

**Beliefs underlying chlamydia risk appraisals: The relationship with young adults'
intentions to use condoms**

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Abstract (299/300)

Risk appraisals are identified by many theories of health behaviour as primary motivators of intention and action. However, limited evidence is available on the beliefs underlying risk appraisals. The nature of these beliefs must be understood in order to optimally modify risk appraisals in ways that motivate positive behaviour change. This study uses Cameron's illness risk representations framework to examine the extent to which beliefs about chlamydia predict risk appraisals and intentions to use condoms with casual sexual partners. A cross-sectional design was used. N=921 secondary school and university students aged between 16 and 24 years completed the Assessment of Illness Risk Representations (AIRR) which includes measures of illness risk representation components namely identity, cause, timeline, consequences and control. As hypothesised, appraisals of the likelihood of chlamydia infection were positively associated with beliefs that symptoms of infection were present (identity), that exposure to chlamydia had occurred (cause), and that chlamydia affected young people (timeline). Severity appraisals were positively associated with beliefs that chlamydia would lead to pain, psychosocial and fertility consequences (all consequences scales). Contrary to hypotheses, severity appraisals were positively associated with beliefs that infection could be prevented (control over prevention) and cured (control over cure), and not associated with the belief that infection could be treated (control over treatment). Intentions to use condoms with casual sexual partners were predicted by beliefs about control over prevention. In conclusion, Cameron's framework appears to be useful for examining the content of risk appraisals and isolating beliefs to be targeted through health promotion interventions. The findings have provided new evidence about the basis for young adults' appraisals of the risk of chlamydia infection. They point to ways in which intentions to use condoms with casual sexual partners could be increased, through for example, developing skills around how to initiate condom use.

Key words: illness risk representations, common sense model, risk appraisal, condom use, chlamydia

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Introduction

Many theories of health behaviour identify risk appraisals as primary motivators of intentions and action. These include the health belief model (Rosenstock 1974), the precaution adoption process (Weinstein 1988) and protection motivation theory (Rogers & Prentice-Dunn 1997). These theories all propose that when individuals make appraisals of an increased health risk, they will act to reduce their actual risk. Evidence from meta-analyses suggests that risk appraisal, operationalised as perceived vulnerability and perceived severity, has a small but significant association with intentions and behaviour (e.g. Milne, Sheeran and Orbell 2000; Witte and Allen 2000). Estimates of these relationships may be smaller than is actually the case due to measurement and study design issues (Wright 2010). This suggests that addressing risk appraisals could be an effective strategy in motivating health promoting behaviour.

Limited evidence is available on the nature of the beliefs underlying risk appraisals, that is, the beliefs about a health threat that people draw upon when they estimate the likelihood and severity of that threat. However, in order to modify risk appraisals in ways that motivate positive behaviour change, the nature of these beliefs must first be understood. For example, if the target behaviour is condom use, enhancing risk appraisals for unintended pregnancy and sexually transmitted infections (STIs) may be an effective strategy in motivating protective action. Changing risk appraisals for pregnancy and STIs however, requires changing the beliefs on which they are based, and in order to do this it is first necessary to understand their content. In line with the literature on social cognition models, such beliefs are the ultimate intra-psychic determinants of behaviour that should be the target of behaviour change interventions (Conner and Norman 2005).

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The beliefs that people piece together and use to inform their assessment of risks have been described as ‘Mental models’ (see Fischhoff 2007). The mental models approach has been used to identify important ways in which the mental models of lay people differ from an expert mental model that captures the pooled beliefs of subject specialists. These differences can be used to guide intervention development, for example, by targeting common misunderstandings held by the lay population. A recent incarnation of the mental models approach can be observed in a body of work initiated by Cameron (2003; 2008) that aims to specify the content of risk appraisals.

The work of Cameron (2003; 2008) is based on the common sense model (CSM; Leventhal, Brisette and Leventhal 2003) which provides a framework for identifying personal beliefs underlying threats to health. Largely the CSM has been used to understand how people appraise and cope with an illness (Hagger and Orbell 2003). The CSM has however now been applied in a different way to understand how healthy populations appraise the risk of illness threats (Cameron 2008; Classen et al. 2010; Decruyenaere et al. 2000; Kaptein et al. 2007; Rees et al. 2004; van Oostrom et al. 2007). Cameron (2003; 2008) has proposed a theoretical framework based on the CSM for understanding beliefs underpinning risk appraisals and how these motivate protective behaviour. This framework integrates the five components of the CSM with constructs more commonly encountered in the risk literature, namely the risk related appraisals regarding likelihood and severity. This theorising returns the CSM to its roots in understanding decision making about risk-related behaviours such as smoking and vaccine uptake (Leventhal et al. 1997).

