

Predicting the Intention to Use Condoms and Actual Condom Use Behaviour: A Three-Wave Longitudinal Study in Ghana

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Background: Growing cross-sectional research shows that the theory of planned behaviour (TPB) is robust in predicting intentions to use condoms and condom use behaviour. Yet, little is known about the TPB's utility in explaining intentions to use condoms and condom use behaviour over time. **Methods:** This study used a longitudinal design and latent variable structural equation modelling to test the longitudinal relationships postulated by the TPB. School-going youths in Ghana provided data on attitudes, subjective norms, perceived control, intentions, and behaviour regarding condom use at three time points, spaced approximately three months apart. **Results:** As predicted by the TPB, the results showed that attitudes were significantly positively associated with intentions to use condoms over time. Contrary to the TPB, subjective norms were not significantly associated with intentions to use condoms over time. Perceived control did not predict intentions to use condoms over time. Moreover, intentions to use condoms were not significantly associated with self-reported condom use over time. **Conclusion:** These results suggest that school-going youths in Ghana may benefit from sex education programmes that focus on within-subject attitude formation and activation. The theoretical and methodological implications of these results are discussed.

Keywords: attitudes, condom use, subjective norms, theory of planned behaviour

INTRODUCTION

There is ample evidence that cross-sectional data support the utility of the theory of planned behaviour (TPB) in understanding young people's condom use. For example, see Bryan, Kagee, and Broaddus (2006), Jemmott et al. (2007),

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Montanaro and Bryan (2014), and Schaalma et al. (2009). However, there is little evidence regarding the TPB's utility in understanding young people's intentions to use condoms and actual condom use behaviour over time. The TPB, in its present form, postulates a longitudinal relationship between its standard constructs over time. Specifically, that attitudes, subjective norms, and perceived behavioural control will influence an individual's intentions towards a given behaviour (e.g. condom use) over time, and that such intentions will predict the likelihood of that individual actually engaging in that given behaviour at some point in the future (Ajzen, 1991). The TPB, therefore, implies a temporal relation between its standard constructs over time.

Cross-Sectional vs. Longitudinal Designs and the TPB

Whereas cross-sectional data are useful in investigating how outcome variable measures differ among participants who possess varying levels of a predictor variable, such cross-sectional data provide little information about the temporal relations between the variables over time, in theoretical models that describe longitudinal relationships (Cole & Maxwell, 2003). Related to this, Maxwell, Cole, and Mitchell (2011) noted that "a variable that is found to be a strong mediator in a cross-sectional analysis may not be a mediator at all in a longitudinal analysis" (p. 816). Further, other research has shown that the use of cross-sectional designs to estimate longitudinal mediation effects can lead to bias in parameter estimates (Maxwell & Cole, 2007; Shrout, 2011). As noted earlier, the TPB is a theoretical model that describes longitudinal mediation relationships between its standard constructs. Arguably, the TPB's utility in understanding young people's condom use may be extended by studies that use longitudinal designs.

Although longitudinal designs cannot test true "causal" assumptions (which are better tested with experimental designs), they offer many advantages over cross-sectional designs. Compared with cross-sectional designs, longitudinal designs allow researchers to better capture the influence of conceptual "third variables", including putative mediators, and to control for autoregressive relationships (Maxwell et al., 2011; Shrout, 2011; West, 2011). In the case of the TPB, a putative mediator would be "behavioural intentions". In addition, longitudinal designs aid in testing construct stationarity, a prerequisite in theoretical models that describe longitudinal relationships (Cole & Maxwell, 2003; Swart, Hewstone, Christ, & Voci, 2011). Kenny (1979) explained that there is construct stationarity when the observed sizes of correlations among measures of the same construct obtained across time (i.e. within-wave correlations) remain unchanged.

Correspondingly, scholars in the field of health behaviour and theory testing have recently begun to express concerns about the widespread use of cross-sectional designs in health behaviour research (see, for example, Weinstein, 2006; Weinstein & Rothman, 2005; West, 2011). For example, Weinstein (2006) argued that cross-sectional designs used to test the TPB may have

produced estimates of current and past behaviour, instead of producing estimates of future behaviour. Moreover, various authors have recommended that psychologists interested in the processes through which antecedent factors influence outcome measures (mediation) should measure each construct at a minimum of three time points (Cole & Maxwell, 2003; Maxwell & Cole, 2007; Reichardt, 2011). For example, Cole and Maxwell (2003) explained that a minimum of three waves of data is required to test the stationarity assumption inherent in longitudinal mediation designs. They argued that a minimum of three waves of data would allow researchers (a) to confirm that sufficient autoregressive stability exists for each measure over time, and (b) to control for prior levels of the dependent variable on itself (autoregressive effects) when testing for cross-lagged effects (see also Swart et al., 2011). In addition, Cole and Maxwell (2003) and Selig and Preacher (2009) recommended that researchers measure all variables at all measurement occasions in order to have the opportunity to partial out any effects that a variable might have on itself over time (see also Reichardt, 2011). These considerations motivated the choice of the three measurement occasions used in the present study, and also served to explain why we assessed all variables at all measurement occasions.

As can be expected, a complete test of the full longitudinal mediation effects described by the TPB would require first and second waves of data (Time 1 and Time 2) to examine the paths from attitudes, subjective norms, and perceived behavioural control to intentions, and then second and third waves of data (Time 2 and Time 3) to examine the path from intentions to overt behaviour.

The Current Study

Recent national sentinel survey reports have shown that young Ghanaians aged 15–24 years accounted for 28 per cent of all new infections of HIV in 2013 (Ghana Aids Commission, 2014). HIV prevalence among young Ghanaians aged 15–19 years and those aged 15–24 years in 2012 was 0.7 per cent and 1.3 per cent, respectively (Ghana Aids Commission, 2014). Sexually transmitted infections (STIs) and unintended pregnancy have also been recorded among young people in Ghana (Morhe, Tagbor, Ankobea, & Danso, 2012; Ohene & Akoto, 2008). Previous research has shown that heterosexual intercourse is driving the spread of the HIV virus in Ghana (Ghana Health Service, 2009). Yet, by all accounts, condom use to reduce one's risk of acquiring sexually transmitted HIV as well as other STDs remains low among Ghanaian school-going youths (Abdul-Rahman, Marrone, & Johansson, 2011; Adu-Mireku, 2003; Odonkor, Nonvignon, Adu, Okyere, & Mahami, 2012; Sallar, 2008).

