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When parsimony is not enough: Considering dual processes and dual levels of influence in sexual decision making

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Abstract

The literature on sexual decision making that has been used to understand behaviors relevant to HIV and STI risk has relied primarily on cognitive antecedents of behavior. In contrast, several prominent models of decision making outside of the sexual behavior literature rely on dual process models, in which both affective and cognitive processing are considered important precursors to behavior. Moreover, much of the literature on sexual behavior utilizes individual-level traits and characteristics to predict aggregated sexual behavior, despite decision making itself being a situational or event-level process. This paper proposes a framework for understanding sexual decision making as the result of dual processes (affective and cognitive) operating at dual level of influence (individual and situational). Finally, the paper ends with a discussion of the conceptual and methodological benefits and challenges to its use and future directions for research.

Keywords

Sexual Decision Making; Dual Process Theory; Sexual Risk Behavior; Multilevel Models

Decisions regarding sexual behaviors—and particularly sexual risk behaviors such as condom use—have potentially important consequences. Non-condom use is the largest contributing risk factor for contracting HIV (Centers for Disease Control and Prevention, 2012) and other sexually transmitted infections (STIs), and rates of non-condom use remain high among both HIV-negative and HIV-positive individuals (Durham et al., 2013; Reece et al., 2010; Rosenberger et al., 2012; Sanders et al., 2010; Teitelman, Tennille, Bohinski, Jemmott, & Jemmott III, 2011). Given the importance of condom use in preventing the spread of these infections, theories are needed to help understand and explain decision making about condom use in an effort to help to curb the modern HIV epidemic. In this review I present theoretical and empirical work from two often distinct but potentially complementary areas—the literatures on individual-level cognitive predictors of aggregate sexual behavior and situational or event-level dual processes in momentary risky decision making. I argue that these areas could be meaningfully combined to form richer models of sexual decision making that incorporate both cognitive/effortful and affective/automatic variables at the levels of both individual dispositions and the momentary processes through

which decisions are made. I end with a discussion of considerations for utilizing the proposed framework and directions for future research.

Existing Perspectives on Decision Making

The decision making models used in both the sexual behavior literature and the dual process literature rely in part on the notion of a cost-benefit analysis, which developed from rational choice theory and expected utility theory (Harless & Camerer, 1994; Monroe & Maher, 1995; Riker, 1995). The main tenet of these theories is that people utilize a largely conscious, logical decision making process in order to arrive at decisions that are of the utmost benefit for themselves through what is termed a utility maximization procedure (Mongin, 1998). When presented with multiple options, people engage in a cost-benefit analysis to arrive at a single choice that is intended to maximize their benefit and minimize their loss (i.e., the choice with the highest “expected utility”), taking into account both present and future consequences. The option that is expected to achieve maximum benefit and minimal loss over time is considered the most rational choice (Mongin, 1998). Each of the two areas of decision making literature I review below builds upon and diverges from these theories in unique ways.

Social Cognitive Theory-Based Models of Sexual Decision Making

Researchers investigating sexual behavior for the purposes of HIV prevention have utilized several theoretical models to understand the processes that lead to sexual risk behavior. According to meta-analytic and review work (Albarracín et al., 2005; Noar, 2007), the most widely used theories of sexual decision making in the HIV literature are the theories of reasoned action and planned behavior (TPB; Ajzen, 1991; Fishbein, 1990; Fishbein & Middlestadt, 1989; Montaña & Kasprzyk, 2002), the health belief model (HBM; Janz, Champion, & Strecher, 2002), and the information-motivation-behavioral skills model (IMB; J. D. Fisher & Fisher, 1992; J. D. Fisher, Fisher, Misovich, Kimble, & Malloy, 1996; J. D. Fisher, Fisher, Williams, & Malloy, 1994; W. A. Fisher, Williams, Fisher, & Malloy, 1999), each of which is based on social cognitive theory (SCT; Bandura, 1976, 1989, 2001). Sharing common roots in the expected utility and rational choice theories discussed previously, these models utilize primarily cognitive components that were specifically selected to be applicable to health behavior and sexual risk behavior. These theories rely on Bandura’s (1976, 1989, 2001) notion of self-efficacy, which refers to the extent to which people believe that they are able to perform a given behavior in order to produce a given outcome (Bandura, 1977). As such, I will refer to them as *SCT-based theories* herein.

Each of these SCT-based theories has garnered at least partial support in the literature. Meta-analyses of each theory and associations between their components and condom use have generally found support for their utility (Albarracín, Johnson, Fishbein, & Muellerleile, 2001; J. D. Fisher & Fisher, 2000; J. D. Fisher, Fisher, & Shuper, 2009; Harrison, Mullen, & Green, 1992; Johnson et al., 2002; Sheeran & Orbell, 1998; Sheeran & Taylor, 1999), though findings have sometimes been mixed and effect sizes have varied considerably. Sexual behavior research has been conducted most often with the TPB, which has been used in at least 96 studies (Albarracín et al., 2001). Several large meta-analyses conclude that these theories lead to successful theory-based interventions, and that key components of

them such as cost-benefit analyses, self-efficacy, and behavioral skills predict behavior and can be intervened upon to enact behavior change (Noar, 2008).