Cameron (2003) proposed that illness risk representations for any illness threat are formed as a result of matching characteristics of the self with relevant illness risk representation components. For example in the case of sexually transmitted infections (STIs), illness risk representations about the cause of infection (“my history of unprotected sex puts

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me at risk of STIs) is based on matching beliefs about the cause of STIs (“STIs are transmitted through unprotected sex”) with self characteristics (“I’ve had lots of unprotected sex”). The components, taken from the CSM, include identity (the illness label and symptoms), cause (factors responsible for its occurrence), timeline (time of onset and course of illness), consequences (expected pain, psychosocial effects and death), and control (personal and medical control over illness progression). The components of identity, cause and timeline are proposed to serve as the basis for perceived likelihood estimates, and the components of consequences and control as the basis for perceived severity estimates. Illness risk representation components are proposed to have an independent association with protection intentions due to their richness and structure. For example, people appear to be more likely to talk about risk in ways that broadly reflect these components, rather than in terms of the likelihood or severity of a threat (French and Hevey 2008).

Evidence to support this framework has been found in the context of skin cancer risk (Cameron, 2008) and cardiovascular disease (CVD) risk (Claassen, et al. 2010; see also table 5). In Cameron’s (2008) study of skin cancer risk, the Assessment of Illness Risk Representations (AIRR) was administered to 120 university students. The five illness risk representations components of skin cancer risk were measured along with risk appraisals (likelihood and severity) and prevention and detection intentions and behaviour, namely engaging in sun protection actions, performing skin self-examination, and attending clinical skin examinations. As hypothesised, risk representation components independently predicted intentions and behaviours after controlling for likelihood and severity. In line with hypotheses, identity, cause and timeline beliefs were positively associated with likelihood appraisals. Thus, people who had more symptoms (e.g. fair hair, moles) which they associated with skin cancer risk were more likely to believe that they were at risk for skin cancer. People who either did not have these symptoms or did not think these symptoms

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were signs of skin cancer risk did not believe they were at increased risk of skin cancer. Furthermore, the more a person believed that they had been exposed to what they considered to be a cause of skin cancer (e.g. bad sunburns) the more likely they were to believe they were at risk of skin cancer, and the more likely they were to associate skin cancer with people of their age, the more likely they were to believe they were at risk. Also in line with hypotheses, perceived severity was positively associated with consequences relating to pain, psychosocial and shortened life, as hypothesised. Thus, people who believed that skin cancer could lead to consequences that were painful (e.g. undergoing painful treatments), could impact negatively on psychosocial functioning (e.g. causing difficulties for those close to them), or could impact upon life (e.g. limit how long they live), were more likely to believe that skin cancer was a serious condition. Contrary to hypotheses, control beliefs were not associated with severity appraisals suggesting that people's beliefs about the seriousness of skin cancer were unaffected by the level of control they felt over preventing the condition, or beliefs about whether skin cancer could be treated or cured.

In Claassen et al.'s (2010) study of CVD risk, measures of risk appraisal (operationalised as perceived likelihood only), the five risk representation components, and the behavioural measure 'adoption of a healthy lifestyle', were taken from a sample of 81 participants identified through genetic testing as at increased risk of developing CVD. In line with Cameron's (2003) theorising, identity and timeline were positively associated with likelihood. Thus people who had been told they had high cholesterol were more likely to believe they were at increased risk of CVD, and people who had more first-degree relatives with CVD were also more likely to believe they were at increased risk of CVD (identity). In addition, the more likely a person was to believe that CVD was a permanent condition, the more likely they were to believe they were at risk of CVD (timeline). Contrary to Cameron's (2003) theorising however, cause was not associated with likelihood. Identity, timeline,

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consequences, and one measure of control, namely efficacy of a healthy lifestyle, were found to independently predict adoption of a healthy lifestyle.

Although these results are promising, they were obtained in the context of only two sources of risk (i.e. skin cancer and CVD), and therefore may be of limited generalisability. Cameron (2003) clearly sets out the need for empirical research across different examples of illness threat to examine whether the five proposed components most accurately model representations of illness risk, or whether components need to be added or modified. The present study is a replication and extension of Cameron's (2008) and Claassen et al.'s (2010) studies to test how well the framework is supported in describing adolescents' risk appraisals regarding genital chlamydia. Chlamydia infection is an example of an acute illness as opposed to a chronic illness as has been studied previously, which was thought to present a useful test of the framework. Chlamydia also represents a significant public health problem.

