197 | | | |
| *Physical activity intention* | | | | |
| Message frame | 1 | .003 | .956 | .000 |
| Message focus | 1 | .619 | .432 | .003 |
| Message frame X message focus interaction | 1 | 1.232 | .268 | .006 |
| Total | 201 | | | |
| *Emotional response* | | | | |
| Message frame | 1 | .145 | .704 | .001 |
| Message focus | 1 | 5.743 | .018* | .029 |
| Message frame X message focus interaction | 1 | 3.752 | .054 | .019 |
| Total | 197 | | | |

*Significant at the $p < .05$ level.

### Physical activity behavioural intentions

Neither of the main effects were statistically significant [message frame: F(1, 193) = .00, $p = .96$; message focus: F(1, 193) = .62, $p = .43$], nor was the interaction effect [F(1, 193) = 1.23, $p = .27$].

### Emotional response

There was a significant main effect for message focus [F(1, 193) = 5.74, $p = .02$]; however, the effect size was small ($d = .03$). The main effect for message frame was not statistically significant [F(1, 193) = .15, $p = .70$], neither was the interaction effect [F(1, 193) = 3.75, $p = .05$].

### Multiple regression analyses

Results are shown in Table 4 (intentions to reduce alcohol intake), Table 5 (intentions to improve diet) and Table 6 (intentions to increase physical activity).

### Alcohol

At step 1 neither age, sex nor self-efficacy were independent predictors of intentions to reduce alcohol consumption. At step 2 the addition of message frame ($\beta = -6.36$, $p = .03$) and the frame x focus interaction ($\beta = .784$, $p = .04$) significantly explained an additional .4% of the variance. This indicates that gain-framed messages resulted in higher behavioural intentions, for messages about psoriasis symptom reduction, gain-framed messages resulted in higher behavioural intentions, and for messages about CVD risk reduction loss-framed messages resulted in higher behavioural intentions. Message focus alone did not significantly contribute to the variance. In the final regression model (step 3) the addition of risk category ($\beta = .290$, $p \leq .01$) significantly explained 7.6% of the total variance, indicating

**Table 4.** Regression model for continuous (age and self-efficacy) and categorical variables on *alcohol* behavioural intentions ($n = 165$).

| Model | | $R^2$ | $\Delta R^2$ | β | 95%CI | *p*-value |
|---|---|---|---|---|---|---|
| 1 | | .008 | −.014 | | | |
| | Age | | | .049 | −.055 to .080 | .572 |
| | Sex | | | .054 | −1.395 to 2.593 | .536 |
| | Self-efficacy | | | .051 | −.160 to .289 | .554 |
| 2 | | .046 | .004 | | | |
| | Age | | | .056 | −.055 to .079 | .514 |
| | Sex | | | .035 | −1.533 to 2.490 | .692 |
| | Self-efficacy | | | .047 | −.162 to .284 | .581 |
| | Message frame | | | −.636 | −13.506 to −1.072 | .027* |
| | Message focus | | | −.441 | −11.042 to .202 | .085 |
| | Frame X focus interaction | | | .784 | .333 to 7.923 | .040* |
| 3 | | .121 | .076 | | | |
| | Age | | | .098 | −.042 to .088 | .246 |
| | Sex | | | −.014 | −2.094 to 1.875 | .870 |
| | Self-efficacy | | | .119 | −.077 to .369 | .164 |
| | Message frame | | | −.608 | −12.874 to −.811 | .028* |
| | Message focus | | | −.403 | −10.478 to .430 | .101 |
| | Frame X focus interaction | | | .722 | .079 to 7.448 | .049* |
| | Risk category | | | .290 | 1.167 to 5.152 | .001* |

*Significant at the < .05 level.

**Table 5.** Regression model for continuous (age and self-efficacy) and categorical variables on *diet* behavioural intentions ($n = 197$).

