Does image congruence impact the effectiveness of a gain-framed physical activity message?

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Abstract

Background: Gain-framed messages can improve processing and physical activity, however inconsistency remains about the merits of using different accompanying images. This study explored whether gain-framed messages alongside positive images (congruent) were more effective than negative (incongruent) images at increasing Social Cognitive Theory (SCT) constructs and moderate-to-vigorous physical activity (MVPA).

Method: Using a mixed design participants ($N = 110$) were randomly assigned to read a gain-framed physical activity booklet containing either congruent or incongruent images. Data were collected at two time points (baseline and one week later) using online questionnaires assessing SCT constructs and interviews about MVPA over the previous seven days.

Results: A time by condition interaction showed that intentions ($p = .039$, $\eta^2 = .04$) and self-efficacy ($p = .005$, $\eta^2 = .07$) increased in the congruent condition only. There was a time main effect for self-regulation ($p = .001$, $\eta^2 = .09$) and MVPA ($p = .011$, $\eta^2 = .06$), but no difference between conditions. Changes in self-regulation predicted changes in MVPA in both conditions (congruent, $p = .003$; incongruent, $p = .030$).

Conclusions: Congruence between message content and images increased intentions and self-efficacy, but not MVPA. Improving self-regulation may increase physical activity levels regardless of message congruence.

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In England the recommended amount of physical activity is 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity. Only 67% of men and 55% of women are active at these levels (HSCIC, 2014) despite inactivity contributing to cardiovascular disease, type 2 diabetes, and cancer (Baumann, 2004). One low-intensity approach to increasing physical activity is persuasive health messaging, which can be framed in terms of gains or losses. Low risk health-promotion behaviours such as physical activity are more amenable to gain-framed messages (Rothman & Salovey, 1997). Gain-framed messages are more likely to encourage physical activity behaviour but the evidence for variables such as intentions is more mixed (Gallagher & Updegraff, 2012; Latimer, Brawley, & Bassett, 2010).

Gain-framed messages can be more appealing, attracting significantly more attention, lead to better message recall, produce more positive attitudes, and increase physical activity levels (Berenbaum & Latimer-Cheung, 2014). Appropriate accompanying images can increase health message comprehension and compliance (Delp & Jones, 1996), as well as increase knowledge (Boer, Ter Huurne, & Taal, 2006). This emphasizes the need for image content to be optimized in order to maximise behaviour change. Smith and Shaffer (2000) presented participants with congruent images alongside a gain-framed health message. This provided what they called 'vividness congruency' - described as the extent to which key elements (text, imagery) were consistent with the overall tone and intention of the message. This led participants in the 'vivid congruent' condition to pay more attention, enabling them to process and recall the information more easily (Smith & Shaffer).

Gain-framed messages incorporating six or more arguments and a negative background image can increase intentions (McCormick & McElroy, 2009). It was suggested

that the negative affect highlighted by the image draws attention to and increases the persuasiveness of the health message. The image was however negative in tone and not related to physical activity, and therefore were not measuring congruency between image and message. The images were also not controlled for factors that have been shown to affect the perceptions of perceivers such as body shape, clothing, or attractiveness (e.g. Howlett, Pine, Orakçıoğlu, & Fletcher, 2013).

For the current study Social Cognitive Theory (SCT) was used as a theoretical background. The core tenets of SCT related to physical activity are self-efficacy (one's belief that they can perform physical activity under challenging circumstance), outcome expectations (beliefs about the utility of performing physical activity), goals (whether people aim to perform physical activity) which includes the ability to self-regulate, and perceived facilitators or impediments to performing physical activity (e.g. social support or lack of exercise facilities) (Bandura, 2004; Young, Plotnikoff, Collins, Callister, & Morgan, 2014). SCT variables strongly predict physical activity (Young, et al., 2014). Self-efficacy, self-regulation, and goals all have an effect on physical activity, with less evidence for social support and outcome expectancies (Young et al., 2014). Physical activity interventions have also consistently shown that increasing participants' ability to self-regulate through techniques such as self-monitoring is effective (Michie, Abraham, Whittington, McAteer, & Gupta, 2009).

The present study focuses solely on the use of gain-framed messages and seeks to determine the influence of congruent and incongruent images alongside gain-framed health messages upon MVPA and SCT constructs (self-efficacy, outcome expectancies, intentions, and self-regulation). Intention is included because it has been posited as the equivalent of a proximal goal (Bandura, 2004). This study further develops the work of McCormick and

McElroy (2009) in that the images used will be more closely linked to physical activity, providing a true test of vividness congruency (Smith & Shaffer, 2000).

