Extending social cognition models of health behaviour

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Abstract

A cross-sectional study assessed the extent to which indices of social structure, including family socio-economic status (SES), social deprivation, gender and educational/lifestyle aspirations correlated with adolescent condom use and added to the predictive utility of a theory of planned behaviour model. Analyses of survey data from 824 sexually active 16-year-olds (505 women and 319 men) tested three hypotheses. Firstly, social structure measures will correlate with behaviour-specific cognitions that predict condom use. Secondly, cognition measures will not fully mediate the effects of social structural indices and thirdly, the effects of cognitions on condom use will be moderated by social structure indices. All three hypotheses were supported. SES, gender and aspirations accounted for between 2 and 7% of the variance in behaviour-specific cognitions predicting condom use. Aspirations explained a further 4% of the variance in condom use, controlling for cognition effects. Mother’s SES and gender added an additional 5%, controlling for aspirations. Overall, including significant moderation effects, of social structure indices increased the variance explained from 20.5% (for cognition measures alone) to 31%. These data indicate that social structure measures should to be investigated in addition to cognitions when modelling antecedents of behaviour, including condom use.

Introduction

Socio-economic and cultural factors predict morbidity and longevity [1–3]. For example, gender affects health not only because of biological differences between men and women but because cultural constructions of gender affect experiences and behaviour patterns [4, 5]. Unfortunately, the influences of socio-economic status (SES), gender and other indices of social structure are often excluded from psychological models of behavioural antecedents. This is, in part, due to the small proportions of behavioural variance that social structure measures usually explain [6] and the assumption that their effects are mediated by more proximal antecedents of behaviour, and, in particular, behaviour-specific cognitions [7]. Yet even small proportions of explained behavioural variance can begin to elucidate how social structure shapes cognition and behaviour [6, 8]. Ignoring social structure effects on health behaviours may result in limited models of modifiable antecedents which may, in turn, result in behaviour change interventions that do not adequately address important determinants of health behaviour [9].

SES and gender may influence health though various, potentially additive pathways [10, 11]. These may be independent of behaviour patterns or operate because culture and environment shape health-related behaviour patterns [12, 13]. For example, neighbourhood deprivation may affect the...
prevalence of cardiovascular disease because physical and social environments promote behaviour patterns such as low physical activity and smoking. Associations between SES and smoking cessation have been found to be mediated by neighbourhood disadvantage, stress, social support and perceived confidence in control of negative affect and cravings [14]. SES and gender may also be indicative of differential stress and social support [15] which, in turn, may both affect emotional experience, cognition and action, including preventive health behaviours and drug and alcohol use [16]. SES may also represent environmental differences which alter (or moderate) relationships between cognitions and health-related behaviour patterns. For example, intentions to participate in sport have been found to be more strongly associated with sport participation among those with better access to sports facilities [17]. It is important, therefore, to explore and map relationships between indices of social structure which cannot be modified at an individual level, including SES and gender, and more proximal, individually modifiable antecedents such as behaviour-specific cognitions.

A range of social cognition models have been developed to represent how evaluations of anticipated action outcomes, perceived social approval and perceptions of control can shape individual cognition and behaviour (for overviews, see Abraham et al. [18] and Conner and Norman [7]). These models overlap extensively in the psychological processes they describe [19] and attempts have been made to integrate them [20]. The most widely applied are the health belief model [21, 22] and the theory of planned behaviour (TPB) [23].

The TPB proposes that intention (e.g. ‘I intend to use a condom the next time I have sexual intercourse’) is the strongest antecedent of action. Intention is determined by a person’s attitude towards the behaviour and by their subjective norm. Attitude refers to the person’s overall evaluation of the behavioural consequences (e.g. ‘Using a condom the next time I have sexual intercourse would be good/bad’) while subjective norm encapsulates the person’s beliefs about what significant others think s/he should do (e.g. ‘People who are important to me think that I should use a condom the next time I have sexual intercourse’). In addition, the model proposes that a person’s perception of his/her ability to perform a behaviour, that is, their perceived behavioural control (PBC, e.g. ‘I will be able to use a condom successfully, next time I have sexual intercourse’) influences intentions and behaviour. Higher PBC can bolster intention because we are not generally motivated to perform tasks at which we will fail. PBC may also predict behaviour directly because, in common with self-efficacy, confidence in one’s ability to succeed enhances effort and persistence as well as lowering stress [24]. The TPB assumes that social structure influences are mediated by these behaviour-specific cognitions.