In the UK, diagnosis of new genital chlamydia is highest amongst 16-24 year olds. The latest figures put current incidence of this STI at 1989.6 and 2177.5 per 100,000 for 15-19 and 20-24 year olds respectively (Health Protection Agency 2010). Data based on only genito-urinary medicine clinic diagnoses which precedes this, indicates a rise in infection of 76% for 16-19 year olds and of 85% for 20-24 year olds between 2000 and 2009 (Health Protection Agency 2010). Incidence in the UK is comparable to the USA where the highest incidence is amongst 15-25 year olds, at 1999.9 per 100,000 for 15-19 year olds and 2165.0 for 20-24 year olds (Centre for Disease Control and Prevention 2010). Untreated chlamydia has serious and long-term health consequences. For women these include pelvic inflammatory disease, ectopic pregnancy and tubal factor infertility. A growing body of evidence also links infection to infertility in men (Joki-Korpela et al. 2009; Idahl et al. 2004).

Condoms are the only effective means of preventing STIs and their consequences but

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consistent use is infrequent amongst young adults (Office for National Statistics [ONS] 2005; Newby et al. 2012).

Study aims

The present study aims to replicate and extend the work of Cameron (2008) and Classen et al. (2010) by exploring the contents of illness risk representations for an acute infection, namely chlamydia, and examining their association with risk appraisals and intentions to use condoms with casual sexual partners. It tests Cameron's (2003; 2008) hypotheses that (a) Likelihood appraisals will be positively associated with higher identity, cause and timeline beliefs; (b) Severity appraisals will be positively associated with higher consequences beliefs and lower control beliefs; (c) All illness risk representation components will be associated with intentions after controlling for likelihood and severity.

Method

Participants

To achieve a sample aged 16-24 years old, participants were drawn from both a secondary school and a university located in a medium-sized city in England. This age range was selected as the incidence of chlamydia is highest amongst this group. There were 921 participants in total, 96 from the school and 825 from the university. All participants were sexually experienced. Table 1 presents demographic characteristics of the sample.

Table 1 about here

Measures

Illness Risk Representations

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The Assessment of Illness Risk Representations (AIRR) (Cameron 2008) was used to measure chlamydia risk representations. The items used in the present study have been largely adapted from those used in the IPQ-R (Moss-Morris et al., 2002). Full details of items and scoring are available from the authors. The five illness risk representation components were assessed using nine measures: one measure each for identity, cause and timeline, and three each for consequences and controllability. Three measures for consequences and controllability were taken as these components include potentially distinct and unique subcomponents of risk representations. The measures were as follows.

Identity risk beliefs. Measured respondents' beliefs about whether they had symptoms of chlamydia. The full list of 15 symptoms was created by supplementing those from the AIRR questionnaire with typical STI symptoms including those of chlamydia. Respondents were asked to indicate whether they had any of these symptoms (0 = no, 1 = yes) and also whether they thought they could be a sign of chlamydia (0 = definitely not, 4 = definitely). For each symptom, the two scores were multiplicatively combined, and then combined scores summed across the symptoms. The maximum possible score was 60; $\alpha=.73$.

Causal risk beliefs. Measured beliefs about experiences that can cause genital chlamydia and beliefs about one's history of those experiences. The full list of 17 causes was created by supplementing those from the AIRR questionnaire with the medically accepted cause of genital chlamydia (having vaginal sex without using a condom), and a number of common misperceptions about cause (e.g. using public toilets, poor hygiene). For each of these items respondents were asked to rate their agreement that each was a cause (0 = strongly disagree, 3 = strongly agree). The cause score was generated by combining the response for the true cause of chlamydia by respondents' personal history of that cause, that is, the frequency with which condoms had been used with casual sexual partners over the past six months (0 =

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every time, 4 = never). The maximum possible score was 12; alpha coefficient not calculated as cause was measured by a single item.

Timeline risk beliefs. Assessed using three items, respondents' beliefs about whether they felt that chlamydia was likely to affect people of their age (0 = no chance/strongly disagree, 10 = certain to happen/strongly disagree). The timeline score was created by averaging responses across the three items. The maximum possible score was 10; $\alpha=.76$.

Control risk beliefs. Measured respondents' beliefs about the extent to which they felt they had personal control over prevention, cure and treatment. For each of the three subscales, scores were created by averaging responses across three items (1 = strongly disagree, 5 = strongly agree). The maximum possible score on each subscale was five. Personal control over prevention $\alpha=.65$, personal control over cure $\alpha=.39$; treatment control $\alpha=.57$.

Consequences risk beliefs. The consequences risk subscale measured beliefs about the likelihood that chlamydia would lead to pain, psychosocial and fertility consequences. The fertility subscale replaced the shortened life subscale used in the original AIRR questionnaire (Cameron 2008) as infertility is the major long-term consequence of chlamydia infection. For each of the three subscales, scores were created by averaging responses across items (three each for pain and fertility, and eight for psychosocial; 1 = strongly disagree, 5 = strongly agree). The maximum possible score on each subscale was 5. Psychosocial consequences $\alpha=.79$; pain consequences $\alpha=.72$; fertility consequences $\alpha=.80$.