We predicted that participants in the congruent condition (booklet containing gain-framed message and positive images) would have improved outcomes over and above the incongruent condition (booklet containing gain-framed message and negative images) in SCT constructs, and MVPA levels after reading the respective physical activity booklet. A further prediction was that changes in SCT constructs would predict changes in physical activity, particularly self-regulation due to its successful application in previous physical activity interventions.

Method

Ethics

This research was reviewed by the University of Hertfordshire Health and Human Science Ethics Committee with Delegated Authority (ECDA) (protocol number: LMS/UG/UH/00440).

Participants

Participants were randomly allocated using a computer random number generator to either the congruent condition, containing 57 participants (13 males, 44 females; age, $M = 24.07$, $SD = 9.23$; BMI, $M = 22.32$, $SD = 2.81$) or the incongruent condition, containing 53 participants (10 males, 43 females; age, $M = 22.81$, $SD = 8.46$; BMI, $M = 21.94$, $SD = 4.57$).

Design

This study used a mixed design with condition as the between-subjects factor (congruent; gain-framed message and positive images, and incongruent; gain-framed message and negative images) and time as the within-subjects factor (pre and post intervention, one week apart). The outcome variables were SCT constructs (self-efficacy, outcome expectancies, intentions, and self-regulation), and MVPA.

Materials

The intervention involved participants reading a four page booklet containing information about physical activity.

Physical activity leaflet

Both booklets utilised the following behaviour change techniques: Instruction on how to perform behaviour, information about health consequences, and credible source (Michie et al., 2013). Booklets highlighted the current physical activity recommendations along with examples of MVPA. A list of health benefits was also included to target expected outcomes of being active. The text emphasised the benefits of physical activity and highlighted the ease of fitting activities into daily routines, to increase self-efficacy. The gain-framed text was identical in each booklet but the images differed.

On the first page, the text was presented alongside an image of a healthy young male and female in physical activity attire. They displayed a positive facial expression (congruent) and a neutral facial expression (incongruent). The models in the incongruent condition were also manipulated to make them appear overweight, emphasizing the potential health consequences of inactivity. On the second page the male was shown playing golf and the female playing tennis (congruent) or sitting down (incongruent). The faces from the first page were copied onto the third page and to emphasize that the booklet was from a credible source, a University logo was included.

Measures

Physical Activity: The short form International Physical Activity Questionnaire (IPAQ; Ainsworth et al., 2006) asked participants how many minutes and on how many days they completed MVPA during the last week. A Metabolic Equivalent of Task (MET) score was calculated taking into account frequency, duration, and intensity.

Intentions: A Theory of Planned Behaviour questionnaire (Francis et al., 2004) asked participants to rate how strongly they agreed with three statements such as 'I expect to take part in regular physical activity over the next 7 days' on a scale from 1, '*strongly disagree*', to 7, '*strongly agree*' (reliability; pre $a = .85$; post $a = .85$).

Self-efficacy: The Physical Activity Appraisal Inventory (Haas & Northam, 2010) asked how confident participants felt in performing regular physical activity in the presence of difficulties. For example 'when I am feeling tired.' Answers were given for 13 items on an 11-point scale from 0, '*cannot do at all*', to 100, '*certain can do*' (reliability; pre $a = .92$; post $a = .94$).

Outcome expectancies: An Expected Outcomes of Regular Physical Activity scale (Steinhardt & Dishman, 1989) assessed how positively participants believe the outcomes of regular physical activity to be. The 11 items were measured on a scale from 1, '*strongly disagree*', to 5, '*strongly agree*' (reliability; pre $a = .88$; post $a = . 88$).

Self-regulation: The Self-Regulation and Action Planning scale (Sniehotta, Scholz, & Schwarzer, 2005) required participants to indicate the extent they agreed with two statements. For example, 'during the past week I have constantly monitored myself whether I exercise frequently enough.' Answers were given on a scale from 1, '*strongly disagree*', to 5, '*strongly agree*' (reliability; pre $r = .70$; post $r = .80$).

Procedure

Participants were presented with the information and consent screen. By clicking 'continue' participants gave their consent to participate. Participants completed the questionnaires followed by demographic questions including their sex, age, height, and weight. Participants then completed the IPAQ with the researcher, allowing for further probing to address over-reporting (Rzewnicki, Auweel, & Bourdeaudhuij, 2003). The participant was then given the corresponding physical activity booklet, and instructed to read

it at least once over the upcoming week. At the post-intervention meeting one week later participants completed the same questionnaires and were then debriefed.