More generally, applications of social cognition models to the prediction of health behaviours tend to assume that the effects of social structure measures (e.g. SES and gender) will be indirect and mediated by behaviour-specific cognitions [7] such that their effects are entirely accounted for by their impact on these more proximal measures. Thus, such models assume that direct effects of social structure indices on behaviour will not be observed when the influence of cognitions on behaviour is controlled [25]. Yet such mediation has rarely been assessed and tests which include both social structure and cognition measures report mixed results. For example, in a study of the uptake of cervical screening, health beliefs were found to entirely mediate the effects of social class [26] but marital status was found to have an unmediated (direct) effect on attendance. Marital status has also been found to have direct (unmediated) and indirect (mediated) effects on number of sexual partners and unintended pregnancies among Latina and African-American women [27]. Direct and indirect effects of occupational status, income and gender and an indirect (mediated) effect of education have been reported for appointment keeping at an inner-city hypertension clinic [28]. Carers’ education and whether they lived in an urban or rural setting were found to be directly associated with compliance to childhood immunisation schedules [29] and, finally, direct and indirect effects of household
income and ownership have been reported in relation to use of hormone therapy and other osteoporosis medications [30].

Direct (unmediated) gender effects have also been reported in relation to adolescent and student condom use, controlling for health-related cognitions [31–33]. Similarly, direct gender effects have been reported for the wearing of facemasks to protect against severe acute respiratory syndrome and dietary behaviours [34, 35].

In applications of the TPB, social structure measures including measures of SES and gender have been found to predict TPB-specified cognitions [36, 37] and to have direct effects when cognition measures are controlled. For example, in relation to adolescent behaviours, school (acting as a proxy measure of SES), ethnicity and gender have been shown to have direct (unmediated) effects on cycling and snacking behaviours [38]. SES has also been found to have direct effects on smoking abstinence [39] and education and gender have been found to predict sexual behaviour and condom use controlling for TPB-specified cognitions [40, 41]. PBC has been found to provide partial mediation of SES in a number of studies including those investigating physical activity and dietary behaviours and Leganger and Kraft [42] concluded that it may be more ‘realistic’ (p. 370) to expect partial mediation of social structure measures by cognition measures than (as the TPB proposes) complete mediation.

Social structure measures may not only have direct effects on health behaviour but also moderate cognition–behaviour relationships. Yet, even when social structure and cognition measures are simultaneously investigated as antecedents of health behaviours, the presence or absence moderation effects are not typically reported, although some examples are available. For example, in applications of the Health Belief Model (HBM), cognitions have been found to better predict AIDS-related behavioural changes for adolescent women than men [43] and perceived costs (a core HBM cognition measure) have been found to be better predictors of women’s fat consumption [44].

Aspirations pertaining to lifestyle, employment and education are cognitions (or beliefs) but are not included in behaviour-specific social cognition models such as the HBM and the TPB. Yet, research indicates that aspirations may be useful proxy measures of socio-economic status, especially in relation to young people’s behaviour [6] and, moreover, that aspirations are significantly correlated with health behaviours [45] as well as occupational attainment and motivation to achieve [46]. Consequently, clarification of relationships between SES, aspirations, behaviour-specific cognitions and health behaviours would be useful.

Thus, while social structure measures are often not included in models of the antecedents of health behaviour, available evidence suggests that these variables, including measures of lifestyle aspirations, may have important unmediated effects on health behaviours and may moderate cognition–behaviour relationships. The present study was designed to systematically test the impact of SES, gender and aspirations on cognitions and condom use, thereby exploring the utility of employing more inclusive models of the antecedents of health behaviour.

Young people are vulnerable to acquisition of sexually transmitted infections because they generally have higher numbers of sexual partners and higher frequency of partner change than older people. In the UK in 2005, for example, young men and women aged 16–24 accounted for 57 and 75% of all gonorrhoea diagnoses, respectively, and approximately 11% of HIV diagnoses, with the largest increases in sexually transmitted infections diagnoses rates seen in Chlamydia among women aged 16–19 [47]. Moreover, between 1990 and 2000, the proportion of young people reporting two or more sexual partners in the previous year and also using condoms inconsistently increased, despite a number of national public health campaigns to reduce unsafe sex among young people [48], and in 2007, more than 40 000 under 18-year-olds conceived in England alone; the highest rates in Western Europe. Consequently, young people are a key public health target for safer sex and condom use promotion initiatives [49] and good predictive models of the antecedents of teenagers’ condom use are required to guide intervention design. Reviewers
have called for research into young people’s condom use to ‘collect more detail about social context … to capture the full range of influences on sexual behaviour’ [50, p. 1585]. This study addresses this issue directly.

Hypotheses
The study tested three hypotheses. Firstly, social structure measures (specifically, parental SES, deprivation, gender and aspirations regarding college/university attendance and teenage parenthood) will correlate with behaviour-specific cognitions found to predict condom use. Secondly, cognition measures will not fully mediate the effects of these measures (i.e. direct effects will be observed) and thirdly, the effects of cognitions on condom use will be moderated by social structure measures.