| Model | | $R^2$ | $\Delta R^2$ | β | 95% CI | *p*-value |
|---|---|---|---|---|---|---|
| 1 | | .144 | .130 | | | |
| | Age | | | −.261 | −.247 to .040 | .157 |
| | Sex | | | .046 | −3.670 to 4.736 | .801 |
| | Self-efficacy | | | .266 | −.114 to .808 | .142 |
| 2 | | .153 | .124 | | | |
| | Age | | | −.258 | −.254 to .049 | .185 |
| | Sex | | | .050 | −3.950 to 5.109 | .799 |
| | Self-efficacy | | | .269 | −.137 to .839 | .160 |
| | Message frame | | | −.195 | −16.303 to 11.831 | .751 |
| | Message focus | | | −.146 | −14.369 to 11.061 | .795 |
| | Frame X focus interaction | | | .313 | −6.949 to 10.211 | .705 |
| 3 | | .228 | .035 | | | |
| | Age | | | −.291 | −.268 to .031 | .131 |
| | Sex | | | −.024 | −4.918 to 4.261 | .902 |
| | Self-efficacy | | | .341 | −.044 to .947 | .080 |
| | Message frame | | | −.303 | −17.661 to 10.126 | .617 |
| | Message focus | | | −.263 | −15.863 to 9.347 | .636 |
| | Frame X focus interaction | | | .376 | −6.297 to 10.514 | .641 |
| | Risk category* | | | .314 | −.831 to 5.692 | .139 |

*model based on $n = 36$ with BMI data.

that participants identified as high risk (according to self-reported current alcohol intake) reported higher behavioural intentions ($M = 11.29$, SD = 5.40) to reduce alcohol compared to those identified as low risk ($M = 8.44$, SD = 5.32). Message frame ($\beta = -6.08$, $p = .03$) and the frame x focus interaction ($\beta = .722$, $p = .05$) remained significant in the final model.

### *Diet*

At step 1, neither age, sex nor self-efficacy were independent predictors of intentions to improve participants' diet. At step 2, the addition of message frame, message focus and frame

**Table 6.** Regression model for continuous (age and self-efficacy) and categorical variables on *physical activity* behavioural intentions ($n = 201$).

| Model | | $R^2$ | $\Delta R^2$ | β | 95% CI | *p*-value |
|---|---|---|---|---|---|---|
| 1 | | .397 | .387 | | | |
| | Age | | | −.177 | −.113 to −.025 | .004* |
| | Sex | | | .041 | −1.092 to 1.465 | .49 |
| | Self-efficacy | | | .587 | .540 to .796 | <.001* |
| 2 | | .402 | .381 | | | |
| | Age | | | −.175 | −.113 to −.024 | .004* |
| | Sex | | | .037 | −1.128 to 1.495 | .55 |
| | Self-efficacy | | | .586 | .536 to .795 | <.001* |
| | Message frame | | | −.127 | −5.631 to 2.530 | .51 |
| | Message focus | | | −.054 | −4.695 to 2.681 | .760 |
| | Frame X focus interaction | | | .170 | −1.476 to 3.501 | .513 |
| 3 | | .454 | .432 | | | |
| | Age | | | −.188 | −.117 to −.032 | .001* |
| | Sex | | | .055 | −.834 to 1.712 | .35 |
| | Self-efficacy | | | .613 | .565 to .816 | <.001* |
| | Message frame | | | −.137 | −5.799 to 2.084 | .46 |
| | Message focus | | | −.075 | −5.014 to 2.121 | .66 |
| | Frame X focus interaction | | | .195 | −1.119 to 3.694 | .43 |
| | Risk category | | | −.231 | −3.495 to −1.080 | <.001* |

*Significant at the < .05 level.

x focus explained no additional variance. At step 3, the addition of risk category (according to self-reported BMI) also explained no additional variance in the model.

### *Physical activity*

At step 1, both age ($\beta = -1.77$, $p \leq .01$) and self-efficacy ($\beta = .587$, $p \leq .001$) were independent predictors of intentions to increase physical activity levels and explained 38.7% of the variance, indicating that younger participants reported higher behavioural intentions, and those with higher self-efficacy reported higher behavioural intentions. At step 2 neither the addition of message frame, message focus or frame x focus interaction significantly added to the variance. Both age ($\beta = -1.75$, $p \leq .01$) and self-efficacy ($\beta = .586$, $p \leq .001$) remained significant but accounted for no additional variance. In the final regression model (step 3), the addition of risk category ($\beta = -.231$, $p \leq .001$) explained an additional 5.1% of the variance, indicating that participants self- identified as high risk reported higher intentions ($M = 14.22$, SD = 5.20) to reduce alcohol compared to those identified as low risk ($M = 12.49$, SD = 5.34).

