

## Integration of five health behaviour models: Common strengths and unique contributions to understanding condom use

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The purpose of this research was to select from the health belief model (HBM), theories of reasoned action (TRA) and planned behaviour (TPB), information–motivation–behavioural skills model (IMB) and social cognitive theory (SCT) the strongest longitudinal predictors of women’s condom use and to combine these constructs into a single integrated model of condom use. The integrated model was evaluated for prediction of condom use among young women who had steady versus casual partners. At Time 1, all constructs of the five models and condom use were assessed in an initial and a replication sample ( $n = 193$ ,  $n = 161$ ). Condom use reassessed 8 weeks later (Time 2) served as the main outcome. Information from IMB, perceived susceptibility, benefits, and barriers from HBM, self-efficacy and self-evaluative expectancies from SCT, and partner norm and attitudes from TPB served as indirect or direct predictors of condom use. All paths replicated across samples. Direct predictors of behaviour varied with relationship status: self-efficacy significantly predicted condom use for women with casual partners, while attitude and partner norm predicted for those with steady partners. Integrated psychosocial models, rich in constructs and relationships drawn from multiple theories of behaviour, may provide a more complete characterisation of health protective behaviour.

**Keywords:** health behaviour model integration; young women’s condom use; theories of reasoned action and planned behaviour; health belief model; information–motivation–behavioural skills model; social cognitive theory

### Introduction

Multiple theoretical models have been developed to characterise the factors that underlie health behaviours, leading to calls for research to identify which models, or constructs within models, best characterise specific behaviours (Noar & Zimmerman, 2005). Beyond comparison, the question of how constructs from different models might combine to motivate behaviour remains largely unanswered. Integration of the most powerful predictors of behaviour may yield a more complete characterisation of health behaviour (Baranowski, 2005). As Nigg and Jordan (2005, p. 292) stated,

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'Potentially the most compelling rationale for simultaneously studying multiple theories may not be to hold experimental horse races, but rather to empirically integrate salient components of theories in an effort to create a more complete or holistic theory of behaviour change'. Thus, our main goal was to develop an integrated model of condom use that drew on the constructs and relationships proposed by the health belief model (HBM; Rosenstock, 1974), the theories of reasoned action (TRA; Fishbein & Ajzen, 1975) and planned behaviour (TPB; Ajzen, 1991), the information-motivation-behavioural skills model (IMB; Fisher & Fisher, 1992) and social cognitive theory (SCT; Bandura, 1998). Our second goal was to examine one important aspect of the generality of the integrated model, whether the status of the relationship with the sexual partner (i.e. casual versus steady) would moderate model relationships.

We focused on young women's condom use due to young women's elevated risk for contracting sexually transmitted infections (STIs). Women aged 16-24 have the highest rates of chlamydia of any age/sex group in the United Kingdom and Australia (Australian Government Department of Health and Aging, 2005; Health Protection Agency, 2008). In the US, women aged 15-19 have the highest rates of both gonorrhoea and chlamydia, followed by women aged 20-24 (Centers for Disease Control and Prevention, 2008).

Models of health behaviour include a plethora of constructs with distinct names that reflect common psychological meaning. These constructs can be organised into the *concept groups* that form the rows of Table 1, expanded from Noar and Zimmerman (2005) to include the IMB and Bandura's (1998) characterisation of SCT for health promotion. The columns of Table 1 are devoted to the individual models, described in detail below. Our approach to theory integration involved drawing the strongest construct from each concept group and integrating the selected constructs into a single model, simultaneously incorporating relationships among constructs from across the five models. Selection of specific constructs from within the construct groups was based on an empirical examination of the correlations between the constructs proposed by each of the five models and condom use assessed 8 weeks later. Correlations were drawn from a single extensive data set in which we measured all constructs from all models in a single population. This strategy of comparing constructs within a concept group followed by concept integration is distinguished from direct model comparisons in which full models are juxtaposed against one another.

Our approach throughout construct selection and model integration was longitudinal; we measured past behaviour and constructs and then re-assessed behaviour at a later point. A strong rationale for the development of psychosocial models that draw from the rich array of existing models is to inform the design of interventions. As has long been articulated in the intervention literature (Chen, 1990; West & Aiken, 1997), comprehensive psychosocial models of health behaviour serve as the *conceptual models* that inform intervention design.

## **Models examined**

### ***Health belief model***

According to the classic HBM, behaviour is determined by perceptions of susceptibility to and the severity of a health threat. Perceived benefits of and

Table 1. Characterisations of related constructs across health behaviour models.

Concept category	TRA/TPB	IMB <sup>a</sup>	HBM	SCT <sup>a</sup>
<i>Attitudinal beliefs</i> Appraisal of positive and negative aspects of the behaviour and expected outcome of the behaviour	Direct attitude; indirect attitude	Direct attitude, subsumed by motivation	Benefits; barriers	Barriers; self-evaluative outcome expectancies
<i>Knowledge/information</i> Knowledge about means of protection and routes of transmission	N/A	Information	N/A	N/A
<i>Self-efficacy</i> Belief in one's ability to perform the behaviour; confidence	Direct perceived behavioural control; indirect perceived behavioural control (not in TRA)	Behavioural skills	N/A	Self-efficacy
<i>Injunctive norm</i> Belief that others want you to engage in the behaviour, and one's motivation to comply	Direct subjective norm; indirect subjective norm; partner norm and motivation to comply	Direct subjective norm, subsumed by motivation	Cues from media, friends (cues to action)	Partner barriers
<i>Risk related beliefs</i> Belief that one is at risk if one does not engage in the behaviour, and consequences may be severe	N/A	N/A	Susceptibility and severity	N/A
<i>Sociostructural factors</i> Impediments or opportunities inherent in health, economic, or environmental systems	N/A	Contained within information	N/A	Impediments

(continued)

Table 1. Continued.

