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Understanding STI testing behaviour among young people in New South Wales, Australia: The contribution of fears and worries in the context of an extended health belief model.

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Abstract

The present study investigated how cognitive determinants and emotional determinants, in particular fears and worries, relate to STI testing behaviour. A survey was conducted online among 906 participants aged 16 to 26 years who completed a digital questionnaire about sexuality, sexual health, STI testing behaviours and cognitive and emotional factors potentially influencing testing behaviours. The cognitive factors were specified by an extended health belief model (HBM) and encompassed perceived risk and severity of STIs, perceived pros and cons of STI testing, and perceived behavioural control over STI testing behaviour. Emotional factors referred to fears and worries about STIs and STI testing. All cognitive variables of the extended HBM, as well as fears and worries, were found to be univariately associated with STI testing behaviour. In multivariate analysis, perceived behavioural control was found to add to HBM variables. As predicted the relation between fears and worries and STI testing was mediated by cognitive variables, but only the combination of extended HBM variables reduced the association between fears and worries and STI testing behaviour to non-significance; individual cognitive variables did not significantly mediate this association. Results of this study suggest that emotions influence cognitions in explaining STI testing behaviour. Fears and worries affect threat perception as well as evaluation of the behaviour, suggesting that threat appraisal and coping appraisal are intricately related and may not work in parallel as suggested by classic social cognitive models. Limitations and implications of the study are discussed.

Introduction

Sexually transmitted infections (STIs) have been recognised as a major public health problem in many Western industrialised countries (Uusküla, Kangur, & McNutt, 2006). In the United Kingdom, for instance, about 10% of the men and women who ever had sex reported having ever been diagnosed with at least one of eight major STIs (Fenton et al., 2001). STIs seem to be most prevalent among young people under the age of 25 (Abel & Brunton, 2005; CDC, 2009). If left untreated or mismanaged, STIs can cause clinical complications such as fertility problems or cancers, and social burdens such as distress, fear, and shame (Jin et al., 2002; Meyer-Weitz, Reddy, Van den Borne, Kok, & Pietersen, 2000). Also, STIs increase the likelihood of becoming infected with HIV or of transmitting HIV (Hawkes, 2008). This empirical evidence suggests that testing for STIs is needed to improve health in young people (Meyer- Weitz et al., 2000). Campaigns and interventions have been initiated to promote STI testing in young people but these campaigns had a limited impact on uptake of testing in this population. To improve programs aimed at promoting STI testing among young people, a better understanding of factors that influence STI testing behaviour is necessary.

Factors related to STI-testing

There is some literature available on the factors that influence STI testing (e.g. Mimiaga, Goldhammer, Belanoff, Tetu, & Mayer, 2007; Tilson et al., 2004). Most of these studies depict the importance of cognitive factors related to threat perception (e.g. Baseman, Leonard, Ross & Hwang 2001; see also Barth, Cook, Downs, Switzer, & Fischhoff, 2002; Zimet et al., 2004). For example, Baseman et al. (2001) found that individuals are less likely to get an STI test, when they do not consider themselves at risk to become infected with an STI. In other studies the evaluation of STI testing behaviour was assessed (e.g., Chacko, Sternberg, von Velasquez, Wiemann, Smith, & Diclemente, 2008; Greenberg et al., 2002). For instance, Chacko et al. (2008) identified several important pros and cons related to STI testing. Partner trust issues were identified as both important

pros as well as important cons in seeking STI testing. On the one hand women saw testing as a way to build trust in the relationship, while on the other hand women were scared that their partner would think they were cheating if they would get tested for STIs (Chacko et al., 2008). Considering the STI testing literature, it seems that as well as cognitive factors, emotional factors also have an influence on health behaviour. However, most of the studies on the determinants of STI testing are not based on a theoretical psychological framework. The current study investigates how both cognitive and emotional factors influence STI testing behaviour in young people in New South Wales (NSW), Australia.

