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Today I'll Use a Condom, But Who Knows about Tomorrow:

A Daily Process Study of Variability in Predictors of Condom Use

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Abstract

Most models of health behavior change applied to condom use behavior have focused on individual differences in theoretical constructs to explain condom use or non-use, while ignoring the possibility that day-to-day within-person changes in these constructs may contribute to understanding this behavior. Using a daily process approach, the present study investigated if condom use attitudes, self-efficacy and behavioral intentions vary day-to-day, if this within-person variability predicts behavior, and if negative affective states help to explain this variability. Sexually-active college students ($N = 116$) reported their current feelings of negative affect, prospectively reported their condom use attitudes, self-efficacy, and behavioral intentions and retrospectively reported their prior evening's sexual behaviors every evening for 30-days using a web-based structured daily diary. Within-person variability was found for each of the constructs. Within-person day-to-day changes in behavioral intentions and attitudes predicted the instances in which an individual would use a condom and daily negative affect partially explained within-person day-to-day changes in behavioral intentions and self-efficacy. Implications for models of health behavior change and for behavior change interventions are discussed.

Keywords

daily process; daily diary; condom use; intentions; attitudes; self-efficacy

Youth aged 15-25 are the age group with the highest rates of Sexually Transmitted Diseases (STDs) in the U.S. (CDC, 2005) accounting for an estimated half of all new STDs (Weinstock, Berman, & Cates, 2004). College women were one of the two groups, the other being female STD clinic attendees, with the highest prevalence of Human Papilloma Virus (HPV) in the U.S. (Revzina & Diclemente, 2005). Moreover, many college students do not report using condoms consistently (Kiene & Barta, 2003; Kiene & Barta, 2006; Kiene, Barta, Zelenski, & Cothran, 2005). Such behavior puts college students at risk not only for STDs but for Human Immunodeficiency Virus (HIV) as well as unintended pregnancy.

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In order to design effective interventions to increase condom use it is necessary to understand the factors that influence condom use behavior (Fisher & Fisher, 1992). Numerous studies have investigated the predictors of condom use and unprotected sex among college students (Bryan, Fisher, & Fisher, 2002; Fisher, Fisher, Misovich, Kimble, & Malloy, 1996; Smith & Stasson, 2000). These studies typically assess the predictors of condom use at one time point and at a second time point ask participants to recall their behavior during the prior 30 days to 3 months. This approach has methodological limitations including biases associated with recall such as recency and salience effects (Reis & Gable, 2000).

Researchers have begun investigating other health behaviors close to or in real time—measuring purported causes and outcomes as they occur or within 24 hours. This reduces recall decay and bias and allows for the temporal sequencing of predictors and behavior (Reis & Gable, 2000). Examining behaviors such as smoking, alcohol use, and health-related constructs such as stress, coping and affect close to real-time (e.g., Armeli, Carney, Tennen, Affleck, & O’Neil, 2000; Carney, Armeli, Tennen, Affleck, & O’Neil, 2000; Shiffman et al., 2002; Tennen, Affleck, Armeli, & Carney, 2000) has allowed researchers the opportunity to explore the co-occurrence of such behaviors and affective states, as well as variability in theoretical predictors of health behaviors. However, little research to date has investigated condom use as well as theoretical predictors of this behavior close to real time. Condom use requires a concerted effort on the part of the individual every time he or she has sex. College-students use condoms inconsistently, even within a 30-day time period (Kiene & Barta, 2003; Kiene & Barta, 2006; Kiene, Barta, Zelenski, & Cothran, 2005), which further highlights the need to examine the situational and intrapersonal circumstances surrounding sex that may vary greatly on a day-to-day basis. It is therefore worth considering if theoretical predictors of condom use such as attitudes and self-efficacy vary day-to-day. The present study addresses these gaps in the literature by examining the close to real time relationship between psychosocial and situational factors and condom use.

Models of behavior change have been quite successful at theorizing factors that predict condom use behavior (Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Albarracin et al., 2003). Theoretical models, such as the Theory of Reasoned Action (TRA: Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), the Theory of Planned Behavior (TPB: Ajzen, 1991), the Information-Motivation-Behavioral Skills Model (IMB: Fisher & Fisher, 1992), and Social Cognitive Theory (SCT: Bandura, 1994) predict protected and unprotected sex from social-cognitive factors including condom use information, motivation (attitudes, subjective norms, behavioral intentions), and self-efficacy to engage in condom-related behaviors (cf. perceived behavioral control in the TPB and behavior skills in the IMB).

Temporal Stability of Social-Cognitive Predictors of Condom Use

Previous research applying models of behavior change to the understanding of condom use has focused on stable individual differences in these social-cognitive factors. Specifically, individuals with more positive attitudes, stronger social norms, behavioral intentions, self-efficacy, and more risk-reduction information report more condom use (Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Albarracin et al., 2003). This body of research has devoted little attention the possibility that temporal stability, conceptualized as within-person day-to-day changes in some of these constructs, may play a role in predicting *when* an individual will use a condom or when unprotected sex will occur.

Temporal stability of constructs that predict behavior including attitudes, intentions, and self-efficacy has typically been conceptualized as the correlation between an individual’s score on the construct measured at two time points ranging from 2 weeks to 12 months. Temporal stability has been likened to strength in that it is a property of the construct (Sheeran &

Abraham, 2003) and has been tested as a moderator of the relationship between the construct and behavior (Doll & Ajzen, 1992; for a meta-analysis see Cooke & Sheeran, 2004). Specifically, temporal stability has been found to moderate attitude-behavior (e.g., Davidson & Jaccard, 1979), intention-behavior (e.g., (Sheeran & Abraham, 2003) and self-efficacy-behavior relationships (e.g., M. Conner, Sheeran, Norman, & Armitage, 2000) for a variety of behaviors.