Data Analysis

Between-group differences in baseline measures (including BMI and age) were checked with independent sample t-tests. To adjust for the inclusion of multiple dependent variables a mixed design MANOVA was used with time (pre and post) as the within-subjects factor and condition (congruent and incongruent) as the between-subjects factor. Significant main effects were then further explored with univariate ANOVAs where appropriate. Multiple regression was then utilised to assess whether changes in SCT variables predicted changes in MVPA.

Results

Overall 55 of the 57 participants in the congruent condition and all 53 participants in the incongruent condition reported reading the booklet. A set of independent samples t-tests confirmed that there was no difference by condition at baseline on any outcome (all $p > .05$).

Insert table 1 about here

A mixed MANOVA was conducted, with one between subjects factor (condition - congruent and incongruent) and one within subjects factor (time – pre and post) on SCT constructs, and MVPA. There was a non-significant multivariate effect for condition, $V = .09$, $F(5, 103) = 2.10$, $p = .071$, $\eta^2 = .09$. A significant multivariate effect was found for time point, $V = .13$, $F(5, 103) = 3.13$, $p = .011$, $\eta^2 = .13$, as well as for the interaction between condition and time point, $V = .11$, $F(5, 103) = 2.46$, $p = .038$, $\eta^2 = .11$. To investigate these effects further, univariate analyses were explored.

Insert table 2 about here

Mixed univariate analyses showed a time main effect for both self-regulation and MVPA. The effect sizes indicated that 9.1% and 5.9% of variability in participant self-

regulation and MVPA respectively was accounted for by time point. There was a significant univariate interaction between condition and time point for intentions and self-efficacy. The effect sizes indicated that 3.9% of variability in intentions and 7.0% of variability in self-efficacy was accounted for by the interaction. Post-hoc analyses showed that both intentions and self-efficacy increased significantly in the congruent condition between pre and post, $t(55) = -2.76$, $p = .008$, and $t(55) = -3.17$, $p = .003$, respectively, but not for the incongruent condition, $t(52) = .18$, $p = .860$, and $t(52) = .92$, $p = .362$.

A multiple regression was undertaken to explore whether the changes in MVPA could be predicted by changes in SCT constructs. For the congruent condition 19.3% of variability in MVPA change and 10.0% for the incongruent condition could be explained by the changes in SCT constructs. The regression model, was not significant for the incongruent condition, $R^2 = .100$, $F(4,48) = 1.34$, $p = .269$, but was significant for the congruent condition, $R^2 = .193$, $F(4,51) = 3.05$, $p = .025$. Changes in self-regulation were the only significant predictor of change in MVPA for the congruent ($p = .003$) and incongruent ($p = .030$) condition.

Discussion

Participants in the congruent condition showed a greater increase in intentions and self-efficacy, whereas self-regulation and MVPA increased irrespective of condition. Therefore the central part of the first hypothesis concerning physical activity was rejected. Self-regulation (particularly in the congruent condition) predicted changes in MVPA, supporting the secondary hypothesis. Vividness congruency between the key elements of the congruent booklet (text and accompanying images) may have resulted in participants paying more attention to (and having a greater understanding of) the health message (Smith & Shaffer, 2000). This may have enabled them to better contemplate their ability to perform the suggested exercises, thus increasing self-efficacy and intentions. Similar findings have shown

that congruency is effective in information provision for smoking cessation (Davis, Nonnemaker, Farrelly, & Niederdeppe, 2011).

Outcome expectancies did not increase after the intervention despite the leaflet outlining advantages of physical activity. However, high baseline scores indicated existing favourable expected consequences. The increase in self-regulation across both conditions may be explained by the fact that the health message encouraged participants to contemplate the required frequency of physical activity, something they may not have previously considered. The only increase across both conditions was seen in self-regulation suggesting this construct may be of most importance in changing physical activity, a notion supported by previous research (Michie et al., 2009).

A strength of the present study is the focus on gain-framed messages alongside physical activity-related images and measuring baseline physical activity, something many studies have not (Cheval, Sarrazin, Isoard-Gautheur, Radel, & Friese, 2015). Images of the same individuals were used in each condition thus controlling for factors such as the models perceived attractiveness. A limitation was the lack of a no-image control, which would have helped uncover whether having images regardless of context is beneficial and/or whether the increases seen were simply from a mere-measurement effect (Godin, Bélanger-Gravel, Amireault, Vohl, & Pérusse, 2011). Also, teasing apart the potential effects of the static and action images (congruent booklet) would also be beneficial in future research.

Ultimately the present study showed that congruence between message content and images increased intentions and self-efficacy, but not MVPA. An increase in self-regulation across both conditions mirrored the increase in physical activity, showing that self-regulation may underpin physical activity change. Further research is needed to optimize health message content and to analyse additional moderators, so that changes in SCT constructs can be more successfully translated into changes in physical activity.

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