Measures of risk appraisals and intentions. Perceived likelihood was measured by averaging responses across two items, 'How likely do you think it is that you will get chlamydia at any time in the future?' and 'How vulnerable do you think you are to getting chlamydia at some point in your life?' (0 = not at all/no chance, 10 = extremely/certain to happen; $\alpha=.81$).

Perceived severity was measured using a single item 'how serious do you think it would be if

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you got chlamydia' (0 = no harm at all, 10 = extremely devastating). Intentions to use condoms was measured using three items beginning 'I intend to', 'I will try to' and 'I plan to'. The stem ending was 'use condoms every time I have sex with a casual sexual partner over the next 12 months' ($\alpha=.95$). The ratings ranged from *extremely unlikely* (1) to *extremely likely* (7). An average of the scores on the three items was created.

Design and procedure

This study used a cross-sectional design. The study received university instituted ethics approval. At the school, questionnaires were distributed to pupils in years 12 and 13 (aged 16-18 years old) within a tutor group period. Seating was arranged to provide individual privacy. Participants were read an information sheet and written informed consent was obtained. Completion of the questionnaires took approximately 40 minutes. A written quiz was provided for those who were either ineligible to participate due to their age or sexual inexperience, or who did not wish to take part, and also to occupy those who finished early.

University students were invited to participate using an advert placed on their online learning platform. Those who met the eligibility criteria and were interested in participating were asked to follow a link to a web survey. Students were offered entry into a prize draw to win £100 (approximately €115) of gift tokens as an incentive to participate. The web survey was preceded by an electronic information sheet and consent form which participants had to agree to in order to access the questionnaire which followed.

Analysis

Pearson correlation coefficients were calculated to identify which variables to enter into multiple regression analysis. Only variables that correlated with the dependent variable

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at a significance level of $P < 0.10$ were included. The enter method of multiple regression was used to determine the independent predictors of likelihood, severity, and prevention intentions. For likelihood and severity, the pool of independent predictors included the five risk representation components. For intentions, the pool included the risk representation components plus likelihood and severity.

Results

Descriptive assessments of risk representation contents

Symptoms rated as most indicative of genital chlamydia risk were having an unusual discharge ($M=2.31$), having inflammation of or around the penis/vagina ($M=2.28$), having a rash of or around the penis/vagina ($M=2.18$), experiencing itching of or around the penis/vagina ($M=2.17$), and pain when passing urine ($M=2.10$). Symptoms seen as least indicative of chlamydia were experiencing headaches ($M=0.94$), having sore eyes ($M=1.06$), having stiff joints ($M=1.15$), experiencing a sudden change in weight ($M=1.15$) and having a sore mouth/throat ($M=1.26$).

The factor that was rated as the most causative of chlamydia was having sex without a condom ($M=2.60$). This was the only factor to have a rating above the scale midpoint. Factors with neutral ratings were poor hygiene - not keeping penis/vagina clean ($M=1.19$), and not washing the vagina/penis thoroughly after sex ($M=1.00$). All other factors had mean ratings of less than 1.00.

Table 2 presents a correlation matrix and the mean and standard deviation scores for the risk representation subscales.

Table 2 about here

Predictors of risk appraisals

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As hypothesised, likelihood appraisals were positively associated with beliefs about identity, cause and timeline (table 3). Likelihood appraisals were also negatively associated with beliefs about pain consequences and psychosocial consequences, and positively associated with treatment control. All of these risk representation constructs accounted for unique variance in likelihood ratings.

Table 3 about here

As hypothesised, severity appraisals were positively associated with beliefs about pain, psychosocial, and fertility consequences. Contrary to hypotheses, severity appraisals were positively associated with beliefs about personal control over prevention and control over cure, and had no association with personal control over treatment. Severity appraisals were also positively associated with identity and timeline. Timeline, psychosocial consequences and fertility consequences accounted for unique variance.

Predictors of prevention behaviour

Intention to use condoms consistently with casual sexual partners was associated with the illness risk representation components of cause, timeline, psychosocial consequences, and the three control scales. In addition, intention to use condoms was associated with likelihood and severity. Multiple regression analyses found that beliefs about cause and control over prevention were significant independent predictors. The relationship between cause and intention to use condoms was not in the expected positive direction. As this analysis was problematic for reasons described below, the multiple regression was run a second time with the cause variable excluded (table 4).