Concept category	TRA/TPB	IMB <sup>a</sup>	HBM	SCT <sup>a</sup>
<i>Intention/commitment/planning</i> Intending or planning to perform the behaviour; setting behavioural goals or making a commitment to perform the behaviour	Intention (examined only as a dependent variable at present rather than as a mediator)	Intention, subsumed by motivation (examined only as a dependent variable at present)	N/A	Goals/intention (examined only as a dependent variable at present rather than as a mediator)

Notes: This table was modified from Noar and Zimmerman (2005).

<sup>a</sup>Noar and Zimmerman did not include the IMB. The version of SCT examined at present, drawn from Bandura (1998), differs from that reported by Noar and Zimmerman.

barriers to taking action are also direct determinants of behaviour, as are cues to action, that is, personal and external cues that may spur adoption of a behaviour. Susceptibility and severity generally fail to predict condom use, as do cues to action (Sheeran, Abraham, & Orbell, 1999). However, benefits and barriers provide more consistent prediction (Sheeran et al., 1999; Sheeran & Taylor, 1999).

### ***Theories of reasoned action and planned behaviour***

In the TRA and TPB, intention is the central determinant of behaviour. Intention, in turn, is predicted by attitude, one's evaluation of the behaviour, and subjective norm, and social pressure from important others to carry out the behaviour. The TPB adds perceived behavioural control, capturing personal control over the behaviour, as a predictor of both intention and behaviour. In both models, the proximal predictors of intention, *direct measures*, are themselves predicted by *indirect measures*, which take on an expectancy-value format. Outcome expectancies, the outcomes associated with performance of a behaviour, multiplied by outcome evaluations, one's evaluations of the salient outcome expectancies, form the underlying structure of attitude. Normative beliefs, whether important others think one should carry out the behaviour, multiplied by motivation to comply with these beliefs, underlie subjective norm. The wishes of a sexual partner weigh heavily in condom use decision making (Sheeran et al., 1999). Thus, partner norm weighted by motivation to comply is distinguished from the normative beliefs of other individuals (von Haeften & Kenski, 2001). Control beliefs, the likelihood of facing a situation that aids or inhibits behavioural performance, weighted by the perceived power of such conditions to aid or prevent behavioural performance, underlie perceived behavioural control.

The TRA and TPB constructs have successfully predicted condom use (Albarracin, Johnson, Fishbein, & Muellerleile, 2001). Attitudes and norms reliably predict intentions. Perceived behavioural control is generally related to intentions but not to condom use (Albarracin et al., 2001). However, the importance of these constructs relative to one another likely varies as a function of cultural orientation (Trafimow & Finlay, 1996).

### ***Information–motivation–behavioural skills model***

In the IMB, information and motivation drive behaviour adoption; their influence on behaviour is partially mediated by behavioural skills. Information captures knowledge of STD transmission and proper condom use. Motivation subsumes the core constructs of the TRA – attitude and subjective norm. Behavioural skills assess one's ability to effectively carry out the behaviour. Motivation consistently relates to both behavioural skills and behaviour, and behavioural skills often predict behaviour (Fisher & Fisher, 2000). Information is related to behavioural skills but not to behaviour.

### ***Social cognitive theory***

In SCT (Bandura, 1998), self-efficacy is a central determinant of behaviour that also influences expectations of the physical, social and self-evaluative outcomes associated with the behaviour. For condom use, barriers to sexual pleasure constitute

physical outcome expectancies; negative partner reaction, social expectancies; and positive self-evaluations for condom use, self-evaluative expectancies (National Institute of Mental Health (NIMH) Multisite HIV Prevention Trial Group, 2001). To aid interpretation, we refer to pleasure and partner barriers in discussing SCT, rather than physical and social outcome expectancies. Behavioural impediments (i.e. structural barriers such as access to high-quality condoms) are also predicted by self-efficacy and in turn predict behaviour. Little research has examined the full model of SCT in the prediction of condom use. Dilorio, Dudley, Soet, Watkins, and Maibach (2000) found that self-efficacy predicted physical expectancies, which in turn predicted condom use. Self-efficacy and physical, social and self-evaluative outcome expectancies partially mediated the effect of an intervention on condom use (NIMH, 2001).

### **The present research**

Drawing together the five models, we sought to develop an integrated model of condom use that might more wholly capture the psychosocial factors associated with condom use. Based on meta-analyses, we hypothesised that attitudinal factors and partner norm would weigh most heavily in women's condom use (Sheeran et al., 1999). We also examined whether having a casual versus steady sexual partner would moderate model relationships. It was possible that partner input would be more related to condom use with a steady partner (Corby, Jamner, & Wolitski, 1996; Glasman & Albarracin, 2003) while constructs related to self-determination of condom use would be more strongly related to condom use with casual partners.