Beliefs and misconceptions about condom use and HIV that make condom use unattractive to young people (e.g. HIV is caused by witchcraft, that condom use results in pleasure loss, that condom use makes sex unnatural and indicates lack of trust in one's sexual partner) are also reported to be widespread among

young Ghanaians (Tenkorang, 2013; Tenkorang, Gyimah, Maticka-Tyndale, & Adjei, 2011). Meta-analyses and systematic reviews have shown that consistent condom use prevents sexually transmitted HIV by between 87 per cent and 96 per cent (Weller, 1993; Weller & Davis-Beaty, 2002).

Despite the risks and negative health outcomes associated with young people's sexual behaviour in Ghana, there is little research effort to examine this health problem. There is the need to identify and understand psychosocial factors that determine why some young Ghanaians use condoms but others do not. This understanding is crucial because the Ghana Aids Commission (2013) has made the halting and reversing of the spread of sexually transmitted HIV in Ghana a key national, public health goal. Unfortunately, in Ghana interventions to reduce young people's sexual risk behaviour have achieved only limited success because they have been largely based on non-governmental organisation initiatives, which have not been theory-guided. Theory-guided studies are central to evidence-based research and interventions (Michie et al., 2005). Nevertheless, to date, there are no known Ghanaian theory-based models advanced to adequately explain HIV, STD, and pregnancy risk reduction among young people in the country.

Relatedly, health behaviour researchers have noted that it is important in evidence-based sexual behaviour research to utilise a theory that reflects the characteristics of the population and dimensions of the particular behaviour under investigation (Eaton, Flisher, & Aarø, 2003; Michie, Johnston, Francis, Hardeman, & Eccles, 2008). Further, they argued that such a theory ought to have a parsimonious framework and well-defined components; and should not only be robust but also should be applicable to both men and women. In addition, they stressed that such a theoretical framework should suggest research questions or indicate hypotheses to help focus research on key variables of interest to the researcher. One health behaviour theory that appears to satisfy these requirements is Ajzen's (1991) theory of planned behaviour (TPB). These considerations informed the choice of the TPB to guide the present research.

The TPB aims to explain human social behaviour in specific situations by making two important assumptions. First, it assumes that an individual's intentions to engage in a specified behaviour (e.g. using condoms consistently) is determined by his or her attitudes, his or her perceived control beliefs, and by the prevailing normative beliefs within his or her social context regarding that behaviour. Second, it assumes that the most important determinant of overt behaviour (e.g. condom-protected sexual behaviour) is an individual's behavioural intentions towards that target behaviour. Taken together, Ajzen (1991) argued that individuals who have favourable attitudes towards a specified behaviour, positive subjective norms regarding that behaviour, and who perceive themselves to have the necessary control over performing that specified behaviour, are more likely to execute their behavioural intentions when the need arises. The aim of this study was to undertake a three-wave longitudinal study to test the

longitudinal relationships postulated by the TPB in understanding heterosexual high school youths' intentions to use condoms and actual condom use behaviour over time.

Study Hypotheses

Using the theory of planned behaviour's framework, we specified the following longitudinal structural models (see Figure 1, for the hypothesised model):

Hypothesis 1: (a) Attitude towards condom use, (b) subjective norms regarding condom use, and (c) perceived behavioural control over condom use at Time 1 would each be significantly positively associated with increased intentions to use condoms at Time 2, even after controlling for the autoregressive effects of the intentions to use condoms at Time 1.

Hypothesis 2: Intention to use condoms at Time 2 would be significantly positively associated with increased condom use behaviour at Time 3, even after controlling for the autoregressive effects of condom use behaviour at Time 1 and Time 2.

Hypothesis 3: Intention to use condoms at Time 2 would mediate the relationship between attitudes, subjective norms, and perceived behavioural control at Time 1, and condom use behaviour at Time 3.

METHOD

Participants and Procedure

Participants ($N = 1,023$) in this study were recruited from a large municipal, public senior high school in the Eastern Region of Ghana. The corresponding author obtained a letter of permission from the Director-General, Ghana Education Service and presented it, including a synopsis of the study as well as ethical approval letters, to the school authorities. Students were recruited at an assembly forum in the participating school with the help of the school authorities. To be eligible for participation in the present study, students must never have been married and must have attained the age of 14 years prior to participation in the survey at the first assessment. Also, they must have indicated a willingness to participate in the study. Of the number recruited, 13 students were below the age of 14 years and were thus excluded from the study. At the Time 1 assessment, 983 students completed the survey. Twenty-seven potential participants were absent for various reasons, including illness, other important co-curricular engagements, and not being in school because of being a day student. Of the

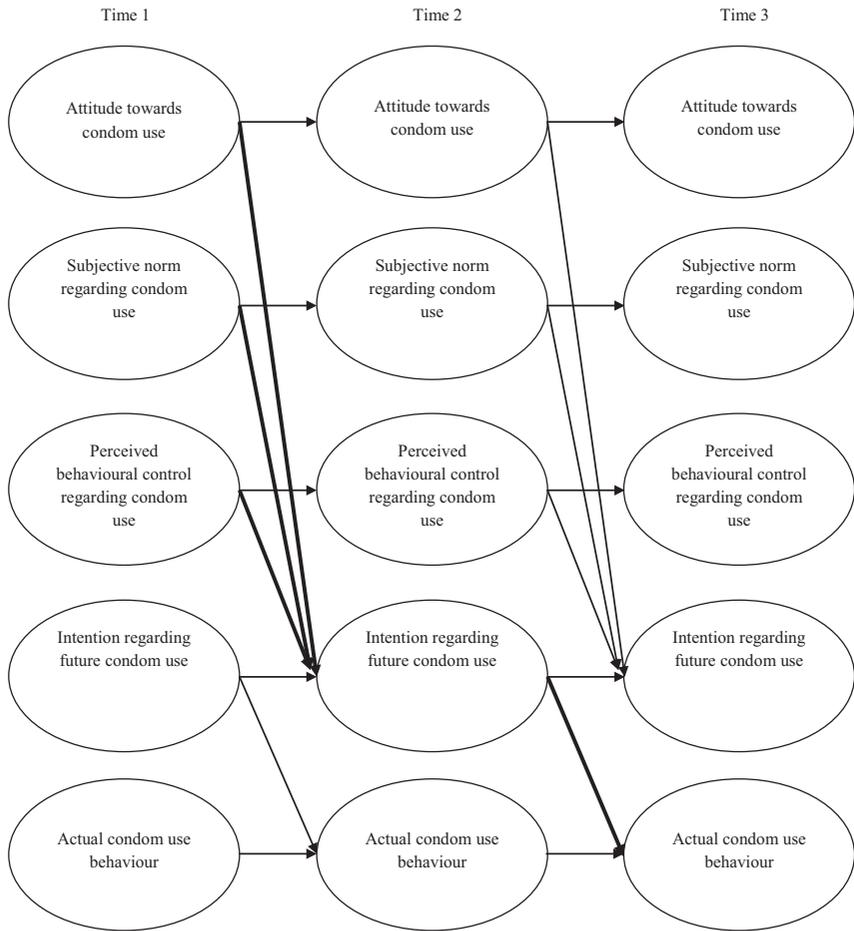


FIGURE 1. Hypothesised longitudinal model of the theory of planned behaviour's (TPB) standard constructs. The three cross-lagged paths coming out of Time 1 *attitude*, *subjective norm*, *perceived behavioural control* respectively depicted by the three boldfaced downwardly sloped lines to Time 2 *intention* and the single cross-lagged path emanating out of Time 2 *intention* depicted by the single boldfaced downwardly sloped line to Time 3 *actual condom use behaviour* represent the hypotheses of this study. For ease of reading, indicators, error terms, and disturbance terms are not shown.