Table 4 about here

Discussion

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In line with hypotheses, likelihood appraisals were positively associated with identity, cause and timeline. As hypothesised, severity appraisals were positively associated with all three consequence subscales. Contrary to hypotheses however, severity appraisals were also positively associated with control over prevention and control over cure and not associated with control over treatment. Intention to use condoms with casual sexual partners was not predicted by either likelihood or severity in an analysis including beliefs about chlamydia risk. Instead, the only variable to be independently associated with intentions to use condoms was beliefs about control over prevention, following removal of the problematic cause variable.

Strengths and limitations

This study builds on the seminal work of Cameron (2003; 2008) by further examining the beliefs underlying risk appraisals within a new framework of illness risk representations. To our knowledge it is the first study to examine the content of young adults' appraisals of chlamydia risk and provides new evidence about the beliefs underlying these appraisals. It has examined the association of risk representation components with risk appraisals and prevention intentions which provides useful information for the development of interventions to motivate protective behaviour. The large sample size (N=921) increases the power of the statistical analyses, providing robust estimates of effect sizes. The sample included both school and university students within the age group known to be at the most increased risk of infection. This provides data representing the beliefs and intentions of a population identified as having the greatest need of targeted intervention.

The findings should be interpreted in the context of the study's limitations. As the sample consisted of students at school and university, the extent to which the findings can be generalised to the wider population in this age range is not known. As this was a cross-

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sectional study, the direction of causation between variables cannot be established.

Accordingly, future studies should include longitudinal or experimental designs including measures of prevention and detection behaviour. The three control sub-scales had modest alpha coefficients ($\alpha=.39$, $\alpha=.57$ and $\alpha=.65$) and consequently it may be that control scales of higher internal consistency would be more predictive of risk appraisals and intention. Our study is however not alone in having problems formulating reliable control scales (Broadbent et al. 2006; Weiman et al. 1996). Finally, it is acknowledged that chlamydia is just a single potential consequence of unprotected sex, and risk appraisals of this outcome alone are unlikely to be the sole determinant of motivations to use condoms. However, by coming to a better understanding of the cognitions that underlie beliefs about possible outcomes of unprotected sex, including chlamydia, the chances of developing effective interventions are increased.

The findings of this study provide a unique insight into the illness risk representation components underlying young adults' perceptions of the risk of chlamydia infection. Likelihood appraisals were positively associated with identity, cause and timeline. Thus young people in this study who had more symptoms which they associated with chlamydia (e.g. unusual discharge, pain when urinating) were more likely to believe that they were at risk of having chlamydia. Furthermore these findings indicate that the more young people believed they had been exposed to the cause of chlamydia (vaginal sex without condoms) the more likely they were to believe they could have the infection, and the more likely they were to think of chlamydia infection as something which affects young people, the more likely they were to believe that they were personally at risk. As hypothesised, severity appraisals were positively associated with all consequence scales. Thus young people in this study who believed that chlamydia would lead to consequences that were painful (e.g. painful treatment), would impact negatively on their psychosocial functioning (e.g. cause relationship

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difficulties), or impact upon their fertility (e.g. affect their ability to have children of their own in the future), were more likely to believe that chlamydia was a serious condition.

Contrary to hypotheses however, severity appraisals were also positively associated with control over prevention and control over cure and not associated with control over treatment.

This suggests that the more young people believed that they could prevent themselves from getting chlamydia, and the more they believed that infection could be cured, the more serious they believed the infection to be. In addition these findings suggest that young people's beliefs about the seriousness of chlamydia are unaffected by their beliefs about the ability to treat this infection.

Practical implications

This study provides descriptive information about young adults' beliefs about chlamydia which has implications for practice. It has identified that young people believe the symptoms most likely to be associated with this infection are unusual discharge and genital inflammation. These indicate that young adults have a good understanding of STI symptoms as a whole although not necessarily those specific to chlamydia. Having sex without a condom was most readily identified as the cause of chlamydia but there was evidence to suggest that some young people may still believe that good hygiene and careful washing after sex could help to protect them from infection. This suggests that education should continue to address such myths surrounding the transmission of STIs.