Social cognitive models

A variety of social cognition models (SCM) have been developed to explain health behaviour (Conner & Norman, 2005). These models try to explain how cognitive factors produce various social and health behaviours. One of the most commonly used SCM is the health belief model (HBM; Abraham & Sheeran, 2005). This classic model of health behaviour emphasises the role of perceived threat as well as the evaluation of behaviour. It proposes that health behaviour is a function of four main factors: perceived susceptibility, perceived severity, perceived pros and perceived cons. Perceived susceptibility, also referred to as perceived risk (Abraham & Sheeran, 2005), is the individual's perceived vulnerability to an illness or disease. Perceived severity is a person's belief how serious the disease is. Perceived risk and perceived severity together form the perception of the health threat. The level of the perceived health threat is assumed to provide the motivation to act (De Wit & Stroebe, 2004). Perceived threat will, however, not generate health behaviour directly.

According to the HBM, an individual will also evaluate the behaviour, by considering the pros and cons of the recommended action. The health behaviour will only be performed if the pros outweigh the cons (Abraham & Sheeran, 2005). Furthermore, the HBM proposes that cues to action act as a trigger to perform the recommended health behaviour. These cues could be internal

symptoms (e.g., an itchy feeling on ones genitals) or external cues (e.g., a health promotion campaign or a close friend who did an STI test). Cues to action can promote enacting health behaviour when supportive beliefs are held (Abraham & Sheeran, 2005). Other variables, such as intention were suggested as extension of the HBM, but results regarding the added value of including intentions in the HBM are inconclusive (Abraham & Sheeran, 2005; Armitage & Conner, 2000). Self-efficacy, also referred to as perceived behavioural control, has been suggested as an additional variable in the HBM as well and was found to contribute to the explanation of various health behaviours using the HBM (Abraham & Sheeran, 2005; Zak-Place & Stern, 2004). For example, Zak- Place & Stern (2004) found that self efficacy as additional appraisal factor in the HBM, was a significant predictor of intended condom-use.

The factors that have been taken into account in the HBM are mostly cognitive factors. However, there is evidence that emotional factors, such as fears and worries, also influence health behaviour (e.g., Barth et al., 2002; Greenberg et al., 2002; Wiebe & Korbel, 2007). For example, several studies found that people are afraid of the negative consequences of STI testing (e.g., Barth et al., 2002; Lichtenstein, 2004; Sosman et al., 2003). Also, fear of medical examinations was found to decrease STI testing in several studies (Baseman et al., 2001; Esler, Ooi & Merritt, 2008). Most theories in the health behaviour literature suggest that fears and worries may reduce adaptive health behaviour. However, there are also studies that find that worries are associated with a higher likelihood to perform specific health behaviours (Hay, McCaul & Magnan, 2006). In their study of breast cancer screening, Hay et al. (2006) found that worries about having breast cancer motivated screening behaviour in high-risk women. These contrasting findings of the relation of emotions with health behaviour show that empirical evidence about this association is still inconclusive. Thereby, is the joint influence of cognitive factors and emotional factors, such as fears and worries, not extensively explored in the STI testing literature. However, some studies did explore the relationship between emotions and cognitions.

Interrelation between emotions and cognitions

Zajonc (1980) suggested that emotions precede cognitions, as neural pathways in the brain seem to translate emotional reactions directly into behaviour without an anterior cognitive appraisal of the particular behaviour (Zajonc, 1980; Zajonc, 1984). Loewenstein, Weber, Hsee and Welch (2001), suggest that emotions and cognitions work both ways. According to their risk-as-feeling theory, emotions can have a direct effect on behaviour when not mediated by cognitive processing. However, according to Loewenstein et al. (2001) emotions can also serve as a predictor of managing risk behaviour when mediated by cognitive determinants. Lazarus (1980), in contrast, suggested that cognitions are needed to experience emotions. In this view, only appraising sensory states as either favourable or unfavourable to one's wellbeing produces an experience of emotion (Lazarus, 1980). Leventhal, (1971) proposed that emotions work in parallel with cognitions. In his parallel process model of fear appeals, Leventhal suggested that health threats generate emotional states of fear and distress and a corresponding need to cope with these emotions (i.e., fear control). Parallel to fear control, health threats also generate danger control processes. Danger control is the cognitive representation of a threat with corresponding action plans to manage the threat (Leventhal, 1971; Leventhal & Scherer, 1987; Diefenbach & Leventhal, 1996). In this theory Leventhal proposes that the motivation to engage in health behaviour results from danger control processes as well as fear control processes.