### **Method**

#### ***Participants***

Data were collected from two samples of young women recruited through introductory psychology classes at a large US university, who received partial course credit for participation. Samples did not differ on any key characteristics but are reported separately to provide evidence of model replication. Inclusion in data analysis required that a woman identified as hetero- or bisexual, participated in both waves of data collection, engaged in intercourse at least once in the 8 weeks prior to each data collection, and answered at least all but one item for each construct. In Samples 1 and 2, respectively, 193 and 161 women met these criteria. Mean ages were 18.6 (SD=1.00) for Sample 1 and 19.1 (SD=1.40) for Sample 2; both were primarily Caucasian (63%, 68%) or Hispanic (15%, 14%). Both samples had an average of five sexual partners to date. In all, 55% and 58% did not use a condom during their most recent sexual encounter. Pooled across Samples 1 and 2, 132 women characterised their most recent sexual partner as casual or non-monogamous; 222 women were currently in a steady monogamous relationship.

#### ***Procedure***

An institutional review board approved all procedures and measures. All participants provided informed consent prior to participation. At Time 1, participants responded to items assessing demographics, psychosocial constructs of all models

and condom use. At Time 2, condom use in the previous 8 weeks and intention to use condoms were assessed online. Average time to follow-up was 11.4 weeks and 8 weeks in Samples 1 and 2, respectively.

### *Measures*

Scales employed, their sources and sample items are provided in Table 2. All scales, except cues to action in the HBM, were drawn from published research on condom use among adolescents or young adults. Measures were specifically selected to represent the particular constructs associated with a model. When the same construct was included for multiple models (e.g. direct attitude in TRA, TPB and IMB), the same measure was employed for each model.

#### *Condom use and intention*

Condom use in the previous 8 weeks was assessed by two frequently employed items (Misovich, W.A. Fisher, & J.D. Fisher, 1998; Montaño, Kasprzyk, von Haefen, & Fishbein, 2001). The mean of the standardised items served as the scale score. Intention was assessed by four items, modified from Rosengard et al. (2005) to refer to an unspecified sexual partner. The mean of the four items served as the intention scale score.

#### *Psychosocial measures*

With few exceptions, measures were employed as published (see Table 2 for sources). To reduce respondent burden we shortened the indirect attitude, indirect subjective norm, barriers and information scales. Items with the strongest loadings in factor analyses or the highest correlations with the outcome were retained. Slight wording changes focused the content of severity and benefits items on STIs. Susceptibility items were altered to reflect conditional susceptibility (Ronis, 1992) to STIs in the absence of condom use. Indirect perceived behavioural control was altered to reflect the likelihood that an inhibiting or facilitating condition might occur rather than the actual frequency of occurrence. Six items addressing HIV testing and oral sex were excluded from the IMB behavioural skills subscales. All other measures were utilised as published. The HBM cues to action scale was comprised of 11 items reflecting 4 previously examined classes of cues (Sheeran et al., 1999): personal cues (3 items), interpersonal cues (4 items), media cues (2 items) and school cues (2 items).

Scale scores for the TRA and TPB indirect measures were formed as the mean of the cross-products of the value-expectancy pairs (Fishbein & Ajzen, 1975). The information scale score was a count of correct responses and cues to action, a count of cues experienced. Susceptibility and benefits scores were means of the standardised item scores due to variation in the number of response alternatives. All other scale scores were the mean of the item scores.

Coefficient alpha for multi-item scales and inter-item correlations for 2-item scales are given in Table 3. The low reliability ( $\alpha = 0.56$ ) of indirect perceived behavioural control and the impediments scale ( $r = 0.24$ ) reflected the multifaceted nature of the items, capturing drug use, support from sexual partners and condom availability. These would not be expected to correlate highly but rather to cumulate to reflect level of control and impediments.

Table 2. Scale information, source and sample items.

Scale	Models	Number of items	Source	Sample item
Condom use	All	2 items	Misovich et al. (1998)	'When you had sexual intercourse during the past eight weeks, how often were condoms used?' (1 = never; 7 = every time) 'When you had sexual intercourse during the past eight weeks, what percentage of the time were condoms used?' (1 = 0%; 11 = 100%)
Intention to use condoms	TRA, TPB and IMB	4 items	Rosengard et al. (2005)	'How often will you use a condom when you have sex during the next eight weeks?'
Direct attitude	TRA, TPB and IMB (in motivation)	9 items	Montaño et al. (2001)	'My using condoms every time I have sex during the next eight weeks is:' (-3 = bad; 3 = good)
Indirect attitude: Outcome expectancies/outcome evaluations	TRA and TPB	14 item pairs	von Haefften and Kenski (2001)	<i>Outcome expectancies</i> : 'Using a condom every time I have sex in the next eight weeks will protect me from getting STDs.' <i>Outcome evaluation</i> : 'Protecting myself from getting STDs is:' (-3 = extremely bad; 3 = extremely good)
Direct subjective norm	TRA, TPB and IMB (in motivation)	1 item	Montaño et al. (2001)	'Most people who are important to me think I should use condoms every time I have sex'.
Indirect subjective norm: Normative beliefs/motivation to comply	TRA and TPB	6 item pairs	von Haefften and Kenski (2001)	<i>Normative belief</i> : 'My family thinks that I should use condoms every time I have sex.' <i>Motivation to comply</i> : 'In general, I want to do what my family thinks I should do'.
Indirect partner norm: Partner norm/motivation to comply	TRA and TPB	1 item pair	von Haefften and Kenski (2001)	<i>Normative belief</i> : 'Anytime I have sex in the next eight weeks, my partner would think that we should use condoms.' <i>Motivation to comply</i> : 'In general, I want to do what my partner thinks I should do'.