Little consideration has been given to whether temporal stability for attitudes and behavioral intentions can be conceptualized as day-to-day changes, that is, will these constructs exhibit meaningful day-to-day variability? Studies from the smoking cessation literature have demonstrated that smoking abstinence self-efficacy varies day-to-day as well as between situational contexts (Gwaltney, Shiffman, & Sayette, 2005; Shiffman et al., 2000). These findings suggest that condom use self-efficacy may exhibit similar variability. If we conceptualize stability as day-to-day changes from an individual's own mean level of a construct, the question of how temporal stability relates to behavior then becomes: On days when an individual's scores on attitudes, self-efficacy and behavioral intentions are different from his or her own normal scores, will this deviation in score predict behavior? We might also wonder whether the effect of relative increases in attitudes and intentions on behavior would be the same for individuals with overall high vs. low scores on the social-cognitive constructs.

Psychological mechanisms underlying the temporal stability of social-cognitive predictors of condom use

While there have been several studies demonstrating the temporal variability of attitudes, behavioral intentions, and self-efficacy (e.g., Conner et al., 2000; Gwaltney, Shiffman, Balabanis, & Paty, 2005; Sheeran & Abraham, 2003; Shiffman et al., 2000), little research in the sexual behavior realm has investigated possible psychological mechanisms that may underlie this variability. That is, what psychological processes can explain temporal variability in condom use attitudes, intentions and self-efficacy? One explanation is that because condom use is an effortful behavior requiring self-control, factors influencing self-regulatory processes may also influence attitudes, intentions, and self-efficacy. Negative affect is an important factor influencing behavioral self-regulation (Jacobs, Prentice-Dunn, & Rogers, 1984; Kirschenbaum, Tomarken, & Humphrey, 1985; Muraven & Baumeister, 2000) that could, as a consequence, also lead to daily variability in attitudes, intentions, and self-efficacy. According to Baumeister and colleagues' Limited Strength Model (Muraven & Baumeister, 2000) dealing with negative affect depletes an individual's self-control resources. If an individual's self-control resources are depleted, the effort involved in using a condom, such as overcoming the desire to not use a condom or negotiating condom use with a partner, may be viewed as more challenging than when self-control resources are not depleted. Reduced self-control resources resulting from experiencing and dealing with negative affect may then change the way an individual assesses his or her ability to use a condom and change evaluations of and intentions to use a condom. Specifically, negative affect-induced self-control resource depletion might reduce an individual's self-efficacy to use a condom, make his/her attitudes toward using condoms more negative, and weaken his/her intentions to use a condom in the near future.

More broadly, negative affect has also been shown to influence information processing and evaluations in a variety of contexts (Isen, Shalcker, Clark, & Karp, 1978; Schwarz & Clore, 1983), which would suggest that negative affect may specifically bias appraisals of an individual's attitudes towards using condoms. In the Fishbein and Ajzen (1975) expectancy-value tradition, attitudes about using condoms contain behavioral beliefs and a positive or negative evaluation of the outcome of the behavior. Within this context the experience of

negative affect on a particular day may alter behavioral beliefs and outcome evaluations thus altering attitudes. For example, situational feelings of negative affect may be misattributed as negative feelings about an attitude object (Byrne & Clore, 1970). In this situation an individual would have more negative behavioral beliefs and more negative evaluations about using condoms leading to more negative attitudes about using condoms. Similarly, the affect-as-information model (Schwarz & Clore, 1983), would predict that the experience of negative affect could bias an individual's perceptions of how well he/she can engage in various condom-related behaviors and bias evaluations of using condoms and as a result weaken his/her intentions to use a condom. Furthermore, drawing on the reasoning of Sayette (1999) using Kunda's (1987; 1990) theory of motivated reasoning, the desire to reduce negative affective states by engaging in gratifying behaviors may influence the desirability of expected outcomes and thus influence attitudes about a particular behavior.

In summary, the Limited Strength Model (Muraven & Baumeister, 2000) suggests that self-efficacy may decrease resulting from feelings of negative affect and negative affect may also bias information processing and evaluations (Schwarz & Clore, 1983) thereby making attitudes more negative. Regarding now negative affect may specifically influence behavioral intentions, in the TRA behavioral intentions are a product of attitudes and subjective norms (Fishbein & Ajzen, 1975) as well as of self-efficacy in the TPB (Ajzen, 1991). Therefore, inasmuch as attitudes and self-efficacy may change in response to negative affective states, so too may behavioral intentions. Given the possible ways that negative affect may influence social-cognitive constructs, we propose that the daily experience of negative affect will partially explain day-to-day variability in condom use self-efficacy, attitudes, and as a result, behavioral intentions.

Research from other health behavior domains supports the role of negative affect in predicting changes in social-cognitive factors. Studies from the relapse prevention literature (e.g., smoking cessation) have demonstrated that self-efficacy is dynamic and changes in response to situational contexts including negative affective states (Gwaltney, Shiffman, Balabanis et al., 2005; Gwaltney, Shiffman, & Sayette, 2005). A recent study examining reports of intentions to comply with hypothetical cancer treatment found that behavioral intentions were significantly lower for those experiencing induced negative affect compared to those in an induced positive or neutral mood. Furthermore, individuals experiencing greater negative affect reported lower self-appraisals than did others (Schuettler & Kiviniemi, 2006). There is also experimental evidence that negative affect predicts lower personal health care self-efficacy (Salovey & Birnbaum, 1989). All of this taken together suggests that the experience of more negative affect on a particular day may lead to a decrease in condom use self-efficacy, more negative attitudes towards using condoms and a weakening of individuals' behavioral intentions to use a condom.

