



Intentions to use hormonal male contraception: The role of message framing, attitudes and stress appraisals

Daryl B. O'Connor¹*, Eamonn Ferguson²
 and Rory C. O'Connor³

¹Institute of Psychological Sciences, University of Leeds, Leeds, UK

²School of Psychology, University of Nottingham, Nottingham, UK

³Dept of Psychology, University of Stirling, Stirling, UK

Two studies are reported. Study one ($N = 104$) explored the extent to which male hormonal contraception is perceived as risky compared to other prevention behaviours. Study two examined the effects of message framing on intentions to use hormonal male contraception and investigated whether attitude moderates message framing effects. Three hundred and four participants read either a loss frame or gain frame message and then completed questionnaires assessing their intentions to use hormonal male contraception, stress appraisals and the theory of planned behaviour (TPB) variables. Exposure to a loss frame influenced intention to use the daily male pill in men with a more positive attitude. This suggests that attitude, but not other TPB variables or stress appraisals have the capacity to moderate framing effects. Stress appraisals, in addition to TPB variables, significantly predicted variance in behavioural intentions in men and women. These findings are discussed within the context of Prospect Theory, perceived risk and prevention/detection behaviours.

There is a large body of evidence showing that individuals respond differently when the same information is framed as either a gain (e.g. lives saved) or a loss (e.g. deaths; see Ferguson, Bibby, & Leaviss, 2003; Kuhberger, 1998; Kuhberger, Schulte-Mecklenbeck, & Perner, 1999; Levin, Schneider, Gaeth, 1998; Rothman & Salovey, 1997 for reviews). Within the domain of health behaviours, Rothman and Salovey have argued that the type of behaviour under consideration moderates framing effects. Initially they argued that loss frames are more effective in influencing cognitions and behaviours for detection behaviours (e.g. breast self-examination) and gain frames for prevention behaviour (e.g. using sun-block). Recently, the role played by perceived risk as a moderator of framing within a single category of behaviour, either prevention or detection, has been highlighted (Apanovitch, McCarthy, & Salovey, 2003; Rothman,

* Correspondence should be addressed to Dr Daryl B. O'Connor, Health Psychology Research Group, Institute of Psychological Sciences, University of Leeds, Leeds, LS2 9JT, UK (e-mail: d.b.o'connor@leeds.ac.uk).

Kelly, Hertel, & Salovey, 2003;). It is argued that when a behaviour is perceived as risky a loss frame advantage should be observed and for behaviours that are perceived as less risky or safe, a gain frame advantage. Here this hypothesis is tested with respect to a prevention behaviour: the male hormonal contraceptive. Unlike other prevention behaviours it is argued that this will be perceived as risky and a loss frame advantage should be observed. Finally, as the need to identify potential mediators and moderators of the relationship between frames and intentions has been stressed (Steward, Schneider, Pizarro, & Salovey, 2003), two classes of psychological model (theory of planned behaviour and stress appraisals) are explored.

The male contraceptive pill

A clinically-available hormonal male contraceptive is likely to be available in the very near future (Anderson & Baird, 2002). Recent research has reported that up to 30% of couples worldwide use a male method of contraception and that over 70% of couples agreed that men should take more responsibility for contraception (see Anderson & Baird, 2002). Moreover, given there is no alternative to vasectomy or condom use for men, the acceptability and demand of male hormonal methods is likely to be high (see Martin *et al.*, 2000). To date, psychological research has only examined the behavioural effects of different formulations of the male hormonal contraceptive (O'Connor, Archer, Hair, & Wu, 2001, 2002; O'Connor, Archer, & Wu, 2004). Little or no research has investigated the psychological factors that may be important in predicting male and female intentions to using male hormonal methods of contraception (pill or injection).

The male hormonal contraceptive was chosen for this study for four reasons. First, it is a prevention behaviour with high perceived health risk. Second, it is a new piece of biomedical technology, which is not yet available, therefore, the base rate of past behaviour is zero. Third, few studies in the framing literature have focused on new biomedical technology (see Kuhberger, 1998; Kuhberger, Schulte-Mecklenbeck, & Perner, 1999). Finally, the male contraceptive will soon be available for clinical use and information on people's psychological responses to it would be of great practical significance with respect to health promotion campaigns (cf. Anderson & Baird, 2002; Martin *et al.*, 2000).

Frames, health behaviours and perceived risk

Prospect theory (Kahneman & Tversky, 1979, 1982) provides a useful framework to guide the predictions of the current study. Kahneman and Tversky's postulate predicts that risky behavioural choices will be more likely when information is framed in terms of relative disadvantages (or losses) compared with advantages (or gains). Underlying this prediction is the notion that exposure to persuasive messages highlighting the potential losses resultant in not performing a risky behaviour are likely to result in a shift in one's reference point from a situation of relative optimism and certainty to one of relative uncertainty and doubt. Consequently, when a message is framed as a loss, individuals are likely to encode the message as a relative loss from their original point of reference. As a result, risk seeking is likely to be enhanced, and their motivation to engage in the behaviour should be greater in order to return to their original reference point.

Rothman and Salovey (1997) developed and applied these ideas to health-related behaviours arguing that framing effects are modified by the type of behaviour (prevention or detection) due to the levels of perceived risk associated with each of these. They initially define risk as reflecting '...the subjective perception that to perform a behaviour may involve an unpleasant outcome' (p. 5). Specifically, detection

behaviours (e.g. breast self-examination) are seen as risky, and therefore, loss frames (which are associated with risk seeking) are more effective. Conversely, for safer prevention behaviours (e.g. using a condom), gain frames are more effective as they emphasize certainty and risk aversion (see also Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999).