The revised protection motivation theory (PMT) of Rogers (1975; Floyd, Prentice-Dunn & Rogers, 2000) also addresses the link between emotional and cognitive factors underlying health behaviour. PMT is an extension of the HBM and shows similarities with the parallel response model. As in Leventhal's (1971) model, PMT proposes threat appraisal and coping appraisal as independent control processes that result from a fear appeal. PMT proposes that the influence on experienced fear on health behaviour is mediated by threat and coping appraisal (Norman, Boer & Seydel, 2005). Threat appraisal is concerned with the factors that influence the probability of maladaptive

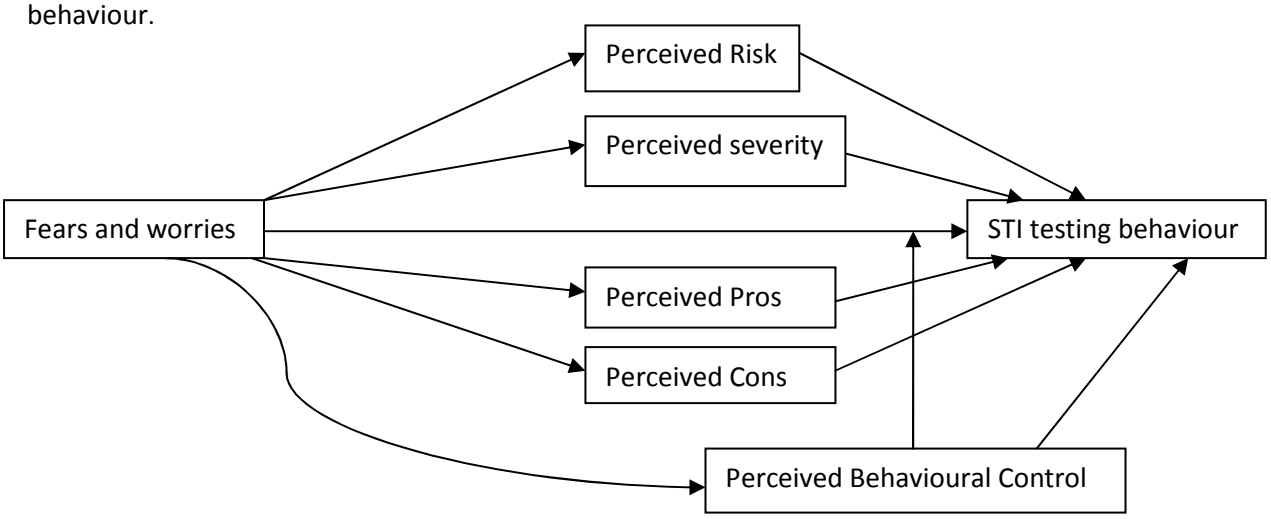
responses (i.e., avoidance or denial of the health threat). Individuals' perceived vulnerability and perceived severity of the threat inhibit maladaptive responses, while intrinsic and extrinsic rewards increase the likelihood of maladaptive responses. Coping appraisal is concerned with the options available to the individual to manage the health threat by engaging in an adaptive response. The likelihood of an adaptive response is assumed to increase when the individual has high response efficacy and self- efficacy to perform the adaptive behaviour. Adaptive responses will be inhibited by the costs of the adaptive behaviour. Protection motivation, or the intention to perform a health behaviour, is assumed to reflect both threat appraisal as well as coping appraisal process, and eventually will result in protective (health) behaviour (De Wit & Stroebe, 2004; Norman, Boer & Seydel, 2005). In addition to both Leventhals' (1971) parallel process model and PMT (Rogers, 1975; Floyd et al., 2000), Witte and Allen (2000) extended the parallel process model into the EPPM. As in the earlier theories (Leventhal, 1971; Rogers, 1975; Floyd et al., 2000), two appraisal processes result from fear appeals; however, the second appraisal only emerges when the threat is perceived to be relevant. If the individual perceives the fear appeal as a threat, a second appraisal, appraisal of efficacy, will determine whether or not the individual performs the health behaviour (Witte & Allen, 2000).