Current Study

The current daily diary study used a sample of sexually active college students to investigate the day-to-day within-person temporal stability of condom use attitudes, intentions, and self-efficacy and the extent to which temporal stability of these constructs predicts daily condom use behavior. We also investigated negative affective states as a possible explanation for day-to-day decreases in condom use, attitudes, intentions, and self-efficacy.

Specifically, we hypothesized that there would be within-person variability in condom use attitudes, intentions, and self-efficacy over the 30 day study. Second, we hypothesized that on days in which an individual's condom use attitudes were more negative and behavioral intentions and self-efficacy were weaker relative to his or her own average, that condom use would be less likely. Third, we hypothesized that day-to-day changes in condom use attitudes,

intentions, and self-efficacy would be partially explained by the experience of more negative affect. Regarding the second hypothesis we also wanted to explore if these within-person relationships were moderated by individual differences in the mean levels of these constructs over the 30-day study. That is, for example, would the effect of daily increases in behavioral intentions on the likelihood of condom use be different for individuals who had high mean behavioral intentions versus those who had low mean behavioral intentions?

Methods

Participants

A total of 222 college undergraduates participated in a larger study of daily experiences and health-related behaviors (e.g., alcohol consumption). Participants who had consumed alcohol in the past 30 days were recruited from the University of Connecticut's department of Psychology participant pool in which students sign-up online to participate in research studies. Recruitment took place during a 3 week period of one semester; all participants began the study at the same time. The sample is representative of college students in general as 70% of college students in a recent survey reported alcohol consumption in the prior 30-days (Johnston, O'Malley, & Bachman, 2003). Participants received research credit and a small cash incentive for their participation. From the 222 participants in the larger study we used data only from those who were sexually active during the 30 day study (N= 116). The sample for the present analysis consisted of 49 male and 67 female undergraduates average age 19.15 (SD = 1.51). A majority (88.9%) described themselves as White/European-American, 5.1% as Black or African-American, 3.4% as Asian-American, 1% as Latino/a or Hispanic, and 1.7% as another ethnicity. Sixty-five percent of these participants were currently in a self-defined "dating relationship" but all were unmarried. Demographic characteristics for the excluded (not sexually active) participants (N = 106) were comparable for ethnicity, but were slightly younger (M = 18.8, SD = .91), and a greater percentage were male (58% male, 41% female).

Procedure

During the daily reporting phase participants logged on to the website each day for 30 days between 2:30pm and 7:00pm to complete the structured daily diaries. Of the possible 3,480 daily diary days during the 30-day study, the 116 participants completed 79.43% of the possible days or 2,764 days. The mean number of days completed was 23.80 (SD = 6.13) and the range was 4 to 30.

Measures

Condom use attitudes—Using the following stem: "During the next 24-hours my partner and I using condoms during sexual intercourse would be. . ." three attitude dimensions were assessed using semantic differential response scales formatted on a 1 (*very bad*) to 5 (*very good*), 1 (*very worthless*) to 5 (*very valuable*), and 1 (*very unpleasant*) to 5 (*very pleasant*) scale (Misovich, Fisher, & Fisher, 1998). We averaged these three items to form participants' daily attitude score and then we averaged the daily score across the 30-days to form a mean attitude score. These items demonstrated acceptable day-level reliability as assessed by Cronbach's alpha at the beginning, middle, and end of the study; .87 at day 3, .93 at day 17 and .94 at day 30.

Self-efficacy of using condoms—Self-efficacy was assessed with 2 items beginning with the stem "If you were to have sexual intercourse during the next 24-hours..." followed by "how *hard* would it be for you to use a condom with your partner while under the influence of alcohol or drugs?" formatted on a 1 (*very hard*) to 5 (*very easy*) scale and "how *effectively* could you help your partner feel good about using condoms during sex?" formatted on a 1 (*very ineffectively*) to 5 (*very effectively*) scale (Misovich et al., 1998). We averaged these two items

to form participants' daily self-efficacy score and then we averaged the daily score across the 30-days to form a mean self-efficacy score. Self-efficacy was operationalized this way to be consistent with both the perceived behavioral control construct of the TPB (Ajzen, 1991) and the behavioral skills construct of the IMB Model (Fisher & Fisher, 1992). The behavioral skills construct of the IMB Model, in practice, is operationalized as an individual's sense of self-efficacy (perceived efficacy and perceived difficulty) to perform condom use related behaviors (Misovich et al., 1998). The specific self-efficacy items were selected from items used in a prior study in this population (Kiene & Barta, 2006) because they demonstrated overall lower means, thereby helping to avoiding possible ceiling effects observed among college-student populations (Kiene & Barta, 2003). Cronbach's alpha for these items at the beginning, middle, and end of the study was acceptable; .82 at day 3, .87 at day 17 and .84 at day 30.

Condom use behavioral intentions—Participants' behavioral intentions to use condoms if they had sex during the next 24 hours was assessed with 1 item measuring intentions to use condoms on a 1 (*very unlikely*) to 5 (*very likely*) scale. A participant's daily behavioral intention scores were averaged over the 30-day study to create their mean behavioral intention score.

Sexual behaviors—Participants self-reported whether or not they had sexual intercourse in the prior 24-hours. Individuals reporting sexual intercourse also answered *yes* or *no* to as whether or not they used a condom. Participants were also asked to describe the person in the sexual situation (even if they did not have sex) as either a casual or steady partner. Even though participants were asked to recall sexual behaviors that occurred up to 24-hours prior to reporting, concrete experiences such as sexual behavior are less susceptible to memory reconstruction bias and retrieval errors than are more transitory experiences such as affective states (Conner, Barrett, Tugade, & Tennen, 2007; Reis & Gable, 2000) and can therefore likely be reliably recalled in our chosen time frame.

