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Master Psychology, Social Psychology

THESIS

Facts and stories about sex and STIs: The effects of health message format and frame on
young people in New South Wales

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28 June 2012

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Abstract

The annual number of diagnoses of sexually transmitted infections (STIs) has been rising, with highest STI rates continuing to be found among young people. Theory and research associate a greater perceived vulnerability to a health threat and higher behavioural intentions with an increase in the likelihood of enacting health behaviour. This study assessed the effects of health message format and health message frame on young people's perceived vulnerability to become infected with an STI and their intention to use condoms. Young people between 18 and 29 years, who currently lived in Australia and thought of themselves as hetero- or bisexual ($n = 167$), completed the online study, in which they were randomly assigned to one of four conditions in a 2 (message format: testimonial or statistical) x 2 (message frame: gain or loss) factorial between-subjects design. Analyses of variance show that testimonial messages are significantly more effective than statistical messages in increasing both young people's perceived vulnerability to become infected with an STI and their intention to use condoms. Moreover, a significant interaction between message frame and message format type on intention to use condoms was found. Results in particular suggest that message framing affects the effect of statistical messages; young people who read a loss-framed statistical message had a significant higher intention to use condoms than people who read a gain-framed statistical message. Furthermore, young people's perceived vulnerability to become infected with an STI is significantly associated with their intention to use condoms. Findings extend previous theorizing and research, and suggest that messages in a testimonial format are the most effective and safest mode in health communication to increase young people's perceived vulnerability to become infected with an STI and their intention to use condoms. Messages in a statistical format should focus on the losses one may experience by engaging in risk behaviour, or not engaging in health protective behaviour.

Keywords: STIs; Behavioural intentions; Perceived vulnerability; Message format; Message frame

Introduction

In the last decade the annual number of diagnoses of sexually transmitted infections (STIs) in Australia has been rising (The Kirby Institute, 2011), with highest rates of STIs continuing to be found among young people (Dehne & Riedner, 2001). Using a condom during sexual intercourse substantially decreases the likelihood of contracting an STI (e.g., Carey et al., 1992; Moniz & Beigi, 2012), but young people use condoms inconsistently (e.g., Abel & Brunton, 2005). Health behaviour theory and research suggest that the intention to use condoms is the proximal determinant of the actual use of condoms (e.g., Albarracín, Johnson, Fishbein & Muellerleile, 2001; Conner & Sparks, 2005; Norman, Boer & Seydel, 2005), and that perceived vulnerability is a key determinant of people's intention to engage in protective health behaviour (e.g., Abraham & Sheeran, 2005; Norman et al., 2005). The purpose of this study is to assess the effectiveness of different health message format and frame types to increase young people's perceived vulnerability to become infected with an STI and their intention to use condoms.

Sexually Transmitted Infections (STIs)

STI is a collective term for a variety of pathogens that can be transmitted from person to person by sexual contact (Moniz & Beigi, 2012). STIs can have long-term negative health consequences. For example, *Chlamydia trachomatis* infection is among the most common STIs and, in women, increases the risk of pelvic inflammatory disease, ectopic pregnancy, premature delivery and infertility (Starnbach & Roan, 2008). Another highly prevalent STI is infection with the human papillomavirus (HPV). A major complication associated with some strains of HPV is cervical cancer (Starnbach & Roan, 2008). Antibiotics and vaccines can treat some STIs, but diagnoses of infections occur often too late when tissue damage already occurred. Moreover, immunization is more often than not impossible and the risk of re-

infection exists (Starnbach & Roan, 2008). Probability of STI transmission during sexual intercourse can be reduced by using condoms (Carey et al., 1992; Moniz & Beigi, 2012).

Intended condom use as preventive health behaviour

Major health behaviour theories suggest that one's behavioural intention is a critical determinant of engaging in (health) behaviour. The Theory of Planned Behaviour (TPB; Ajzen, 1991) assumes that behavioural intentions capture the motivational factors attitude, subjective norm and perceived behavioural control (PBC), and intentions play a central role in the theory. A person's attitude is shaped by the overall evaluations of the behaviour by the individual, while the subjective norm arises from perceptions of significant others' preferences about whether one should or should not engage in a behaviour. At the same time, PBC consists of the beliefs concerning whether one has access to the necessary resources and opportunities to perform the behaviour successfully (Ajzen, 1991; Conner & Sparks, 2005). In general, TPB holds that, provided that the behaviour is under volitional control, the stronger the intention to engage in a behaviour, the more likely should be its performance (Ajzen, 1991).

Also Protection Motivation Theory (PMT; Rogers, 1975) postulates behavioural intention as a crucial antecedent of engaging in health behaviour. PMT proposes that environmental and intrapersonal sources of information can initiate two independent appraisal processes: threat appraisal and coping appraisal. Threat appraisal focuses on the source of the threat and factors that increase or decrease the probability of maladaptive responses. Greater levels of perceived vulnerability to, and severity of, a health threat are considered to inhibit maladaptive responses. At the same time, coping appraisal focuses on the coping responses available to the individual to deal with the health threat and factors that increase and decrease the probability of an adaptive response. The belief that the

recommended behaviour is effective in reducing the threat and the belief that one is capable of performing the recommended behaviour are considered to increase the probability of an adaptive response. One's threat appraisal and coping appraisal together result in protection motivation (i.e., intention to perform a recommended behaviour), which directs and sustains protective behaviour (Norman et al., 2005; Rogers, 1975).

A meta-analysis of prospective studies by Sheeran (2002) confirms that behavioural intention is an important determinant of behaviour. The results in particular showed that behavioural intention on average accounts for 28% of the variance in behaviour. When it comes to sexual health behaviour (e.g., condom use), meta-analyses found that, on average, there is a moderate to large positive correlation (i.e., $r = .45$ and $r = .44$) between the intention to use condoms and actual condom use (Albarracín et al., 2001; Sheeran & Orbell, 1998).

Perceived vulnerability and behavioural intentions

Perceived vulnerability to a health threat is considered to be a critical determinant of motivation and behaviour. The Health Belief Model (HBM; Rosenstock, 1974) postulates one's perceived vulnerability to illness or health problems as a key factor in predicting health behaviour. The HBM focuses on importance of two aspects of individual's representations of health behaviour: threat perception and behavioural evaluation. Threat perception consists of perceived vulnerability to a health threat and anticipated severity of the consequences of illness. At the same time, behavioural evaluation consists of the beliefs concerning the benefits or efficacy of the recommended health behaviour, and the beliefs concerning the costs of, or barriers to, engaging in the behaviour. A higher perceived vulnerability and greater anticipated severity of the illness, greater perceived benefits of the health behaviour, and lower perceived barriers to engaging in the behaviour, together are assumed to result in

an increased likelihood of engagement in a health behaviour (Abraham & Sheeran, 2005; Rosenstock, 1974). According to the PMT (Rogers, 1975), perceived vulnerability to a health threat is a key factor to increase threat appraisal. A higher perceived vulnerability inhibits maladaptive responses, and increases the likelihood of engaging in a health behaviour (Norman et al., 2005).