Materials and methods

Participants
Data were extracted from questionnaires used in the control arm of a randomised controlled trial (RCT) designed to test the SHARE (‘Sexual Health And RElationships: Safe, Happy And REsponsible’) sex education programme (International Standard RCT Number Register ISRCTN48719575). In this trial, 12 non-denominational state schools within 15 miles of two major cities in Scotland were randomly allocated to the control arm and received no intervention. We have focused on these data so as to exclude any influence of the intervention on the relationships between measures. Across the intervention and control arms, 7616 students completed the baseline survey. This sample had a mean age of 14 years, 2 months and was representative of Scottish 14-year-olds in terms of parents’ social class and proportion of one-parent households as reported in the 1991 census [51]. In control schools, 74.7% of those completing the baseline survey also completed a 2-year follow-up questionnaire, yielding 2987 questionnaires. Those who had left school were contacted at home by post but follow-up was reduced by non-responses from school leavers and school absentees. Full trial details are provided elsewhere [52, 53]. The present study focuses on measures administered in control schools when respondents were 16 years old. Most students were not sexually active and could not provide data on consistency of condom use. Condom use data were available for 824 respondents (505 women and 319 men) who had an average age of 16 years and 1 month. Thus, hypotheses were tested using cross-sectional analyses of responses provided by a sample of sexually active 16-year-olds drawn from a nationally representative sample.

Procedure
The questionnaire was tested and improved in five pilot schools over 2 years, involving analyses of 337 questionnaires as well as transcripts of interviews and discussion groups. Questions and response options were worded to maximise comprehension for 14 to 16-year-olds and to minimise repetition which respondents found frustrating and demotivating. A variety of items focused on family background, lifestyle, sexual experience, beliefs, attitude and intentions with cognition measures based mainly on the TPB. Separate versions for young men and women were administered by trained researchers in classrooms under examination conditions, without teachers being present. Identifying numbers, but not names, were included and students sealed their own questionnaires in unmarked envelopes.

Measures
Unless otherwise stated, questionnaire items employed five-point response scales: strongly agree, agree, unsure, disagree and strongly disagree. Condom use consistency (CUC) was measured using two questions which asked respondents to record the number of times during the past year they had had sexual intercourse and the number of occasions on which they had used a condom. The following options were provided: 0, 1, 2, 3, 4–6, (scored as 4) 7–9, (5) 10 or more (6). The frequency of condom use score was divided by the frequency of intercourse score, resulting in a maximum score of 1.0. This measure was strongly correlated with...
a separate, self-report measure of consistency of condom use (‘How often did you use a condom, ever? … never, not very often, about half the time, most of the time, always’): \( r = 0.82, P < 0.0001 \), indicating that reports of condom use were reliable [54].

Single items were used to measure intention to use condoms consistently (‘In the future, if you have sexual intercourse with someone and don’t want to get pregnant would you intend to always use a condom during sexual intercourse’; strongly do not intend to—strongly intend to) and self-efficacy in relation to condom use (‘How easy or difficult would it be for you to use a condom properly’; very difficult—very easy).

Three behavioural beliefs were measured in relation to condom use (‘Using a condom would be embarrassing’, ‘Using a condom would interrupt sexual fun’ and ‘Using a condom would reduce sexual enjoyment’). Scale reliability was satisfactory (Cronbach’s alpha = 0.72) and these items were reverse-coded and mean scores used as an index of pro-condom attitude.

Three single items measured normative beliefs regarding condom use at first intercourse: ‘subjective norm’ (‘In the future, the first time you have sex with someone other people who are important to you would want you to use a condom’), anticipated ‘friends’ approval’, (‘In the future when you first have sex with someone your friends would want you to use a condom’) and anticipated ‘partner approval’ (‘In the future, the first time you have sex with someone he/she will want you to use a condom’).

Aspirations were operationalised as single item measures of (i) college expectations by 18 (‘How likely is it that you will be at a college or university in 2 years time’) and (ii) parental expectations by 18 (‘How likely is it that you will have a child/children in 2 years time’).

An area-based measure of deprivation was constructed based on deprivation category scores for Scottish postcode sectors ranging from 1 (most affluent) to 7 (most deprived). These were calculated from Carstairs scores based on a combination of four variables derived from 2001 census small area statistics relating to overcrowding, male unemployment, low social class and car ownership [55].

Students were asked to write down their mother’s and father’s current and last job. These jobs were used to construct dichotomous measures of mother’s and father’s SES. Where current job was provided this was coded, otherwise last job was used. Jobs were categorised as either manual or non-manual using the Registrar General’s 1991 classification scheme for non-manual (classifications I–IIIa were scored as zero) and manual (classifications IIIB–V were coded as 1). So that high scores indicated lower occupation-based SES.