Findings relating to the predictors of likelihood and severity point to ways in which health education could be used to create a greater sense chlamydia risk amongst young people. Both likelihood and severity appraisals were independently predicted by timeline beliefs. This indicates that highlighting the age relevance of chlamydia, in particular emphasising that young people are more at risk of infection due to both physiological and

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behavioural factors, could be effective in increasing risk appraisals. Beliefs about the psychosocial and fertility consequences of chlamydia both independently predicted severity appraisals suggesting that encouraging young people to process information about the long-term consequences of infection could be effective in enhancing appraisals of risk. Pain and psychosocial consequences beliefs were also independent predictors of likelihood but had a negative association. This relationship may indicate defensive processing (see theoretical implications) as a way of coping with anxiety relating to beliefs about the severity of infection. Whilst this suggests that providing information about the risk of chlamydia could lead to a maladaptive response, accompanying this information with strategies to raise self-efficacy for preventing infection, such as for purchasing and using condoms, could help to prevent messages backfiring. Cause and identity beliefs were independent predictors of likelihood. This relationship indicates that young people take into account the number of symptoms they have when making assessments of how likely they are to have infection. Given that the quantity or even presence of symptoms bears no relationship to the likelihood of chlamydia, health education should counter this belief to avoid young people being falsely reassured by an absence of evident infection. The relationship between cause and likelihood indicates that a further strategy for increasing feelings of risk could be to encourage young people to consider the relationship between exposure and infection, with the likelihood of infection increasing as instances of unprotected sex increase.

Findings relating to the predictors of prevention intentions also lead to a number of implications for health education. Intentions to use condoms with casual sexual partners were independently associated with control over prevention. Given that control over prevention includes measures of self-efficacy and response efficacy (Floyd, Prentice-Dunn, and Rogers 2000), the relationship between control and prevention intentions indicates that those who have greater confidence in using condoms with casual sexual partners, and believe that this

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will be effective in preventing infection, are likely to have higher intentions to do so. Good awareness amongst young people that condoms are the only way of preventing chlamydia during sexual intercourse (Newby, Wallace and French, 2012) suggests that attentions are best focussed on promoting strategies designed to increase condom use skills, for example rehearsing strategies for initiating condom use. Condom use with casual sexual partners is likely to present additional challenges given the context, not least that the partner may not be well known to the individual. These specific difficulties should be addressed as part of any intervention.

Theoretical implications

Taken together, the findings of Cameron (2008), Claassen et al. (2010) and the present study provide some support for the illness risk representations framework (table 5).

Table 5 about here

It is not clear whether there are illness risk representation components which consistently serve as the basis for likelihood and severity estimates across different health risks. There appears to be good evidence to support identity and timeline risk beliefs being positively associated with measures of likelihood as was found in Cameron's (2008) study, Claassen et al.'s (2010) study, and the present study. Causal beliefs were also found to be positively associated with likelihood appraisals in both Cameron's (2008) study and the present study indicating that this component may also contribute to likelihood appraisals. It stands to reason that people do not carry around epidemiological estimates of their susceptibility to various risks in their heads. Instead, when required to make estimations of risk, they are much more likely to base this on relevant accessible beliefs which are pieced together in a rational, albeit biased, way using their mental models.

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Severity was not measured in the Claassen et al.'s (2010) study so only Cameron's (2008) study and the present study can be used to draw conclusions about the relationship between risk representations and severity. Consequences beliefs have been shown in both Cameron's (2008) study and the present study to be predictors of severity. Control beliefs on the other hand have not performed as expected in either study, either failing to be associated with severity appraisals or having an association in the direction opposite to that predicted.

Behavioural intentions were not examined in Claassen et al.'s (2010) study. Constructs found to predict prevention and detection intentions across Cameron's (2008) and the present study were entirely different. Taken together however, these two studies indicate that illness risk representation components are directly linked with prevention and detection intentions, whereas likelihood and severity appraisals are not always important predictors when other illness risk representations are taken into account. This supports the notion that it is mental models based on risk representations that drive intention to avoid risk and not more abstract appraisals of likelihood or severity. This may explain in part why evidence from meta-analyses indicates that risk appraisal has only a small relationship with intentions and behaviour (e.g. Milne, Sheeran and Orbell 2000; Witte and Allen 2000).

Some risk representation components performed contrary to hypotheses in the present study. Although pain consequences and psychosocial consequences were hypothesised to not be associated with likelihood, they were negatively associated. This finding may be accounted for by defensive processing (see Croyle, Sun and Hart 1997), that is, the more serious individuals believe the consequences of chlamydia to be, the more likely they are to downplay their vulnerability to infection as a way of minimising the threat. The relationship between pain consequences and likelihood may alternatively reflect the belief that chlamydia often presents without symptoms including pain, which may serve to increase appraisals of

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vulnerability. Good awareness of the frequent asymptomatic presentation of chlamydia has been established elsewhere (ONS 2009).

The risk components of identity and timeline were not hypothesised to be associated with severity but were positively associated in the present study. The relationship between identity and severity may reflect the belief that the greater the number of symptoms, the more serious the infection. The relationship between timeline and severity suggests that the more young people believe that they, as a demographic group, are vulnerable to chlamydia, the more severe they believe infection to be. The relationship of severity with timeline in this study adds weight to Cameron's (2008) proposal that the age relevance of illness may enhance severity appraisals, that is, the belief that infection may occur in the near future motivates the processing of information about it causing more detailed representation of its consequences to be developed.

