**Changing self-reported physical activity using different types of affectively and cognitively framed health messages, in a student population**

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The present research focused upon the power of different messages to increase self-reported physical activity. 596 participants were randomised to one of five conditions that varied in the content of message: short-term affective, short-term cognitive, long-term affective, long-term cognitive and a no message control. Physical activity was measured at baseline and follow-up (7 days later) using the Godin Leisure Time Exercise Questionnaire over the subsequent 7 day period. The affective short-term message (ASM) was shown to be equally effective at increasing self-reported physical activity as a cognitive long-term message (CLM). Furthermore, when controlling for baseline activity levels, the ASM emerged as being the message that produced the highest levels of self-reported physical activity at follow-up. The findings point to the value of distinguishing between health messages in terms of the focus on affective and cognitive outcomes and the temporal nature of the outcomes (short-term or long-term).

**Keywords:** affect, messaging, physical activity, behaviour change

## Introduction

Educational programmes have long represented a substantive approach to behaviour modification for the general population (Sallis et al., 1999). These approaches assume that providing individuals with information identifying the benefits of health promoting activity or potential hazards of health harming activity will sufficiently modify behaviour (Blalock et al., 1990). If this were the case then simply highlighting risks associated with certain behaviours would be sufficient to change behaviour. Regrettably this is not consistently supported (e.g., Corvera-Tindel et al., 2004; Nutbeam, 2000; Transport Accident Commission, 2002; Williams et al., 1998). One explanation for this failure in translating information into action is that individuals can fail to construct accurate outcome expectancies, derived through mental impressions of behavioural outcomes (Williams et al., 2005). The present work examines the impact of different message types on behaviour. Specifically affective messages (AM) that are deemed to elicit more actionable outcome expectancies (Finucane et al., 2000; Rottenstreich & Hsee, 2001) are compared with cognitive messages (CM) that may be predicted to elicit these outcome expectancies less.

## Affective information

Accurate risk appraisal is dependent upon the availability of relevant information coupled with effectively using that information to form judgements (Fischhoff et al., 1978). Presenting affective information, compared with cognitive information, has been shown to be more effective at instigating change in some instances (Conner et al., 2011; Hsee & Rottenstreich, 2004; Sirreyeh et al., 2010). In addition affect has shown to be influential in several common health behaviours

(Lawton et al., 2009). Positive affect with physical activity (PA) is associated with an increase in self-reported behaviour (Kivinemi, Voss-Humke, & Seifert, 2007), more affective imagery elicits cravings for smoking (Tiffany & Drobes, 1990), affective ambivalence predicts likelihood to hold positive attitudes towards organ donation (van den Berg, 2005) and conversely negative affect has been shown to prime beer consumption (Zack, 2006). Specifically, in a meta-analysis (including 83 studies) conducted by Rhodes et al (2009) a significant positive correlation was reported between affective judgments and PA.

Accurate risk appraisal is dependent upon the availability of relevant information coupled with effective use of that information to form judgements (Fischhoff et al., 1978). The comprehension of risk is thus inherently captured by the nature of the material, such that a health message becomes relevant as a function of its ability to elicit a desired response (Peters et al. 2006). For example, Rottenstreich and Hsee (2001) have shown that affect rich stimuli can influence the perceived probability of an outcome, demonstrating that a reward of a kiss (high affect) was favoured over a cash prize (low affect) under a condition of uncertainty. Such studies demonstrate that the perceived value of an outcome can be influenced by the affective richness of the messaging and this variation in response to affectively rich and affectively poor stimuli could have implications for behavioural interventions.

AM may be argued to more readily convey this more evocative information through the targeting of such emotional responses (Zeelenberg & Beattie, 1997). Presenting health information in the form of an AM may be predicted to more readily have a health promoting effect upon behaviour than a CM, driving judgements (Caruso & Shafir, 2006; Tiedens & Linden, 2001; van Dijk & Zeelenberg, 2006). As such, presenting health information in the form of a positively framed AM may be

expected to more readily have a health promoting effect upon behaviour than a CM. This comparison was tested presently.