According to these theories, assessing a personal risk seems to be an important first step in the development of behavioural intentions to prevent disease. Several studies among adolescents and young adults confirmed that a higher perceived vulnerability to become infected with STIs was associated with a higher intention to use condoms and higher numbers of actual condom use (Bettinger, Adler, Curriero, & Ellen, 2004; Bryan, Aiken, & West, 1997; Hingson, Strunin, Berlin, & Heeren, 1990). However, findings show that young people on average have low levels of perceived vulnerability to become infected with an STI (Adam et al., 2011; Wolfers et al., 2011).

A low perceived vulnerability to a health threat (e.g., becoming infected with an STI) can possibly be explained by unrealistic optimism: the tendency of people to believe that their risk of experiencing negative events is less than that of the average person like them (Weinstein, 1982). People tend to have an optimistic bias about their vulnerability to many health issues (Dillard, McCaul, & Klein, 2006; Dillard, Midboe, & Klein, 2009; Weinstein, 1982). Unrealistic optimism decreases people's worry about the negative event and subsequently increases comfort for individuals. However, greater worry about a health issue is related to increased interest in taking actions to reduce the risk of health problems (Weinstein, 1982). When it comes to perceived vulnerability to become infected with an STI, Abel and Brunton (2005) showed that most young people perceive that other people of their age are likely to acquire an STI; few perceive that they are personally vulnerable.

Next to unrealistic optimism, defensiveness to health-promoting information could explain young people's low perceived vulnerability to become infected with an STI. In their overview study, Van 't Riet and Ruiter (2011) postulate that, for high relevance recipients, health promoting messages can challenge their views of themselves and cause negative self-evaluative emotions. To avoid the experience of these negative emotions, individuals can react defensively to the message, which causes avoidance, denial and dismissal of the information (Van 't Riet and Ruiter, 2011).

Despite numerous interventions to increase knowledge about STIs and promote condom use (Scott-Sheldon, Huedo-Medina, Warren, Johnson & Carey, 2011), results suggest current interventions are not effectively influencing young people's perceived vulnerability to become infected with an STI. Determining which aspects should be targeted in health communication to increase young people's perceived vulnerability to become infected with an STI and their intention to use condoms is essential to promote protected sexual intercourse, and withstand the transmission of STIs among young people.

Health communication

Rimal and Lapinski (2009) indicate that health communication has relevance for different aspects of health and well-being. Health messages can help people understand the risks they face and help them better decide which behaviours they should or should not enact (Rimal and Lapinski, 2009). When developing health messages, there are several aspects of information presentation that can be distinguished.

Information in health communication can be presented from different perspectives (from now on called 'message format'); it can either be presented as a personal experience of the situation ('testimonial' format) or as abstract data and factual assertions ('statistical' format; De Wit, Das, & Vet, 2008). Testimonial messages seem promising in health

communication, as they reflect the basis of human interaction and therefore are perceived as a comfortable and familiar way of exchanging information (Hinyard & Kreuter, 2007). Tversky and Kahneman (1973) suggest that the availability heuristic could explain the greater persuasive effect of messages in a testimonial format. According to the availability heuristic, people estimate probability of an event by the ease with which that event can be brought to mind. A testimonial message presents the information more vividly than a statistical message; vivid exemplars are assumed to be more easily brought to mind, which should increase the estimated probability of an event (Tversky & Kahneman, 1973).

Slater and Rouner (1996) showed that testimonial evidence is more persuasive than testimonial evidence in messages which are not congruent with people's views (preference-inconsistent messages). For messages which are congruent with people's views (preference-consistent messages), statistical evidence is considered more effective. Since health messages raise awareness of potential personal health threats (e.g., an STI infection), these messages are considered as preference-inconsistent. The greater persuasiveness of messages in a testimonial format has been confirmed in a study by De Wit et al. (2008), who showed that, compared to statistical evidence, testimonial evidence elicits a higher perception of personal vulnerability to become infected with the hepatitis B virus. As predicted by major health behaviour theories (e.g., HBM, PMT), they subsequently showed that this higher perceived vulnerability could increase people's intention to engage in health protective behaviour.

Next to message format, the framing of behavioural recommendations and health outcomes in the health message can differ as well. According to Rothman and Salovey (1997), message frame consists of two factors: Outcome and action. The outcome is either desirable or undesirable, while the action is either attaining or not attaining the outcome. Combination of these factors results in two types of messages in the field of health communication: Gain-framed messages focus on the benefits possibly experienced when

engaging in a health protective behaviour or not engaging in a health risk behaviour, while loss-framed messages focus on the losses one may experience by engaging in a health risk behaviour or not engaging in the health protective behaviour (Rothman & Salovey, 1997).

These two types of message frame are assumed to have a differential impact on behavioural decision-making. According to prospect theory, people tend to avoid risks when faced with the potential benefits of a decision, but are more willing to take risk when faced with the potential costs of a decision (Kahneman & Tversky, 1979). Based on prospect theory, Rothman and Salovey (1997) proposed that gain-framed messages are more effective in promoting low-risk behaviours, whereas loss-framed messages are more effective in promoting high-risk behaviours. Health preventive behaviours are considered to reflect low-risk behaviour, as they increase the chance that one will not experience a health problem (e.g., condom use). Health detective behaviours are considered to reflect high-risk behaviour, as they are used to detect the existence of a health problem (e.g., STI testing; Rothman & Salovey, 1997). A meta-analytic review by Gallagher and Updegraff (2012) confirms that gain-framed messages are more effective than loss-framed messages in promoting health prevention behaviours. When it comes to promoting condom use, Garcia-Retamero and Cokely (2011) showed that message frames have a differential influence on behavioural intentions. In their study, participants who read a message in a gain-frame had significantly greater intentions to use condoms than participants who read a message in a loss-frame.

This study

To date, there is no proven strategy to effectively influence young people's perceived vulnerability to become infected with an STI and subsequently the behavioural intention to use condoms. This study evaluates the effectiveness of different types of message format (i.e. testimonial or statistical format) and message frame (i.e. gain- or loss-frame) in health

communication, to increase young people's perceived vulnerability to become infected with an STI and their intention to use condoms. To the best of our knowledge, this is the first study to assess the combined effects of message format and message frame as a strategy in written health messages to increase young people's perceived vulnerability to become infected with an STI and their intention to use condoms. Based on the presumed influence of a testimonial or statistical message format, and gain- or loss-framing in health communication, we postulate the following hypotheses.