### Results

Table I presents the means, standard deviations and correlations for measures of condom use consistency (CUC), condom use-related cognitions, future college and parental expectations at 18 (aspirations), an area-based deprivation index, SES of father and mother and participants’ sex, here referred to as ‘gender’. High levels of CUC were reported with 70% of respondents scoring between 0.7 and 1.0 on this ratio measure (\( M = 0.82 \)). High mean scores were observed for pro-condom use cognitions with means ranging from 4.45 on a five-point response scale (for self-efficacy), through 4.02 (intention) to 3.40 (attitude).

### Correlates of consistent condom use

Condom use cognitions were positively correlated with CUC, especially intention (\( r = 0.36 \), attitude (0.34) and friends’ approval of condom use at first intercourse (0.33) with correlation magnitudes in the usual range for such measures. Intention was significantly correlated with all other cognition measures.

College expectations were positively correlated with CUC (0.16) but expectations that one might have children by 18 was negatively correlated with consistent use (−0.23). Deprivation and gender showed smaller but significant correlations (−0.11 and −0.10, respectively). Female students and those who from more deprived areas reported less
consistent use. Mother’s and father’s SES are positively but not strongly correlated (0.20) and both were correlated with deprivation. Higher SES was correlated with less consistent condom use (\(r = 0.11\) and \(r = 0.16\), respectively).

**Are parental SES, deprivation, gender and aspirations associated with pro-condom cognitions?**

The first hypothesis was tested by sequentially regressing each of the three cognition measures most strongly associated with CUC (i.e. intention, attitude and friends’ approval) onto measures of SES, deprivation, gender and aspirations (see Table I). These regressions were then re-run retaining independent variables accounting for significant proportions of the variance in the target cognition.

Stronger intentions were associated with lower expectations of becoming a parent by 18 which accounted for 4% of the variance (beta = −0.20, \(P < 0.001\), \(R^2 = 0.040\), \(F (1,789) = 33.01, P < 0.001\)).

Stronger pro-condom attitudes were associated with higher college aspirations (beta = 0.08, \(P < 0.05\), \(\Delta R^2 = 0.018\), \(\Delta F (1,803) = 15.05, P < 0.001\)), lower parental aspirations (beta = −0.12, \(P < 0.01\), \(\Delta R^2 = 0.014\), \(\Delta F (1,804) = 12.04, P < 0.01\)) and being female (beta = 0.19, \(P < 0.001\), \(\Delta R^2 = 0.037\), \(\Delta F (1,803) = 31.96, P < 0.001\)).

These three variables collectively explained 7% of the variance in attitudes towards condom use.

Stronger perceived friends’ approval was associated with lower parental aspirations (beta = −0.10, \(P < 0.01\), \(\Delta R^2 = 0.012\), \(\Delta F (1,720) = 8.63, P < 0.01\)) and lower deprivation (beta = −0.11, \(P < 0.01\), \(\Delta R^2 = 0.011\), \(\Delta F (1,719) = 8.32, P < 0.01\)) with these two variables collectively explaining 2.3% of the variance in perceived friends’ approval.

Thus between 2 and 7% of the variance in pro-condom cognition measures was explained by parental SES, deprivation, gender and aspirations, supporting our first hypothesis.

**Are effects of parental SES, deprivation, gender and aspirations on condom use mediated by pro-condom cognitions?**

The second hypothesis was tested using a hierarchical regression in which CUC was regressed onto cognition measures and then onto measures of parental SES, deprivation, gender and aspirations. If the effects of these social structure indices are mediated by cognitions then no independent association should be observed once the effects of cognitions are controlled. Steps 1–4 in Table II show the results of this regression run to include only those variables accounting for

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**Table I. Correlations between study variables (n = 824)**