983 original participants, 956 and 835 provided the data at Time 2 and Time 3 assessments, respectively.

Surveys were completed in classrooms on the school compound. Participants completed assent or consent forms depending on their self-declared age. Because

the majority of the students lived on the school compound, far away from their parents or guardians, and were fed by school authorities, and also because they were not allowed to use cell phones on the school compound, school authorities liaised with the school's parent-teacher association (PTA) to waive parental consent to enable interested students aged 14 to 17 years, who were not legally eligible to sign consent themselves, to participate in the study. Permission, informed consent and assent were obtained only once at the first assessment and had a prospective effect on subsequent assessments.

All participants were provided with instructions to help them generate their own alpha-numeric string identifiers on top of each survey they completed. These alpha-numeric string identifiers were aimed at enabling the research team to match the responses of the participants across all three waves of data collection. However, because some participants failed to generate their own alpha-numeric string identifiers, and because other participants provided incomplete alpha-numeric string identifiers or alpha-numeric string identifiers that differed from wave to wave, only a total of 684 surveys with correct alpha-numeric string identifiers were matched across the three waves of data collection. And because we used only cases that we were able to match across time, the sample size was reduced from 983 to 684, representing an overall retention rate of 69.6 per cent for the main analyses. Using Jackson's (2003) ratio of observations (N) to model parameters to be estimated (q) procedure of ($N:q = 20:1$; i.e. 20 observations per one estimated parameter), our retained sample size ($N = 684$) was deemed adequate for performing the confirmatory and structural analyses with the maximum likelihood estimation. In addition, a post-hoc power analysis in G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) indicated that with an estimated population effect size of (0.30; medium) and significance level of (.05), the retained sample size of 684 was enough to provide us with sufficient statistical power (.99) to detect correlational effects.

The current analyses relate to the 684 matched sample ($n = 335$ males; $n = 349$ females). Participants were between the age range of 14 and 20 years. About 418 of the matched sample were *boarding students* (i.e. students who lived on the school compound and were fed by the school) and 266 were *day students* (i.e. students who lived at home while attending school). This study was approved by the Institutional Review Board of the Noguchi Memorial Institute for Medical Research (#034/12-13), University of Ghana and by the Health Ethics Research Committee of Stellenbosch University (#S12/06/179), South Africa.

Measures

Attitudes towards Condom Use. Five items adapted from previous research (Basen-Engquist et al., 1999; Carmack & Lewis-Moss, 2009) assessed participants' attitudinal beliefs about condom use. Sample items included "I believe condoms should always be used if a person my age has sex", and "I believe

condoms should always be used if a person my age has sex, even if the two people know each other very well.” Response scale for the items ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Scale responses were scored such that higher scores indicated more favourable attitudinal beliefs about condom use. Composite mean score, standard deviation, and coefficient alpha for the attitudes towards condom use were, Time 1 ($M = 5.64$, $SD = 0.06$, $\alpha = .64$); Time 2 ($M = 5.72$, $SD = 0.13$, $\alpha = .66$); and Time 3 ($M = 5.97$, $SD = 0.15$, $\alpha = .69$).

Subjective Norms Regarding Condom Use. Five items adapted from previous research (Basen-Engquist et al., 1999; Carmack & Lewis-Moss, 2009) assessed participants’ perception of descriptive normative influences on them regarding condom use. Sample items included “Most of my friends believe condoms should always be used if a person my age has sex, even if the two people trust each other very well”, and “Most of my friends will say ‘no’ to sex if a boyfriend or girlfriend won’t use a condom.” Response scale for the items ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Scale responses were scored such that higher scores indicated greater perceived normative influence and motivation to comply with peer norms regarding condom use. Composite mean score, standard deviation, and coefficient alpha for the subjective norms regarding condom use were, Time 1 ($M = 5.55$, $SD = 0.04$, $\alpha = .62$); Time 2 ($M = 5.66$, $SD = 0.15$, $\alpha = .66$); and Time 3 ($M = 5.82$, $SD = 0.03$, $\alpha = .71$).

Perceived Behavioural Control over Condom Use. Four items adapted from previous research (Carmack & Lewis-Moss, 2009; Jemmott et al., 2007) assessed participants’ perceived behavioural control over condom use. Sample items included “I can use a condom correctly”, and “I can get my boyfriend or girlfriend to use a condom, even if he or she doesn’t want to do so.” Response scale for the items ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Scale responses were scored such that higher scores reflected a greater perceived efficacy or controllability over condom use. Composite mean score, standard deviation, and coefficient alpha for the perceived behavioural control over condom use were, Time 1 ($M = 5.25$, $SD = 0.90$, $\alpha = .67$); Time 2 ($M = 5.43$, $SD = 0.23$, $\alpha = .66$); and Time 3 ($M = 5.66$, $SD = 0.14$, $\alpha = .75$).

Behavioural Intentions towards Future Condom Use. Six items adapted from previous research (DeHart & Birkimer, 1997) assessed participants’ intentions to use condoms in the future (i.e. over the coming three months). Sample items included “I am determined to use condoms in the next 3 months, if I have sex”, and “I planned to use condoms, if I were going to have sex in the next 3 months.” Scale responses were scored such that higher scores indicated more favourable intentions towards condom use over the next three months. Response scale for the items ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Composite mean score, standard deviation, and coefficient alpha for the

intentions to use condoms were, Time 1 ($M = 5.59$, $SD = 0.19$, $\alpha = .78$); Time 2 ($M = 5.74$, $SD = 0.18$, $\alpha = .78$); and Time 3 ($M = 5.85$, $SD = 0.13$, $\alpha = .84$).