Control beliefs did not perform as expected. Although beliefs about control over prevention and cure were associated with severity, these associations were not in the predicted negative direction. In addition, beliefs about treatment control were positively associated with likelihood. The relationship between treatment control and likelihood may be attributable to threat minimisation, that is, the less likely individuals are to believe that chlamydia can be treated, the more likely they are to downplay their susceptibility to it (see Croyle et al., 1997). Findings relating to control risk as a whole may also reflect problems with the reliability of the scale or indicate that control beliefs do not represent a useful component in predicting risk estimates. It should however be noted that control over prevention was an independent predictor of intentions to use condoms, that is, it may have a direct relationship with prevention intentions rather than operating via risk estimates as has been found elsewhere (Sheeran and Taylor 1999).

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Issues with operationalisation of the AIRR were encountered in this study. The AIRR was used as specified by Cameron (2008) to test its validity in the context of acute illness. The problems encountered suggests that the AIRR measure may need to be modified to improve its validity and to accommodate different illness types. The cause and identity subscales were problematic. With regards to the cause construct, researchers should consider measuring and scoring this subscale using all factors identified by participants as a cause of illness, not just those which correspond with current medical thinking. This suggestion is made given that any factors believed to be a cause, whether they accord with correct medical thinking or not, are likely to contribute to beliefs about vulnerability to illness and thereby their behaviour (Leventhal et al. 1997). In the present study the nature of the illness meant that cause was reduced to a single item, namely unprotected sex. This will present an issue for other studies examining acute illness and may reduce the validity of the causal risk subscale. Taking the above approach to measuring cause will therefore provide an additional advantage in reducing the likelihood of this occurring. A final further consideration is whether future intentions to engage in potential causes of the illness, rather than personal history of those causes, should be used in the measurement of cause. This appears to be more in line with the framework's theoretical rationale and of particular importance when examining acute illness where, unlike chronic illness, the threat of illness does not build over time with successive exposure to cause.

In terms of the identity subscale, the acute nature of infection presents further problems. Cameron (2008) specifies that identity should be measured as a combination of beliefs about both the predisposing characteristics and symptoms of illness. For infectious illnesses such as chlamydia however, there are no predisposing characteristics such as being overweight or having pale skin. Reducing measurement to the single dimension of symptoms may reduce its validity. A further problem with the identity measure lies in symptoms

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indicating presence of illness rather than future risk. In the case of chronic illness, which may include ‘early warning’ signs, the inclusion of symptoms within illness risk representations is consistent with theoretical understanding. This is less the case for acute infectious illness where symptoms are diagnostic of illness and therefore do not correspond to judgements about likelihood of future illness. The problems with this particular subscale suggest that it may be necessary to measure it using a different approach. It may for example be helpful to include items that assess individuals’ beliefs about whether there is a certain ‘type’ of person who is more susceptible to infection than others.

In conclusion, this study has provided insight into which risk components serve as the basis for young adults’ appraisals of chlamydia risk. The findings point to ways in which risk appraisals could be enhanced in order to increase prevention intentions. Cameron’s risk representations framework (Cameron 2003; 2008) appears to be a useful approach for examining the content of risk appraisals and isolating beliefs to be targeted through health promotion. Improved understanding of how appraisals of chlamydia risk may inform motivation to use condoms adds to the wealth of evidence about the determinants of young adults’ sexual behaviour. The illness risk representations framework appears to be a good starting point to advance understanding and assessment of risk appraisals. Evidence suggests that risk representation components are not completely accounted for by risk appraisals and that including these components within measures of risk may improve insight into the beliefs underlying intentions to avoid health threats. The relationship between risk representation components, risk appraisals and intentions to perform protective behaviour are however not straightforward and may differ for different risks. Further studies of this nature will be important for theory development and refinement of the AIRR measure.