**Temporal salience of outcomes**

The expected utility model (Edwards, 1954), acknowledges the role of time in influencing the choices we make, for example individuals have been found to attribute greater value to short-term rewards compared to later rewards, even in cases when they have the same functional values (Hsee & Rottenstreich, 2004). Indeed, where long-term consequences have a greater utility, but are waylaid in favour of short-term gains the greater long-term rewards are said to be discounted. This reasoning may be a product of the ways in which gain framed information has been traditionally posed (e.g., Petty & Cacioppo, 1984).

Whilst nearly all behaviours have both short and long-term consequences, the 'temporal salience' of these consequences, and the risks appraised, would seem to be directive in decision making. Strong hedonic, short term gains may negate long-term risks, at least in the short-term. Whereas, strong long-term benefits may be distorted by less compelling short-term cues, and this is supported in the literature (Loewenstein & Elster, 1992; Strathman et al., 1994; Zimbardo & Boyd, 1999; Zimbardo et al., 1997).

Providing individuals with relevant additional short-term consequences of certain behaviours may be sufficient to motivate individuals to modify their behaviour (Ainslie & Haendel, 1983), or at least engage in less temporal discounting of long-term rewards, making them more attractive. Hall and Fong (2003) used a brief time perspective intervention to increase long-term thinking about PA, providing attendees at an aerobics class with one of three messages (goal setting, time perspective,

control) to enhance long-term thinking about PA. They demonstrated that the time perspective condition resulted in significantly more subsequent vigorous PA and that they engaged in more long-term thinking, compared with both other conditions. This effect has been replicated with a six-month follow-up, suggesting a robust effect for a time frame intervention in this behaviour.

**Health messages**

Strong emotional responses, readily facilitated via affective based material, can often take less time to effect change and are often seen as short cuts to decision making (Benthin et al., 1995; MacGregor, 2000; Slovic et al., 2007), whereas cognitive responses require comparably longer deliberation and as such are more amenable to long-term experience. Based upon this assessment, messages that are framed in terms of affective consequences (emotional focused) may have greater positive influence in the short-term. Whereas messages framed in terms of cognitive consequences (information presented as data) may have greater effect over a longer-term.

As affective and cognitive information can be described as usually functioning on different time frames (Williams et al., 2005) it may be valuable to assess whether a focus on short-term or long-term consequences in a message has an effect upon behaviour, and furthermore whether this interacts with message type (e.g., affective-based, cognitive-based). Since affective information can be viewed as usually residing in an immediate domain of experience (requiring less deliberation) it may be hypothesised that affective-based information operates most efficiently when framed in terms of short-term consequences, whereas the opposite may be predicted for

cognitive-based information (i.e., works best when focused upon long-term consequences).

The paper presents a study comparing a message targeting affective attitudes (affective-based) with one targeting cognitive attitudes (cognitive-based) and a no message control in changing self-reported levels of PA over a one week period. Messages contained information (affective, cognitive) that described the consequences of engaging in PA. This information was then framed further either in terms of proximal (short term) or distal (long term) consequences.

**Method**

**Participants**

Recruitment of participants was through email lists collated from University websites (42 institutions/507 departments) across the United Kingdom. Students received an email inviting them to visit a website and take part in a study on health behaviour change. Where student email addresses were not available, requests were sought from department/school secretaries to forward requests to take part in the study to their students. For this reason the precise number of students approached is not available. A priori power calculations indicated that a minimum of 64 participants per messaging group was required in order to detect a large effect size (d=.50). This indicated that the total sample size would need to be at least 320 participants. Data collection took place over a five week period. The website was visited by 2245 individuals and recorded baseline data from 2049 participants. Simple randomisation was used to allocate participants to message condition. One week later at follow-up 921 visited the website and due to incomplete data sets the final number for analysis

was 834 (286 females; 548 males; mean age 23 (sd=7.02); control N=156, ASM

N=182, affective distal (ALM) N=155, cognitive proximal (CSM) N=161, CLM

N=180). As the focus of this study was on increasing PA levels we excluded

participants who at baseline rated they were already engaging in four sessions of PA

greater than 30 minutes in duration per week, this is in line with the recommendations

of the World Health Organisation (WHO, 2011). It was felt that these individuals

would already be engaging in moderate to large amounts of PA and as such would not

reflect a suitable target population for intervention. The final number of respondents

analysed was 596 (199 females; 397 males; mean age 23; control N=106, ASM

N=126, ALM N=118, CSM N=115, CLM N=131).