<table>
<thead>
<tr>
<th>Consistency of use</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>0.36***</td>
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<tr>
<td>Self-efficacy</td>
<td>0.15***</td>
<td>0.13***</td>
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<td></td>
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<tr>
<td>Attitude</td>
<td>0.34***</td>
<td>0.42***</td>
<td>0.13***</td>
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<tr>
<td>Subjective norm</td>
<td>0.19***</td>
<td>0.34***</td>
<td>0.05</td>
<td>0.32***</td>
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<tr>
<td>Partner approval</td>
<td>0.27***</td>
<td>0.33***</td>
<td>0.23***</td>
<td>0.29***</td>
<td>0.42***</td>
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<tr>
<td>Friends' approval</td>
<td>0.33***</td>
<td>0.30***</td>
<td>0.20***</td>
<td>0.28***</td>
<td>0.31***</td>
<td>0.33***</td>
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<tr>
<td>College expectations</td>
<td>0.16***</td>
<td>0.08*</td>
<td>−0.01</td>
<td>0.13***</td>
<td>0.20***</td>
<td>0.04</td>
<td>0.09*</td>
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<tr>
<td>Parental expectations</td>
<td>−0.23***</td>
<td>−0.20***</td>
<td>−0.00</td>
<td>−0.15***</td>
<td>−0.25***</td>
<td>−0.13***</td>
<td>−0.11***</td>
<td>−0.25***</td>
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<tr>
<td>Deprivation score</td>
<td>−0.11**</td>
<td>−0.06</td>
<td>0.05</td>
<td>−0.03</td>
<td>−0.06</td>
<td>0.03</td>
<td>−0.11***</td>
<td>−0.18***</td>
<td>0.09*</td>
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<tr>
<td>SES father</td>
<td>−0.11**</td>
<td>0.04</td>
<td>0.07</td>
<td>0.03</td>
<td>0.04</td>
<td>0.00</td>
<td>−0.07</td>
<td>0.18***</td>
<td>−0.12<em>0.22</em>**</td>
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<tr>
<td>SES mother</td>
<td>−0.16***</td>
<td>−0.02</td>
<td>−0.03</td>
<td>0.03</td>
<td>−0.04</td>
<td>−0.05</td>
<td>−0.02</td>
<td>0.14***</td>
<td>−0.07 0.16* 0.20***</td>
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<tr>
<td>Gender</td>
<td>−0.10**</td>
<td>0.06</td>
<td>−0.16***</td>
<td>0.20***</td>
<td>0.32***</td>
<td>−0.12***</td>
<td>0.04</td>
<td>−0.10**</td>
<td>0.03 0.03</td>
<td>0.10</td>
<td>0.04</td>
<td></td>
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</tr>
<tr>
<td>Mean</td>
<td>0.82</td>
<td>4.02</td>
<td>4.45</td>
<td>3.40</td>
<td>4.10</td>
<td>3.81</td>
<td>3.93</td>
<td>2.18</td>
<td>4.16 3.70</td>
<td>0.51</td>
<td>0.341.61</td>
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<tr>
<td>Standard deviation</td>
<td>0.27</td>
<td>1.01</td>
<td>0.68</td>
<td>0.81</td>
<td>0.90</td>
<td>0.96</td>
<td>0.96</td>
<td>1.15</td>
<td>1.00 1.71</td>
<td>0.50</td>
<td>0.470.49</td>
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</tr>
</tbody>
</table>

*\(P < 0.05\) (two-tailed), **\(P < 0.01\), ***\(P < 0.001\).
independent significant proportions of the variance in CUC. Intention explains 11.9% of the variance in CUC. Controlling for this, attitude and friends’ approval collectively add a further 8.6%. Adding aspirations added a further 3.9% of the variance with both parental and college expectations having independent effects. Finally, mother’s SES (but not father’s SES or deprivation) and gender added an additional 5.3% to the variance explained, controlling for cognitions and aspirations. Thus aspirations, mother’s SES and gender had independent, unmediated effects on CUC, supporting our second hypothesis. Overall, those with stronger intentions to always use condoms, those with stronger pro-condom attitudes, those who perceived friends’ approval of condom use at first intercourse, those expecting to attend college and not expecting to become parents by 18, those with higher mother’s SES and those who were male were more likely to report consistent condom use.

Are effects of pro-condom cognitions on condom use moderated by parental SES, deprivation, gender or aspirations?

The third hypothesis was tested using moderated hierarchical regressions with each of the three cognition measures found to independently account for variance in CUC (i.e. intention, attitude or friends’ approval). In each case, CUC was regressed onto the mean-centred score for the target cognition and then onto this score multiplied by the mean-centred score for one of the six aspiration or macro-level measures (college expectations, parental expectations, deprivation, father’s SES, mother’s SES and gender). Consequently, 18 regressions were conducted. Significant interactions between one of the three cognition measures and one of the macro-level or aspiration measures were found in 5 of these 18 tests and marginally significant interactions were observed in 3 others.

Father’s SES moderated the effect of intention on CUC. Controlling for intention (beta = 0.32, $P < 0.001$, $\Delta R^2 = 0.100$, $\Delta F (1,577) = 64.36$, $P < 0.001$) and father’s SES (beta = −0.13, $P < 0.01$, $\Delta R^2 = 0.014$, $\Delta F (1,576) = 9.43$, $P < 0.01$), the interaction term explained an additional 0.9% of the variance in CUC (beta = 0.09, $P < 0.02$, $\Delta R^2 = 0.009$, $\Delta F (1,575) = 5.63$, $P < 0.02$).

College and parental expectations moderated the effect of attitude on CUC. Controlling for the effect of attitude (beta = 0.32, $P < 0.001$, $\Delta R^2 = 0.118$, $\Delta F (1,808) = 108.12$, $P < 0.001$) and college expectations (beta = 0.18, $P < 0.01$, $\Delta R^2 = 0.013$, $\Delta F (1,807) = 12.34$, $P < 0.001$), the interaction term explained an additional 0.6% of the variance in CUC (beta = 0.08, $P < 0.02$, $\Delta R^2 = 0.006$, $\Delta F (1,806) = 4.74$, $P < 0.02$).