The present study

The purpose of this study is to investigate the joint influence of cognitive and emotional factors on health behaviour, particularly STI testing behaviour. Social cognitive theories, such as the HBM, suggest that the decision to perform health behaviour is influenced by various cognitive factors. According to the HBM, when a threat is perceived as high, and the individual feels capable to perform the behaviour, a conscious weighing of pros and cons of the health behaviour influences the likelihood to perform the appropriate health behaviour. However, SCM differ widely in the cognitive variables they propose in predicting health behaviour and are not conclusive with respect to the

importance of these different variables. Furthermore, SCMs mostly specify cognitive factors as determinants of health behaviour. However, research has shown that emotional factors also influence health behaviour. Notably fears about STI testing have been found to inhibit STI testing behaviour (Barth et al., 2002), but the opposite has also been found (Hay et al., 2006). Both these findings suggest that cognitive factors may not be sufficient in explaining health behaviour. The aim of this study is to assess the association between fears and worries and STI testing behaviour in the context of the extended HBM. In particular, this study investigates how perceived risk and severity, perceived pros and cons, perceived behavioural control and fears and worries regarding STI testing jointly influence young people's decision to test for STIs (see Figure 1. for the expected relations).

Fig. 1 Expected relations of the extended HBM variables and fears and worries with STI testing behaviour.



Based on the health behaviour literature and the STI testing literature in particular (e.g. Abraham & Sheeran, 2005; De Wit & Stroebe, 2004; Zak-place & Stern, 2004), it is expected that the cognitive factors specified by the extended HBM are associated with STI testing behaviour. It is also hypothesized that emotional factors, in particular fears and worries, are related to STI testing, and that this effect is mediated by cognitive factors, as suggested by PMT. In this study it is expected that the perceived risk and the perceived severity mediate the relationship between fears and worries

and STI testing behaviour. In parallel, fears and worries might also affect the balance of perceived pros and perceived cons (Flowers, Duncan & Knussen, 2003) as well as individuals' perceived behavioural control (Bandura, 1990) related to STI-testing. To the extent that a direct association exists between fears and worries and STI testing, it is expected that this relationship is moderated by perceived behavioural control as posited by theorising of fear appeals (Witte & Allen, 2000).

Methods

Procedures and design

A cross-sectional study was conducted via the Internet and a website was created to host the online questionnaire. On this website (www.gettingdowntoit.net), information about the survey was presented as well as the contact details of the researchers. Participants were mainly recruited through (paid) Facebook advertisement that targeted people between the ages of 16 and 26 who lived in New South Wales, Australia. Respondents were also recruited through a Facebookgroup or by flyers containing the address of the study website, that were handed out by investigators on the UNSW Kensington campus. Through a link on the website, participants could access the questionnaire (appendix 1). Before starting the questionnaire, all participants read a participants' information sheet and provided informed consent. Data were collected in May 2010. No personal identifiers were collected and no reimbursement was provided. The questionnaire was created using a software provided by Netquestionnaires; data were stored on a secure server and could only be accessed by the researchers. The study protocol was approved by the Human Research Ethics Committee of the University of New South Wales, Sydney.

The questionnaire started with several social demographical questions and further contained a diversity of questions about participants' sexual health and related behaviours. Depending on their lifestyles, sexual behaviors and reported relationships, participants were routed

to different modules of questions. At the end of the questionnaire participants were provided with contact information of the research team, in case they had any questions about the survey.

Participants

To be eligible for this study, participants had to be between 16-26 years of age living in NSW, and had to have had sex with at least one partner. Of the 1,713 individuals participants who initiated the survey, about half (*N*=906) met the inclusion criteria and completed all relevant questions. Biographic characteristics of the eligible participants are presented in Table 1.

Table 1. Biographic characteristics of participants (*N*=906)

Variables	*%*
Age	
16-18	26.9
19-21	34.7
22-24	26.7
25-26	11.7
Gender	
Male	39.1
Female	60.6
Transgender	0.3
Education level	
No university degree (or still in school)	79.7
University degree	20.3
Ethnic background	
Anglo-Australian	71.7
Other ethnic background	24.9
Sexual identity	
Heterosexual	71.9
Bisexual	16.2
Homosexual	9.2
Other	2.8

Most of the participants were between the ages of 19 and 21 years; participants' mean age was 20.7 years (SD= 2.80). The majority of participants were female (60.6%); 20% had a university degree and three quarter of the sample (71.7%) had an Anglo-Australian background. The majority (71.9%) identified as heterosexual, with the remainder identifying as bisexual, homosexual or other (such as "bicurious", or "confused"). The majority of the participants (79.7%) was recruited through the

Facebook advertisements; only 5.7% of the participants was recruited through the Facebook group, and 3.0% of the participants were recruited on campus. The remainder had heard about the study through a friend, or saw a poster of the study on the UNSW Kensington campus.