However, recent theoretical and empirical work on framing effects and perceived risk has extended this original model (Apanovitch *et al.*, 2003; Rothman *et al.*, 2003). It is argued that even within a category of health-related behaviour (e.g. prevention behaviours), the relative effectiveness of a frame will depend on the level of perceived risk associated with that behaviour (Rothman *et al.*, 2003). With the category of *detection behaviours* these authors define risk as the 'possibility of learning undesirable information about one's health' (Rothman *et al.*, 2003). This has been operationalized in terms of the perceived uncertainty associated with test results – uncertainty about the future outcome (see Apanovitch *et al.*, 2003; Rothman *et al.*, 2003). Specifically, when a behaviour is perceived as having high risk (uncertainty), there should be a loss frame advantage, and for behaviours with perceived low risk (certainty), a gain frame advantage should prevail. This argument has recently received partial empirical support with respect to the uptake of HIV screening (Apanovitch *et al.*, 2003). These latter authors demonstrated a gain frame advantage for those who perceived their test results to be less risky, but there was no significant loss frame advantage for those who perceived their results to be more risky.

These authors further argue that for prevention behaviour to be considered risky or safe depends on the extent that it is perceived as effective in maintaining health (Rothman *et al.*, 2003). Therefore, risk in the context of this study on the male hormonal contraception (a prevention behaviour), was defined in terms of perceived health-outcome effectiveness. That is, the extent to which the male hormonal contraceptive is seen to be risky with respect to health.

The male contraceptive may be viewed as a potentially risky prevention behaviour for the following reasons. First, there may be concerns about side effects, efficacy, and unwanted pregnancy associated with using hormonal male contraception. Second, new advances in bio-technology and medicine are often seen as risky (Gaskell, Bauer, Durant, & Allum, 1999). Third, there is empirical evidence that hormonal contraception is viewed as risky (in terms of health-related side-effects) for people who are about to use it for the first time (Emmett & Ferguson, 1999). Therefore, it is hypothesized that (a) compared with other prevention behaviours, the male hormonal contraceptive would be viewed as risky, and (b) for this prevention behaviour, a loss frame rather than a gain frame will be observed.

Frame, intentions and the theory of planned behaviour (TPB)

The framing literature has consistently shown that frames influence intentions to behave, and there is evidence that frames also influence other parameters of the theory of planned behaviour (TPB) (see Levin *et al.*, 1998 for a review). Therefore, it may be the case that attitudes, subjective norm, and/or perceived behavioural control mediate the relationship between frame and intentions. To the authors' knowledge, the potential mediating role of all TPB variables with respect to frame and intentions has not been examined before. Previous studies have investigated the mediating effects of attitudes and intentions to explain effects of frame on behaviour, but they have failed to demonstrate any mediation effects (Banks *et al.*, 1995). However, these authors did show that framing effects still accounted for additional variance once social cognitive

variables had been controlled (e.g. attitudes). Nevertheless, it may be the case that TPB variables (e.g. perceived behavioural control) mediate the relationship between frame and intentions.

Moderating role of attitude

Attitude and attitude strength have been identified as important variables within the broader attitude-behaviour and persuasion literatures (e.g. Petty & Krosnick, 1995). Krosnick and Petty (1995) suggest that 'attitudes can influence information processing and judgments, in the sense that they make it more likely that certain information will come to mind, or that certain decisions will be rendered' (p. 3). Similarly, other researchers have presented data that demonstrate how different components of attitude strength (e.g. attitude accessibility) can moderate attitude-behaviour relations (e.g. Fazio & Williams, 1986) and information-processing (Fazio, 1995). However, despite the large corpus of research, few studies have examined whether attitude moderates the effect of frame on intention (or behaviour). Such that individuals with more positive attitudes are more likely to attend to the frame, and as a result, report higher behavioural intentions compared with individuals with less positive attitudes. This possibility will be examined in the current study.

Framing, intentions and appraisals of stress

Stress appraisals may also act as predictors of intentions as well as mediators of the frame-intentions link. First, many models of health behaviour (e.g. health belief model) explicitly contain an appraisal component (e.g. perceived threat, severity), and therefore, it seems reasonable to assume that appraisals and intentions should be associated (see Conner & Norman, 1996). Furthermore, it may also be the case that framing information influences how people emotionally respond to that information. For example, loss framed information may make people feel more distressed (see Smith & Petty, 1996). Therefore, frames may influence appraisals, which in turn influence intentions. Indeed, Detweiler *et al.* (1999) have shown that anticipated negative emotional reactions (cf. appraisals) are related to intentions, and only weakly related to framing.

Primary appraisals of threat, challenge and loss are believed to underlie an individual's initial evaluation of a potential stressful situation (Lazarus & Folkman, 1984). The challenge component of these appraisals is of particular interest in this context. Challenge refers to appraising the situation as one where learning and growth is possible. Challenge appraisals should be higher in situations that are novel and allow for potential learning and new experiences (Ferguson, Lawrence, & Matthews, 2000; Lazarus & Folkman, 1984; O'Carroll, Whiten, Jackson, & Sinclair, 2002; Skinner & Brewer, 2002). The male hormonal contraceptive offers a novel form of contraception and life experience, and as such, it would be expected that it should be related positively to intentions. This is also consistent with the ideas in positive psychology that positive aspects of emotionality are important to our understanding of behaviour as much as negative aspects (e.g. Folkman & Moskowitz, 2000). This is important with respect to TPB research where positive appraisals and emotions have tended not to be studied (Conner & Norman, 1996).

The present studies

Two studies are reported. The first study aims to explore the extent to which the male hormonal contraceptive (pill and injection preparation) is viewed as risky compared with other prevention behaviours.

The second study explores the role of framing with respect to intentions to use the male hormonal contraceptive (pill and injection preparations). It is argued that a loss rather than a gain frame advantage should be observed with the framing effect predicted to be strongest in individuals who have a positive attitude towards using hormonal male contraception. It is further hypothesized that the predicted loss frame advantage should be stronger for men rather than women (cf. Rothman *et al.*, 1993).

Rothman *et al.* (1993) demonstrated that framing effects are moderated by gender when the object of the frame has a gender-based personal relevance. Specifically, they showed that for intentions to use sun-block (a prevention behaviour) the gain frame advantage was only observed for women who they argued were more personally concerned about issues of sun-bathing. The same should be true for men in the context of the male hormonal contraceptive.

In addition, it is also predicted that challenge appraisal will be a significant predictor of intentions to use both methods of contraception. Finally, the mediation effects of attitudes, subjective norms, perceived behavioural control, attributions of responsibility, and stress appraisals are examined.