Direct perceived behavioural control	TPB	2 items	Montaño et al. (2001)	'My using condoms every time I have sex in the next eight weeks is:' (-3 = not up to me; 3 = up to me)
Indirect perceived behavioural control: Control beliefs/power to prevent	TPB	8 pairs	von Haeflten and Kanski (2001)	<i>Control belief</i> : 'When you have sex, how likely are you to have condoms available?' <i>Power to prevent</i> : 'Would having condoms available make it easy or difficult for you to use a condom?'
Information	IMB	17 items	Misovich et al. (1998)	'Condoms may be safely stored in one's wallet for up to two months.'
Behavioural skills	IMB	27 items	Misovich et al. (1998)	'How effectively could you refuse to have unsafe sexual intercourse?'
Susceptibility	HBM	4 items	Bryan et al. (1997)	'What is the chance you will be exposed to an STD if you never use a condom?'
Severity	HBM	5 items	Bryan et al. (1997)	'How disruptive would an STD be to your health?'
Benefits	HBM	4 items	Bryan et al. (1997)	'How beneficial do you believe condom use would be for you if you were sexually active?'
Partner barriers	HBM and SCT	5 items	St. Lawrence et al. (1999)	'If I asked my partner to use a condom he might get angry'.
Pleasure barriers	HBM and SCT	4 items	St. Lawrence et al. (1999)	'Condoms interrupt the mood'.
Cues to action	HBM	11 items	Original scale	'I have been diagnosed with a STD'.
Self-efficacy:	SCT	3 items	Brafford and Beck (1991);	'I feel confident I would remember to use a condom even if I were high'.
Intoxicants		3 items	Brien, Thombs, Mahoney, and Wallnau (1994)	'I feel confident in my ability to suggest using condoms with a new partner'.
Assertiveness		4 items		'I feel confident in my ability to put a condom on my partner'.
Mechanics		5 items		'If I were unsure of my partner's feelings about using condoms, I would not suggest using one'.
Partner disapproval				

(continued)

Table 2. Continued.

Scale	Models	Number of items	Source	Sample item
Self-evaluative outcome expectancies	SCT	2 items	von Haefften and Kenski (2001)	'Using a condom every time I have sex in the next eight weeks will make me feel more relaxed'.
Impediments	SCT	2 items	Misovich et al. (1998)	There are several locations around campus where condoms can be purchased at any hour of the night.

Table 3. Scale internal consistency reliabilities and correlations with intention and condom use.

Scales	Models	Reliability	Correlation with Time 2 intention	Correlation with condom use at	
				Time 1	Time 2
Time 2 condom use	All models	$r = 0.99$	0.80***	0.67***	—
Time 1 condom use	All models	$r = 0.99$	0.66***	—	0.67***
Time 1 intention	All models	$\alpha = 0.94$	0.71***	0.82***	0.69***
<i>Attitudinal beliefs</i>					
Direct attitude	TRA, TPB and IMB	$\alpha = 0.89$	0.61***	0.67***	0.59***
Indirect attitude	TRA and TPB	$\alpha = 0.84$	0.48***	0.52***	0.45***
Benefits	HBM	$\alpha = 0.68$	0.20***	0.23***	0.21***
Partner barriers	HBM and SCT	$\alpha = 0.90$	-0.16**	-0.18***	-0.11*
Pleasure barriers	HBM and SCT	$\alpha = 0.89$	-0.42***	-0.45***	-0.39***
Self-evaluative outcome expectancies	SCT	$r = 0.60$	0.42***	0.44***	0.40***
<i>Knowledge/information</i>					
Information (contains sociostructural items)	IMB	N/A	0.02	0.02	0.03
<i>Self-efficacy</i>					
Direct perceived behavioural control	TPB	$r = 0.77$	0.30***	0.24***	0.25***
Indirect perceived behavioural control	TPB	$\alpha = 0.53$	0.40***	0.48***	0.37***
Self-efficacy: intoxicants	SCT	$\alpha = 0.83$	0.24***	0.33***	0.22***
Self-efficacy: assertiveness	SCT	$\alpha = 0.68$	0.10	0.13*	0.14**
Self-efficacy: mechanics	SCT	$\alpha = 0.84$	-0.00	0.02	-0.05
Self-efficacy: partner disapproval	SCT	$\alpha = 0.82$	0.13*	0.06	0.11*
Behavioural skills	IMB	$\alpha = 0.91$	0.27***	0.32***	0.28***
<i>Injunctive norm</i>					
Direct subjective norm	TRA, TPB and IMB	N/A	0.40***	0.41***	0.39***
Indirect subjective norm	TRA and TPB	$\alpha = 0.88$	0.46***	0.49***	0.39***
Indirect partner norm	TRA and TPB	N/A	0.64***	0.75***	0.61***
Cues to action	HBM	N/A	-0.07	-0.08	-0.04

(continued)

Table 3. Continued.

Scales	Models	Reliability	Correlation with Time 2 intention	Correlation with condom use at	
				Time 1	Time 2
<i>Risk-related beliefs</i> Susceptibility Severity	HBM	$\alpha = 0.83$	0.20***	0.17**	0.18***
	HBM	$\alpha = 0.62$	-0.03	-0.03	-0.03
<i>Sociostructural factors</i> Impediments	SCT	$r = 0.24$	0.00	0.04	-0.01

Notes:  $N = 354$ ; pooled sample. Reliability estimates: coefficient  $\alpha$  for multiple item scales;  $r$ , correlation for two-item scales; no reliability (N/A) for single-item scales.

\*, \*\*, \*\*\* $p < 0.05$ , 0.01 and 0.001.