Table II. Trimmed hierarchical regression of CUC on social structure measures, aspirations and behaviour-specific cognitions

<table>
<thead>
<tr>
<th>Step</th>
<th>$\Delta R^2$</th>
<th>$R^2$</th>
<th>$\Delta F$</th>
<th>$F$</th>
<th>Beta (final equation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>0.119</td>
<td>0.119</td>
<td>70.26***</td>
<td>70.26***</td>
<td>0.17***</td>
</tr>
<tr>
<td>Behaviour-specific cognitions</td>
<td>0.086</td>
<td>0.205</td>
<td>28.25***</td>
<td>44.70***</td>
<td>0.20***</td>
</tr>
<tr>
<td>Attitude</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Friend’s approval</td>
<td>0.039</td>
<td>0.244</td>
<td>13.54***</td>
<td>33.53***</td>
<td></td>
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<td>Aspirations</td>
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<tr>
<td>College expectations</td>
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<td>0.297</td>
<td>19.31***</td>
<td>31.16***</td>
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<td>Parental expectations</td>
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<td>SES mother</td>
<td>0.013</td>
<td>0.310</td>
<td>4.74**</td>
<td>25.64***</td>
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<td>Attitude × college expectations</td>
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<td></td>
<td></td>
<td>0.10*</td>
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<td>Attitude × gender</td>
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<td>0.08*</td>
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*P < 0.05, **P < 0.01, ***P < 0.001.
Extending social cognition models

(1,806) = 5.94, P < 0.02). Similarly, controlling for the effect of attitude (beta = 0.31, P < 0.001, ΔR² = 0.118, ΔF (1,808) = 108.12, P < 0.001) and parental expectations (beta = −0.18, P < 0.001, ΔR² = 0.036, ΔF (1,807) = 34.71, P < 0.001), the interaction term explained an additional 0.5% of the variance in CUC (beta = 0.07, P < 0.05, ΔR² = 0.005, ΔF (1,806) = 4.68, P < 0.05).

Parental expectations and father’s SES moderated the effect of friends’ approval on CUC. Controlling for friends’ approval (beta = 0.31, P < 0.001, ΔR² = 0.112, ΔF (1,790) = 99.64, P < 0.001) and parental expectations (beta = −0.20, P < 0.001, ΔR² = 0.043, ΔF (1,789) = 39.67, P < 0.001), the interaction term explained a further 0.4% of the variance in CUC (beta = 0.066, P < 0.05, ΔR² = 0.004, ΔF (1,788) = 3.99, P < 0.05). Similarly, controlling for friends’ approval (beta = 0.29, P < 0.001, ΔR² = 0.100, ΔF (1,576) = 63.92, P < 0.001) and father’s SES (beta = −0.09, P < 0.05, ΔR² = 0.006, ΔF (1,575) = 4.18, P < 0.05), the interaction term explained a further 1.2% of the variance in CUC (beta = 0.11, P < 0.01, ΔR² = 0.012, ΔF (1,574) = 7.59, P < 0.01).

Interactions approaching significance were observed between attitude and deprivation, father’s SES and gender. Controlling for the effect of attitude (beta = 0.34, P < 0.001, ΔR² = 0.121, ΔF (1,746) = 102.96, P < 0.001) and deprivation (beta = −0.09, P < 0.01, ΔR² = 0.008, ΔF (1,745) = 6.97, P < 0.01), the interaction term explained an additional 0.3% of the variance in CUC which approached significance (beta = 0.06, P < 0.10, ΔR² = 0.003, ΔF (1,744) = 2.74, P < 0.10). Similarly, controlling for the effect of attitude (beta = 0.31, P < 0.001, ΔR² = 0.095, ΔF (1,590) = 61.65, P < 0.001) and father’s SES (beta = −0.12, P < 0.01, ΔR² = 0.014, ΔF (1,589) = 9.13, P < 0.01), the interaction was marginally significant explaining an additional 0.5% of the variance in CUC (beta = 0.07, P < 0.08, ΔR² = 0.005, ΔF (1,588) = 3.41, P < 0.08). Finally, controlling for the effect of attitude (beta = 0.38, P < 0.001, ΔR² = 0.116, ΔF (1,816) = 107.23, P < 0.001) and gender (beta = −0.17, P < 0.001, ΔR² = 0.029, ΔF (1,815) = 27.81, P < 0.001), the interaction was marginally significant explaining an additional 0.3% of the variance in CUC (beta = 0.06, P < 0.08, ΔR² = 0.003, ΔF (1,814) = 3.22, P < 0.09).