Because testimonial evidence appears to be more persuasive than statistical evidence when it comes to preference-inconsistent messages, it is expected that reading a message in a testimonial format will result in a higher perceived vulnerability to become infected with an STI and a greater intention to use condoms compared to reading a message in a statistical format. Furthermore, gain-framed messages are shown to be more persuasive than loss-framed messages when it comes to illness prevention behaviours, accordingly it is expected that reading a message in a gain-frame will result in a higher perceived vulnerability to become infected with an STI and a greater intention to use condoms compared to reading a message in a loss-frame. Next, we explore a possible interaction between message format and message frame on young people's perceived vulnerability to become infected with an STI and their intention to use condoms. Lastly, because several health behaviour models hold that a higher perceived vulnerability to a health threat can positively affect the enactment of health behaviour, it is expected that a higher perceived vulnerability to become infected with an STI is associated with a higher intention to use condoms in young people.

Method

Design and procedure

This study used a 2 (message format: testimonial or statistical) x 2 (message frame: gain or loss) factorial between-subjects design. Participants were eligible when they were between 18 and 29 years, currently lived in Australia and did not think of themselves as being exclusively gay.

Throughout April and May 2012, participants were recruited by research staff approaching potential participants on the UNSW Kensington campus. If the potential participant was interested in participating, research staff explained the study entailed reading a short text and filling out a concise questionnaire. Also, research staff advised the study was voluntary and anonymous. If potential participants were interested in taking part in the study, they received a printed copy of the Participant Information Statement and could consent to provide their email address to receive an email from research staff with a link to the online study. In addition, advertisements with the URL of the study website and information about the study were posted on advertisement boards across the UNSW Kensington campus. Participants were also recruited via a specifically established Facebook group targeting UNSW students.

At the start of the study, participants were asked to provide some information regarding their socio-demographic characteristics. Eligible participants were subsequently randomly assigned to one of four health message conditions, after which they filled out assessments of dependent social cognitive factors. Participants' were then asked about their sexual partners and behaviours, as well as their STI history. Lastly, participants were debriefed and it was explained that the information provided was correct, but that the researchers had designed the health messages in specific for this study. It was also explained that the magazine *Sex & You* did not exist and that the character in the message was fictive

(testimonial format condition only). Should participants have any questions or concerns about STIs, they were referred to the website <http://www.sti.health.gov.au>. The study protocol was approved by the University of New South Wales' Human Research Ethics Committee.

Participants

A total of 210 participants started the online study. However, 43 participants did not meet the inclusion criteria or did not finish the online study and were therefore excluded from data analyses. This resulted in a final sample of 167 young people (82 men and 85 women). The majority of participants was recruited either through being approached by research staff on the UNSW Kensington campus (26.9%) or through seeing an advertisement for the study on the UNSW Kensington campus (39.5%). The other participants mostly reported being alerted to the study through the study Facebook group (17.4%) or were told about the study by a friend (15.0%).

The average age of participants was 22.2 years ($SD = 2.81$), ranging from 18 to 29 years. Of all participants, 70.1% was born in Australia and 48.8% reported an Anglo-Australian background; participants not born in Australia mostly originated from Europe (62.0%) or Asia (24.0%). The majority of participants reported living in a capital city (i.e., Sydney; 82.6%). Of all participants, 97% thought of themselves as exclusively straight or more straight than gay; the remainder considered themselves bisexual. Most participants (83.8%) reported to have had sexual intercourse in the past 12 months. Of all participants, 34.7% indicated they ever had an STI test and 4.2% reported they ever had (or currently have) an STI.

Materials

The experimental health messages we used in our study differed on two factors: message format (testimonial or statistical) and message frame (gain- or loss-frame). To differentiate in message format, we followed testimonial and statistical message format types as specified by De Wit et al. (2008); messages in a testimonial format were presented as a personal experience of the situation, while messages in a statistical format were presented as abstract data and factual assertions. To construct messages with different frame types, we followed the specifications provided by Rothman and Salovey (1997); gain-framed messages focused on attaining desirable outcomes and not attaining undesirable outcomes, while loss-framed messages focused on attaining undesirable outcomes and not attaining desirable outcomes. Implementation of the two factors message format and message frame in the development of health messages resulted in four different experimental health message conditions.

All health messages were approximately of the same length (± 170 words). The source of the message was identified as either a letter from a reader (testimonial format), or an article reporting on research (statistical format); in all cases, the text was published in the magazine '*Sex and you*'. The health messages in a testimonial format were tailored to the gender of the participant; male participants read a message written by a male character (Matthew), and female participants read a message written by a female character (Jessica). The heading of the messages was constructed in such a way that it signalled that the text either focused on the advantages of using condoms (gain-frame), or the disadvantages of not using condoms (loss-frame). Messages in a testimonial format continued with the personal experience of Matthew/Jessica, who recently had experienced an STI. Messages in a statistical format then presented findings regarding young people and STIs. After reading the health message, all participants received a short advice of approximately 45 words about why

it is important to use condoms. This advice was presented in the same message format and message frame as the preceding message.

Measurements

Manipulation checks

To check whether the different message format types were perceived as intended, participants were asked to what extent they agreed with the following statements: ‘The text I just read told about personal experiences with becoming infected with an STI’, and ‘The text I just read showed statistics about STIs among young people’ (recoded). Participants could respond on a scale ranging from 1 (‘totally disagree’) to 5 (‘totally agree’). Pearson correlation suggested that internal consistency of the items was sufficient ($r = .33, p < .001$), and a mean score was computed; a higher score indicates a greater perceived focus on personal experiences, while a lower score indicated a greater perceived focus on statistics.

To check whether the different message frame types were perceived as intended, participants were asked to what extent they agreed with the following statements: ‘The text I just read focused on the advantages of using condoms’, and ‘The text I just read focused on the disadvantages of not using condoms’ (recoded). Participants could respond on a scale ranging from 1 (‘totally disagree’) to 5 (‘totally agree’). Pearson correlation showed good internal consistency of the two items ($r = .62, p < .001$), and a mean score was computed; a higher score indicates a greater perceived focus on advantages of using condoms, while a lower score indicates a greater perceived focus on disadvantages of not using condoms.

Dependent variables

Perceived vulnerability to become infected with an STI was assessed with four items, for instance: ‘It is rather probable that I will get an STI’. Participants could respond on a scale ranging from 1 (‘totally disagree’) to 5 (‘totally agree’). Internal consistency of the items was

good (Cronbach's $\alpha = .83$) and a mean score was computed; a higher score indicates a higher perceived vulnerability to become infected with an STI.