STUDY I

Examination of the health risks associated with the male hormonal contraceptive

The aim of this study was to empirically explore the arguments that the male hormonal contraceptive is perceived as having greater health-related outcome risk than other prevention behaviours: (a) using a condom and (b) using sun-block. These two behaviours were chosen for the following reasons. Assessment of risk associated with condom use allows for comparison with another (most commonly used) form of male contraception. Assessments of risk associated with using sun-block allows for comparison with another form of prevention behaviour, which has been widely researched in the literature, and for which a gain-frame advantage is found (Rothman *et al.*, 1993). This makes it possible to judge the relative risk of the different forms of male hormonal contraception relative to a known safe prevention behaviour (use of sun-block) and a form of male contraception (condom) that does not pose in itself a health risk. As such, the use of sun-block and condom should similarly be rated as low health risks (i.e. safe in terms of future ill-health).

Method

Design

A convenience sample of undergraduates and staff at two UK universities were asked to complete a short 4-item questionnaire.

Participants

A total of 104 participants (46 males, 55 female, and 3 failed to specify) with a mean age of 22.9 years ($SD = 5.6$) answered questions on perceived health outcome risk.

Measures

Perceived health outcome risk

This was assessed for the two forms of male hormonal contraceptive (daily pill and injection), the use of condoms, and sun-block. Participants responded on a 7-point

Likert-type scale (1 = *not at all risky* to 7 = *very risky*) to indicate, the risk they believed that each form of contraception and using sunblock was to someone's health.¹

Results and discussion

The results for perceived risk are presented in Table 1. A repeated measures multivariate analysis of variance (MANOVA) was used to explore the main and interactive effects of sex and perceptions of risk. Sex was the between-participants factor and the four perceived risk questions were treated as a repeated measures factor. The results indicated a significant main effect for sex ($F(1, 99) = 14.9, p < .001$), a significant main effect for the type of risk ($F(3, 297) = 134.8, p < .001$) and a significant interaction between sex and type of risk ($F(3, 297) = 4.4, p = .05$). Adjusted Tukey HSDs were used to examine the nature of the interaction. Men perceived both forms of male hormonal contraception as significantly more risky than did women. There were no significant differences between men and women for condom or sun-block use risk estimates. For women there was no significant difference between the two forms of male hormonal contraception, but both were perceived as more risky than using a condom or sun-block. Also, for women there was no significant difference in perceived risk between the use of condoms and sun-block. However, for men there was a significant difference in terms of perceived risk for the two forms of male contraception. The injection preparation was perceived as riskier than the pill version and both of these were perceived as significantly different from using condoms or sun-block. Again there was no significant difference in perceived risk estimates between using condoms and sun-block for men.

Table 1. Means and standard deviations (SDs) for perceived health outcome risk of prevention behaviours in males ($N = 46$) and females ($N = 55$) in Study 1

	Males		Female	
	Mean	SD	Mean	SD
Risk – male pill	3.6	1.3	2.8	1.0
Risk – male injection	4.2	1.4	3.3	1.1
Risk – condom	1.6	0.9	1.6	0.8
Risk – sun-block	1.9	1.4	1.4	0.6

The pattern of these results confirms the prediction that the male hormonal contraceptive is perceived as riskier than the other main form of male contraception (for both men and women). In addition, levels of perceived risk for the male hormonal contraception were higher for men. Furthermore, compared with women, men significantly differentiated between the two forms of male hormonal contraception by perceiving the injection preparation as riskier than the pill preparation. As levels of perceived risk were significantly different for the two preparations of the male hormonal contraceptive these were treated as separate design variables s in the subsequent study.

¹ The question refers to someone's health in order to try and identify the general social perception of risk associated with the male hormonal contraception. This was done for the following reason: Rothman and Salovey (1997) discuss the risk/safety of classes of behaviours (prevention and detection) in terms of general societal perceptions and we wanted to extend this to a single class of behaviour (prevention). Furthermore, we wanted a general assessment of risk for all four prevention behaviour studied.

Given the above findings, a loss frame advantage is predicted in Study 2. It should be noted that on the 7-point scales used the mean risk rating for the male hormonal contraceptives was towards the mid-point. This may be taken to indicate that they are not perceived as that risky. However, relative to the safe prevention behaviours (sun-block and condom use) included as calibration points, they were judged as significantly more risky. Therefore, while not at extremes of risk, relatively speaking the male hormonal contraception is perceived as having potential health risk by both men and women and more so for men. It is this relative difference that indicates the potential for a loss frame advantage for this prevention behaviour.

STUDY 2

Framing and intentions to use the male hormonal contraceptive

This study explored the hypothesis that a loss frame advantage would be observed for intentions to use the male hormonal contraceptive and that this would be moderated by attitude and it would be stronger for men than women.

Method

Design and procedure

The study employed a two-way frame (loss versus gain) by gender (male versus female) between-participants design in which participants were randomly assigned to either a loss frame condition or a gain frame condition. Participants received only materials pertaining to their assigned condition that initially provided some background information about the development of hormonal male contraception. The two contraceptive preparations (i.e. daily pill intake versus the injection lasting up to 2–3 months) were made explicit to participants in the background information and in the items they subsequently rated. They were then instructed in *imagine* male hormonal contraception was now available and that they were in a relationship, and then to read their framing manipulation. Having read their particular message frame, participants completed ratings of intention to use the male pill and the injection preparations and completed the TPB and stress appraisal measures.

Participants

A total of 304 undergraduate students from two universities in England and a university in Scotland were recruited to the study. Of these, 297 (145 females, 152 males) participants completed the entire questionnaire. We sampled only participants who had previously used some form of contraception (male or female). The mean age of the sample was 20.41 years (range 18–40 years). The age of male and female participants did not significantly differ.

Message framing

In the gain frame, participants were provided with the following information: 'If you use the male contraceptive pill or injection², you will be able to take advantage of an alternative, convenient method, which would provide reliable contraception,

² The message frame provided information about using the daily pill and the injection preparation simultaneously in order to closely mimic the decision alternatives men and women will be faced with in the real world when these methods are available.

does not carry a significant risk of side effects and would allow for a more equal sharing of the responsibility for contraception.' In the loss-frame condition, participants were provided with exactly the same information, but it was framed as 'If you do not use the male contraceptive pill or injection, you will not be able to...'