## Discussion

This is the first study to examine the effects of message framing on reported intentions to modify health behaviours in people with psoriasis. There was a small but significant interaction between message frame and message focus in the context of alcohol reduction, contrary to previous studies. For messages focused on short-term health risk (reducing visible psoriasis symptoms), gain-framed messages were more persuasive than loss-framed messages in increasing behavioural intentions. Messages about long-term health risk (CVD risk reduction) were more persuasive when presented as a loss-framed message rather than a gain-framed message. This finding must be interpreted with caution given the small

interaction effect observed, and the nature of this study in the specific context of a long-term condition.

Our study suggests that loss-framed messages may be effective in situations beyond detection behaviours as previously suggested (O'Keefe & Jensen, 2009; Rothman et al., 1999). Using this approach in people with psoriasis and greater CVD risk may encourage behaviour change but needs further testing beyond our initial findings.

There was a significant effect for message focus (psoriasis symptom reduction compared to CVD risk reduction) on emotional responses to information. Messages about CVD produced a higher emotional response compared to messages about psoriasis symptom reduction. This finding has important implications for how sensitive health information is delivered to patients (McBride et al., 2010).

We found no effect of message framing on behavioural intentions related to increasing physical activity or diet. Similar findings have been observed for physical activity and making dietary changes (de Bruijn et al., 2014; van Assema et al., 2001), and health behaviours more generally (Avraham et al., 2016).

### *Implications for practice*

Message framing has been examined in a range of behaviours (Abhyankar et al., 2008; Churchill et al., 2016; Morris et al., 2016; Pavey & Churchill, 2014; Updegraff et al., 2015), and now in a psoriasis population. We demonstrate a clear need for condition-specific health information for people with psoriasis (Keyworth, Nelson, Chew-Graham et al., 2015; Keyworth, Nelson, Griffiths et al., 2015; Nelson et al., 2017).

The precise reason for observing significant effects in changes to behavioural intentions for reducing alcohol consumption must be examined in future research. However one hypothesis may be that in this population, the desire to reduce alcohol consumption outweighed all other health behaviours. One-third of our sample was exceeding recommended guidelines for alcohol consumption, consistent with the psoriasis population generally (McAleer et al., 2011). High alcohol consumption is particularly problematic in this population (Parisi et al., 2017), and our results suggest some wish to make the necessary behavioural changes.

Risk category was a significant predictor of increased intentions for both alcohol reduction and increasing physical activity. People self-identifying as high risk according to their alcohol consumption or by not meeting guidelines for recommended activity reported greater intentions to modify their health behaviours. This illustrates the need for targeted health risk communication strategies. Psoriasis-specific information may increase message salience and facilitate cognitive processing (Kreuter et al., 1999; Latimer et al., 2005).

Based on our findings we recommend psoriasis-specific health messages that consider both the health behaviour being targeted and the message frame used. This will be more effective if done in a way that considers a range of psychological mechanisms involved in behaviour change, as communicating risk information alone may not be sufficient to induce sustained behaviour change (French et al., 2017). Finding new ways of communicating this information in a way that aids understanding and facilitates behaviour change can only serve to improve the clinical management of patients.

### *Limitations*

The low interaction effect observed in the context of alcohol reduction, and a lack of significant effects in further health behaviours, may be due to limitations in the specific measures used in the study. Validated measured for psoriasis populations would benefit from being sensitive to the known psychological impact of living with psoriasis (Kurd et al., 2010). The cross-sectional nature of the study limits our ability to assess the longer-term impact of appropriately framed health messages on behavioural intentions. Including a measure of self-reported behaviour in future studies would strengthen such conclusions. Additionally, the majority of participants in the study were recruited from the UK. Not all demographic information is available for the psoriasis population generally, and whilst we could not match population characteristics for psoriasis identically in terms of age and gender (Springate et al., 2017), alcohol intake closely resembled known levels of consumption (Parisi et al., 2017) with strengthens our hypotheses related to desire to intentions to reduce alcohol intake.

## Conclusions

This is the first study to examine health risk communication, in the context of psoriasis, by investigating the role of message framing about future disease risk. For alcohol reduction, loss-framed messages appear to be more effective for CVD risk reduction information, and gain-framed messages are more effective for psoriasis symptom reduction information. Messages about CVD result in higher emotional responses compared to messages about psoriasis symptom reduction. Taken together, our findings should be used to develop important health information for patients with psoriasis.

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## ORCID

*C. Keyworth* http://orcid.org/0000-0002-7815-6174

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