Measures

This study is part of a larger survey; only the measures that are used in this study will be discussed.

Sexual behaviour and risk-taking

Participants who responded positively to the question whether they had sex in the last six months, were successively asked if they had had a regular partner and casual partner(s) during this period of time. For each type of partners, participants were asked to report if they had unprotected vaginal and/or anal sex in the last 6 months. Responses were given on a 5-point scale, ranging from (1) always to (5) never. A dichotomous variable was created to indicate whether participants had had any unprotected sex in the last six months (0= no unprotected sex, 1= unprotected sex).

STI testing behaviour

To assess STI testing behaviour, participants were asked if they had ever tested for STIs and/or HIV. The answers were recoded into a dichotomous variable (0 = never STI test, 1 = ever STI test).

Perceived risk of STIs

Perceived risk of STIs was measured with seven items. Six items asked about participants' perceived likelihood to become infected with a specific STI (i.e. Chlamydia, gonorrhoea, syphilis, herpes, HPV and HIV) and one item asked about the likelihood of becoming infected with an STI in general. Responses were given on a 5-point scale, ranging from (1) very low likelihood to (5) very high likelihood. Internal consistency of the items was high (Cronbach's α=.96) and scores were averaged.

Perceived severity of STIs

Perceived severity of STIs was also measured with seven items. As for perceived risk, six items asked participants to indicate how serious it would be if they contracted a specific STI, and one item asked to indicate how serious it would be to contract an STI in general (e.g. 'It would be serious for me if I would contract an STI'). Responses were given on a 5-point scale, ranged from (1) totally disagree or (5) totally agree. The internal consistency was high (Cronbach's α=.93) and scores were averaged.

Evaluation of STI testing

Participants' evaluation of STI testing was assessed by asking for perceived pros and cons of STI testing. Perceived pros and cons were presented together and the order in which items were presented was randomized automatically by the data collection software. Perceived pros were assessed with 10 items, for instance 'Getting tested for STIs prevents passing on potential STIs to your partner(s)' and 'Getting tested for STIs helps to put new relationships on the right track'. Response ranged from (1) totally disagree to (5) totally agree. The internal consistency of the items was high (Cronbach's α= .90) and item scores were averaged.

The perceived cons scale also consisted of 10 items. Participants were asked to rate how much they agreed with negative statements about getting tested for STIs, for instance 'Confidentiality is problematic in STI testing facilities'. Responses were given on a 5-point scale, ranging from (1) totally disagree to (5) totally agree. Internal consistency of the items was good (Cronbach's α=.76) and item scores were averaged.

Perceived behavioral control

Perceived behavioral control was measured with five items that measured the level of participants' perceived capability to perform STI testing behavior, for example 'I'm perfectly able to get tested for STIs' and 'If I think I need to test for STIs, it will be easy for me to obtain a test'. Responses were

indicated on 5-point scales, ranging from (1) strongly disagree to (5) strongly agree. Internal consistency of the items was high (Cronbach's α=.91) and item scores were averaged.

Fears and worries regarding STI testing

Fear and worries were measured with eight newly constructed items that measured the most important aspects of STI-related fear as identified in the literature. In particular, fears regarding loss of reputation (Barth et al., 2002); worries about medical procedures (Greenberg et al., 2002; Esler et al., 2008); worries related to service provider aspects, in particular negative attitudes of staff in STI testing facilities (Goldenberg et al., 2008); worries of staff disclosing private information to others (Banikarim et al., 2003); and fears regarding the reaction of other people, notably friends or family (Lichtenstein, 2004). Fears and worries were assessed by asking participants to imagine that they were considering testing for STIs and indicate the extent to which they would experience specified fears and worries, for example 'I would be worried about losing my reputation', 'I would be worried that STI testing staff would talk about or give out information about me' and 'I would be worried about my partner's reaction.' Responses were indicated on a 5- point scale that ranged from (1) totally disagree to (5) totally agree. The internal consistency of items was high (Cronbach's α=.85) and item scores were averaged.