### ***Attrition***

At the first wave of data collection, 336 women in Sample 1 and 195 women in Sample 2 met the criteria for inclusion in the study (i.e. engaged in sexual intercourse in the previous 8 weeks, identified as hetero- or bisexual, and answered at least all but one item per construct). Of these, 68% and 90% of Sample 1 and 2 participants, respectively, provided follow-up data. We compared participants retained versus lost on age, level on all psychosocial constructs, and condom use at Time 1. A single difference was observed: Sample 1 participants lost at follow-up scored lower on information concerning condom use than those retained,  $F(1, 334) = 6.98$ ,  $p < 0.01$ ,  $\eta^2 = 0.02$ . Sample 1 attrition was unrelated to either Time 1 intention,  $\eta^2 = 0.00$ , or condom use,  $\eta^2 = 0.00$ . The same was true in Sample 2; intention  $\eta^2 = 0.00$ ; condom use:  $\eta^2 = 0.00$ . Retention was greater in Sample 2 because, while Sample 2 participants received course credit in exchange for participation in both waves of data collection, Sample 1 participants received credit only for Time 1 participation. Among retained participants, 83% of those with casual partners and 92% of those with steady partners engaged in intercourse in the 8 weeks prior to Time 2.

### **Results**

We first provide correlations of the model constructs in each concept category with Time 2 condom use. We then explain the specification of the integrated model and its estimation.

#### ***Correlations of constructs with condom use***

Correlations of all constructs with condom use at Times 1 and 2 and Time 2 intention are given in Table 3. With the exception of sociostructural factors and information, constructs within all construct groups significantly related to condom use. Of all constructs, direct attitude and indirect partner norm from TPB most strongly correlated with Time 2 condom use ( $r = 0.59$ ,  $r = 0.61$ , respectively,  $p < 0.001$ ).

#### ***Development of the integrated of the model***

Towards the goal of developing 'a more complete or holistic' (Nigg & Jordan, p. 292) model of condom use, we favoured completeness over parsimony and sought to incorporate in the integrated model (Figure 1) at least one construct from each of the theoretical categories in Table 1. As each concept category contains constructs that have demonstrated relationships to condom use in previous research (Sheeran et al., 1999), we felt it was important to incorporate each category in the model. We also sought to minimise conceptual overlap among constructs by selecting for inclusion only one construct from each category unless there was a theoretical rationale for including multiple constructs (i.e. direct and indirect attitude). With one exception, discussed below, the construct within a concept category that evidenced the strongest correlation with intention and behaviour (Table 3) was selected for inclusion. When all constructs within a category evidenced low or non-significant relationships with intention and behaviour, the potential upstream role of the constructs in the decision making process was considered.

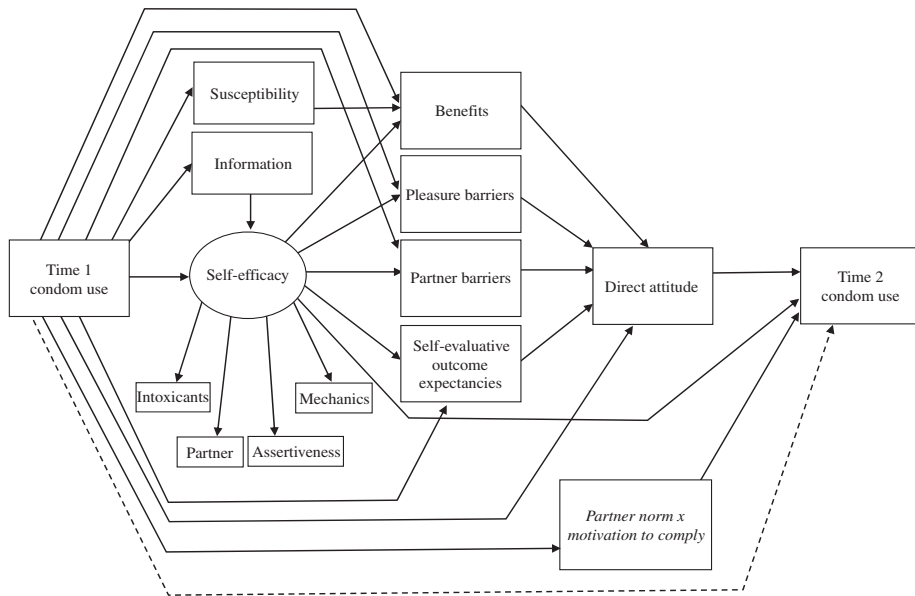


Figure 1. Hypothesized integrated model. Solid lines represent those included in the pure precursor model. The dashed line represents the residual relationship of Time 1 to Time 2 behaviour.

### *Attitudinal beliefs*

Multiple attitudinal belief measures evidenced significant correlations with intention and behaviour. Of these, direct attitude bore the strongest correlation with behaviour and was included as a direct predictor of condom use. Indirect attitude in the TRA/TPB subsumes positive and negative expectancies. We selected the distinct pleasure barriers, partner barriers and self-evaluative outcome expectancies from SCT to serve as precursors to direct attitude. We also included benefits from the HBM, as these capture protection against STIs, a component of indirect attitude not reflected elsewhere.

### *Injunctive norm*

Partner norm evidenced the strongest correlations with intention and behaviour and was selected from the normative measures as a direct predictor of behaviour.

### *Self-efficacy*

Self-efficacy from SCT, perceived behavioural control from the TRA/TPB and behavioural skills from the IMB share common themes of overcoming barriers to condom use. Although it did not evidence the strongest correlation with behaviour, we selected the multifaceted measure of self-efficacy for inclusion as it provided the broadest characterisation of potential barriers to condom use. Following Bandura's (1998) specification of SCT, self-efficacy was included as both a precursor to outcome expectancies and a direct predictor of behaviour.