Negative affect—Nine items were used to measure participant's feelings of negative affect at the time of reporting, 5 (*nervous, ashamed, guilty, hostile, and jittery*) of which were from the Positive and Negative Affect Schedule (PANAS, (Watson, Clark, & Tellegen, 1988). Two (*sad* and *bored*) of the remaining 4 items were drawn from Larsen and Diener's Mood Circumplex (1992), and the remaining 2 (*angry* and *dejected*) were added by the authors. The affect items were selected to represent 3 discrete moods/emotions: anxiety/hostility; sad/depressed; and anger/hostility. Participants indicated to what extent they felt each of these negative emotions 'right now' on a 1 (*not at all*) to 5 (*extremely*) scale. We computed the internal consistency at the day level for the negative affect items on 3 days representing the beginning (day 3), middle (day 17), and end (day 30) of the study. The day-level alphas were .89, .92, and .88 respectively.

Results

Descriptive Statistics

The aggregated means over the 30 day study for the within-person variables were: 3.78 (SD = 1.36) for attitudes, 3.72 (SD = 1.12) for self-efficacy, 3.48 (SD = 1.59) for behavioral intentions and 1.43 (SD = .40) for negative affect. These means for the social cognitive variables are comparable those reported in a study using a similar sample from the same University (Kiene & Barta, 2006). Participants on average reported 3.06 (SD = 2.19, range 1-11) sexual intercourse events with a condom and 5.25 (SD = 4.87, range 1-19) sexual intercourse events without a condom during the 30 day study. The majority (86%) of sexual events, with or without a condom occurred with partners considered to be steady partners. Of participants who reported more than 1 sex event during the study (n=101), 39% were inconsistent condom users, 22% never used condoms, and 39% always used condoms.

Within-Person Variability in Social Cognitive Variables

To examine our first hypothesis, we calculated the percentage of within-person variability, throughout the 30-day study, for the condom use attitudes, self-efficacy and behavioral intentions. Within-person and between-person variance components were obtained by estimating unconditional multilevel regressions with the variable of interest as the outcome. The within-person variance for all of the social cognitive variables was statistically significant as evaluated with a z-test ($p < .001$ for all tests). The percentage of total variability that was within-persons was 13.85% for attitudes, 14.65% for behavioral intentions, and 13.78% for self-efficacy. While statistically significant, the within-person variability for the social cognitive constructs was less than that observed for negative affect, where 47% of the total variability was within-person variability. Individuals who were inconsistent condom users displayed significantly more variability over the 30-day study in attitudes ($t_{78} = 32.44, p < .01$), intentions ($t_{78} = 19.32, p < .01$), and self-efficacy ($t_{78} = 32.44, p < .01$) than did individuals who always used condoms. There were no significant differences in within person variability on these constructs between inconsistent condom users and those who never used condoms.

Multilevel Modeling Analysis Approach

To examine our second and third hypotheses pertaining to day-to-day within-person covariability between (a) social-cognitive variables and condom use behavior and (b) negative affect and condom-related attitudes, self-efficacy, and behavioral intentions we conducted multilevel regressions using HLM6 (Bryk, Raudenbush, & Congdon, 2005). Multilevel analyses allow us to partition the variance into two sources: within-person day-to-day changes (Level 1) and between-person differences in the average levels of each of the variables over the 30-day study (Level 2). In the present analyses the within-person or Level 1 components for each variable are an individual's score on a particular variable for that day. The between-person or Level 2 component for each variable is an individual's mean for that variable calculated across the 30-days of the study. We are interested in the Level 1 within-person relationships between variables, that is, how day-to-day changes from an individual's own mean level affect the outcome variable. We are also interested in the effects of Level 2 variables on the Level 1 intercepts or how individual differences in the mean level of the variable affect the outcome. Finally, we are interested in the cross-level or moderating effects of Level 2 variables on the within-person (Level 1) relationships, that is, are there between-person differences in how within-person day-to-day changes affect the outcome? In all analyses the Level 1 variables were person-mean centered and the Level 2 variables were grand-mean centered. Intercepts and slopes were modeled as random effects initially and then residual variances for slopes that were not statistically significant were fixed to zero. Unit specific results were used for all analyses; logistic models are reported using odds ratios instead of beta weights.

Temporal sequencing of measures—Temporal sequencing of the social cognitive variables (measured with reference to the future 24-hours) and sexual behavior (assessed retrospectively for the prior 24-hours and then lagged back 1 day in the data file) was accomplished, ensuring that the social cognitive variables for a particular person-day were measured before any sexual behavior occurred.

Within-Person Variability as it Relates to Condom Use Behavior

To examine our second hypothesis of how day-to-day within-person variability in the condom use social-cognitive variables relates to condom use behavior (a binary outcome) we conducted a multilevel logistic regression modeling the probability of condom use on days when individuals had sex. Specifically, we specified a Bernoulli sampling distribution at Level 1 and

a logit link function. This type of model yields an outcome variable that is the logarithm of the odds (η_{ij}) of success, which in this case is defined as condom use.