Self-Reported Condom Use Behaviour. Seven items adapted from previous research (Holland & French, 2012; Walsh, Senn, Scott-Sheldon, Venable, & Carey, 2011) assessed participants' self-reported condom use over the past three months. Multiple items that sought to tap relevant aspects of condom use such as condom use frequency (e.g. "How often have you had sex with your regular boyfriend/girlfriend with a condom in the past 3 months?"), condom non-use frequency (e.g. "How often did you refuse to have sex with a partner because they would not use a condom in the past 3 months?"), and type of partners (e.g. "How often have you had sex with someone who is not your boyfriend/girlfriend (casual sex) with a condom in the past 3 months?") were used in this study. The response scale for this construct ranged from 1 (*never*) to 7 (*all the time*). Scale responses were coded such that higher scores indicated greater self-reported condom use behaviour over the past three months. Composite mean score, standard deviation, and coefficient alpha for the self-reported condom use behaviour were, Time 1 ($M = 2.91$, $SD = 0.14$, $\alpha = .88$); Time 2 ($M = 3.06$; $SD = 0.19$, $\alpha = .90$); and Time 3 ($M = 3.33$, $SD = 0.15$, $\alpha = .89$).

RESULTS

Preliminary Analyses

To test for attrition effects, we compared participants who completed all three waves of data (completers) with those who dropped out after Time 1 and those who dropped out after Time 2 (attriters). Taking a pair of waves, we defined attriters as those participants who provided data at Time 1 but not at Time 2, and then those who provided data at Time 1 but not at Time 3, by creating a missing data indicator. We ran two multivariate analyses of variance on the continuous variables, using the missing data indicator as a grouping variable. We then ran two binary logistic regression analyses on the categorical variables, using the missing data indicator as an outcome variable.

Continuous Variables. Attrition analyses revealed significant differences between the longitudinal sample (completers) and those who dropped out after Time 1 (attriters), Wilks' $\lambda = .961$, $F(5, 975) = 7.97$, $p < .001$, partial $\eta^2 = .04$. However, there were no significant differences between completers and Time 2 attriters, Wilks' $\lambda = .996$, $F(5, 976) = 815$, $p = .539$, partial $\eta^2 = .004$. An inspection of the univariate differences between completers and Time 1 attriters, using a Bonferroni adjusted alpha level of ($p < .01$), showed that only subjective norm, $F(1, 979) = 16.80$, $p < .001$, partial $\eta^2 = .02$; perceived behavioural

control, $F(1, 979) = 27.57$, $p < .001$, partial $\eta^2 = .03$; intention, $F(1, 979) = 23.29$, $p < .001$, partial $\eta^2 = .02$; and condom use behaviour, $F(1, 979) = 9.55$, $p < .01$, partial $\eta^2 = .01$, reached statistical significance. As per the Bonferroni adjusted alpha level, there were no significant univariate differences between completers and Time 1 attriters in attitudes towards condom use, $F(1, 979) = 4.81$, $p = .028$, partial $\eta^2 = .01$.

Moreover, inspection of the mean scores indicated that completers scored slightly higher on subjective norms ($M = 46.38$, $SD = .62$) than did Time 1 attriters ($M = 43.63$, $SD = .62$). Completers perceived slightly greater control over condom use ($M = 51.88$, $SD = .34$) than did Time 1 attriters ($M = 47.26$, $SD = .81$). In addition, completers possessed slightly greater intentions towards condom use ($M = 46.38$, $SD = .30$) than did Time 1 attriters ($M = 42.62$, $SD = .72$), and completers reported slightly more condom-protected sexual behaviour ($M = 30.26$, $SD = .50$) than did Time 1 attriters ($M = 26.29$, $SD = 1.18$). We note that despite the significant univariate differences, Cohen's (1988) effect size calculation criteria showed that these differences were small, suggesting that completers did not differ significantly from Time 1 attriters. As can be expected, our attrition analyses seemed to indicate that data were missing at random.

Categorical Variables. Logistic regression analyses, using the missing data indicator as outcome variable and gender, age, and student status (day or boarding) as predictor variables, distinguished between completers and Time 1 attriters $\chi^2(3) = 14.89$, $p = .002$. Only age made a significant contribution to the model ($p = .001$). Participant gender ($p = .377$) and student status (day or boarding; $p = .099$) did not contribute significantly to the model. Compared with Time 1 attriters, completers were 2.14 times more likely to be older (age; odds ratio (OR) = 2.14, 95% CI [1.39, 3.28], $p = .001$). However, there were no significant differences between completers and Time 2 attriters, $\chi^2(3) = 5.27$, $p = .153$.

Further, the matched sample ($N = 684$) was compared with the full Time 1 sample ($N = 983$) along the continuous and categorical variables of interest in this research. Multivariate analysis of variance showed that the matched sample did not differ significantly from the full Time 1 sample, Wilks' $\lambda = .990$, $F(5, 977) = 1.93$, $p = .087$, partial $\eta^2 = .01$. In addition, logistic regression revealed a non-significant difference between the matched sample and the full Time 1 sample along our categorical variables of gender, age, and student status (day or boarding), $\chi^2(3) = 4.61$, $p = .203$.

Following the attrition analyses, we first screened the study variables for normality at each time point, using West, Finch, and Curran's (1995) cut-off criteria of skewness (-2.00 and $+2.00$) and of kurtosis (-7.00 and $+7.00$) in IBM SPSS Statistics (v20). All variables under consideration were normally distributed. Second, we checked construct dimensionality at each time point by conducting

exploratory factor analyses, using maximum likelihood estimation. Each construct demonstrated adequate unidimensionality at each time point. We then used item-parcelling (Little, Rhemtulla, Gibson, & Schoemann, 2013) to reduce the number of items on scales with more than four items. Bivariate correlations were examined across time. Generally, items demonstrated significant intra-construct correlations. The correlation matrices are available from the corresponding author on written request.

Main Analyses

Latent Variable Structural Equation Model. All structural equation analyses were conducted in Mplus (v6.0) with maximum likelihood robust (MLR) estimation. As noted earlier, the monotone pattern of drop-out in this study coupled with the results from our attrition analyses suggested that data were missing at random. Research has shown that when data are missing at random, the full information maximum likelihood (FIML) estimation provides unbiased parameter estimates (Enders, 2001). Missing data were handled using the FIML estimation in Mplus. Parameter estimates were calculated using robust maximum likelihood (MLR) estimation.