Statistical analyses

To assess the contribution of cognition and emotion in explaining STI testing, several analyses were performed. The analyses consisted of first describing the average scores of the variables of the extended HBM and fears and worries. Then univariate and multivariate associations between cognitive and emotional variables and STI testing behaviour were assessed using logistic regression analyses. Mediation effects were assessed in four steps. After assessing the associations between STI testing behaviour and fears and worries as well as extended HBM variables, the associations

between fears and worries and the extend HBM variables were assessed by univariate linear regression analyses. Hierarchal logistic regression analyses were then performed to assess if the association between fears and worries and STI testing behaviour became non-significant when cognitive variables that qualified as potential mediators were entered into the model, either independently or jointly. To assess potential moderation of the association between fears and worries and STI testing behaviour, a hierarchal logistic regression analyses was performed in which the main effects of fears and worries were entered, as well as their interaction terms. Variables were mean-centred. All analyses were conducted using SPSS version 18.

Results

Sexual relations and sexual risk taking

Most participants (91.4%) had at least one sexual partner in the last 6 months (see Table 2) and 67.4% had unprotected sex with any partner in the past six months. Of the individuals who had unprotected sex in the last 6 months, 83.3% had had unprotected sex with a regular partner, and 36.8% had had unprotected sex with a casual partner. Only 58.3% of the participants who had unprotected intercourse in the last six months, had ever tested for STIs.

Table 2. Number of sexual partners and STI testing behavior

Demographic variables	*%*
Number of sexual partners in the last 6 months	
0	8.6%
1	51.1%
2	15.7%
3 or more	24.6%
STI testing behavior	
Ever had an STI test	50.3%
Never had an STI test	49.7%

History of STI testing

Half of the sample (50.3%) ever had an STI test (see Table 2). About one third (36.8%) of the

participants had ever had an STI test as well as an HIV test and 13.6% had only tested for STIs. Of the respondents who ever tested for STIs, one quarter (22.6 %) had tested less than three months before the study, and one quarter had tested 4-6 months ago (26.8%). The other half of participants who ever tested for STIs had tested either between 7- 12 months ago (23.2%), or more than 12 months ago (27.4%).

Cognitive and emotional factors potentially influencing testing decision

In Table 3 the mean scores on the extended HBM scales and fears and worries scales are presented. Participants scored relatively low on perceived risk of STIs and high on perceived severity of STIs. They agreed on most of the pro statements on STI testing and on average neither disagreed nor agreed on con statements. Participants scored high on perceived behavioral control and average on fears and worries.

Table 3. Mean scores and standard deviation (SD) for extended HBM variables and fears and worries

Variables	*M*	*SD*
Perceived risk	1.7	.89
Perceived severity	4.6	.68
Perceived pros	4.3	.62
Perceived cons	2.8	.68
Perceived behavioural control	4.2	.88
Fears and worries	3.0	1.03

Associations between extended HBM variables, fears and worries and STI testing behavior

In univariate and multivariate logistic regression analysis (see Table 4), STI testing behavior was found to be positively associated with perceived risk of STIs, perceived pros of STI testing and perceived behavioral control. STI testing behaviour was found to be negatively associated with perceived cons of STI testing and fears and worries. No association was found between perceived severity of STIs and STI testing. In multivariate analyses, the effect of fears and worries on STI testing

seems to decrease and looses significance. This suggests a mediation effect of the extended HBM variables of the relationship of fears and worries with STI testing behavior.

Table 4. Univariate and multivariate logistic regression analysis of extended HBM variables and fears and worries on STI testing behaviour

	Univariate analyses		Multivariate analysis*	
	OR	*p*	*ORa*	*p*
Perceived risk	1.26	.002	1.41	.000
Perceived severity	.94	.517	.82	.070
Perceived pros	2.18	.000	1.36	.030
Perceived cons	.41	.000	.56	.000
Perceived behavioural control	2.35	.000	1.82	.000
Fears and worries	.64	.000	.86	.074

**Note:* Nagelkerke R^2= .20.

Mediation effects on STI testing behavior

To assess the mediation of the effects of fears and worries on STI testing behavior by the extended HBM variables four requirements need to be met (Baron & Kenny, 1986).

Step 1: a significant relation between fears and worries and STI testing behavior.

Step 2: a significant relation between fears and worries and extended HBM variables.

Step 3: a significant relation between potential mediators (extended HBM variables) and STI testing behaviour.

Step 4: the strength of the relation between fears and worries and STI testing behavior is significantly reduced when extended HBM variables are added to the model.