These five significant interactions terms together with the three approaching significance were added in a fifth step to the hierarchical regression reported above. Two terms—attitude by college aspirations and attitude by gender—enhanced the variance explained in CUC. Step 5 in Table II shows the results of adding these two interaction terms to the equation and column 5 shows the final standardised regression coefficients (betas) after these terms were added. Controlling for the direct effects of cognitions, aspirations and social structure measures, the addition of these interaction terms increased the overall variance explained in CUC by 1.3%. These interactions were decomposed using simple slopes analysis as recommended by Aiken and West [56] and the resulting graphs are shown in Figs 1 and 2. Men’s pro-condom attitudes were less strongly associated with CUC (r = 0.35, P < 0.001; unstandardised B = 0.102) than women’s (r = 0.39, P < 0.001; unstandardised B = 0.142) and pro-condom attitudes of those with lower expectations of attending college were more strongly associated with CUC. Exploring this latter effect further we found that, omitting those who selected ‘unsure’ in relation to college expectations, those with higher expectations of attending college by 18 had a noticeably lower pro-condom-attitude—CUC correlation (r = 0.25, P < 0.001; unstandardised B = 0.095) than those with lower expectations (r = 0.42, P < 0.001; unstandardised B = 0.114). Overall then, while all observed moderation effects were small we found evidence that educational aspirations and gender can alter the relationship between condom-specific cognitions and consistent condom use, supporting our third hypothesis and suggesting that such moderation effects can enhance models of the antecedents of adolescent condom use.

Discussion

We found that measures of SES, gender and aspirations accounted for between 2 and 7% of the
variance in condom use-specific cognitions derived from the TPB (i.e. intention, attitude and friends’ approval) in a cross-sectional analyses. Higher college aspirations, lower parental SES and being female collectively explained 7% of the variance in pro-condom attitudes, one of the strongest correlates of consistent condom use. More importantly, our results show that cognition measures do not mediate (or fully account for) the effects of the SES gender and aspirations on behaviour. We found that aspirations explained a further 4% of the variance in consistent condom use, after controlling for the effects of cognition measures and that, controlling for cognitions and aspirations, mother’s SES and participant gender added a further 5%. Including moderation effects, measures of social structure and increased explained variance (by comparison with a cognition-only model) by a full 50%, adding 11% in additional variance explained. This is contrary to claims that social structure influences health behaviour through behaviour-specific cognitions. Our results strongly suggest that the
effects SES, deprivation, aspirations and gender, should to be examined in addition to cognitions when modelling antecedents of health behaviours such as condom use. Finally, although the moderation effects observed here added only 1% to the variance explained in consistent condom use controlling for direct effects, they, nonetheless, illustrate how gender and education aspirations can alter relationship between cognitions (in this case attitudes) and behaviour. All three of our hypotheses were supported suggesting that both direct and moderation effects of social structure measures and aspirations should be routinely examined. Thus, we conclude that cognition models of the antecedents of health-related behaviours, including condom use, should be extended so that the relationships between a variety of social structure, environmental cultural and neighbourhood characteristics are simultaneously investigated.

The condom-specific cognition measures used here were found to explain behaviour at a comparable level to previous applications of similar cognition measures of condom use, suggesting that the challenges we faced in collecting data from teenagers in schools (e.g. limited use of multi-item scales) did not affect the expected performance of these measures. Correlations between consistent condom use and intention (0.36), self-efficacy (0.15), attitude (0.34) and friends’ approval (0.33) were within the ranges observed by two previous meta-analyses of the condom use literature (Sheeran et al. [57] and Albarracín et al. [58]) which found similar average weighted correlations between condom use and intention (0.43 and 0.45), self-efficacy/perceived control (0.25 and 0.25), attitude (0.37 and 0.32), subjective norm (0.25 and 0.26), respectively. Thus, our observations based on a large sample drawn from a nationally representative group are likely to be relevant to applications of social cognition models to condom use more generally. Moreover, intention, attitude and friends’ approval accounted for 20.5% of the variance in consistent condom use while, a comprehensive meta-analysis of applications of the TPB, across behaviours [59], found that the measures derived from the theory accounted, on average, for 27% of the variance in behaviour. Thus, it is possible that substantial proportions of additional variance could be explained by incorporating social structure measures into models of other health behaviours among other populations. At very least, our findings demonstrate that mediation of characteristics such as SES, deprivation, gender and aspirations by behaviour-specific cognitions should be tested on a case-by-case basis rather than assumed a priori.

Of course social structural measures may not always enhance the predictive utility of social cognition models. For example, Godin et al. [60] who read an earlier draft of this paper did not replicate our findings. They conclude that their findings are ‘more consistent than not with the assumption that social structural factors have little influence on behaviour once cognitions have been taken into account’ (p. 92). Yet applying the same social cognition model to the same behaviour as Godin et al., Prins et al. [17] concluded that intentions to participate in physical activity were moderated by the availability of sports facilities, thereby emphasising the range of measures needed to adequately investigate relationships between individuals’ position within social structures, their access to resources, their cognitions and their health behaviour patterns.