We estimated a model to examine the within-person (Level 1) relations between day-to-day changes in attitudes, self-efficacy, and behavioral intentions and the likelihood of condom use on days in which participants had sexual intercourse.¹ Regarding possible moderating effects of Level 2, or between-person differences, in the model we included the interaction between the daily social cognitive variable and an individual's mean level of that variable for each of the social cognitive variables. Also included in the model was the within-person effect of partner type (Level 1), and gender (Level 2). The final equation after having trimmed non-significant effects from the model took the following form:

$$\begin{aligned} \text{Probability of Unprotected Sexual Behavior} = & \beta_{00} + \beta_{01} (\text{Gender}) + \beta_{02} (\text{Attitude Mean}) + \beta_{03} (\text{Self-efficacy Mean}) \\ & + \beta_{04} (\text{Behavioral Intention Mean}) + \beta_{10} (\text{Daily Attitude}) + \beta_{11} (\text{Daily Attitude} \times \text{Attitude Mean}) \\ & + \beta_{20} (\text{Daily Self-efficacy}) + \beta_{21} (\text{Daily Self-efficacy} \times \text{self-efficacy Mean}) + \beta_{30} (\text{Daily Behavioral Intention}) \\ & + \beta_{31} (\text{Daily Behavioral Intention} \times \text{Behavioral Intention Mean}) + \beta_{40} (\text{partner Type}) + \beta_{41} (\text{Partner Type} \times \text{Gender}) + u_0. \end{aligned}$$

The results with ORs for this model are presented in Table 1. Overall, women were less likely to use a condom than were men. As models of behavior change would predict, individuals with higher mean scores on condom use attitudes and behavioral intentions were more likely to use a condom. Mean levels of self-efficacy did not predict a greater likelihood to use a condom. Turning to the within-person relationships, on days when an individual's attitudes were more positive than average for that individual condom use was more likely. This effect was not moderated by individual differences in mean attitudes scores. Similarly, on days when individual's behavioral intentions were stronger than average for that individual condom use was more likely. As Figure 1 illustrates, this effect was moderated by individual differences in mean levels of behavioral intentions. More specifically, individuals with stronger (+ 1 point) mean behavioral intentions were more affected by daily changes in their behavioral intentions than were individuals with weaker (- 1 point) mean behavioral intentions. Interestingly, on days when individuals with strong mean behavioral intentions reported much weaker behavioral intentions than normal their likelihood using condoms was nearly as low as it was for individuals with weak mean behavioral intentions. There were also differences in the likelihood of using condoms based upon partner type and these differences varied by gender. As Figure 2 illustrates, men were more likely to use condoms with casual partners than they were with steady partners whereas women were more likely to use condoms with steady partners than they were with casual partners. Gender did not moderate the effect of daily attitudes nor the effect of daily behavioral intentions. The Level 1 effect for self-efficacy was not significant.

To further explore why self-efficacy was not a statistically significant predictor of daily condom use, we estimated a linear multilevel model to examine the theorized relationships between attitudes, self-efficacy, and behavioral intentions according to the TPB (Ajzen, 1991). In this model, attitudes and self-efficacy, at both Level 1 and Level 2 were entered as predictors of daily behavioral intentions. As expected, individuals with more positive mean attitudes, $B = .84$, $t(114) = 10.66$, $p < .001$, and greater mean self-efficacy, $B = .29$, $t(114) = 3.05$, $p < .01$, had stronger behavioral intentions. Consistent with the TPB, at the day-level, individuals whose daily attitudes were more positive, $B = .45$, $t(1.16) = 7.94$, $p < .001$, and whose daily self-efficacy was stronger, $B = .23$, $t(116) = 4.53$, $p < .001$, had stronger behavioral

¹We initially took a step-wise approach to the analysis by first estimating separate models testing the relationships between attitudes, behavioral intentions, self-efficacy and the likelihood of unprotected sex. We found that the direct relationships between daily changes in attitudes and self-efficacy and unprotected sex were not statistically significant. The direct relationship between daily changes in behavioral intentions and unprotected sex was statistically significant. Given these findings we felt the model in which all 3 constructs are included better represented the data. Furthermore, given that the direct relationships between attitudes and self-efficacy and unprotected sex were not statistically significant we did not formally test the mediating role of behavioral intentions in these relationships.

intentions. This suggests that having high self-efficacy about using condoms is not sufficient to influence condom use behavior if the individual does not intend on using condoms.

Explaining Within-Person Variability in the Social Cognitive Variables

To test our third hypothesis regarding the effect of daily negative affect on attitudes, self-efficacy, and behavioral intentions we used linear multilevel models. Preliminary analyses showed that partner type and gender (in the Level 1 and Level 2 models, respectively) were not significant predictors in any of the models, thus, they were omitted from the analyses

We found that on days when individuals experienced more negative affect their self-efficacy to use a condom was lower, $B = -.10$, $t(115) = 2.02$, $p < .05$, as were their behavioral intentions $B = -.29$, $t(2284) = 3.34$, $p < .01$. In the model for daily attitudes, daily negative affect was not a statistically significant predictors of attitudes.²

Discussion

We found that condom use attitudes, self-efficacy, and behavioral intentions demonstrated variability day-to-day, and more importantly, that within-person daily decreases in attitudes and behavioral intentions were associated with failure to use condoms. Furthermore, we found that daily variation in negative affective states explained day-to-day changes in condom use intentions and self-efficacy.

Why variability in attitudes, intentions and self-efficacy matters

Collecting daily measures of condom use attitudes, intentions and self-efficacy allowed us to investigate our first hypothesis: that individuals would display meaningful day-to-day changes in these variables. Each of these measures has displayed acceptable measurement reliability in past research as well as in the current research. We are therefore able to rule out measurement instability as a cause of within-person variability. While it is difficult to discern what constitutes a “meaningful” amount of variability, attitudes, self-efficacy, and behavioral intentions all displayed within-person variability over time that was significantly different from zero. However, when compared to the within-person variability in negative affect, within-person variability in attitudes, intentions and self-efficacy was lower. Interestingly, within-person variability in attitudes, self-efficacy and behavioral intentions was unrelated to mean levels of attitudes, self-efficacy or behavioral intentions indicating that such variability is not an inherent quality of either low or high scores on the construct (cf. Conner et al., 2000; Sheeran, Orbell, & Trafimow, 1999).