**Measures**

The Godin Leisure Time Exercise Questionnaire (GLTEQ; Godin &

Shephard, 1985) was used to measure PA. Three intensities of activity are specified

(mild, moderate and strenuous) and individuals are asked to report the frequency and

duration of activity over the past week. The outcome variable calculated from the

GLTEQ was sessions of moderate and strenuous intensity activity of at least 30

minutes in duration. This outcome measure was deemed to suitably measure a

meaningful increase in PA over the period accounting for duration, frequency and

intensity of PA. The GLTEQ has proven reliability Cronbach's $\alpha$=.74 (Godin &

Shepherd, 1985) and validity Cronbach's $\alpha$=.61 (Miller et al., 1994).A separate item

was included alongside the GLTEQ to discriminate between consistent exercisers and

non-exercisers. This asked participants "How often do you engage in more than 4

sessions of exercise per week of more than 30 minutes duration?" Scores of 5 or

above on a 7 point likert scale indicated a high frequency of engaging in PA and thus excluded these individuals from subsequent analysis.

**Intervention**

The study included 4 conditions varying by message type (affective, cognitive) and temporal salience (proximal, distal), plus a single no message control. Messages focused on the positive health benefits of engaging in PA. All participants received a generic message first. Since PA is a prevention behaviour all messages were gain framed (see Abhyankar et al., 2008 for an example).

This message read "Research has shown that regular moderate-vigorous PA is associated with the following health benefits: Weight control and decreased risk of obesity, reduces the risk of heart disease and helps build and maintain healthy bones, muscles and joints". In the conditions other than control this was accompanied by either a set of affective (e.g., "Increased moderate exercise can raise endorphin levels within the body. Which is useful in alleviating feelings of anxiety and stress") or cognitive (e.g., "Exercise has been shown to make your heart healthier and stronger thus improving your health") messages, that were either proximally (e.g., "Increased moderate exercise can raise endorphin levels within the body. Which is useful in helping people concentrate on day-to-day tasks") or distally (e.g., "Increased moderate exercise can raise endorphin levels within the body. In the long term this is useful in helping people maintain mental alertness") framed messages. Table 1 presents examples of these different types of messages. Messages were piloted in a separate sample of 204 students who received one of the messages (affective, cognitive, proximal, distal). Refer to supplementary file 1 for details of the pilot study.

**[Insert tables 1 and 2 here]**

**Procedure**

Participants received an email invitation to participate in one of the studies. Clicking on the hyperlink in the email invitation took them to a webpage outlining the nature of the study with subsequent pages collecting various pieces of information. At baseline, demographic information was requested (e.g., age) which acquainted participants with the website, this was followed by the health message and then by a range of questions focusing upon PA (not all reported here). A definition of PA was also provided. The first measure recorded the participant's PA levels over the past week (see Measures). Participants worked through the website which took around 20 minutes to read the message and complete all measures.

At follow-up participants were sent an individual reminder email inviting them to take part in the follow-up portion of the study. Clicking on the hyperlink took them to the first page of the website. Questionnaire items measured behaviour using the same self-reported behavioural measure as used at baseline, not all shown here (refer to supplementary file 2).

**Results**

**Analysis**

The principal set of analyses focused on the effects of the interventions on behaviour. A repeated measures ANOVA was used to compare message condition (five levels) on behaviour across two time points. Effect size (Cohens d) was calculated by SPSS 16.0 and reported alongside the main effects and interactions, as a measure of magnitude of these effects. An outcome measure was calculated from the GLTEQ that closely reflected the study definition of PA, namely moderate and

strenuous intensity activity of at least 30 minutes duration. Paired samples t-tests were used to further explore any differences between individual conditions.