*Knowledge/sociostructural factors*

Consistent with the IMB, information was incorporated as a predictor of self-efficacy. The measure of information included items from the sociostructural construct (e.g. knowing where to access condoms); thus information captured both the information and the sociostructural categories.

*Risk-related beliefs*

Of the two risk-related beliefs, susceptibility was more strongly correlated with the outcomes, though not as strongly as direct attitude and partner norm. Accordingly, susceptibility was included as a precursor of benefits, a relationship that has been supported in previous intervention research (Aiken, West, Reno, Woodward, & Reynolds, 1994).

Because we aimed to examine prediction of behaviour by model constructs, rather than mediation of model constructs by intention (Weinstein, 2007), Time 2 behaviour served as the outcome. There are multiple perspectives on the inclusion of past behaviour in predictive models (Ajzen, 2002; Hennessey et al., 2010; Weinstein, 2007). Since we were studying ongoing behaviour in the absence of intervention, we employed a *stability* model that explains the link between past and future behaviour through psychological mechanisms. In a stability model, past behaviour predicts current status on psychological constructs, and these constructs, in turn, predict future behaviour (Hennessey et al. (2010), refer to this as a precursor model, with past behaviour serving as a precursor). In other words, psychological constructs mediate between past and future behaviour, as shown in Figure 1. While a pure precursor model assumes that psychological constructs completely account for the link between past and future behaviour, the addition of a direct, residual path from past to future behaviour is indicated when the mediation through psychological constructs is not complete. We estimated a model with past behaviour only as precursor (no direct path between past and future) and then added the direct residual path. The precursor model without versus with the residual direct path serves to bracket the magnitude of other direct paths from model constructs to behaviour. As Weinstein (2007) has argued, excluding past behaviour altogether potentially overestimates the relationships between model constructs and behaviour, while including past behaviour underestimates these relationships. Comparison of the direct paths from model constructs to behaviour with versus without past behaviour included provides a sensitivity analysis of model parameters for prediction of behaviour as the behaviour path is added (Lee and Wang (1996), for a discussion of sensitivity analysis in structural equation modelling).

*Model estimation*

Models were estimated using Mplus 3; SPSS 18 was used for all other analyses. Scale scores served as the input data. First, we estimated a pure precursor model in which Time 1 behaviour predicted all model constructs; this model is represented by the solid lines in Figure 1. Then, we estimated a model that added the direct path from past to future behaviour to the precursor paths, shown as a dashed line in Figure 1. This strategy was used (1) to assess potential attenuation of model paths due to inclusion of a path from Time 1 to Time 2 behaviour, and (2) to estimate the

proportion of the stability of behaviour over time not explained by the integrated model. Stacked models were then employed to examine replication across Samples 1 and 2. First, models were estimated with corresponding paths constrained to be equal across samples. Then, one path at a time was freed to provide a 1 degree of freedom test of whether the path coefficient differed across samples. The same strategy was employed with the integrated model for an analysis of model differences as a function of relationship status.

### ***Sensitivity analysis***

Model fit was assessed by the  $\chi^2$ , CFI and SRMR. CFI values above 0.95 and SRMR values below 0.08 indicate good fit (Hu & Bentler, 1998). Fit of the pure precursor model was weak ( $\chi^2(150) = 353.53$ ,  $p < 0.01$ ; CFI = 0.87; SRMR = 0.09) but accounted for 39% and 48% of the variance in Time 2 condom in Samples 1 and 2, respectively. Addition of the residual path from Time 1 to Time 2 condom use significantly improved model fit ( $\chi^2(149) = 310.10$ ,  $p < 0.01$ ; CFI = 0.90; SRMR = 0.08) and increased variance accounted for to 46% and 57% in Samples 1 and 2, respectively. Variance explained in Sample 2 was likely greater due to the shorter average time to follow up among these women (8 weeks) as compared to Sample 1 (11.4 weeks). With the residual behaviour path included, both direct attitude and indirect partner norm remained significant predictors ( $ps > 0.001$ ) of Time 2 condom use. There was small attenuation of unstandardised paths for two direct predictors of behaviour: for direct attitude to behaviour, paths of 0.27 versus 0.17 without versus with the direct residual behaviour path; for indirect partner norm, 0.03 versus 0.02, respectively. Self-efficacy was not directly related to Time 2 behaviour in either the precursor model or the residual path model ( $ps > 0.20$ ). Given the small attenuation of, paths we examined both the replication of the model paths for Samples 1 and 2 and replication for casual versus steady partners with the residual path included.

### ***Model replication for Samples 1 and 2***

The estimated model for Samples 1 and 2 is shown in Figure 2; paths that differed across samples are noted with adjacent values for Samples 1 and 2. Model fit was good. All paths replicated in that they were either both significant or both non-significant in the two samples; three significant paths were stronger in Sample 2 than Sample 1. Overall, all but two theoretical paths were supported: self-efficacy to condom use; partner barriers to direct attitude.