TPB variables³

Behavioural intentions were measured using two single items '(I (or my partner) intend(s) to use the daily male pill'; 'I (or my partner) intend(s) to use the injection (lasting up to 2-3 months)', on a 7-point bipolar scale (-3 = *unlikely* to +3 = *likely*). Attitudes were measured using four bipolar (-3 to +3) semantic differential scales. The items were 'my using any form of hormonal male contraception would be...' followed by 'good-bad', 'beneficial-harmful', 'pleasant-unpleasant', 'desirable-undesirable' (Cronbach's $\alpha = .84$). Perceived behavioural control⁴ was assessed using three unipolar (+1 to +7) items: 'How much control do you feel you have over (your partner) taking the "male pill" everyday (no control-complete control)'; 'I am confident that I (or my partner) will take the "male pill" everyday (strongly disagree-strongly agree)'; 'For me (or my partner) to take the "male pill" will be... (difficult-easy)'. Cronbach's $\alpha = .78$. Subjective norm was assessed using the single-item, 'people who are important to me would... (1 = *approve* to 7 = *disapprove*)'. Martin *et al.* (2000) identified the importance of perceptions of responsibility for contraception (males or females) in an earlier study on hormonal male contraception. Therefore, we also included their single-item 'do you think that responsibility for contraception falls too much on women (1 = *strongly disagree* to 7 = *strongly agree*)' to assess attributions of responsibility.

Stress appraisals

Appraisals of threat, challenge and loss were assessed using the Appraisals of life events (ALE) scale (Ferguson & Bibby, 2002; Ferguson, Matthews, & Cox, 1999). The ALE scale is an adjective checklist designed to elicit a participant's appraisals of a transaction in terms of the extent to which they perceive their environment to be threatening (six items; e.g. fearful, frightening), challenging (six items; e.g. stimulating, exhilarating) or loss-provoking (four items; e.g. pitiful, depressing). In the current study, a shortened version was employed where only the two highest factor loading items from each scale were included. Participants respond to each adjective on a 6-point Likert-type scale (0 = *not at all* to 5 = *very much so*) to indicate their perception of the environment (in this case, using male hormonal contraception).

Analysis

In order to examine whether the message frame impacted on intentions and whether any framing effects were mediated by the TPB or stress appraisal variables, a 2 (frame: gain versus loss) by 2 (sex: male versus female) MANOVA was performed including all

³ Items assessing attitudes and subjective norm relate to 'using any form of hormonal contraception' and not to using the 'daily pill' or 'injection' separately. Given that using hormonal male contraception is a novel behaviour and that participants were unlikely to be aware of the different preparations expected to become available, we felt that they would hold more generic attitudes and subjective norm beliefs to using 'hormonal male contraception' per se. Whereas, items assessing perceived behavioural control relate only to using the daily pill, as we felt, in this context, that the injectable preparation was likely to be viewed as being under the health professional's control and not the man's volitional control.

⁴ As PBC items only relate to taking the 'daily pill', PBC is not included in regression analysis when intention to use the injection preparation is the dependent variable.

study variables. Pearson's product moment correlations were calculated to investigate the relationship between all variables. Hierarchical linear regressions were used to examine the predictors of intention and to test for moderation effects of attitude (Baron & Kenny, 1986). All variables were mean-centred before being entered into the regression analyses.

Results

Descriptive statistics and zero-order bivariate correlations for study variables are presented in Tables 2 and 3. Consistent with existing research, TPB and stress appraisal variables were significantly associated with intentions (Ajzen, 1991; Farrell, Ferguson, James, & Lowe, 2001).

Frame and gender effects

A two-factor, between-participants MANOVA was conducted on all dependent variables. The multivariate F tests indicated a significant main effect of gender $F(9, 285) = 16.70, p < .001$, but not for frame, $F = (9, 285), 0.76$ ns, or the, frame \times gender interaction, $F(9, 285) = 0.31$ ns. Subsequent univariate analyses, revealed significant effects of gender on attitude, $F(1, 293) = 57.39, p < .001$, subjective norm, $F(1, 293) = 22.93, p < .001$, perceived behavioural control, $F(1, 293) = 26.30, p < .001$, attributions of responsibility, $F(1, 293) = 47.10, p < .001$, appraisals of threat, $F(1, 293) = 4.72, p < .05$ and challenge $F(1, 293) = 5.06, p < .05$. That is, compared with males, female respondents had a significantly more positive attitude towards using hormonal male contraception, and they were more likely to report that people important to them would disprove of their using hormonal male contraception, that responsibility for contraception falls too much on women and perceived themselves as having lower levels of control over taking the 'male pill'. Female respondents also appraised using male contraception as significantly more threatening and challenging compared with their male counterparts.

Prediction of intention

In order to examine which psychological factors significantly predicted variations in intention to use hormonal male contraception, a series of hierarchical regression analyses were conducted (Tables 4 and 5). Separate analyses were performed for males and females and for intentions to use the daily pill and the injection preparation. Analyses were performed separately for males and females as gender differences were seen for a number of the predictor variables.

Age was entered at the first step, with all TPB and appraisals of stress variables entered at Step 2, followed by frame entered at Step 3 (see Tables 4 and 5).