We conducted all model comparisons with the Satorra-Bentler scaled chi-square difference test (Bryant & Satorra, 2012). In accordance with Anderson and Gerbing's (1988) two-step approach, we first fitted the longitudinal measurement model and then fitted the longitudinal structural model. We used multiple goodness-of-fit indices to determine model fit: chi-square test statistic (χ^2) with degrees of freedom, chi-square/degrees of freedom ($\chi^2/df < 3.0$) ratio, comparative fit index (CFI $\geq .95$), root mean square error of approximation (RMSEA $< .07$) with confidence interval, and the standardised root mean square residual (SRMR $< .05$). We did not carry out any suggested model modifications in these structural analyses.

Longitudinal Measurement Model. We fitted the longitudinal measurement model including all observed and latent variables across time, using longitudinal confirmatory factor analysis (CFA; Little, Preacher, Selig, & Card, 2007). The longitudinal measurement model demonstrated adequate measurement across time, χ^2 (1102, $N = 684$) = 1850.95, $p < .001$, $\chi^2/df = 1.68$, CFI = .949, RMSEA = .032; 90% CI [.029, .034]; SRMR = .040, suggesting that the hypothesised structural relationships among the latent constructs of the theory of planned behaviour could be tested. All factor loadings were significant at ($p < .001$).

Factorial Invariance Model. Invariance constraints (Widaman, Ferrer, & Conger, 2010) were imposed by constraining the factor loadings for the respective indicators of a given construct to equality over time. The factorial invariance model showed a good fit to the data, χ^2 (1126) = 1850.95, $p < .001$, $\chi^2/$

$df = 1.67$, CFI = .949, RMSEA = .031; 90% CI [.029, .034], SRMR = .042. A comparison between the factorial invariance model and the longitudinal CFA model, using the Satorra-Bentler scaled chi-square difference test, showed that the factorial invariance model did not differ significantly from the longitudinal CFA model, $\Delta\chi^2(24) = 21.75$, $p > .05$.

Longitudinal Structural Model of the Theory of Planned Behaviour. Using the better-fitting longitudinal measurement model (i.e. the model with partial measurement invariance) as the starting point, a series of longitudinal structural models was fitted to the data. The fitted longitudinal models addressed questions of direct effects—autoregressive effects and cross-lagged effects. The cross-lagged effects constitute the longitudinal hypotheses of the current analyses.

Autoregressive longitudinal structural model of the TPB: To assess autoregressive stationarity among the five TPB constructs under consideration over time, a series of increasingly restrictive autoregressive models was fitted to the data (see Table 1). These models set various equality constraints on the within-construct relationships over time. The best-fitting longitudinal autoregressive structural model exhibited partial stationarity and showed acceptable model fit, $\chi^2(1195) = 1996.59$, $p < .001$, $\chi^2/df = 1.67$, CFI = .945, RMSEA = .031; 90% CI [.029, .034], SRMR = .053 (see Figure 2).

In the best-fitting autoregressive structural model, the within-construct relationships between attitudes and subjective norms were constrained to equality with one another over time, whereas the within-construct autoregressive relationship of behaviour was constrained to equality over time. The within-construct autoregressive relationships of perceived behavioural control and intentions were freely estimated over time. This is because it was not possible to achieve acceptable model fit by imposing within-construct equality constraints on perceived behavioural control and intentions over time.

Cross-lagged longitudinal structural model of the TPB: The cross-lagged structural paths that constituted the longitudinal hypotheses of the current analyses were added to the best autoregressive longitudinal model illustrated in Figure 2. These cross-lagged structural paths test whether, beyond the within-construct autoregressive effect that each TPB construct has on itself over time, there also exist between-construct (cross-lagged) relationships among the latent constructs of the TPB over time. To test the cross-lagged longitudinal structural effects (i.e. longitudinal hypotheses), a freely estimated cross-lagged longitudinal model was first fitted to the data. This model demonstrated adequate fit, $\chi^2(1187) = 1977.00$, $p < .001$, $\chi^2/df = 1.67$, CFI = .946, RMSEA = .031; 90% CI [.029, .034], SRMR = .050.

Next, to establish parsimony all cross-lagged structural paths in the longitudinal model were constrained to between-construct equality across time. This constrained cross-lagged longitudinal structural model described the data well, $\chi^2(1191) = 1985.45$, $p < .001$, $\chi^2/df = 1.67$, CFI = .946, RMSEA = .031; 90%

TABLE 1
Comparison between Autoregressive and Cross-lagged Longitudinal Models

Model	Model fit	Model comparisons	Corrected chi-square difference test
1a	$\chi^2(1191) = 1989.53^{***}$; CFI = .95; RMSEA = .031; SRMR = .055	1b vs. 1a	$\Delta\chi^2(5) = 18.20, p < .05$
1b	$\chi^2(1196) = 2018.34^{***}$; CFI = .94; RMSEA = .032; SRMR = .053	1c vs. 1a	$\Delta\chi^2(4) = 10.57, p < .05$
1c	$\chi^2(1195) = 2007.52^{***}$; CFI = .95; RMSEA = .032; SRMR = .053	1d vs. 1a	$\Delta\chi^2(3) = 7.16, p > .05$
1d	$\chi^2(1194) = 1997.44^{***}$; CFI = .95; RMSEA = .031; SRMR = .053	1e vs. 1d	$\Delta\chi^2(1) = .37, p > .05$
1e	$\chi^2(1195) = 1996.59^{***}$; CFI = .95; RMSEA = .031; SRMR = .050		
2a	$\chi^2(1187) = 1977.00^{***}$; CFI = .95; RMSEA = .031; SRMR = .050	2b vs. 2a	$\Delta\chi^2(4) = 6.04, p > .05$
2b	$\chi^2(1191) = 1985.45^{***}$; CFI = .95; RMSEA = .031; SRMR = .051	2b vs. 1e	$\Delta\chi^2(4) = 10.04, p < .05$

Note: CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardised root mean square residual. 1a = autoregressive model (freely estimated theory of planned behaviour (TPB) model relationships); 1b = autoregressive model (within-construct equality constraints for all five TPB components); 1c = autoregressive model (within-construct equality constraints for attitude, subjective norm, intention, and behaviour with perceived behavioural control freely estimated); 1d = autoregressive model (within-construct equality constraints for attitude, subjective norm, and behaviour with intention and perceived control freely estimated); 1e = autoregressive model (within-construct equality constraints for behaviour, with between-constraints for attitude and subjective norm, and intention and perceived control freely estimated). 2a = cross-lagged structural model (all five TPB components freely estimated); 2b = cross-lagged structural model (within-construct equality constraints for all five TPB components).