### ***Model estimation and results for casual versus steady partners***

The integrated model was re-estimated as a stacked model contrasting women with casual versus steady sexual partners to examine whether and how relationship status moderated model paths. Path estimates and fit for this model are given in Figure 3. Moderation of a path by relationship status is noted with two adjacent coefficients for a single path. The first coefficient is for women with casual partners; the second, for those with steady partners. The direct predictors of condom use differed by relationship status. For women with casual partners, their own self-efficacy but



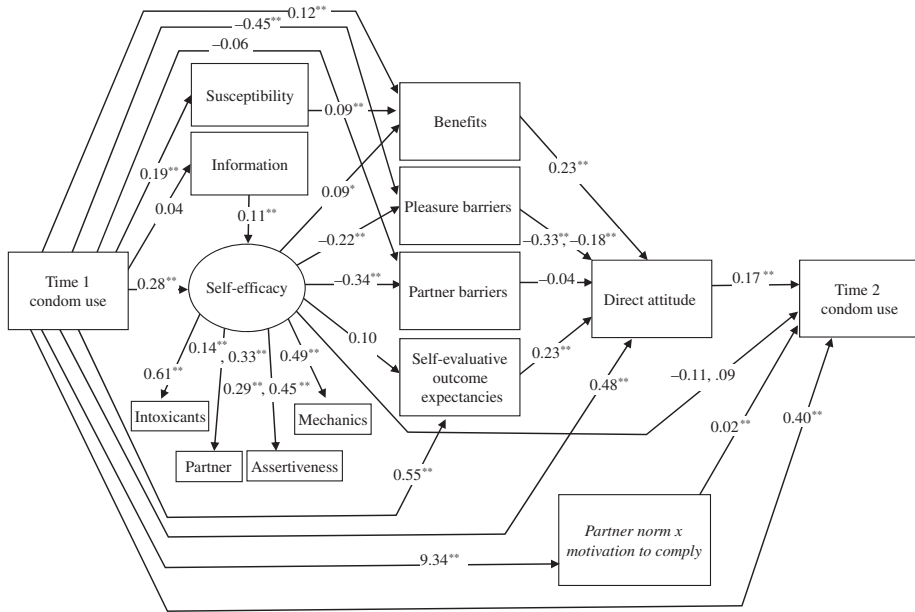


Figure 2. Estimation of the integrated model for samples 1 and 2. Unstandardized path coefficients, required for cross-group comparisons, are reported. Two coefficients are reported where group differences exist – the first referring to sample 1 and the second to sample 2.  $\chi^2(145) = 286.82, p \leq 0.001$ ; CFI = 0.91; SRMR = 0.08. \*, \*\* $p \leq 0.05$  and 0.01.

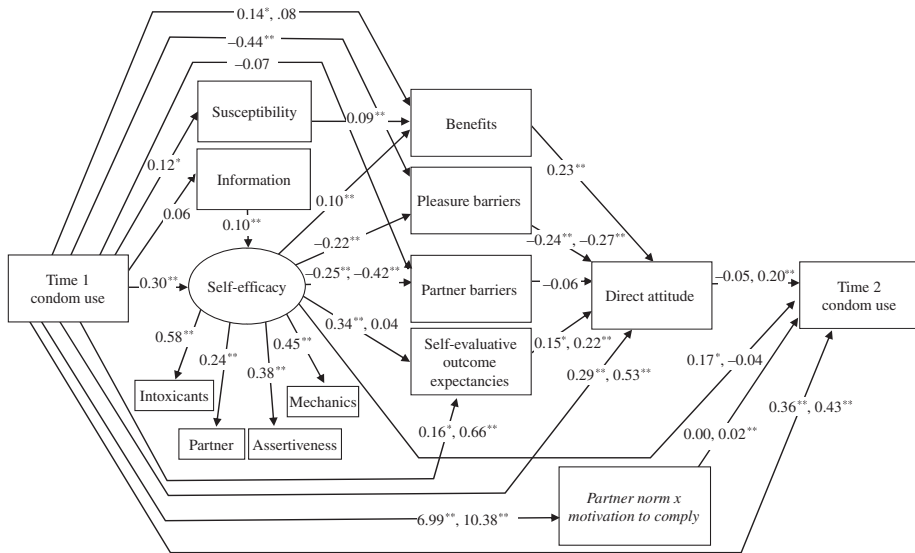


Figure 3. Estimation of the integrated model for women with casual and steady sexual partners. Unstandardised path coefficients, required for cross-group comparisons, are reported. Two coefficients are reported where group differences exist – the first referring to women with casual partners and the second to women with steady partners.  $\chi^2(135) = 247.94, p \leq 0.001$ ; CFI = 0.93; SRMR = 0.08. \*, \*\* $p \leq 0.05$  and 0.01.

neither attitude nor partner norm predicted Time 2 condom use. For women with steady partners, the exact opposite was true – direct attitude and partner norm but not self-efficacy predicted Time 2 condom use. Time 1 condom use was more strongly related to benefits and self-efficacy more strongly related to self-evaluative expectancies among women with casual partners. For all other observed differences, relationships between constructs were stronger among women with steady partners. Pleasure barriers, self-evaluative outcome expectancies and Time 1 condom use were more strongly related to direct attitude among women with steady partners; the same was true for the relationship of Time 1 condom use to both self-evaluative outcome expectancies and partner norm. Not surprisingly, the relationship of Time 1 to Time 2 condom use was significantly stronger for women with steady as opposed to casual partners. Driven by differences in the stability of condom use over time, the model accounted for 65% of the variance in Time 2 condom use for those with steady partners, but only 20% of the variance for those with casual partners.

## Discussion

The present research sought to first examine the relationships of the psychosocial constructs proposed by five models of health behaviour to condom use behaviour and intentions. Consistent with previous research (Sheeran et al., 1999), partner norm and attitudinal factors emerged as the strongest motivators of condom use among young women overall. However, as demonstrated in Figure 3, the relative importance of these constructs varied as a function of the woman's relationship status. Three constructs did not relate to condom use. Information was retained in the model because the IMB specifies an indirect effect via behavioural skills. Cues to action may relate to condom use at other times (e.g. immediately following STI diagnosis; Fortenberry, Brizendine, Katz, & Orr, 2002). Perceived severity likely has little influence on condom use, as women uniformly view contracting an STI as quite severe.