**Moderate and strenuous intensity activity of at least 30 minutes duration**

The results indicated that there was a significant main effect of time ($F(1,444) = 70.13$, $p<.001$, $d=1.00$) and a significant main interaction of time by condition ($F(4,444) = 3.28$, $p<.05$, $d=.84$). Table 2 reports the nature of this main effect, showing that self-reported PA levels were greatest following the ASM and CLM.

This interaction was then assessed in more detail by examining the change in PA between baseline and follow-up. Paired samples t-tests indicated that there was a small but significant increase in the control group ($t(83) = 3.10$, $p<.01$), a large and significant increase in the ASM group ($t(93) = 4.97$, $p<.001$), a moderate but significant increase in the ALM group ($t(87) = 3.79$, $p<.001$), a moderate but significant increase in the CSM group ($t(85) = 2.44$, $p<.05$), and a large significant increase in the CLM group ($t(96) = 4.58$, $p<.001$). This pattern is illustrated in Figure 1, which shows the largest increase in PA to follow the ASM and CLM, there was no significant difference between these two latter messages at follow-up. Table 3 shows the means and standard deviations at both time points. Post hoc tests indicated that none of the groups significantly differed at follow-up.

**[Insert figure 1 and table 3 here]**

**Discussion**

Two messages emerged as most effective at increasing self-reported levels of PA. These were a CLM and an ASM message. This latter finding is the main contribution of the current research. In a more novel use of a messaging paradigm, a

combination of message type (affective, cognitive) and message salience (proximal, distal) has shown that an AM has the potential to increase self-reported behaviour, when framed in the short-term, whereas a CM can increase self-reported behaviour to a greater extent when framed in the long-term, over a 1 week period.

Currently there is a limited experimental literature demonstrating specific differences in emphasising the short-term or long-term benefits of engaging in health behaviour (Ditto et al., 2006; Hall & Fong, 2003; Orbell et al., 2004). This work demonstrated significant differences between messages that emphasised either short-term or long-term consequences of engaging in PA. This is in accordance with work indicating that short-term benefits might be expected to be more directive, in decision making compared with long-term gains (MacGregor, 2000; Slovic et al., 2007). Long term AM with consequences seen to occur in the future may lose the sense of immediate relevance that is experienced when reading an ASM counterpart (Williams et al., 2005). For example, how an individual feels looking in the short term may be easier for them to appraise than how they may feel in the distant future (Finucane et al., 2000; Rottenstreich & Hsee, 2001).

These findings, if replicated, have significant practical value. Here we identify two messages that are effective in producing increases in PA: long-term cognitive benefits of PA; short-term affective benefits of PA. Interestingly the ASM was as effective as the CLM in changing self-reported PA. The findings illustrate the importance of considering message content both in terms of the affective versus cognitive, and in terms of the proximal versus distal nature of the outcomes considered.

Finally, we propose a subtle extension to the Expected Utility Theory, arguing that the value of time discounting can be manipulated as a function of the message

content. Highlighting the short-term cognitive consequences of PA was shown to be less effective than stressing the short-term affective consequences of PA.

**Limitations**

There are several potential issues with the present work. Firstly, there are inherent difficulties in measuring behaviour using a self-report tool. An objective measure of behaviour would have been more accurate. However, there was no evidence that this measurement inaccuracy would unequally influence the results from all conditions and therefore in terms of identifying differences between messages this is less of a concern. Secondly, a measure of dispositional style may have identified potential moderation effects of such measures as need for affect. To investigate whether certain messages would have had a more profound effect on activity levels for individuals who had high or low dispositions for certain information (e.g., high versus low need for affect; see Conner et al., 2011). Thirdly, the present follow-up period was one week. A longer follow-up period may determine the longevity of these messaging effects and may be a useful consideration in future work. Fourthly, although we have justification for selecting an at risk student population, this group may be less capable of forming mental representations about the future and as such this may have influenced the efficacy of the DM (Byrnes, 2002). Finally, the measures used in the pilot study to discriminate between message types had not been previously validated.