One rationale for focusing primarily on cognitions rather than social structural influences is that the former are thought to be more amenable to change. Yet there is evidence suggesting that aspirations may be subject to change [61]. Moreover, changes in the relative deprivation of areas in which people live are associated with morbidity and mortality [2] and intervention effectiveness may be enhanced by a combination of environmental and institutional policy change and behavioural intervention [17, 62]. Thus, interventions which target structural and community influences on health behaviour may well be more effective than interventions based solely on cognition change techniques [63]. Our data support this conclusion by showing that a model of condom use which only includes cognitions is a poorer description of the antecedents of behaviour than one that also includes social structure measures.

Structural effects are also important to cognition-focused interventions. A comprehensive review [58]
demonstrated that inclusion of techniques designed to change cognitions specified by the TPB improved the effectiveness of interventions designed to promote condom use. However, change techniques had different effects on different audiences. For example, use of normative arguments enhanced the effectiveness of interventions targeting people older than 21 years but reduced the effectiveness of interventions targeting younger people. Such findings underline the importance of testing for moderation effects in predictive models and in reviews of intervention effectiveness. Our results indicate that pro-condom attitudes are somewhat more important to women’s condom use than men’s and, excluding those who were undecided, considerably more important to condom use among those with low (versus high) educational aspirations (with the correlation halving in value across these two groups). Thus, the effects of social structure are important to behaviour change intervention [64] and to the application of particular behaviour change techniques derived from social cognitive theories [7, 65].

We have argued for more comprehensive, integrated models of the antecedents of health behaviours and acknowledge the limited nature of our own model. Researchers working with social cognition models will identify a range of other cognition measures that have been used to extend the TPB including moral norms, descriptive norms affective attitudes and identity [18].

Our measure of PBC focused on confidence in using condoms, rather than, for example, availability or cost of condoms. This measure was not associated with SES or deprivation but is possible that other aspects of condom use control may be related to SES. Nonetheless, it noteworthy that the three cognitions which emerged as independent predictors of consistent condom use in our analyses were the same cognitions highlighted by Sheeran et al. [57] in a meta-analysis of 120 psychosocial antecedents of condom use. Thus, while other cognition measures should be included in future studies, those included here provide a robust models of the behaviour-specific cognitions associated with condom use.

Researchers focusing on social structural influences will note the limited range of measures we included (parental SES, deprivation, gender as well as educational and parenting aspirations). Undoubtedly integrated models need to include multiple measures of social structural effects including, for example, ethnicity, marital status, urban versus rural setting, neighbourhood resources and social cohesion. Our data serve to highlight the potential added value of such measures in understanding cognitions and behaviour but further work is required to understand the pathways by which multiple social structural influences influence cognition and behaviour [12–14].

The need to include a range of social structural measures is highlighted by our findings. For example, parental SES measures based on self-reported parental employment were significantly, but not strongly, correlated with a deprivation measure based on postcodes, emphasising the importance of including multiple indicators of SES. Asset-based measures of SES (e.g. car ownership) have been shown to discriminate more precisely in studies of health [66] and it would be interesting to compare these measures with other SES measures in studies of the antecedents of health behaviour. Similarly, our data suggest that measures of aspiration should perhaps not be regarded as simply proxy measures of SES because these measures of aspiration and SES were significantly, but not strongly, correlated. Moreover, mother’s SES explained independent variance in consistent condom use, controlling for measures of participants’ aspirations. Overall then, wider range of social structure and mediating measures are required to interrogate integrated socio-psychological processes responsible for differences in health behaviour.

Social and cultural influences also shape action at more immediate levels as when social support [67] and quality of relationships and communication [68] affect health behaviours. In the context of condom use, for example, the particular histories and sexual scripts developed by partners may be crucial to joint decision making and self-efficacy (Henderson et al. [51]; Marston and King [50]). We have not assessed the independent and mediating effects of such local social influence in addition to measures of perceived approval and this issue could be explored in future research.
In conclusion, we have demonstrated how gender and educational and lifestyle aspirations are important to understanding condom use among a particular population (young people in Scotland). These findings illustrate the value of incorporating measures of social structural influences into psychological models of the antecedents of health behaviour, both from a theoretical perspective, to better understand how social context shapes cognitions and behaviour, and, from an empirical perspective, to enhance the predictive utility of such models. Social cognition models were developed in the 1950s partly because of pessimism in relation to the capacity of social structure measures to capture variance in individual health behaviour [69]. These models have proved their worth in explaining variance in health behaviour but their very success has led to a restrictive focus. Re-contextualising psychological models within wider social and cultural processes is likely to enhance our understanding of behavioural variation and behaviour change opportunities.

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Conflict of interest statement

None declared.

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