The main goal of the present research was to develop and estimate an integrated model of condom use, drawing on the relationships among constructs proposed in commonly employed models of health behaviour. The direct predictors of behaviour in the integrated model – direct attitude, partner norm and self-efficacy – mirror the predictors of behaviour in the TPB. However, the integrated model goes beyond the TPB in both the proposed configuration of constructs as they ultimately relate to behaviour and in the inclusion of constructs from multiple models. First, self-efficacy is placed upstream as a driving force in the formation of attitudinal beliefs and direct attitude itself, as in the SCT (Bandura, 1998). Second, roles for information as a precursor to self-efficacy and susceptibility as a precursor to benefits were supported. Thus, as has been argued by Fisher and Fisher (1992), acquisition of accurate knowledge concerning condom use is necessary for engaging in condom use, but is insufficient, as an adequate level of efficacy for carrying out the behaviour must also be present. Third, previously reported links between perceived susceptibility and benefits for condom use (Bryan, Aiken, & West, 1997) and between change in perceived susceptibility and change in benefits (Aiken et al., 1994) is supported, suggesting that increasing perceptions of susceptibility to STIs should produce increases in perceptions of the benefits associated with condom use. Fourth, while the TPB aggregates across different classes of expectancies, the integrated model

explicitly shows the importance of benefits, self-evaluative responses and the pleasure-reducing quality of condoms in influencing one's overall attitude. Fifth, while the TPB does not allow for the possibility of a relationship between self-efficacy and attitude, we followed and obtained support for the SCT specification of the relationship of self-efficacy to attitude, suggesting a mediational link of self-efficacy through outcome expectancies that may hold in experimental research.

Multiple relationships between self-efficacy and outcome expectancies are reflected in extant models: in SCT self-efficacy drives outcome expectancies, whereas in the IMB, motivation (which subsumes attitude) precedes behavioural skills. This view is also supported by characterisations of the HBM that incorporate self-efficacy, in which barriers are considered to precede self-efficacy (Jackson & Aiken, 2000). A third perspective from the TRA and TPB is that there is no causal relationship between the two constructs. Whether self-efficacy causally influences attitude towards a behaviour, or attitude influences self-efficacy, or a third variable accounts for the relationship between the two constructs has not been examined experimentally and deserves attention in future research (Weinstein, 2007).

A number of theoretical relationships were moderated by relationship status. Attitude and partner norm emerged as important predictors of condom use among women with steady sexual partners but not among women with casual partners. Rather, self-efficacy emerged as an important determinant of behaviour among women with casual partners, perhaps because condom use is an ongoing negotiation for these women. Thus, the influence of specific behaviour change techniques on changes in behaviour may vary as a function of relationship status. Single women may benefit greatly from interventions that target self-efficacy, while those in relationships may be best helped by interventions that foster partner support for condom use. Additional factors, such as cultural orientation and personality, moderate the importance of psychosocial factors as well (Rhodes, Courneya, & Jones, 2005; Trafimow & Finlay, 1996).

Generally, stronger relationships between constructs were observed among women with steady partners than among those with casual partners. The integrated model accounted for 65% of the variance in condom use among women with steady partners, but only 20% of variance in the outcome among women with casual partners. Similar findings, in both disparity in variance explained and lack of prediction from common psychosocial constructs among individuals with casual sexual partners, have emerged in previous research (Glasman & Albarracin, 2003; Lescano et al., 2006). The success of the integrated model among women with steady partners, driven by the strong relationship of Time 1 to Time 2 behaviour, likely reflects the habitual nature of condom use (or lack thereof) among these women (Ouellette & Wood, 1998). The weaker prediction of behaviour among women with casual partners may be reflective of these women having multiple sexual partners, a significant source of variability in condom use.

### *Limitations*

Our findings rely entirely on self-report data, and we are limited to characterising correlational relationships among the psychosocial constructs. Results obtained from correlational designs may reflect the reciprocal influence between behaviour

and beliefs (Weinstein, 2007); experimental studies are necessary to evaluate the causal influence of constructs on one another. Further, our focus on college women of whom 65% were Caucasian, may limit generalisation to other sexually active samples. The Time 1 questionnaire contained 205 items, potentially resulting in participant fatigue. However, we administered two versions of the questionnaire and observed no systematic relationship of scale position to correlations with the outcomes. Finally, we utilised two mediums for collecting data, paper-and-pencil and online; research suggests that these yield comparable measurement (Preckel & Thiemann, 2003).

## Conclusion

Supporting calls for model integration, the integrated model illustrates that existing models contribute complementary relationships of constructs to one another and to behaviour. Integrated psychosocial models, rich in constructs and relationships drawn from multiple theories of behaviour, may provide a more complete characterisation of health protective behaviour that can also accommodate population differences in the salience of individual constructs for behaviour.

We acknowledge that psychosocial models of behaviour, however complete they may be, are based on observational relationships over time. Such models do not provide demonstrations of causal relationships; this is not their role. Rather, psychosocial models of health behaviour provide the roadmaps for intervention design to bring about health behaviour change. Comprehensive integrative psychosocial models, based on longitudinal relationships between constructs and behaviour over time, are a critical first step in the process of developing effective methodologies for enhancing health behaviour.

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