^a How to determine which comparison model describes the data well: (a) when you compare two versions of a model with one being less restrictive (has no equality constraints, freely estimated) and the other being more restrictive (has equality constraints) from the same category (e.g. autoregressive models), the more restrictive model should yield a non-significant *p*-value (*p* > .05) for the model fit to be considered acceptable, and (b) when you compare two models from two different categories (e.g. autoregressive model versus cross-lagged structural model) the model that improves model fit (*p* < .05) is the one to be accepted.

****p* < .001; all relative χ^2 statistic < 3.1; *N* = 684.

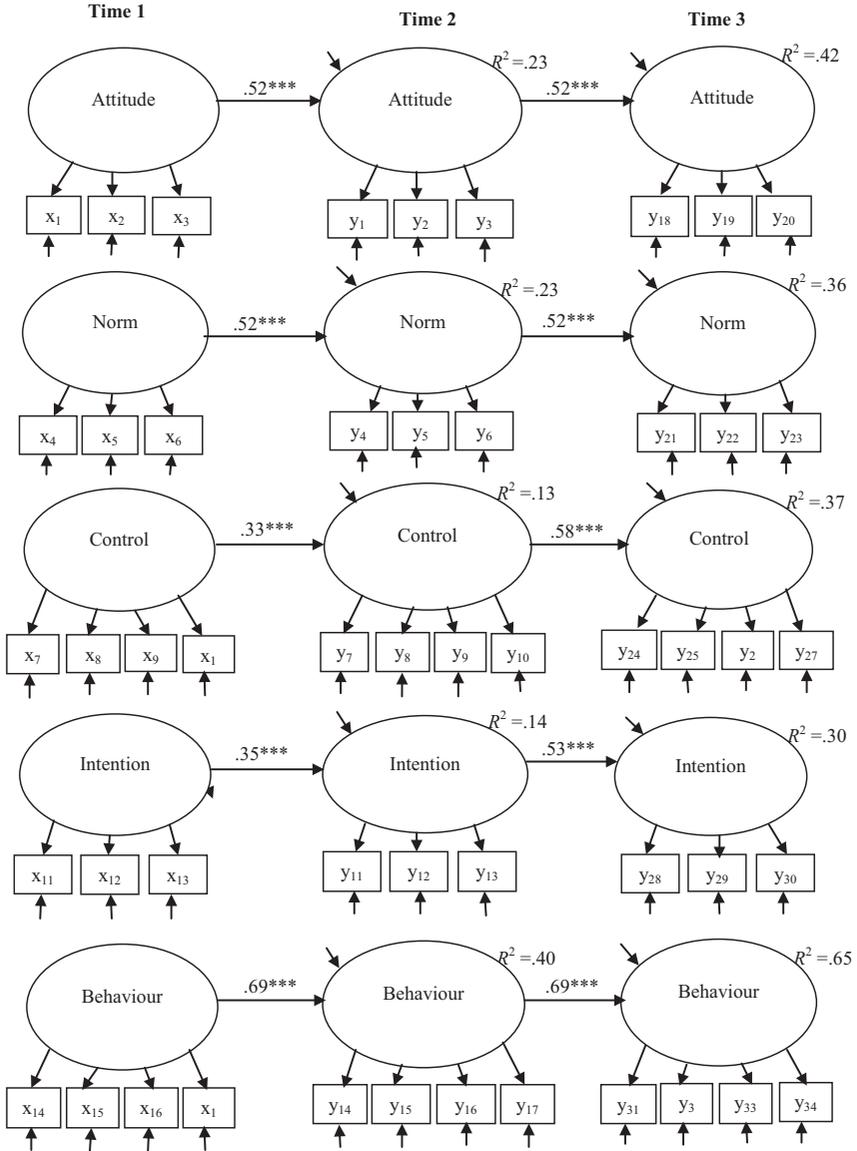


FIGURE 2. Autoregressive longitudinal structural model showing unstandardised parameter estimates and explained variances. For ease of reading, within-wave correlations among the error terms, disturbance terms, and within-wave between-construct correlations are not shown. Model fit: $\chi^2 (1195, N = 684) = 1996.59, p < .001$, relative $\chi^2 = 1.67$, comparative fit index = 0.945, root mean square error of approximation [90% CI] = 0.031 [0.029, 0.034], standardised root mean square residual = 0.053. * $p < .05$; *** $p < .001$.

CI [.029, .034], SRMR = 0.051. Compared with the freely estimated cross-lagged longitudinal structural model, the Satorra-Bentler scaled χ^2 -difference test revealed that the constrained cross-lagged longitudinal model did not differ significantly from the freely estimated model, $\Delta\chi^2(4) = 6.04, p > .05$ (see Table 1 [2b vs. 2a]). Further, a comparison between the best cross-lagged longitudinal structural model and the best autoregressive longitudinal structural model showed that the best cross-lagged longitudinal structural model fitted the data significantly better than did the best autoregressive longitudinal structural model, $\Delta\chi^2(4) = 10.04, p < .05$ (see Table 1 [2b vs. 1e]).

The results of the best cross-lagged longitudinal structural model suggest that the hypothesised longitudinal structural relationships between the theory of planned behaviour's constituent components achieved limited support (see Figure 3). Specifically, the path from attitudes towards condom use at Time 1 to intentions to use condoms at Time 2 was statistically significant ($b = .11, p < .05$), even after controlling for prior effects of intentions to use condoms at Time 1. On the contrary, the specific path from subjective norms regarding condom use at Time 1 to intentions to use condoms at Time 2 was not statistically significant ($b = .06, p = .261$).

Similarly, the specific path from perceived behavioural control over condom use at Time 1 to intentions to use condoms at Time 2 did not reach statistical significance ($b = -.03, p = .537$), at least after controlling for prior levels of intentions to use condoms at Time 1. The path from intentions to use condoms at Time 2 to self-reported condom use behaviour at Time 3 was nonsignificant ($b = .04, p = .318$), at least after controlling for prior levels of self-reported condom use behaviour at Time 2. On the basis of these results, the longitudinal mediation hypothesis (i.e. Hypothesis 3) of the current study was not supported. Despite the limited support obtained for the longitudinal structural relationships postulated by the theory of planned behaviour, the cross-lagged longitudinal structural model accounted for a substantial portion of the variance in attitudes towards condom use (Time 2: $R^2 = 24\%$, Time 3: $R^2 = 44\%$), subjective norms regarding condom use (Time 2: $R^2 = 24\%$, Time 3: $R^2 = 38\%$), perceived behavioural control over condom use (Time 2: $R^2 = 13\%$, Time 3: $R^2 = 38\%$), intentions to use condoms (Time 2: $R^2 = 15\%$, Time 3: $R^2 = 31\%$), and self-reported condom use behaviour (Time 2: $R^2 = 40\%$, Time 3: $R^2 = 65\%$) over time.