Intention to use condoms was also assessed with four items, for instance: 'What is the probability that you will use condoms as a protection against STIs when you have intercourse with someone for the first time?'. Participants could respond on a scale ranging from 1 ('totally disagree') to 5 ('totally agree'). Internal consistency of the items was good (Cronbach's $\alpha = .89$) and a mean score was computed; a higher score indicates a stronger intention to use condoms.

Perceived severity of having an STI was included as a control variable to ascertain that our written health messages affected perceived vulnerability to become infected with an STI, and not perceived severity of having an STI. Perceived severity was equally assessed with four items, for instance: 'It would be serious for me if I became infected with an STI'. Participants could respond on a scale ranging from 1 ('totally disagree') to 5 ('totally agree'). Internal consistency of the items was good (Cronbach's $\alpha = .85$) and a mean score was computed; a higher score indicates a higher perceived severity of becoming infected with an STI.

Statistical analyses

Analyses of variance (ANOVAs) and logistic regression analyses were used to assess differences in characteristics of participants who were randomized to different message conditions. ANOVAs were also conducted for manipulation checks. Analyses of covariance (ANCOVAs) were used to test the study hypotheses. Linear regression analyses were used to assess possible mediation. All analyses were conducted using SPSS (version 20).

Results

Randomization checks

To ensure the groups of participants who were randomized to different conditions in factors (message format and message frame) were comparable and did not significantly differ on their socio-demographic characteristics, sexual behaviour and STI history, full factorial ANOVAs of message format and message frame (for continuous variables) and logistic regression analyses (for categorical variables) were conducted. This showed that ethnic background differed (marginally) significant between the message format conditions (OR = 1.79, $p = .06$); 56% of participants reading a statistical message reported an Anglo-Australian background, compared to 41.5% of participants who read a testimonial message. There were no other significant differences in participants' socio-demographic characteristics, sexual behaviour and STI history between different message format types and message frame types.

Manipulation checks

Full factorial ANOVAs of message frame and message format were conducted to check whether the different types of message format and message frame were perceived differently by participants, as intended. As expected, participants who read a testimonial message indicated to a higher extent that the health message told about personal experiences; they scored significantly higher on the manipulation check of message format than participants who read a statistical text ($M = 4.11$, $SD = .66$ and $M = 1.76$, $SD = .65$, respectively), $F(1, 165) = 540.37$, $p < .001$. Also consistent with our expectations, participants who read a gain-framed message indicated that the health message told more about advantages of using condoms; they scored significantly higher on the manipulation check of message framing than participants who read a loss-framed message ($M = 3.68$, $SD = .56$ and $M = 2.36$, $SD = .83$, respectively), $F(1, 165) = 146.14$, $p < .001$.

Control variable perceived severity

As the ethnic background of participants differed (marginally) significant between message format conditions, ethnic background is included as a control variable in further analyses. A full factorial ANCOVA of message format and message frame with ethnic background as covariate was conducted. As expected, the results revealed no main effects of message format $F(1, 161) = .19, p = .66$, and message frame $F(1, 161) = .18, p = .67$, nor was there a significant interaction effect between the two factors $F(1, 161) = .01, p = .91$ (see Table 1).

Test of hypotheses

A full factorial ANCOVA of message format and message frame with ethnic background as covariate was conducted. The results revealed a marginally significant main effect of message format on perceived vulnerability to become infected with an STI, $F(1, 161) = 2.80, p < .10$. As expected, young people who read a message in a testimonial format had a higher perceived vulnerability to become infected with an STI than young people who read a message in a statistical format (see Table 1). In contrast with our expectations, the effect of message frame on perceived vulnerability to become infected with an STI was not significant, $F(1, 161) = 1.41, p = .24$, nor was the interaction between message format and message frame, $F(1, 161) = .63, p = .43$.

A further full factorial ANCOVA with message format and message frame as factors and ethnic background as covariate, revealed a (marginally) significant main effect of message format on intention to use condoms, $F(1, 161) = 3.52, p = .06$. Young people who read a message in a testimonial format had a higher intention to use condoms than young people who read a message in a statistical format (see Table 1). In contrast with our expectations, the effect of message frame on intention to use condoms was not significant,

$F(1, 161) = .73, p = .39$. The results further revealed a (marginally) significant interaction effect between message format and message frame on intention to use condoms, $F(1, 161) = 3.72, p = .06$ (see Figure 1).

Table 1. Mean scores (SD) regarding perceived vulnerability to become infected with an STI, intention to use condoms and perceived severity of becoming infected with an STI by health message type.

	Testimonial format		Statistical format	
	Gain-frame (<i>n</i> = 42)	Loss-frame (<i>n</i> = 41)	Gain-frame (<i>n</i> = 41)	Loss-frame (<i>n</i> = 43)
Perceived vulnerability*	2.46 (.89)	2.21 (.67)	2.20 (.85)	2.15 (.79)
Intention	3.96 (.65) ^a	3.87 (.44)	3.65 (.58) ^{a,b}	3.88 (.42) ^b
Perceived severity	3.60 (.94)	3.55 (.88)	3.50 (.89)	3.42 (1.01)

Note. ^{a,b} = values with the same superscript differ significantly

* = values differ significantly between message format types

Simple effects analyses were conducted to deconstruct the message format by message frame interaction. The results revealed a significant effect of message frame within statistical messages, $F(1, 161) = 3.92, p < .05$. Young people who read a statistical message in a loss-frame had a higher intention to use condoms compared to young people who read a statistical message in a gain-frame (see Table 1). Also, the results revealed a significant effect of message format within gain-framed messages, $F(1, 161) = 7.22, p < .01$. Young people who read a gain-framed message in a testimonial format had a higher intention to use

condoms compared to young people who read a gain-framed message in a statistical format (see Table 1). There was no significant effect of message frame within testimonial messages, $F(1, 161) = .57, p = .45$, nor was there a significant effect of message format within loss-framed messages, $F(1, 161) = .00, p = .98$ (see Table 1).