To conclude, the present work has demonstrated that temporal valence may play a key role in the efficacy of different health promoting messages, significantly here we contrasted AM and CM. Overall the ASM and CLM were equally effective at increasing self-reported PA. This is in contrast to both the ALM and CSM that were less effective. These findings present an important distinction between affective and

cognitive information and suggests how these different types of information may be fashioned to influence PA optimally.

**References**

Abhyankar, P., O'Connor, D.B. & Lawton, R. (2008). The role of message framing in promoting MMR vaccination: evidence of a loss-frame advantage. Psychology, Health and Medicine, 13, 1-16.

Ainslie, G. & Haendel, V. (1983). The motives of the will. In E. Gottheil, K. Druley, T. Skodola & H. Waxman. (1983) Etiology Aspects of Alcohol & Drug Abuse. Springfield: Illinois.

Benthin, A., Slovic, P., Moran, P., Severson, H., Mertz, C.K. & Gerrard, M. (1995). Adolescent health-threatening and health-enhancing behaviors: A study of word association and imagery. Journal of Adolescent Health, 17, 143-152.

Blalock, S.J., Devellis, B.M., Afifi, R.A. & Sandler, R.S. (1990). Risk perceptions and participation in colorectal cancer screening. Health Psychology, 9, 792-806.

Byrnes, J.P. (2002). The development of decision making. Journal of Adolescent Health, 31(6), 208-215.

Caruso, E. M., & Shafir, E. (2006). Now that I think about it, I'm in the mood for laughs: decisions focused on mood. Journal of Behavioral Decision Making, 19(2), 155–169.

Conner, M.T., Rhodes, R., Morris, B., McEachan, R.R.C. & Lawton, R.J. (2011). Changing exercise through targeting affective or cognitive attitudes. Psychology & Health, 26, 133-149.

Corvera-Tindel, T., Doering, L.V., Gomez, T. and Dracup, K. (2004). Predictors of Noncompliance to Exercise Training in Heart Failure. Journal of Cardiovascular Nursing, 19(4), 269-277.

Ditto, P.H., Pizarro, D.A., Epstein, E.B., Jacobsen, J.A. and MacDonald, T.K. (2006). Visceral influences on risk-taking behavior. Journal of Behavioral Decision Making, 19, 99-113

Edwards, W. (1954). The theory of decision making. Psychological Bulletin, 51, 380-417.

Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S. & Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. Policy Sciences, 9, 127-152.

Finucane, M.L., Alhakami, A. Slovic, P. & Johnson, S.M. (2000). The affect heuristic in judgements of risks and benefits. Journal of Behavioral Decision Making, 13, 1-17.

Godin, G. & Shepard, R.J. (1985). A simple method to assess exercise behavior in the community. Canadian Journal of Applied Sport Science, 10, 141-146.

Hall, P.A. & Fong, G.T. (2003). The effects of a brief time perspective intervention for increasing physical activity among young adults. Psychology & Health, 18, 685-706.

Hsee, C.K. & Rottenstreich, Y. (2004). Music, pandas, and muggers: on affective psychology of value. Journal of Experimental Psychology, 133, 23-30.

Kiviniemi, M.T., Voss-Humke, A.M. & Seifert, A.L. (2007). How do I feel about the behavior? The interplay of affective associations with behaviors and cognitive beliefs as influences on physical activity behaviour. Health Psychology, 26, 152-158.

Lawton, R.J., Conner, M.T. & McEachan, R.R.C. (2009). Desire or Reason: Predicting Health Behaviors from Affective and Cognitive Attitudes. Health Psychology, 28, 56-65.

Loewenstein, G.F. & Elster, J. (1992). Choice over time. Russell Sage Foundation: New York.

MacGregor, D.G., Slovic, P., Dreman, D. & Berry, M. (2000). Imagery, affect, and financial judgment. Journal of Psychology and Financial Markets, 1, 104-110.

Miller, D.J., Freedson, P.S. and Klime, G.M. (1994). Comparison of activity levels using Caltrac accelerometer and five questionnaires. Medicine and Science in Sport and Exercise, 26, 376-382.

Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promotion International, 15(3), 259-267.