Conceptualizing attitudes, self-efficacy, and behavioral intentions as being variable on a day-to-day basis, while novel, is consistent with the theoretical underpinnings of these constructs. Attitudes contain a positive or negative evaluation of the outcome of the behavior (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), which could be subject to variability due to daily situations such as changes in affective state. Attitudes are also composed of behavioral beliefs which could change over time and with experience, however, it seems less likely they that would change from one day to the next. According to SCT, self-efficacy to use condoms, as a type of self-efficacy, is expected to fluctuate depending upon various intrapersonal states and situations (Bandura, 1994). Furthermore, an individual could come to have higher or lower

²Per one reviewer’s suggestion we explored the possibility that changes in social cognitive constructs mediate a relationship between negative affect and the likelihood of unprotected sex. Without the inclusion of other individual difference variables there was no direct effect of daily changes in negative affect on the likelihood of unprotected sex. At the within-person level for most individuals the experience of more negative affect than normal on a particular evening led to a decreased likelihood of unprotected sex. For individuals with high scores on neuroticism who were having sex with steady partners, the likelihood of unprotected sex on a particular evening increased as a function of increases in negative affect.

self-efficacy based on the how effectively he/she has executed using a condom in the recent past. Inasmuch as intentions are in part a product of attitudes (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and self-efficacy (Ajzen, 1991) it is also consistent with theory that intentions would display day-to-day variability. However, the question of if this within-person variability is meaningful is perhaps better answered by answering the question of if the variability in these constructs relates to individuals' behavior.

Consistent with our second hypothesis, within-person variability in attitudes and behavioral intentions predicted the likelihood of condom use. Daily increases in attitudes and behavioral intentions from an individual's "normal" attitude and behavioral intention strength were associated with an increased likelihood of using a condom during sex the next 24 hours. However, the effect for behavioral intentions was moderated by individual differences in the overall mean strength of behavioral intentions. Day-to-day increases in behavioral intentions increased the likelihood of condom use more for individuals who tend to have stronger behavioral intentions than for those who tend to have weaker behavioral intentions. Contrary to our hypothesis, we did not find direct effects of daily deviations in self-efficacy on the likelihood of condom use. These findings are consistent with theory as self-efficacy (TPB) is thought to primarily work through behavioral intentions to influence behavior. According to the TPB, self-efficacy (e.g., perceived behavioral control) is only expected to predict behavior when it is an accurate reflection of actual control over the behavior (Ajzen, 1991). In the case of condom use behavior, actual control may be affected by a number of factors including the sexual partner's role in the behavior. This finding is contrary to the IMB model and a related body of supporting literature, however, which states that motivation (including attitudes and behavioral intentions) works through behavioral skills (self-efficacy) to predict behavior and therefore behavioral skills show the strongest links to behavior.

Our findings that the effect of daily behavioral intentions was stronger among those with higher overall intentions is especially interesting since these are the individuals that we would be most likely to expect to use condoms. Furthermore, in accord with the majority of research and interventions using these constructs to predict behavior (e.g., Fisher, Fisher, Bryan, & Misovich, 2002; Jamner, Wolitski, Corby, & Fishbein, 1998) we would be least likely to target these individuals for intervention. However, our data shows that on days when these individuals' behavioral intentions are lower than their own "normal" they are nearly as likely to fail to use a condom as those individuals with overall weak behavioral intentions. These findings extend the prior research that has suggested that temporal stability of these constructs plays a moderating role in predicting behavior, such that, for example, more stable attitudes are better predictors of behavior (e.g., Conner, Norman, & Bell, 2002; Sheeran & Abraham, 2003), but the present study is the one of first to examine daily variability and show distinct effects for stability and global levels on behavior.

Speculating as to why day-to-day changes appear to affect behavior more for individuals with stronger behavioral intentions, it may be that there is a "tipping point" or a level of behavioral intentions at which condom use becomes more likely to occur. Individuals with weaker overall behavioral intentions may always be below this tipping point and therefore further decreases in intentions do not affect behavior. For individuals with stronger overall behavioral intentions, on most days their score is above the tipping point. However, on days when their behavioral intentions are weaker than normal they might cross this threshold; on these days they are as likely (or less likely) to fail to use a condom as individuals with weaker overall behavioral intentions.

We also observed gender differences in the likelihood of condom use with steady versus casual partners. For women condom use was less likely with casual partners than with steady partners but for men the reverse was true. This finding should be interpreted in the context of the fact

that overall women had less sexual events (protected or unprotected) with casual partners than did men. One possible explanation for this observed gender difference is that since relatively fewer women had casual partners than did men the women who had casual partners may differ from men who had casual partners in that they may be more likely to take risks in general and are thus less likely to use a condom.

In summary, the present data from our 30-day daily process study indicates that individuals with high levels of condom use behavioral intentions may be the most susceptible to daily changes in this construct affecting their behavior. This has obvious implications for interventions; indicating that individuals with strong behavioral intentions still need to be targeted for interventions, as they may be just as likely to fail to use a condom on days when their behavioral intentions are weak as individuals with overall weaker behavioral intentions. According to health behavior change theories, condom use interventions should be tailored to an individual's or a sample's deficits in social cognitive variables which are usually assessed cross-sectionally (Ajzen, 1991; Fisher & Fisher, 1992). The present data provide a caution to researchers who tailor intervention content based upon a pre-intervention assessment social cognitive predictors of condom use behavior.

Explaining daily variability in attitudes, intentions and self-efficacy: Negative affect as an underlying psychological mechanism

We also found some support for our third hypothesis, that greater daily negative affect was related to decreased behavioral intentions and self-efficacy. We did not find any relationship between negative affect and attitudes. It is possible that for some individuals negative affect leads to more deliberate processing and makes condom use attitudes more positive (Schwarz & Clore, 1983), whereas, for others the general biasing effects of negative affect could make condom use attitudes more negative (Byrne & Clore, 1970). Experiencing more negative affect than normal on a particular day predicted lower daily self-efficacy. This is consistent with the past research from the smoking cessation literature showing daily decreases in self-efficacy predicted by negative affect (Gwaltney, Shiffman, Balabanis et al., 2005; Gwaltney, Shiffman, & Sayette, 2005). The experience of more negative affect than normal was also associated with weaker behavioral intentions. Negative affect may be only one potential mechanism to explain daily changes in social-cognitive constructs, therefore, future research should investigate other possible psychological mechanisms that help to explain variability in these social cognitive factors.