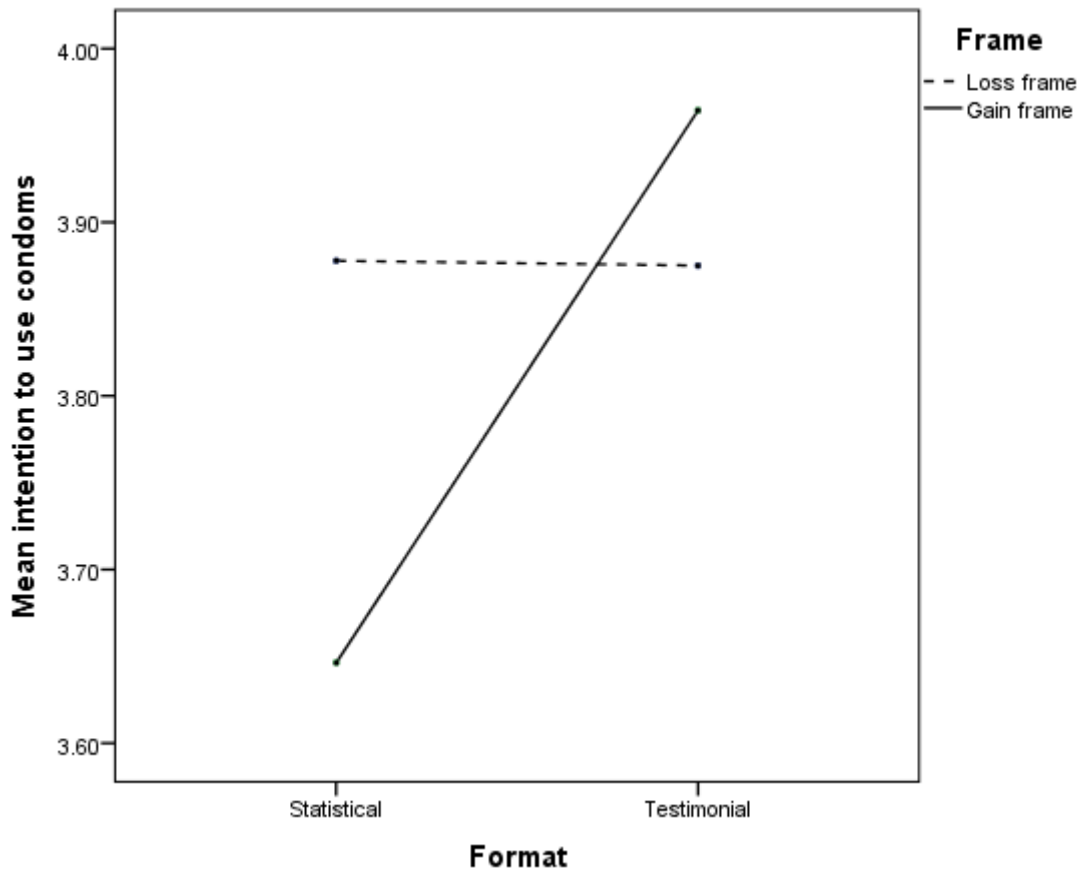


Figure 1. *Interaction between message format and message frame on intention to use condoms.*

Mediation of health message format effect on intention

As expected we found message condition effects on intention to use condoms as well as on perceived vulnerability to become infected with an STI. In particular, a (marginally) significant main effect of message format was found for perceived vulnerability to become

infected with an STI as well as intention to use condoms. To assess if the effect of message format on intention was possibly mediated by perceived vulnerability, we followed the procedure specified by Baron and Kenny (1986). We first regressed intention to use condoms (i.e., the dependent variable) on message format (i.e., the independent variable), controlling for ethnic background. In accordance with our previous results, we observed a (marginally) significant effect of message format ($\beta = .15, p = .06$). Next, we regressed perceived vulnerability to become infected with an STI (i.e., the proposed mediator) on message format, controlling for ethnic background. In accordance with our previous results, we again observed a marginal significant effect of message format ($\beta = .13, p < .10$). We then regressed intention to use condoms on perceived vulnerability to become infected with an STI, controlling for ethnic background. This showed a significant association between perceived vulnerability to become infected with an STI and intention to use condoms ($\beta = .21, p < .01$).

Lastly, we regressed intention to use condoms on message format as well as on perceived vulnerability to become infected with an STI, controlling for ethnic background. In this analysis, message format failed to achieve statistical significance ($\beta = .12, p = .12$), while the effect of perceived vulnerability to become infected with an STI remained significant ($\beta = .19, p < .05$). A Sobel-test of mediation (Aroian version, $z = a*b/\sqrt{(b^2s_a^2 + a^2s_b^2 + s_a^2s_b^2)}$; Baron & Kenny, 1986) proved insignificant ($Z = 1.39, p = .17$). The results suggest the effect of message format on intention to use condoms is not mediated by perceived vulnerability to become infected with an STI.

Discussion

To the best of our knowledge, the present study is the first to assess the combined effects of message format and message frame as a strategy in health communication to increase young people's perceived vulnerability to become infected with an STI, and their intention to use condoms. As expected, results showed that testimonial health messages were more effective in increasing young people's perceived vulnerability to become infected with an STI. Furthermore, results showed that messages in a testimonial format were also more effective in increasing young people's intention to use condoms. In contrast with our expectations, message frame did not have a significant effect on young people's perceived vulnerability to become infected with an STI and their intention to use condoms. Results did, however, establish a significant interaction effect between message format and message frame on young people's intention to use condoms. As expected, young people's perceived vulnerability to become infected with an STI was positively associated with their intention to use condoms.

Before considering the implications of these findings, we note that our study has some limitations. Firstly, because recruitment targeted UNSW students, our study sample consists solely of highly educated young people, who mainly live in Sydney. This may have influenced the study results, as young people with a lower educational level may process the messages differently. The present findings can hence not necessarily be generalized to all young people in Sydney, Australia or elsewhere. Also, in our study we assume that behavioural intentions are predictive of actually enacting the behaviour, and thus that young people's intention to use condoms is a (partial) reflection of their actual condom use. Although several major health behaviour theories identify behavioural intention as the proximal determinant of behavior (Ajzen, 1991; Rogers, 1975), and research and studies confirm the association between condom use intention and behaviour (Albarracín et al. 2001;

Sheeran & Orbell, 1998), the strength of the association between intention and behaviour is limited (Sheeran, 2002). Nevertheless, we are confident that the health messages we tested are effective in changing young people's perceived vulnerability to become infected with an STI and their intention to use condoms, which are essential steps in promoting behaviour change.

Furthermore, it is important to acknowledge that certain factors may have limited the impact of the health messages used in this study. Notably, this study did not test the use of comprehensive interventions; both the message format and message frame manipulations consisted of minimal interventions, using only short texts. Because the health messages were concise, their impact may have been limited in comparison to more extensive text. However, the concise nature of the message is thought to reflect the limitations health communication faces in practice. Lastly, the messages tested in this study contained written text only and this study did not use any additional tools to increase their efficacy, such as images and other visual or graphic elements (Garcia-Retamero & Cokely, 2011). However, these limitations were put in place to ensure a controlled test of message format and message frame on young people's perceived vulnerability and behavioural intentions. It also remains to be tested how health messages of the type tested in this study can contribute to more comprehensive health promotion interventions.