Orbell, S., Perugini, M. & Rakow, T. (2004). Individual Differences in Sensitivity to Health Communications: Consideration of Future Consequences. Health Psychology, 23(4), 388-396.

Peters, E., Lipkus, I. & Diefenbach, M.A. (2006). The functions of affect in health communications and in the construction of health preferences. Journal of Communication, 56, 140-162.

Petty, R.E. and Cacioppo, J.T. (1984). The effects of involvement on responses to argument quantity and quality: central and peripheral routes to persuasion. Journal of Personality and Social Psychology, 46(1), 69-81

Rottenstreich, Y. & Hsee, C.K. (2001). Money, Kisses, and Electric Shocks: On the Affective Psychology of Risk. Psychological Science, 12(3), 185-190.

Rhodes, R.E., Fiala, B. & Conner, M. (2009). A Review and Meta-Analysis of Affective Judgments and Physical Activity in Adult Populations. Annals of Behavioral Medicine, 38, 180-204.

Sallis, J.F., Calfas, K.J., Nichols, J.F., Sarkin, J.A., Johnson, M.F., Caparosa, S., Thompson, S. & Alcaraz, J.E. (1999). Evaluation of a university course to promote physical activity: Project GRAD. Research Quarterly for Exercise for Sport, 70, 1-10.

Sirriyeh, R.H., Lawton, R.J., & Ward, J.K. (2010). Physical activity and adolescents: An exploratory randomised controlled trial (RCT) investigating the influence of affective and instrumental text messages. British Journal of Health Psychology, 15, 825-840.

Slovic, P., Finucane, M.L., Peters, E. & MacGregor, D.G. (2007). The affect heuristic. European Journal of Operational Research, 177, 1333-1352.

Strathman, A., Gleicher, F., Boninger, D.S. & Edwards, C.S. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. Journal of Personality & Social Psychology, 66, 742-752.

Tiedens, L. Z. & Linton, S. (2001). Judgment under emotional certainty and uncertainty: The effects of specific emotions on information processing. Journal of Personality and Social Psychology, 81, 973-988.

Tiffany, S.T. & Drobes, D.J. (1990). Imagery and smoking urges: the manipulation of affective content. Addictive Behaviors, 15, 531-539.

Transport Accident Commission (2002). *The TAC's road safety campaign*. Transport Accident Commission. Melbourne, Victoria.

van den Berg, H., Manstead, A.S.R., van der Pligt, J. & Wigboldus, D. (2005). The role of affect in attitudes toward organ donation and donor-relevant decisions. Psychology & Health, 20, 789-802.

van Dijk, E. & Zeelenberg, M. (2006). The dampening effect of uncertainty on positive and negative emotions. Journal of Behavioral Decision Making, 19(2), 171-176.

Williams, D.M., Anderson, E.S. & Winett, R.A. (2005). A review of the outcome expectancy construct in physical activity research. Annals of Behavioral Medicine, 29, 70-79.

Williams, M.V., Baker, D.W., Honig, E.G., Lee, T.M. and Nowlan, A. (1998). Inadequate Literacy Is a Barrier to Asthma Knowledge and Self-Care. CHEST, 114(4), 1008-1015.

World Health Organisation (2011). Global recommendations on Physical Activity for Health: 18-64 year old. Accessed 26th August 2014 http://www.who.int/dietphysicalactivity/physical-activity-recommendations-18-64years.pdf

Zack, M., Poulos, C.X., Fragopoulos, F., Woodford, T.M. & MacLeod, C.M. (2006). Negative affect words prime beer consumption in young drinkers. Addictive Behaviors, 31, 169-173.

Zeelenberg, M. & Beattie, J. (1997). Consequences of regret aversion 2: Additional evidence for effects of feedback on decision making. Organizational Behavior & Human Decision Processes, 72, 63-78.

Zimbardo, P.G. & Boyd, J.N. (1999). Putting time in perspective: A valid, reliable individual-differences metric. Journal of Personality & Social Psychology, 77, 1271-1288.

Zimbardo, P.G., Keough, K.A. & Boyd, J.N. (1997). Present time perspective as a predictor of risky driving. Personality & Individual Differences, 23, 1007-1023.