Prediction of intention in male sample

Age did not significantly predict intention to use the pill at Step 1, however, subjective norm, perceived behavioural control and appraisals of challenge significantly explained 37% of the variance in intention. When frame was entered into the equation, it failed to account for any additional variance. In the final regression model (total $R^2 = .38$), subjective norm ($\beta = -0.17, p < .05$), perceived behavioural control ($\beta = 0.41,$

Table 2. Descriptives statistics (SD) for all study variables in males (N = 152) and females (N = 145) in Study 2

	Gain frame			Loss frame		
	Male		Female	Total	Male	
	Male	Female		Male	Female	Total
Intention to use pill	−4.7 (1.93)	−8.9 (1.67)		−.66 (1.82)	−.49 (2.00)	−.55 (1.61)
Intention to use injection	−1.14 (1.79)	−1.46 (1.55)		−1.29 (1.68)	−1.16 (1.72)	−1.05 (1.76)
Attitude	−.47 (5.93)	4.06 (4.21)		1.63 (5.66)	.23 (4.75)	4.56 (4.90)
Perceived behavioural control	12.61 (4.69)	9.69 (3.80)		11.26 (4.53)	12.68 (4.34)	10.48 (4.24)
Subjective norm	3.84 (1.64)	4.83 (1.29)		4.30 (1.56)	4.17 (1.58)	4.86 (1.47)
Responsibility	4.45 (1.81)	5.71 (1.43)		5.03 (1.76)	4.30 (1.67)	5.59 (1.40)
Threat-ALE	3.87 (2.91)	4.50 (2.32)		4.16 (2.66)	3.59 (2.48)	4.30 (2.80)
Loss-ALE	1.69 (2.12)	1.51 (1.72)		1.61 (1.94)	1.91 (2.64)	1.60 (2.06)
Challenge-ALE	2.17 (2.35)	2.97 (2.50)		2.54 (2.44)	2.71 (2.68)	3.21 (2.41)

Table 3. Zero-order bivariate correlations for the main study variables

Variable	1	2	3	4	5	6	7	8	9
1. Intention to use pill	—	.60***	.32***	.40***	.30***	.20*	—	-.26***	-.20*
2. Intention to use injection	.70***	—	.35***	—	.25***	.13	-.10	—	.17*
3. Attitude †	-.18*	-.21***	—	.27***	.26***	.22***	—	-.25***	-.31***
4. Perceived behavioral control	-.51***	—	-.08	—	.28***	—	.05	—	.17*
5. Subjective norm †	-.25***	—	.51***	-.12	—	.17*	—	-.21*	-.18*
6. Responsibility	.20*	.10	.01	.30***	—	.02	—	-.14	—
7. Threat-ALE	-.21***	.23***	.22***	—	.27***	.21*	—	.42***	.31***
8. Loss-ALE	-.29***	—	.20*	.21***	—	.37***	.24***	—	.37***
9. Challenge-ALE	.23***	.08	—	.06	.07	.12	.07	.31***	—

Note: * $p < .05$; ** $p < .01$; *** $p < .001$; male sample below the diagonal, female sample above the diagonal; †lower scores indicate greater approval for subjective norm; †lower scores indicate a more positive attitude; Threat-ALE, Loss-ALE, Challenge-ALE = all subscales from the Appraisal of Life Events scale.

Table 4. Hierarchical regression of intentions on age, TPB and stress-appraisal variables and message frame in the male sample

Step/predictor	Intentions to use daily male pill				Intentions to use injection preparation				Total R^2
	β (Step 1)	β (Step 2)	β (Step 3)	ΔR^2 for Step	Total R^2	β (Step 1)	β (Step 2)	β (Step 3)	
Step 1									
Age	−0.09	−0.11	−0.12	.01	.01	−0.07	−0.07	−0.07	.00
Step 2									
Attitude	−0.01	−0.01	−0.01	.37***	.38***	−0.05	−0.05	−0.05	.14**
Subjective norm	−0.17*	−0.17*	−0.17*	−0.17*	−0.17*	−0.18*	−0.18*	−0.18*	−0.18
PBC	0.41***	0.41***	0.41***	0.41***	0.41***	−	−	−	−
Threat-ALE	−0.09	−0.10	−0.10	−0.10	−0.10	−0.20*	−0.20*	−0.20*	−0.20*
Loss-ALE	−0.10	−0.10	−0.10	−0.10	−0.10	−0.08	−0.08	−0.08	−0.08
Challenge-ALE	0.25**	0.25**	0.25**	0.25**	0.25**	0.17	0.17	0.17	0.17
Responsibility	0.05	0.04	0.04	0.04	0.04	0.06	0.06	0.06	0.06
Step 3									
Frame	−0.04	−0.04	−0.04	−0.04	−0.04	−0.02	−0.02	−0.02	−0.02

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Threat-ALE, Loss-ALE, Challenge-ALE = all subscales from the Appraisal of Life Events scale; PBC = perceived behavioral control.

Table 5. Hierachial regression of intentions on age, TPB and stress-appraisal variables and message frame in the female sample

Step/Predictor	Intentions to use daily male pill				Intentions to use injection preparation				Total R^2
	β (Step 1)	β (Step 2)	β (Step 3)	ΔR^2 for Step	Total R^2	β (Step 1)	β (Step 2)	β (Step 3)	
Step 1									
Age	−0.18*	−0.13	−0.13	.03*	.03*	−0.09	−0.08	−0.07	.01
Step 2									
Attitude	0.13	0.13	0.13	.25***	.28***	0.23*	0.22*	0.22*	.19***
Subjective norm	0.08	0.09	0.09	.029***	.029***	0.11	0.11	0.11	—
PBC	0.29***	0.29***	0.29***	—	—	—	—	—	—
Threat-ALE	0.12	0.12	0.12	—	—	0.02	0.02	0.01	—
Loss-ALE	−0.05	−0.05	−0.05	—	—	−0.15	−0.15	−0.15	—
Challenge-ALE	0.08	0.07	0.07	—	—	0.22*	0.22*	0.22*	—
Responsibility	0.14	0.14	0.14	—	—	0.02	0.03	0.03	—
Step 3									
Frame	—	—	.00	.28	.05	.01	.01	.01	.20
					0.09				

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Threat-ALE, Loss-ALE, Challenge-ALE = all subscales from the Appraisal of Life Events scale; PBC = perceived behavioral control.

$p < .001$) and appraisals of challenge ($\beta = 0.25, p < .01$) significantly contributed to the regression equation.

For intentions to use the injection preparation, age did not enter the equation, whereas subjective norm and appraisals of threat significantly explained 14% of the variance at Step 2. Frame did not significantly explain any additional variance in intention when entered at the final step. In the final regression model (total $R^2 = .14$), appraisals of threat ($\beta = -0.20, p < .05$) was the only variable to significantly contribute to the final equation (see Table 4). Although it is worth noting that subjective norm ($\beta = -0.18, p = .054$) and appraisals of challenge ($\beta = -0.17, p = .052$) just missed conventional statistical significance.