In the first step a univariate logistic regression analysis was performed to check the association between the fears and worries and STI testing behavior (see Table 4). In the second step, the relationship between fears and worries and extended HBM variables was investigated by a series of univariate linear regression analyses; Table 5 displays these associations. Fears and worries were positively associated with perceived risk and perceived cons and negatively associated with perceived pros and perceived behavioural control. Perceived severity did not meet the requirements of mediation was therefore excluded from this analysis.

Table 5: Univariate associations between fears and worries and potential mediators

Variables	*β*	*p*
Perceived risk	.09	.006
Perceived pros	-.16	.000
Perceived cons	.48	.000
Perceived behavioural control	-.35	.000

In the third step the relationship between extended HBM variables and STI testing behavior was investigated by performing univariate logistic regressions (see Table 4). In the fourth step multivariate hierarchal logistic regression analyses were conducted to check if the association of fears and worries with STI testing behavior is weakened or disappears if extended HBM variables are entered in the analyses. Table 6 shows the results of these logistic hierarchal regressions for each of the potential mediators. The effect of fears and worries on STI testing behavior decreased somewhat when perceived cons and perceived behavioral control were entered in the model. The effect of fears and worries on STI testing behavior was not substantially modified when perceived risk or perceived pros of STI testing are entered in the model. When all potential mediators were included in the model, the association between fears and worries and STI testing behavior became non-significant.

Table 6: Test of mediation effects of extended HBM variables

	OR	*p*
Step 1		
Fears and worries	.64	.000
Step 2		
Mediation by perceived risk		
Fears and worries	.62	.000
Perceived risk	1.35	.000
Mediation by perceived pros		
Fears and worries	.67	.000
Perceived pros	2.02	.000
Mediation by perceived cons		
Fears and worries	.78	.002
Perceived cons	.48	.000
Mediation by perceived behavioural control		
Fears and worries	.76	.000
Perceived behavioural control	2.13	.000
Mediation by all extended HBM variables		
Fears and worries	.85	.055
Perceived risk	1.44	.000
Perceived pros	1.29	.066
Perceived cons	.57	.000
Perceived behavioural control	1.83	.000

Moderator effect of perceived behavioral control

To investigate the potential moderator effect of perceived behavioral control of the relation between fears and worries and STI testing behavior a multivariate hierarchal logistic regression analysis was conducted. In addition to the mean effects of fears and worries and perceived behavioural control, this analysis included the interaction between these variables. To reduce multicollinearity, variables were mean centred. The analysis did not show a significant effect for the interaction term and hence no moderator effect of perceived behavioural control of the relation between fears and worries and STI testing is found.

Discussion

The present study investigated how cognitive determinants and emotional determinants, in particular fears and worries, relate to STI testing behaviour. The cognitive factors were specified by an extended health belief model (HBM) which consisted of perceived threat (i.e. perceived risk and

perceived severity), evaluation of STI testing behaviour (i.e. perceived pros and perceived cons) and perceived behavioural control over STI testing (Abraham & Sheeran, 2005; Bandura, 1990). It was hypothesized that all cognitive determinants would be associated with STI testing behaviour, and that perceived behavioural control would add to the explanation of STI testing behaviour afforded by perceived threat and evaluation of the behaviour. It was also hypothesized that fears and worries would be associated with STI testing behaviour and that this effect would be mediated by the extended HBM variables. To the extent that there would be a direct relationship between fears and worries and STI testing, it was expected that this association was moderated by perceived behavioural control.

To test these hypotheses, a cross-sectional online study was conducted using online and offline advertisements. A total of 906 young people living in New South Wales, Australia completed an extensive questionnaire about their sexual health and related behaviours. A substantial proportion (67.4%) had engaged in unprotected sex in the last six months, but only half (58.3%) of these young people had ever tested for STIs. This indicates that young people are at risk for STIs and underscores the need to promote testing (or retesting) for STIs among young people who often do not use protection during sexual intercourse.