We remind the reader that negative affect was measured in real time. The strength of this approach is that recall of affect tends to be influenced by momentary affect (Parkinson, Briner, Reynolds, & Totterdell, 1995). In our analyses we examined negative affect as a predictor of social cognitive variables which were both measured in real time thereby eliminating this potential limitation for that analysis. However, the limitation of possible reverse causation remains. The daily diary items were ordered such that the affect measure preceded the social-cognitive variables measures. However, it is possible that during each day's reporting if participants knew they would be asked about their feelings about condom use later in the questionnaire and if they felt negatively about using condoms this could result in an increase in feelings of negative affect.

In summary, our data showed meaningful day-to-day within-person variability in condom use attitudes, self-efficacy (cf. perceived behavioral control and self-efficacy), and behavioral intentions during a 30-day daily diary study. As the first study to examine day-to-day variability in these constructs for condom use behavior, this data adds to the extant literature of several health behavior change models (TRA, TPB, SCT and IMB). Consistent with the structure of the TRA and TPB, day-to-day variability in behavioral intentions was the strongest predictor of that evening's condom use behavior whereas day-to-day changes in attitudes was a weaker

predictor of behavior and daily self-efficacy did not directly predict daily condom use. Also consistent with the TRA and TPB, day-to-day changes in attitudes and self efficacy were reliable predictors of daily behavioral intentions. However, this is contrary to the IMB and SCT and the supportive research in these traditions, both of which would predict a direct relationship between day-to-day changes in self-efficacy and behavior. Regardless of the particular theoretical framework, the present data challenge the notion that understanding condom use behavior is exclusively about investigating stable individual differences in predictors of behavior. Instead, our data have provided evidence that within-person changes in social-cognitive constructs also play a role in understanding both who will be more likely to use a condom and under what circumstances will condom use be more likely.

Contrary to the assumptions of the broader literature on the social-cognitive understanding of behavior, stability of behavioral intentions was not an indication of behavioral intention strength. Therefore, according to our data, understanding the predictors of condom use requires an examination of not only the level or strength of social-cognitive predictors of behavior, but also of the stability of these constructs. Variability in social-cognitive predictors of health behavior may be an avenue worthy of investigation in attempts to understand the maintenance of safer behavior. Finally, extending the findings from the smoking cessation literature, our data provided preliminary evidence that negative affective states are one possible psychological mechanism that partially explains day-to-day variability in self-efficacy and behavioral intentions relating to condom use.

Limitations and Future Directions

While the current study was highly innovative in that it explored within-person associations, some of which were temporally sequenced (e.g., attitudes, intentions, and self-efficacy predicting condom use) the reader is cautioned about inferring causality from these associations as other variables that we did not assess (e.g., a partner's influence in condom use decision making) may also play a role in the associations. Other within-person associations examined in the current study were not temporally sequenced (e.g., negative affect predicting attitudes, intentions, and self-efficacy) and thus the reverse causal order cannot be ruled out. For example, it is also possible that changes in intentions and self-efficacy on a particular day could lead to changes in negative affect. Future studies should examine the ordering of changes in negative affect and the social cognitive variables which could be accomplished by multiple within-day assessments of these variables; however, increasing the number of daily assessments may increase participant reactivity (Affleck, Zautra, Tennen, & Armeli, 1999).

As with all studies with multiple assessment points participant burden and reactivity are possible limitations. Daily reporting may lead to increased self-monitoring which may influence the behaviors and variables under study (Stone et al., 1994). Analyses for the effect of time on our behavioral outcomes, social cognitive variables, and negative affect were not significant, indicating that our participants did not change as a function of time. This suggests that measurement reactivity - at least as indicated by changes in mean levels - was not a problem in the present study.

It is possible that the between-person data were not completely independent if participant's sexual partners also participated in the study. Our recruitment procedures (no snowball or rolling recruitment) worked against such non-independence, but it is possible a few partners of participants were also enrolled in the study. A final limitation of the present study is that the sample was composed of college students; a population that may not be representative of young adults aged 18-25. College students, who engage in relatively high levels of unprotected sex, are at relatively low risk for HIV infection. College students are however a population at risk of STDs and unintended pregnancy. It is therefore unknown to what extent the observed findings would generalize to other, higher risk populations such as at-risk adolescents, injection

drug users, men who have sex with men and individuals living with HIV/AIDS. Future research should be conducted to examine these processes in higher risk populations.

Despite these limitations the present daily process study provided the first evidence that condom use attitudes, intentions, and self-efficacy display day-to-day variability within-persons and that this variability is meaningful in predicting condom use. Examining multiple levels of analysis also allowed us to highlight the complex relationships between gender, partner type and sexual behaviors. Finally, we were able to explore daily changes in negative affect as a possible mechanism to explain variability in attitudes, intentions, and self-efficacy. Because the daily process approach studies individuals over time, allowing for the investigating of both within-person and between-person phenomenon, its most valuable potential contributions to the condom use literature may be to allow researchers to gain insight into factors that explain inconsistent condom use, the maintenance of behavior, and the development of “safer sex fatigue” in a variety of populations.