Prediction of intention in female sample

Results are presented in Table 5. Age significantly predicted 3% of the variance at Step 1, with perceived behavioural control explaining an additional 25% at Step 2 in intention to use the daily male pill. Adding frame to the equation at Step 3 did not significantly explain any further variance. In the final regression model (total $R^2 = .28$), only perceived behavioural control ($\beta = 0.29, p < .001$) significantly contributed to the final equation.

For intentions to use the injection preparation, age did not significantly enter the equation at Step 1, whereas attitude and appraisals of challenge significantly explained 18% of the variance at Step 2. Frame did not significantly explain any additional variance in intention when entered at the final step. In the final regression model (total $R^2 = .19$), attitude ($\beta = 0.22, p < .05$) and appraisals of challenge ($\beta = 0.22, p < .05$) significantly contributed to the final equation.

Testing moderation effects of attitude and gender

To specifically investigate the potential moderating role of attitude on the relationship between frame and intention, two hierarchical regressions were conducted for intentions to use the daily pill and the injection. In addition, given that a main effect of gender was identified in the MANOVA the effect of gender was also examined. In this case, gender was entered directly into the analysis rather than conducting separate analysis by gender. This is because specific interaction (moderation) effects for attitude on frame are predicted and whether or not this is further moderated by gender can be included in this analysis in terms of specific interaction terms. The previous regression analyses (see Tables 4 and 5) were conducted separately for males and females as no specific interaction with gender was predicted.

Therefore, frame, attitude, and gender were entered at Step 1, followed by the three cross-product terms (Attitude \times Frame, Gender \times Frame, Gender \times Attitude) at Step 2 and the three-way Gender \times Frame \times Attitude interaction at Step 3 (Baron & Kenny, 1986; Cohen & Cohen, 1983).

For intentions to use the daily male pill, attitude, the Attitude \times Frame, Gender \times Attitude and Gender \times Frame \times Attitude interactions were all statistically significant ($F_{\text{Change}} = 5.68, p < .05$) in the final regression equation model. In order to decompose the three-way interaction, the regression analyses were rerun on the male and female samples separately with attitude and frame entered at Step 1, followed by the Attitude \times Frame interaction at Step 2. In the male sample, attitude and the Attitude \times Frame interaction ($F_{\text{Change}} = 8.02, p < .01$) were statistically significant in the final model indicating that attitude moderates the effect of frame on intention. In the female sample, none of the variables were significant in the final regression model, indicating

that the effect of frame on intention to use the daily male pill and the moderating effect of attitude was restricted to the male sample.

To decompose the Attitude \times Frame interaction, consistent with Aiken and West (1991), we plotted the lines of best fit for the gain frame and the loss frame on intentions to use the daily male pill at one standard deviation above (high) and below (low) the mean for attitude. Further tests were conducted separately on the slopes of the high and low attitude lines to determine whether they were significantly different from zero. Application of the procedures outlined by Aiken and West revealed that only the high attitude slope was significantly different from zero ($\beta = 0.33$, $t(151) = 2.37$, $p < .05$). This suggests that exposure to the loss frame has an advantage over the gain frame in men who hold a positive attitude towards using hormonal male contraception.

In order to examine whether the latter finding is mediated by the additional TPB variables or stress appraisals as suggested in the Introduction, an additional regression analysis was conducted in the male sample. At Step 1, attitude and frame were entered, followed by the Attitude \times Frame interaction at Step 2 and perceived behavioural control, subjective norm, and the stress appraisal variables at Step 3. The results showed that the effect of the Frame \times Attitude interaction remained unchanged and statistically significant when the additional variables entered the equation at Step 3. Therefore, indicating that the loss frame advantage observed in men who hold a positive attitude towards using hormonal male contraception is not mediated by TPB or stress appraisals.

For intentions to use the injection preparation, no evidence for the moderating effect of frame was found.

GENERAL DISCUSSION

Three key findings emerged from this study: (a) frame and attitudes interact to predict behavioural intentions in men, (b) there is no evidence for mediation of this effect by TPB variables or stress appraisals, and (c) that stress appraisals, in addition to TPB variables, significantly predict variance in behavioural intentions in men and women. These findings are discussed below.

Framing and attitudes

The main effect of frame was found to be non-significant, however, as predicted, exposure to a loss frame in the context of a high perceived risk prevention behaviour influenced intentions to use the daily pill in men who held positive attitudes to hormonal male contraception. This effect observed for the loss frame is consistent with recent theorising that, within a behavioural category, levels of perceived risk influence the relative effectiveness of frames (Apanovitch *et al.*, 2003).

The finding that attitudes moderate the effect of frame for men only was also hypothesized. The role of attitude observed here is consistent with the persuasion literature and with Krosnick and Petty (1995), who suggested that attitudes could influence information-processing and judgments. Individuals who hold a negative attitude are more likely to *deflect* the message frame when it is presented and therefore process the information less adequately, compared with individuals with a positive attitude (see Meyers-Levy & Maheswaran, 2004; Krosnick & Petty, 1995). Furthermore, the effect for men is consistent with previous evidence that framing effects are moderated by gender when the frame has gender-specific qualities (Rothman *et al.*, 1993). Indeed, compared to women, men did rate the male hormonal contraceptive as riskier. Finally, it is necessary to explain why the loss frame advantage was only observed

for the pill and not the injection preparation. One possibility may again be to do with salience and relevance. Pill preparations as a form of contraception, and in general, are familiar and frequently used. As such, the male participants may be more able to visualize and imagine using such a preparation, and again, this would facilitate processing of that information (Loewenstein, Weber, Hsee, & Welch, 2001).