Effects of message format and frame

Young people who read the health message in a testimonial format on average had a higher perceived vulnerability to become infected with an STI and a stronger intention to use condoms than young people who read the health message in a statistical format. This finding is in line with previous research showing a more persuasive effect of testimonial messages (De Wit et al., 2008; Slater & Rouner, 1996), and confirms the theoretical assumption that

testimonial evidence has a more persuasive and effective influence on perceived vulnerability when it comes to preference-inconsistent messages (Tversky & Kahneman, 1973).

The stronger effect of testimonial messages, compared to statistical messages, on perceived vulnerability and intention, could arise from higher issue involvement young people experienced when reading a testimonial message. According to transportation theory (Green & Brock, 2000), 'people can become absorbed in a story or transported in a narrative world, and may show effects of the story on their real-world beliefs' (p. 701). Transported readers are less likely to disbelieve and counter-argue information, resulting in less negative cognitive responding, also when the persuasive text is inconsistent with prior values and beliefs (Green & Brock, 2000; Slater & Rouner, 2002). Transportation can change beliefs and motivate action (Green, 2006), as shown in several studies (Green & Brock, 2000).

The way young people processed the information in the health message could have been influenced by transportation with the health message. According to the heuristic-systematic model of information processing (Chaiken, 1980), people can use heuristic processing, systematic processing, or both, when receiving information. When using heuristic processing, 'rather than processing arguments, people may rely on more accessible information such as the source's identity or other non-content cues in deciding to accept a message's conclusion' (Chaiken, 1980, p. 752). Communicator characteristics such as likability may directly affect recipients' tendencies to accept a message's overall conclusion (Chaiken, 1980). Systematic processing, on the other hand, elicits a more critical type of processing where people 'actively attempt to comprehend and evaluate the message's arguments as well as to assess their validity in relation to the message's conclusion' (Chaiken, 1980, p. 752), and base their judgments on the perceived strength and diagnosticity of claims presented the message (Meyers-Levy & Malaviya, 1999). Testimonial messages are thought to elicit high transportation with the message and therefore result in automatic,

heuristic processing, while statistical messages are thought to elicit low transportation with the messages and therefore result in systematic processing (Green & Brock, 2000). Young people using heuristic processing when reading a testimonial message, and accepting the message information without extensive processing, could explain the greater persuasiveness testimonial messages had on both young people's perceived vulnerability to become infected with an STI and their intention to use condoms.

Results suggest there was no significant effect of message frame on young people's perceived vulnerability to become infected with an STI and their intention to use condoms. This study therefore did not support previous findings (Gallagher & Updegraff, 2012) and theoretical assumptions (Rothman & Salovey, 1997), positing that gain-framed messages are more effective in promoting preventive health behaviours (e.g., using condoms) than loss-framed messages. More specifically, our results contradict recent research which showed that, in written health messages, gain-framed messages were more effective in promoting condom use among young adults (Garcia-Retamero & Cokely, 2011). Possibly of importance, however, Garcia-Retamero & Cokely (2011) included descriptions of different types of condoms and how they should be used in the health messages.

According to several studies, the effects of message frame might be moderated by people's self-efficacy (Van 't Riet, Ruiter, Werrij, & De Vries, 2008, 2010; Werrij, Ruiter, Van 't Riet, & De Vries, 2011). Self-efficacy refers to a person's belief in being capable to successfully perform a behaviour (Bandura, 1986). Studies have shown that, for people low in self-efficacy, there was no difference in the effect of gain- and loss-framed messages in increasing behavioural intentions (Van 't Riet et al., 2008, 2010; Werrij et al., 2011). The lack of effect we observed between gain and loss-frames messages could hence suggest that participants in our study on average experienced low self-efficacy to use condoms. More

generally, more research seems needed to address potential moderators of the effect of message framing.

To the best of our knowledge, this is the first study to test and find an interaction effect between message format and message frame on young people's intention to use condoms. Results in particular suggest that message framing affects the effect of statistical messages; young people who read the statistical message in a gain-frame had a significantly lower intention to use condoms than young people who read the statistical message in a loss-frame. At the same time, testimonial messages were equally effective in increasing young people's intention to use condoms, whether they were presented in a gain-frame or a loss-frame. Together these findings suggest that health communication in a testimonial format can focus on either the benefits possibly experienced when engaging in a health protective behaviour or not engaging in a risk behaviour, or on the losses one may experience by engaging in a risk behaviour or not engaging in the health protective behaviour. Health communication in a statistical format, however, should focus on the losses one may experience by engaging in a risk behaviour or not engaging in the health protective behaviour. In health messages that focus on the benefits of a health behaviour, presenting the information in a statistical format can significantly reduce the effectiveness of the message.

The significant effect of message frame in statistical messages could be explained by the way young people processed the message information. As previously mentioned, statistical messages are assumed to elicit systematic processing of the information (Green & Brock, 2000). Because negative information is in most instances non-normative and often unexpected, it tends to be viewed as more diagnostic than positive information (Fiske, 1980). Consequently, when people use systematic processing, loss-framed messages have been shown to produce greater persuasiveness than gain-framed messages (Meyers-Levy & Maheswaran, 2004). Statistical texts eliciting systematic processing of the message, could

explain the significant greater effectiveness of statistical messages in a loss-frame in increasing young people's intention to use condoms, compared to statistical messages in a gain-frame.

Lastly, our results suggested perceived vulnerability to become infected with an STI as a mediator between message format and intention to use condoms. Results confirm postulations of several health behaviour theories (Rogers, 1975; Rosenstock, 1974) and extend previous findings (Bettinger, Adler, Curriero, & Ellen, 2004; Bryan, Aiken, & West, 1997; Hingson, Strunin, Berlin, & Heeren, 1990) with showing a significant association between perceived vulnerability and behavioural intentions. A mediation effect of perceived vulnerability could clarify the significant effect of message format on young people's intention to use condoms. However, the Sobel-test of mediation failed to confirm a significant mediation effect of perceived vulnerability between message format and intention to use condoms.

Conclusions and future directions

This study indicates testimonial messages as the more effective mode in health communication to increase young people's perceived vulnerability to become infected with an STI and their intention to use condoms. To the best of our knowledge, our research is unique in assessing the combined effects of message format and message frame on young people's perceived vulnerability to become infected with an STI, and their intention to use condoms. Therefore, this is the first study to show that there is an interaction effect between message format and message frame on young people's intention to use condoms. This study suggests that, in public health interventions, presenting health messages in a testimonial format is the most effective and safest option to increase perceived vulnerability to a health threat and behavioural intentions. Health messages in a statistical format should focus on the

losses one may experience by engaging in a risk behaviour, or not engaging in the health protective behaviour; focusing on the benefits when engaging in health protective behaviour or not engaging in health risk behaviour can significantly reduce the effectiveness of the message. Furthermore, young people's perceived vulnerability to become infected with an STI is significantly associated with their intention to use condoms, and is therefore an important factor to affect in health interventions.