Of the cognitive variables specified by the extended HBM, only perceived severity was not found to be associated with STI testing behaviour. This lack of association with perceived severity has also been reported for variety of other preventive health behaviours in several reviews of HBM and protection motivation theory (PMT) studies (Floyd, Prentice-Dunn, & Rogers, 2000; Janz & Becker, 1984; Milne, Sheeran & Orbell, 2000). According to Janz and Becker (1984), individuals might find it difficult to conceptualize the seriousness of the threat when they are asymptomatic, or when their knowledge of health consequences is insufficient. Perceived risk was found to be positively associated with STI testing behaviour, and this is in line with what has been found in reviews of studies based on PMT (Floyd et al., 2000; Milne et al., 2000). As hypothesized, and equally in line

with previous reviews, a positive association was also found between perceived pros and STI testing behaviour, and a negative association with STI testing behaviour was found for perceived cons. According to Floyd et al. (2000), to adopt preventive health behaviour, one must believe that the recommended action avoids the danger (i.e. higher perceived pros) and that benefits outweigh the costs of performing the action (i.e. lower perceived cons). As expected, perceived behavioural control was also found to be associated with a higher likelihood of STI testing behaviour. This effect remained significant in multivariate analysis, which suggests that perceived behavioural control adds to the HBM, as previously suggested (Abraham & Sheeran, 2005; Bandura, 1990).

As hypothesized, it was found that the more fears and worries individuals experienced, the lower the likelihood was that they had tested for STIs. This supports findings in earlier research (e.g., Barth et al., 2002). The possible mediation of the association between fears and worries and STI testing behaviour by the extended HBM variables was analysed in a series of univariate logistic regression analyses. In these analyses, no strong mediation-effects were found for the individual cognitive factors. However, in a multivariate logistic regression analysis that included all eligible extended HBM variables, the association between fears and worries and STI testing behaviour became non-significant. Correlations between cognitive and emotional variables further show that fears and worries are associated with both perceived threat and evaluation of the behaviour, as well as perceived behavioural control. Together these findings suggest that emotions affect both threat appraisal and coping appraisal, which does not support classic theoretical notions that emotions affect only fear control or threat appraisal processes, as suggested by Leventhal's (1971) parallel processing model, Protection Motivation Theory (e.g., Rogers, 1975; see also Floyd et al., 2000), and the Extended Parallel Processing Model (e.g., Witte & Allen, 2001). Furthermore, the lack of moderation of the association between fears and worries and STI testing behaviour is at odds with interactions between threat and coping appraisal processes suggested by PMT (e.g., Floyd et al., 2000) and EPPM (e.g., Witte & Allen, 2000). In contrast, the findings of the present study support the

idea proposed by De Wit, Das and De Hoog (2007) in their study on fear appeals in persuasive messages, that the perception of the threat (also) influences coping appraisal.

Limitations of the present study

The current study has some limitations that have to be taken into account when interpreting the results. The participants were recruited online and therefore the sample cannot be considered representative of young people living in NSW, Australia. However, recent studies show that samples recruited through the Internet are more diverse than those obtained through more traditional (offline) convenience sampling methods, and that results from online surveys are as valid as the results derived from surveys using these more traditional methods (Gosling, Vazire, Srivastava, & John, 2004). A further limitation is that the present study was cross-sectional. The causality of the influence of cognitive and emotional factors on STI testing behaviour therefore remains unclear, as in many other studies (e.g., Barth et al., 2002; Baseman, 2001; Jin et al., 2002; see also Janz & Becker, 1984; Milne et al., 2000). To measure the predictive value of emotional and cognitive factors on STI testing, longitudinal research is needed.

Conclusions

This study demonstrated that the extended HBM variables are associated with STI testing behaviour, and perceived behavioural control added to classic HBM variables. Furthermore, the expected effect of fears and worries on STI testing behaviour was mediated by cognitive variables specified by the extended HBM. Results in particular suggest that emotions influence cognitions in explaining STI testing behaviour, and that threat appraisal and coping appraisal do not work in parallel as suggested by classic social cognitive models (Leventhal, 1971; Rogers, 1975; Witte & Allen, 2000). Despite its limitations, this study contributes to an increased theoretical understanding of the relations between cognitive and emotional determinants in explaining health behaviour, STI testing

in particular. With respect to prevention practice, findings of this study suggest that STI testing behaviour can be improved by intervention campaigns aimed at increasing individuals' perceived risk of STIs and perceived pros of STI testing, as well as decreasing individuals' perceived cons of STI testing. To be optimally effective, such interventions should also aim at reducing fears and worries related to STI testing that may affect individuals' cognitive appraisal.

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Appendix 1

(pdf questionnaire)