DISCUSSION

Pathway between Attitude and Intention

This study simultaneously tested the theory of planned behaviour's (TPB) utility in explaining adolescent condom use over time. Overall, the results demonstrated

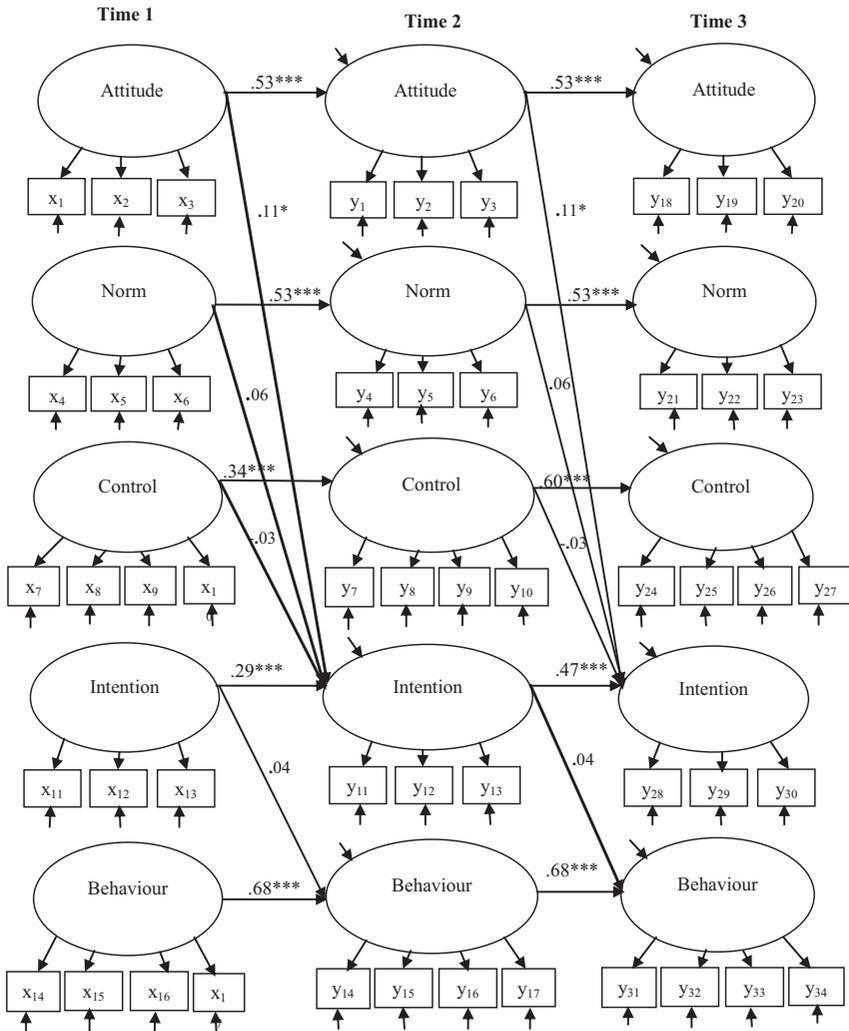


FIGURE 3. Cross-lagged longitudinal model showing structural paths with main longitudinal hypotheses depicted by downwardly sloped paths between theory of planned behaviour components across time (bold). All structural paths are indicated. Unstandardised parameter estimates are reported. Model fit: $\chi^2(1191) = 1985.45, p < .001, \chi^2/df = 1.67$, comparative fit index = .946, root mean square error of approximation = .031; 90% CI [.029, .034], standardised root mean square residual = .051. * $p < .05$; *** $p < .001$; $N = 684$.

only limited support for the postulated longitudinal relationships of the TPB's constituent components. Consistent with the TPB, attitudes towards condom use at Time 1 were longitudinally associated with intentions to use condoms three

months later at Time 2, and attitudes towards condom use at Time 2 were longitudinally associated with intentions to use condoms another three months later at Time 3. This result is consistent with a recent two-wave panel study in sub-Saharan Africa that found attitude to be the strongest predictor of intentions to use condoms among young people (Molla, Åstrøm, & Brehane, 2007). The current finding is consistent with a systematic review among African adolescents that found attitudes to be a more reliable predictor of condom use intentions, and behavioural intentions to be a poor predictor of actual behaviour (Paul-Ebhohimhen, Poobalan, & van Teijlingen, 2008).

In addition, a previous meta-analysis revealed that attitude is an important predictor of intentions to use condoms (Albarracín, Johnson, Fishbein, & Muellerleile, 2001). Similarly, our results are consistent with findings from other previous longitudinal studies using structural equation modelling with high school adolescents (Beadnell et al., 2007). Moreover, the current finding regarding attitude–intention correspondence compared favourably with those reported in a longitudinal investigation by Morrison, Baker, and Gillmore (1998) and by Reinecke, Schmidt, and Ajzen (1996), using the theory of planned behaviour's (TPB) framework. To our knowledge, as far as the TPB sexual behaviour literature is concerned, this is the first research to examine the longitudinal association between the TPB's components with three waves of data, using latent variable structural equation modelling. Consequently, the finding relative to attitude strength would contribute significantly to our current knowledge of attitude–intention correspondence.

Pathway between Subjective Norms and Intention

In the present analyses, the longitudinal pathways between subjective norms and behavioural intentions were not supported. And neither were the longitudinal pathways between perceived behavioural control and behavioural intentions. The current findings regarding subjective norms and perceived behavioural control contrast with those of Beadnell et al. (2007). The differences in these results may reflect a methodological difference between their research and the present study. This is because Beadnell et al.'s (2007) research was a two-wave panel study with data collection spaced one year apart, predicting the intentions to have sex, compared to the present study that used three waves of data collection spaced three months apart, predicting the intentions to use condoms. Also, Beadnell et al. (2007) assessed intentions to have sex only at Time 1 but not at Time 2, as compared to the present study that assessed all TPB model constructs at all three time points.

In this study, items measuring the subjective norm construct focused on descriptive norms, specifically peer norms (what friends say and do) and not on injunctive norms (what significant others expect the adolescent to do). It is possible that descriptive peer norms are not salient for condom use intentions and

behaviour for the current sample. Correspondingly, there is evidence that the cultural and societal restrictions on adolescent sexual behaviour in Ghana are making sexual relations among young people strictly private and confidential affairs (Darteh, Doku, & Esia-Donkoh, 2014).