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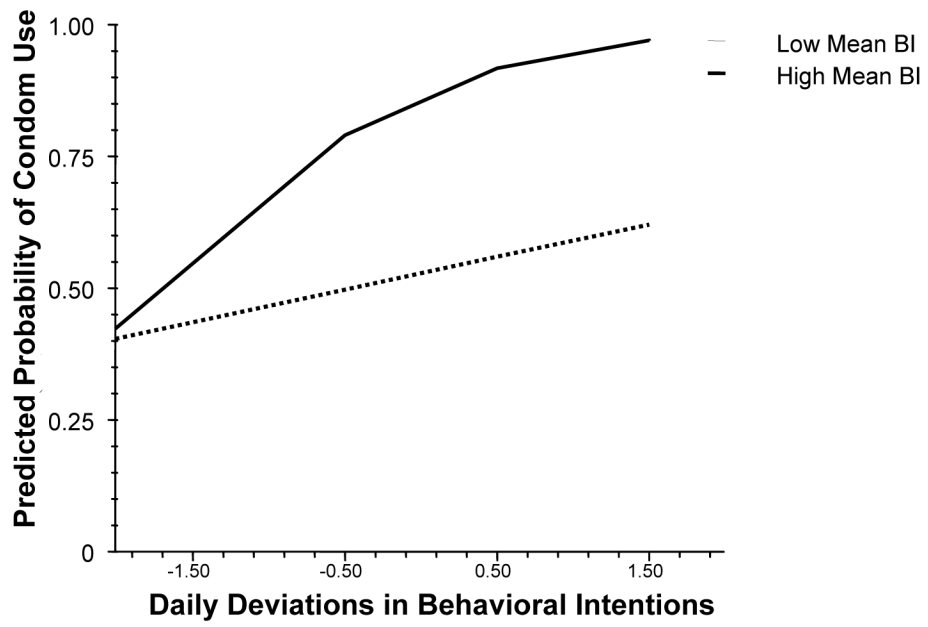


Figure 1. The relationship between condom use and daily variability in behavioral intentions moderated by mean behavioral intentions.

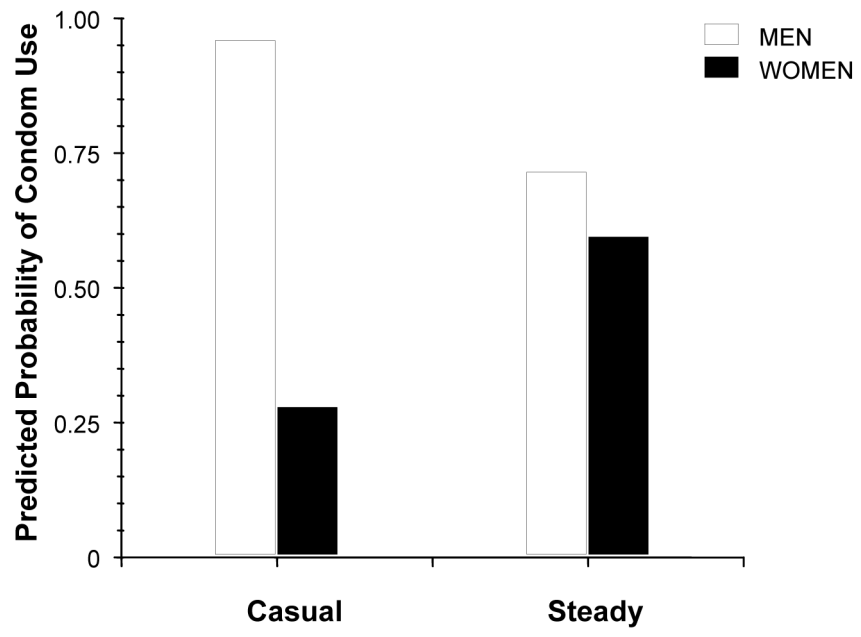


Figure 2. The cross-level interaction between partner type and gender for daily condom use.

Table 1

Model Predicting the Likelihood of Condom Use on a Given Day from Mean Levels and Daily Changes in Condom Use Attitudes, Self-Efficacy, and Behavioral Intentions

<i>Fixed Effects</i>	<i>OR (CI)</i>	<i>t (df)</i>
Intercept (β_{00})	6.41(2.36 - 17.44)	3.68 (112)***
Gender (β_{01})	0.10 (0.03 - 0.30)	3.40 (112)***
Mean Attitudes (β_{02})	2.07 (1.16 - 3.70)	2.49 (112)**
Mean Self-Efficacy (β_{03})	1.03 (0.64 - 1.65)	0.13 (112)
Mean Behavioral Intentions (β_{04})	2.39 (1.44 - 3.97)	3.41 (112)***
Daily Changes in Attitudes (β_{10})	3.03 (1.40 - 6.54)	2.83 (514)**
Daily Changes in Attitudes \times Mean Attitudes (β_{11})	1.09 (0.43 - 2.76)	0.18 (514)
Daily Changes in Self-Efficacy (β_{20})	1.41 (0.56 - 3.57)	0.71 (514)
Daily Changes in Self-Efficacy \times Mean Self-Efficacy (β_{21})	1.18 (0.55 - 2.50)	0.42 (514)
Daily Changes in Behavioral Intentions (β_{30})	1.94 (1.29 - 2.93)	3.17 (514)**
Daily Changes in Behavioral Intentions \times Mean Behavioral Intentions (β_{31})	1.51 (1.08 - 2.11)	2.43 (514)*
Partner Type (β_{40})	0.33 (0.15 - 0.73)	2.74 (514)**
Partner Type \times Gender (β_{41})	5.95 (1.76 - 20.10)	2.87 (514)**
<i>Random Effects (Variance)</i>	<i>df</i>	χ^2
Condom Use (τ_{00})	96	119.21 [†]

[†]
 $p < .10$

*
 $p < .05$

**
 $p < .01$

 $p < .001$