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Table 1 Demographic characteristics of participants

		School		University		Total	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Gender	Female	42	43.8	545	66.1	587	63.7
	Male	54	56.3	280	33.9	334	36.3
Ethnicity	White	50	52.1	546	66.2	596	64.7
	Mixed ethnicity	8	8.3	128	15.5	136	14.8
	Asian	33	34.4	86	10.4	119	12.9
	Black	3	3.1	39	4.7	42	4.6
	Other	2	2.1	26	3.2	28	3
Age	16-19 years	95	100.0	321	38.9	416	45.2
	20-24 years	0	0	504	61.1	504	54.8

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Table 2 Correlation matrix for illness risk representation subscales

	1	2	3	4	5	6	7	8	9	10	11
1. Identity	-										
2. Cause	.13**	-									
3. Timeline	.15**	.09*	-								
4. Pain consequences	.09**	-.03	.05	-							
5. Psychosocial consequences	.07*	.05	.32**	.48**	-						
6. Fertility consequences	.09*	.06	.26**	.40**	.57**	-					
7. Personal control -prevention	-.02	-.03	.29**	.05	.36**	.21**	-				
8. Personal control - cure	-.05	-.00	.26**	.02	.29**	.11**	.50**	-			
9. Treatment control	-.06	.02	.18**	-.11**	.12**	-.02	.42**	.54**	-		
10. Likelihood	.15**	.20**	.12**	-.14**	-.11**	-.05	-.05	.03	.08*	-	
11. Severity	.09**	-.01	.21**	.19**	.34**	.30**	.18**	.08*	.00	-.10**	-
Mean	3.57	3.13	6.67	3.36	3.78	3.49	4.16	3.80	3.84	2.88	7.45
SD	5.45	3.73	1.86	0.82	0.64	0.79	0.73	0.70	0.73	2.36	2.53
Possible range	0-60	0-12	0-10	1-5	1-5	1-5	1-5	1-5	1-5	0-10	0-10

Note: *p<0.05; **p< 0.01, ***p<0.001

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Table 3 Correlation and multiple regression analyses of the relationships of risk representation components with risk appraisals

	<i>r</i>	<i>b</i>	β	sr ² (unique)	Mean (SD)	Model
Likelihood					2.88 (2.36)	R ² = .14*** AdjR ² = .13 (N=580)
Identity	.15**	.07	.16***	.02		
Cause	.20**	.11	.17***	.03		
Timeline	.12**	.17	.14**	.01		
Pain conseq.	-.14**	-.41	-.14**	.01		
Psychosocial conseq.	-.11*	-.49	-.13**	.01		
Treatment control	.08*	.29	.09*	.01		
Severity					7.45 (2.53)	R ² = .15*** AdjR ² = .15 (N=857)
Identity	.09**	.02	.05			
Timeline	.21**	.15	.11**	.01		
Pain conseq.	.19**	.04	.01			
Psychosocial conseq.	.34**	.85	.22***	.02		
Fertility conseq.	.30**	.44	.14***	.01		
Control - prevention	.18**	.25	.07			
Control - cure	.08*	-.22	-.06			

Note: *p<0.05; **p<0.01, ***p<0.001

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Table 4 Correlation and multiple regression analyses of the relationships of risk representation components with protection and detection intentions.

	<i>r</i>	<i>b</i>	β	sr^2 (unique)	Mean (SD)	Model
Intentions to use condoms					18.53 (4.45)	$R^2 = .04^{***}$ $AdjR^2 = .03$ (N=869)
Cause	-.49**	\$	\$			
Timeline	.07*	.04	.02			
Psychosocial conseq.	.09**	-.01	-.00			
Control - prevention	.17**	.87	.15***	.01		
Control - cure	.09*	.05	.01			
Treatment control	.07*	.04	.01			
Likelihood	-.11**	-.17	-.09			
Severity	.10**	.07	.04			

Note: * $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$;

\$ Variable removed from analysis

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Table 5 Summary of support for hypotheses in Cameron's 2008 work and the present study

Component	Likelihood				Severity		
	Hypothesised association	Cameron 2008	Classen et al. 2010	The present study	Hypothesised association	Cameron 2008	The present study
Identity	<i>Positive</i>	Positive	Positive	Positive	<i>Not hypothesised</i>	No association	Positive
Cause	<i>Positive</i>	Positive	No association	Positive	<i>Not hypothesised</i>	No association	No association
Timeline	<i>Positive</i>	Positive	Positive	Positive	<i>Not hypothesised</i>	Positive	Positive
Pain consequences	<i>Not hypothesised</i>	No association	↑	Negative	<i>Positive</i>	Positive	Positive
Psychosocial consequences	<i>Not hypothesised</i>	No association	No association ^a	Negative	<i>Positive</i>	Positive	Positive
SL¹/Fertility consequences	<i>Not hypothesised</i>	No association	↓	No association	<i>Positive</i>	Positive	Positive
Control over prevention	<i>Not hypothesised</i>	No association	No association	No association	<i>Negative</i>	No association	Positive
Control over treatment	<i>Not hypothesised</i>	No association	^b	Positive	<i>Negative</i>	No association	No association
Control over cure	<i>Not hypothesised</i>	Negative	^b	No association	<i>Negative</i>	No association	Positive

^aConsequences was operationalised as a single variable.

^bControl over treatment and control over cure were not measured.