Pathway between Perceived Behavioural Control and Intention

The current study did not confirm the longitudinal relationship between perceived behavioural control over condom use and intentions to use condoms. This result is comparable to the findings of a previous panel study (Reinecke et al., 1996). A possible explanation for the nonsignificant longitudinal associations between perceived behavioural control and intentions may be traced to the dyadic nature of sexual behaviour. That is, since sexual intercourse involves two people, it is possible for one partner to perceive greater control to use condoms, but the non-availability of a sex partner or even failure to convince a sex partner regarding the advantages of condom use may prevent this perception of control from being enacted. Therefore, one's sex partner's cooperation is a central aspect of condom negotiation and may serve to reinforce the notion held by sexual behaviour researchers that condom use requires more than an individual sex partner's volitional control.

Pathway between Intention and Behaviour

Moreover, the hypothesised longitudinal relationship between intentions to use condoms and condom use behaviour was not supported in the present study. Although this finding is contrary to the postulate of the TPB, it is consistent with other structural equation modelling investigations of condom use that reported nonsignificant longitudinal associations between intentions and behaviour (Carvajal, Estrada, & Estrada, 2005). The Ghanaian high school system proscribes adolescent sexual behaviour. For example, high school students are not allowed to use cell phones while in school, and pregnant students are often excluded from school (Ghana News Agency, 2014). It is most likely that students with intentions to engage in protected sexual behaviour may not have adequate time to undertake preparatory behaviours (such as purchasing condoms for an intended sexual activity), for fear this preparatory behaviour may expose them to school authorities. This situation may serve to attenuate the effect of behavioural intentions to use condoms on actual condom use behaviour. Relatedly, in an attempt to explain why some people act on their intentions and others don't, Fishbein, Hennessy, Yzer, and Douglas (2003) noted that "although intention is viewed as the primary determinant of behaviour, the model recognizes that a lack of skills (or abilities) and/or environmental constraints may prevent one from acting on his or her intentions. Thus, intentions alone are not the sole

determinant of behaviour, and different factors may attenuate or enhance the intention/behaviour relationship” (p. 3).

Implications of Results

The current results suggest that school-aged adolescents in eastern Ghana possess attitudinally controlled intentions. Consequently, it seems clear that sexual risk reduction programmes in Ghana that target the antecedents of attitude formation and activation may help strengthen positive attitudes towards condom use. Having positive attitudes towards condom use may be an important first step for sexual behaviour modification. This study raised theoretical questions relating to the construct validity of some of the TPB components. In the present study, attitudes explained variance in intentions to use condoms over time, as postulated by the TPB. Conversely, subjective norms and perceived behavioural control each failed to predict intentions to use condoms over time, contrary to the postulate of the TPB. Also, there was no longitudinal association between intentions to use condoms and actual condom use behaviour. These nonsignificant results are inconsistent with the postulated model relationships of the TPB. In accordance with the current results, other findings from an experimental test of the TPB (using a different health behaviour) questioned the postulated relations between intentions and behaviour (Sniehotta, 2009; see also Sniehotta, Presseau, & Araújo-Soares, 2014). Thus, our results seem to call into question the sufficiency assumption of the TPB, and may provide opportunities for theory refinement.

Empirical questions raised by our results reflect the methodological quality of previous tests of the TPB in the extant sexual behaviour literature. The limited support obtained for the postulated relationships of the TPB in the current analyses cannot be attributed to measurement artefacts. This is because our longitudinal measurement model and the factorial invariance model both fitted the data well. Again, the latent variables of the TPB exhibited adequate autoregressive stationarity over time. From an empirical perspective, it seems plausible that the current results contrast with most previous findings reported in the TPB test literature because of variations in study design, measurement, and in analytic strategy. Strikingly, Reinecke et al. (1996) evaluated their longitudinal research findings by concluding that “had we relied solely on the cross-sectional data available at the end of the 12-month period, we would have been led to the conclusion that the theory of planned behaviour accounts for a substantial amount of variance in intention to use condoms with new sex partners, as well as in actual condom use” (p. 765).

Limitations and Future Research

This study used self-report measures and a convenience sampling technique. It also used global constructs of the TPB to investigate adolescent condom use.

The TPB test literature may benefit from future research in Ghana that employs differentiated/decomposed constructs of the TPB. Moreover, we did not carry out an elicitation study to identify condom use relevant beliefs as recommended by Ajzen (1991). Instead, general measures of adolescent condom use, obtained from previous research, were used to assess participants' intentions to use condoms and condom use behaviour. It is possible that the use of the general measures, global constructs, and the non-use of an elicitation study accounted for the fairly low internal consistency reliabilities, for example, attitudes ($\alpha = .64$, at Time 1) and subjective norms ($\alpha = .62$, at Time 1), reported in this study. However, we note that the latent variable structural modelling procedures used in this study took into account the measurement error associated with items on each scale as well as the scale as a whole by way of the disturbance terms and modelled them. Thus, the fairly low reliability coefficients reported were not expected to bias the parameter estimates.

In addition, methodologists have recently suggested that longitudinal data may provide opportunities for disaggregating between-person and within-person effects (see, for example, Curran & Bauer, 2011; Hoffman & Stawski, 2009). For theoretical and methodological reasons, the current research did not use advanced modelling statistical techniques such as multilevel models or latent growth statistical models to elucidate within-person associations (stability) from between-person effects (change). We note that within-person effects may not occur in a vacuum. Thus, there appears to be the need for future research to overcome this limitation by considering the capabilities offered by multilevel and growth statistical models to clarify the dependencies associated with between-person and within-person effects in longitudinal autoregressive models. Further, although we believe that the participant attrition rate in this study emanated from a design issue, we suspect that the participant-generated alpha-numeric string identifier used to match the data across time in this study may have contributed to the reduction in the final sample size used in the analysis. We note that the errors associated with some of the identifiers on completed surveys may have emanated from the rather long string identifiers required of participants (i.e. between 10 and 15 strings). Future research should consider the possibility of using shorter string identifiers to help reduce participant errors.

Another possible limitation to note is the three months' time lag between measurement occasions used in this study. Reviews of the TPB literature indicated that time lags of three months were preferable and optimal (Noar, Cole, & Carlyle, 2006; see also Dormann & Griffin, 2015). However, given that the present participants were in-school youths, it would seem that a longer time lag may have been more appropriate to provide enough time for the effect of one variable on another to manifest (e.g. effect of intention on behaviour). Given the limited support obtained in the present study for the TPB components, future research may focus on clarifying the intention-behaviour correspondence longitudinally, using appropriate study designs and robust statistical techniques. This

research may further our current understanding of the psychosocial constraints preventing adolescents from acting on their intentions. Arguably, an immediate next step may be to replicate and validate the current findings in a sample of public high school students drawn from a cluster of schools in Ghana.

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