Little research determined the effects of health message format and frame types on actual health behaviour (e.g., condom use), and determined the long-term effects of message format and frame types on behavioural changes. Future research should further assess message format and frame type effects, and empirically determine the combined effects of message format and frame types on behavioural changes. Moreover, further research should also assess whether the effects of message format and frame suggested in this study can be confirmed when used in more comprehensive health promoting interventions.

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doi:10.1089/apc.2010.0186

Appendix A – Questionnaire

Welcome!

This study will take about 10 minutes to complete. The questions ask about sexual practices, sexual health and the risk of becoming infected with a sexually transmitted infection (STI). Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission, except as required by law. In any publication, information will be provided in such a way that you cannot be identified. Please answer as honestly as possible.

The full version of the Participant Information Statement is available on the study website at the following address: www.factsandstories.nchsr.org. We advise that you save and print this document for your records.

The study has been approved by the Human Research Ethics Committee of the University of New South Wales. You can stop at any moment without penalty should you feel distressed when participating in this study.

Complaints may be directed to the Ethics Secretariat, The University of New South Wales, SYDNEY 2052 AUSTRALIA (phone 9385 4234, fax 9385 6648, email ethics.sec@unsw.edu.au). Any complaint you make will be investigated promptly and you will be informed about the outcome.

Thank you in advance for your participation.

I understand that this study is about sexual practices, sexual health and the risk of contracting an STI, and agree to participate.

- Yes, I agree
- No, I don't agree

How old are you? Please type your age in years.

Do you think of yourself as...

- Exclusively straight
- More straight than gay
- Equally straight as gay
- More gay than straight
- Exclusively gay

What is your gender?

- Male
- Female

What is your country of birth?

- Australia
- Other, please specify...

Do you currently live in Australia?

- Yes
- No, in another country. Please specify...

In which Australian state or territory do you currently live?

- Australian Capital Territory
- New South Wales
- Northern Territory
- Queensland
- South Australia
- Tasmania
- Victoria
- Western Australia

Are you of Aboriginal or Torres Strait Islander origin?

- Yes
- No

Is your ethnic background:

- Anglo-Australian
- Other background

Where does your family originate from?

- Europe
- Middle East
- Asia, please specify which country...
- India
- Oceania
- Africa
- North America
- South America

Which of the following best describes where you live?

- Capital city
- Major regional centre or city
- Smaller city or town
- Rural or remote area

How important is religion in your life?

- Not at all important
- Of little importance
- Moderately important
- Important
- Very important

HEALTH MESSAGE

How likely is it that you will use a condom when you have intercourse with someone for the first time?

- Very low likelihood
- Moderately low
- Neither high nor low likelihood
- Moderately high
- Very high likelihood

Considering your own behaviour and what you know about STIs, what do you think your chances are of getting an STI?

- Very low chance
- Quite low chance
- Neither high nor low chance
- Quite high chance
- Very high chance

What is the probability that you will use condoms as a protection against STIs when you have intercourse with someone for the first time?

- Very low probability
- Moderately low
- Neither high nor low probability
- Moderately high
- Very high probability

Please indicate to what extent you think the following statements apply to you.

	Totally agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Totally disagree
It is rather probable that I will get an STI	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It would be serious for me if I became infected with an STI	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

There is a good possibility that I will get an STI

I intend to use condoms as a protection against STIs when I have intercourse with someone for the first time

The likelihood of me becoming infected with an STI because of my sexual behaviour is substantial

The thought of an STI scares me

An STI is a serious health problem for me

I will use a condom next time I have intercourse with a someone for the first time

Becoming infected with an STI would be severe for me

Please indicate to what extent you think the following statements apply to the text you just read.

The text I just read...
 Totally agree Somewhat agree Neither agree nor disagree Somewhat disagree Totally disagree

Focused on the advantages of using a condom when having intercourse

Focused on the disadvantages of not using a condom when having intercourse

-

Showed statistics about STIs among young people

-

Told about personal experiences with contracting STIs

-

The following questions ask about your sexual experiences

In the last 12 months, have you had intercourse with...

- | | Yes | No |
|------------------|-----------------------|-----------------------|
| A male partner | <input type="radio"/> | <input type="radio"/> |
| A female partner | <input type="radio"/> | <input type="radio"/> |

This study distinguishes between REGULAR (boyfriend/girlfriend) and CASUAL partners.

Have you had a regular partner in the past 12 months?

- Yes
- No

Did you have intercourse with a regular partner in the past 12 months?

- Yes
- No

How often did you use a condom when you had intercourse with a regular partner in the past 12 months?

- Always
- Often
- Sometimes
- Rarely
- Never

Have you had one or more casual partners in the past 12 months?

- Yes
- No

Did you have intercourse with a casual partner in the past 12 months?

- Yes
- No

How often did you use a condom when you had intercourse with a casual partner in the past 12 months?

- Always
- Often
- Sometimes
- Rarely
- Never

The next questions ask about STIs

Have you ever been tested for STIs?

- Yes
- No

When was the last time you had an STI test?

- 0-6 months ago
- 6 months-1 year ago
- Longer than 1 year ago

Have you ever had (or do you have) an STI?

- No
- Yes

Please tick the box of which STI you had (multiple answers possible):

- Chlamydia
- Gonorrhoea
- Herpes
- HPV
- Syphilis
- Other, please specify...

Which of the following best describes how you heard about this study?

- I was directly approached by one of the staff members on the UNSW Kensington campus
- Through Facebook

- I saw a flyer advertising for the experiment
- A friend told me about it
- Other, please specify...

Would you agree that you provided honest answers to all of our questions?

- Totally disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Totally agree

Debriefing (compulsory) A = testimonial message with male character; B = testimonial message with female character; C = statistical message

A

Please note:

The letter you just read in this study has been constructed by the researchers to assess your ideas and thoughts about becoming infected with an STI. The *Sex & You Magazine* does not exist and Matthew is a fictive person.

For STI facts and information go to <http://www.sti.health.gov.au>

- I understand that the letter I just read was constructed by the researchers for this study
-

B

Please note:

The letter you just read in this study has been constructed by the researchers to assess your ideas and thoughts about becoming infected with an STI. The *Sex & You Magazine* does not exist and Jessica is a fictive person.

For STI facts and information go to <http://www.sti.health.gov.au>

- I understand that the letter I just read was constructed by the researchers for this study
-

C

Please note:

The article you just read in this study has been constructed by the researchers to assess your ideas and thoughts about becoming infected with an STI. The *Sex & You Magazine* does not exist. The research information in the article was correct.