A competing explanation for the loss frame advantage exhibited in this study comes from the work of Levin and colleagues (1998). These researchers present an alternative typology to understand the ambiguous and inconsistent findings within the message framing literature *per se*. They distinguish between three different modes of frames (i.e. risky choice, attribute, & goal frames) and argue that it is the type of frame manipulation that is paramount. Specifically, in goal framing studies, loss frames generally have a stronger impact on outcomes than gain frames. They and others suggest (e.g. Meyerowitz & Chaiken, 1987) that a negativity bias in processing of information may underpin the loss frame advantage in goal-framing manipulations. Previous research has found that individuals attend more to, and are more likely to, be persuaded by negative information compared with objectively-equivalent positive information (cf. Levin *et al.*, 1998; Taylor, 1991). This explanation remains a plausible possibility. However, while the Levin *et al.* account offers an alternative explanation of the loss framing advantage (based on framing mode) to the Rothman and Salovey (1997) account based on perceived risk, issues of processing, gender relevance, and salience are still required to fully explain the results.

Mediation effects

The second key finding that emerged was that neither TPB nor stress appraisals acted as mediators of the framing effect observed in this study. This suggests that framing influences intention by a route other than via stress appraisals and TPB. Other potential mediating mechanisms, including emotional reactions, self-efficacy and perceived knowledge, have been explored resulting in null results (Banks *et al.*, 1995; Detweiler *et al.*, 1999). It may well be that more cognitive factors such as memory, semantic activation or related positive and negative constructs or attentional biases are important mediators. As mentioned earlier, negativity bias in the processing of negative information has also been mentioned within the context of goal framing (e.g. Levin *et al.*, 1998; Meyerowitz & Chaiken, 1987). Therefore, laboratory-based studies using techniques such as the emotional stroop, priming and basic free-recall should be used to explore these issues and possibilities further. It may also be the case that the extent to which the frame activates vivid images and memories is an important potential mediator (see Loewenstein *et al.*, 2001). Again assessments of imagery should be pursued.

Predicting pill and injection behavioural intentions

The final key finding to emerge from this study was that in addition to TPB variables, stress appraisals were found to significantly predict intentions to use the daily pill and the injection preparation. Similar to work previously reported for blood transfusion, appraisals relate to intention, but do not vary systematically as a function of frame (Farrell *et al.*, 2001). Instead, their impact seems to be related by gender: appraisals of challenge were found to significantly predict intentions to use the daily pill in men and the injection in women; appraisals of threat were found to negatively predict intentions to use the injection in men only. The finding that negative stress appraisals of threat are inversely related to intentions is not surprising as negative appraisals of symptom or disease (in terms of severity) are often related to intentions theoretically and empirically

(cf. Conner & Norman, 1996). However, the findings relating to positive appraisals, while predicted, are interesting and novel. These imply that even for a behaviour that carries some risk (cf. appraisals of threat), people's ability to perceive it as a learning opportunity is still present and related to intentions. This implies that stress variables and theoretical arguments from the stress literature could and should be incorporated within models of behavioural intentions and change (e.g. TPB). It also highlights the need to consider positive aspects of people's experiences with health-related behaviours that might be perceived to have a negative impact.

The differential impact of challenge and threat appraisals may have practical implications in that it indicates that men and women react to the alternative preparations of hormonal contraception in psychologically different ways. Another finding that may have practical implications relates to perceived behavioural control. This variable was found to predict a significant proportion of the variance in intentions to use the daily pill in men *and* women. Therefore, with respect to increasing intentions to use male hormonal contraceptive methods, health professionals and related agencies should be mindful of the different psychological predictors identified in this study. In particular, interventions to increase the sense of learning and challenge associated with the male hormonal contraceptive might be useful. In addition, interventions aimed at enhancing men and women's control beliefs – the antecedents of perceived behaviour control – are likely to increase behavioural intentions to use the daily male pill.

It is also worth noting that the mean score for behavioural intentions for the alternative delivery methods for the entire sample was slightly negative. These figures appear low, however, we are unable to discern in the current study whether these data reflect a truly low level of behavioural intentions or are *relatively* low made in comparison with existing forms of contraception in mind. If the former, these findings contrast markedly with data from a sample in Scotland that indicated that 78% of women would use hormonal male contraception in the future and other data that showed that over 70% of couples agreed that men should take more responsibility for contraception (cf. Anderson & Baird, 2002; Glasier *et al.*, 2000). Nevertheless, with respect to the central focus of this study – the impact of message framing on intentions to use hormonal male contraception – our findings suggest that when male hormonal contraceptive methods become available, persuasive message aimed at men that promote positive evaluations of using the daily male pill and framed as a loss are likely to encourage uptake.

Finally, future studies may want to examine different aspects of outcome risk associated with the male hormonal contraceptive, as a moderator. For example, perceived effectiveness to prevent pregnancy, risk of sexually transmitted infections, risk of specific side effects as well as specific potential health benefits as has been done with the female hormonal contraceptive (Emmett & Ferguson, 1999).

Caveats

We acknowledge a potential limitation of the present study. We measured behavioural intention and not *actual* contraceptive behaviour. At present, hormonal male contraception is not available to the general public, therefore this study represents the first investigation of predictors of intentions to use this method of contraception – currently the most proximal measure of this future actual behaviour.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.

Anderson, R. A., & Baird, D. T. (2002). Male contraception. *Endocrine Reviews*, 23, 735-762.

Apanovitch, A. M., McCarthy, D., & Salovey, P. (2003). Using message framing to motivate HIV testing among low-income, ethnic minority women. *Health Psychology*, 22, 60-67.

Banks, S. M., Salovey, P., Greener, S., Rothman, A. J., Moyer, A., Beauvais, J., & Epel, E. (1995). The effects of message framing on mammography utilization. *Health Psychology*, 14, 178-184.

Baron, R. A., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.

Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioural sciences*. New York: Erlbaum.

Conner, M., & Norman, P. (1996). *Predicting health behaviour*. Philadelphia: OUP Press.

Detweiler, J. B., Bedell, B. T., Salovey, P., Pronin, P., & Rothman, A. J. (1999). Message framing and sunscreen use: gain framed messages motivate beach goers. *Health Psychology*, 18, 189-196.

Emmett, C., & Ferguson, E. (1999). Oral contraceptive pill use, decisional balance, risk perception and knowledge: An exploratory study. *Journal of Reproductive and Infant Psychology*, 17, 327-343.