For STI facts and information go to <http://www.sti.health.gov.au>

- I understand that the article I just read was constructed by the researchers for this study
-

Thank you for your contribution to the study. We greatly appreciate your assistance. In September 2012 a summary of the results will be available on the website of The National Centre in HIV Social Research (<http://nchsr.arts.unsw.edu.au>). In the meantime, you will be kept posted on preliminary results through the “Facts and stories” Facebook page. You may now close this window.

Very sincerely,
Philippe Adam
National Centre in HIV Social Research
The University of New South Wales
NCHSR website: <http://nchsr.arts.unsw.edu.au/>
Study website: <http://FactsandStories.nchsr.org/>

Appendix B – Health messages

Gain-framed/testimonial format (male character)

The following letter from a reader called Matthew was published in the magazine *Sex & You*:

Matthew (21) recently learned that protecting oneself during sex has many advantages. It is the best way to reduce one's chance of becoming infected with a sexually transmitted infection (STI).

Here is Matthew's story: 'Last year I broke up with my first girlfriend who was also my first sexual partner. A few months after breaking up I met a girl at a party. She was sexy and fun and we went back to her place. Before having sex she told me she was healthy and didn't want to use a condom, but I insisted on using one. That turned out to be a smart decision, because a few weeks later she told me she was diagnosed with Chlamydia! I had no idea that she was infected; neither did the girl by the way. I thought I would never be at risk of catching an STI, but now I realize that in some situations using a condom really protects you from becoming infected.'

Matthew's advice:

'I always tell my friends to use condoms, it has so many advantages:

- It considerably reduces your chance of catching an STI.
- It shows that you take responsibility for your own health.
- With a condom you don't have to worry about your health.'

Gain-framed/testimonial format (female character)

The following letter from a reader called Jessica was published in the magazine *Sex & You*:

Jessica (21) recently learned that protecting oneself during sex has many advantages. It is the best way to reduce one's chance of becoming infected with a sexually transmitted infection (STI).

Here is Jessica's story: 'Last year I broke up with my first boyfriend who was also my first sexual partner. A few months after breaking up I met a boy at a party. He was sexy and fun and we went back to his place. Before having sex he told me he was healthy and didn't want to use a condom, but I insisted on using one. That turned out to be a smart decision, because a few weeks later he told me he was diagnosed with Chlamydia! I had no idea that he was infected; neither did the boy by the way. I thought I would never be at risk of catching an STI, but now I realize that in some situations using a condom really protects you from becoming infected.'

Jessica's advice:

'I always tell my friends to use condoms, it has so many advantages:

- It considerably reduces your chance of catching an STI.
- It shows that you take responsibility for your own health.
- With a condom you don't have to worry about your health.'

Loss-framed/testimonial format (male character)

The following letter from a reader called Matthew was published in the magazine *Sex & You*:

Matthew (21) recently learned that not protecting oneself during sex has many disadvantages. It increases one's chance to become infected with a sexually transmitted infection (STI).

Here is Matthew's story: 'Last year I broke up with my first girlfriend who was also my first sexual partner. A few months after breaking up I met a girl at a party. She was sexy and fun and we went back to her place. When we got there we realised neither of us had condoms with us. She told me she was healthy, so we decided to just have sex without a condom. After a few weeks I felt pain when urinating. When I told my GP he suggested I'd be tested for STIs and to my surprise it got back positive for Chlamydia! I had no idea that she was infected; neither did the girl by the way. I thought I would never catch an STI, but now I realize that in some situations not using a condom really puts you at risk to become infected.'

Matthew's advice:

'I always tell my friends that not using condoms has so many disadvantages:

- It considerably increases your chance of catching an STI.
- It shows that you don't take responsibility for your own health.
- Without a condom you have to worry about your health.'

Loss-framed/testimonial format (female character)

The following letter from a reader called Jessica was published in the magazine *Sex & You*:

Jessica (21) recently learned that not protecting oneself during sex has many disadvantages. It increases one's chance to become infected with a sexually transmitted infection (STI).

Here is Jessica's story: 'Last year I broke up with my first boyfriend who was also my first sexual partner. A few months after breaking up I met a boy at a party. He was sexy and fun and we went back to his place. When we got there we realised neither of us had condoms with us. He told me he was healthy, so we decided to just have sex without a condom. After a few weeks I felt pain when urinating. When I told my GP he suggested I'd be tested for STIs and to my surprise it got back positive for Chlamydia! I had no idea that he was infected; neither did the boy by the way. I thought I would never catch an STI, but now I realize that in some situations not using a condom really puts you at risk to become infected.'

Jessica's advice:

'I always tell my friends that not using condoms has so many disadvantages:

- It considerably increases your chance of catching an STI.
- It shows that you don't take responsibility for your own health.
- Without a condom you have to worry about your health.'

Gain-framed/statistical format

The following statistical data were published in an article in the magazine *Sex & You*:

Research shows protecting oneself during sex has many advantages. It reduces one's chance to become infected with a sexually transmitted disease (STI).

Here are the findings: If you protect yourself during sex with an infected partner you have an 83% chance of not becoming infected with an STI if your partner has an STI. Research shows that STIs are common among young people in Australia: three quarters of the known STI cases occurs among people aged between 15 and 29 years old. In the last few years, STI prevalence has risen; for example the population rate of reported diagnoses of Chlamydia more than tripled in both the male and female population over the past ten years. Studies show that 42% of young people in Australia think that prevention from STIs is the main advantage of using condoms. Partly because they take the responsibility for their own health and use condoms when having intercourse, 75% of the sexually active young people don't have an STI.

The advice that follows these statistical data:

Using condoms has many advantages:

- It considerably reduces your chance of catching an STI.
- It shows that you take responsibility for your own health.
- With a condom you don't have to worry about your health.

Loss-framed/statistical format

The following statistical data were published in an article in the magazine *Sex & You*:

Research shows not protecting oneself during sex has many disadvantages. It increases one's chance to become infected with a sexually transmitted disease (STI).

Here are the findings: If you don't protect yourself during sex with an infected partner you have a 38% chance of becoming infected with an STI if your partner has an STI. Research shows that sexually transmitted infections (STIs) are common among young people in Australia: three quarters of the known STI cases occurs among people aged between 15 and 29 years old. In the last few years, STI prevalence has risen; for example the population rate of reported diagnoses of Chlamydia more than tripled in both the male and female population over the past ten years. Studies show that 42% of young people in Australia think that becoming infected with an STI is the main disadvantage of not using condoms. Partly because they don't take the responsibility for their own health and don't use condoms when having intercourse, 25% of the sexually active young people have an STI.

The advice that follows these statistical data:

Not using condoms has many disadvantages:

- It considerably increases your chance of catching an STI.
- It shows that you don't take responsibility for your own health.
- Without a condom you have to worry about your health.