Farrell, K., Ferguson, E., James, V., & Lowe, K. (2001). Confidence in the safety of blood for transfusion: The effect of message framing. *Transfusion*, 41, 1335-1340.

Fazio, R. H. (1995). Attitudes as object-evaluation associations: Determinants, consequences, and correlates of attitude accessibility. In R. E. Petty & J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences* (pp. 247-282). Mahwah, NJ: Erlbaum.

Fazio, R. H., & Williams, C. J. (1986). Attitude accessibility as a moderator of the attitude-perception and attitude-behaviour relations: An investigation of the 1984 presidential election. *Journal of Personality and Social Psychology*, 51, 505-514.

Ferguson, E., & Bibby, P. A. (2002). Predicting future blood donor returns: Past behavior, intentions and observer effects. *Health Psychology*, 21, 513-518.

Ferguson, E., Bibby, P. A., & Leaviss, J. (2003). *Effective design of workplace risk communications*. Sudbury, UK: HSE Books, (also available as a PDF at <http://www.hse.gov.uk/research/rrhtm/rr093.htm>).

Ferguson, E., Lawrence, C., & Matthews, G. (2000). Associations between primary appraisals, life events while controlling for depression. *British Journal of Clinical Psychology*, 39, 143-155.

Ferguson, E., Matthews, G., & Cox, T. (1999). The appraisal of life events (ALE) scale: Reliability and validity. *British Journal of Health Psychology*, 4, 97-116.

Folkman, S., & Moskowitz, (2000). Positive affect and the other side of coping. *American Psychologist*, 55, 647-654.

Gaskell, G., Bauer, M. W., Durant, J., & Allum, N. C. (1999). Worlds apart? The reception of genetically modified foods in Europe and the US. *Science*, 285, 384-387.

Glasier, A. F., Anakwe, R., Everington, D., Martin, C. M., van der Spuy, Z., Cheng, L., Ho, P. C., & Anderson, R. A. (2000). Would women trust their partners to use a male pill. *Human Reproduction*, 15, 646-649.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47, 263-291.

Kahneman, D., & Tversky, A. (1982). The psychology of preferences. *Scientific American*, 246, 160-173.

Krosnick, J. A., & Petty, R. E. (1995). Attitude strength: An overview. In R. E. Petty & J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences* (pp. 1-24). Mahwah, NJ: Erlbaum.

Kuhberger, A. (1998). The influence of framing on risky decisions: A meta-analysis. *Organizational Behavior and Human Decision Processes*, 75, 23-55.

Kuhberger, A., Schulte-Mecklenbeck, M., & Perner, J. (1999). The effects of framing, reflection, probability and payoff on risk preference in choice tasks. *Organizational Behavior and Human Decision Processes*, 78, 204-231.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York: Springer.

Levin, I. P., Schneider, S. L., & Gaeth, G. J. (1998). All frames are not created equal: A Typology and critical analysis of framing effects. *Organizational Behavior and Human Decision Processes*, 76, 149-188.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin*, 127, 267-286.

Martin, C. W., Anderson, R. A., Cheng, L., Ho, P. C., van der Spuy, Z., Smith, K. B., Glasier, A. F., Everington, D., & Baird, D. T. (2000). Potential impact of hormonal male contraception: Cross-cultural implications for development of novel preparations. *Human Reproduction*, 15, 637-645.

Meyerowitz, B. E., & Chaiken, S. (1987). The effect of message framing on breast self-examination attitudes, intentions and behavior. *Journal of Personality and Social Psychology*, 52, 500-510.

Meyers-Levy, J., & Maheswaran, D. (2004). Exploring message framing outcomes when systematic, heuristic, or both types of processing occur. *Journal of Consumer Psychology*, 14, 159-167.

O'Carroll, R. E., Whiten, S., Jackson, D., & Sinclair, D. W. (2002). Assessing the emotional impact of cadaver dissection on medical students. *Medical Education*, 36, 550-554.

O'Connor, D. B., Archer, J., Hair, W. M., & Wu, F. C. W. (2001). Activational effects of testosterone on cognitive function in men. *Neuropsychologia*, 39, 1385-1394.

O'Connor, D. B., Archer, J., Hair, W. M., & Wu, F. C. W. (2002). Exogenous testosterone, aggression and mood in eugonadal and hypogonadal men. *Physiology and Behavior*, 75, 557-566.

O'Connor, D. B., Archer, J., & Wu, F. C. W. (2004). Effects of testosterone on mood, aggression and sexual behavior in young men: A double-blind, placebo-controlled, cross-over study. *Journal of Clinical Endocrinology and Metabolism*, 89, 2837-2845.

Petty, R. E., & Krosnick, J. A. (1995). *Attitude strength: Antecedents and consequences*. Mahwah, NJ: Erlbaum.

Rothman, A. J., Kelly, K. M., Hertel, A. W., & Salovey, P. (2003). Message frames and illness representations. Implications for interventions to promote and sustain healthy behaviors. In L. D. Cameron & H. Leventhal (Eds.), *The self-regulation of health and illness behavior*. New York: Routledge, (pp. 279-297).

Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin*, 121, 3-19.

Rothman, A. J., Salovey, P., Antone, C., Keough, K., & Martin, C. D. (1993). The influence of message framing on intentions to perform health behaviours. *Journal of Experimental Social Psychology*, 29, 408-433.

Skinner, N., & Brewer, N. (2002). The dynamics of threat and challenge appraisals prior to stressful achievement events. *Journal of Personality and Social Psychology*, 83, 678-692.

Smith, S. M., & Petty, R. E. (1996). Message framing and persuasion: A message processing analysis. *Personality and Social Psychological Bulletin*, 22, 257-268.

Steward, W. T., Schneider, T. R., Pizarro, J., & Salovey, P. (2003). Need for cognition moderates responses to framed smoking cessation messages. *Journal of Applied Social Psychology*, 33, 2439-2464.

Taylor, S. E. (1991). Asymmetrical effects of positive and negative events: The mobilization-minimization hypothesis. *Psychological Bulletin*, 110, 67-85.

Received 17 May 2004; revised version received 8 March 2005