Despite their successes, findings also suggest that there is also significant room for improvement with these models. For example, although the TPB is the most widely used and cross-sectional associations between TPB variables and behavioral outcomes tend to be moderate, prospective (Albarracín et al., 2001), longitudinal (Huebner, Neilands, Rebchook, & Kegeles, 2011), and intervention-based (Tyson, Covey, & Rosenthal, 2014) predictions using this model have been less strong. A detailed meta-analysis of the HIV prevention literature provides insight as to which specific components of these various theories might be the most promising for influencing sexual decision making (Albarracín, Durantini, & Earl, 2006). Analyzing more than 446 different datasets from theory-based HIV prevention interventions, the authors found strongest support for the use of attitudes, self-efficacy, and behavioral skills within models of HIV risk behavior.

In sum, the SCT-based models of sexual decision making have been partially effective, particularly when considering the specific role of self-efficacy, but their success has been mixed and has varied across methods of assessment. These mixed findings may result from the general assumption that decision making consists primarily of rational, cognitive processing that is relatively stable over time. Core cognitive components of the models leave out the role of experiences such as intimacy, affect, and arousal during sexual situations. Because their core components are thought to be relatively stable, there is little room for explaining situational variability in sexual behavior. Although some individuals can be differentiated in such ways due to highly consistent behavior, this is unlikely to be the norm (Cooper, 2010). As such, although stable predictors may be useful for determining types of people who do and do not ever use condoms, they are unlikely to provide substantial insight into the *processes* that occur within situations that lead the same individual to engage in condom use at some times and not at others.

Dual Process Models of Risky Decision Making

Affective processing was rarely studied and theorized about by early psychologists with the exception of some (e.g., James, 1884). Rather, when it was studied, affect was typically assumed to be the result of cognitive processing, though later work suggested a more independent and prominent role for affect in decision making. For example, Zajonc (1980, 1984) hypothesized that affective responses are the first and foremost human reaction to a stimulus. Building on this, LeDoux (1996) proposed that the emotional “go” system in the brain developed in early animals for making fight, flight, or freeze decisions. As humans evolved, these older structures remained active while newer, more cognitive and effortful systems in the brain developed the ability to exert control over the older systems. Dual process models of decision making focus on both the evolutionarily older, rapid, automatic, affectively-based, “hot,” “feeling” System 1 and an evolutionarily more recent, slower, effortful, cognitively-based, “cool,” “thinking” System 2 (Barrouillet, 2011; Frankish, 2010; Lepper, 1994; Metcalfe & Mischel, 1999; Redlawsk, 2002; Sloman, 1996; Slovic, Finucane, Peters, & MacGregor, 2004).

The interaction between Systems 1 and 2 have been described differently within various theoretical paradigms, though it is generally agreed that the role of feelings (i.e., System 1) in decision making is central. Slovic, Finucane, and colleagues developed the notion of an *affect heuristic* (Finucane, Alhakami, Slovic, & Johnson, 2000; Slovic et al., 2004; Slovic, Finucane, Peters, & MacGregor, 2007), which refers to a process by which System 1 utilizes affectively-laden information to make split-second decisions. The authors conducted research showing that feelings regarding a certain decisional target influence whether people focus either on its risks (i.e., resulting from negative feelings) or benefits (i.e., resulting from positive feelings) and subsequently discount the other. As such, feelings (i.e., System 1) lead to rapid cost-benefit analyses by influencing the cognitive (i.e., System 2) processing of risks and benefits, particularly when decisions are considered risky (Bateman, Dent, Peters, Slovic, & Starmer, 2007; Hine, Marks, Nachreiner, Gifford, & Heath, 2007; Hirsleifer & Shumway, 2003).

Building upon theories about the central and facilitative role affect plays in decision making, Damasio (1994, 2001) developed the Somatic Marker Hypothesis (SMH), in which he proposed that affect may be so important for decision making that people are unable to make personally advantageous decisions *without* an intact affective processing system. The underlying tenet of SMH is that the brain and body operate within a feedback loop in which bodily (i.e., somatic) states provide cues to the brain about physiological arousal that relates to the primary emotions (e.g., fear, sadness, happiness) and the brain similarly provides signals to the body to activate cascades of somatic arousal that correspond to primary emotions. These feelings are associated with prior experiences and thus provide automatic “gut reactions” when making decisions. Damasio hypothesized and later confirmed with his own research that cognitive processes are inadequate for decision making in the face of difficult or conflicting decisions (e.g., Bechara, Damasio, Damasio, & Lee, 1999; Bechara et al., 2001; Bechara, Tranel, Damasio, & Damasio, 1996), and these hypotheses have been supported by others (Batson, Engel, & Fridell, 1999; Carter & Pasqualini, 2004; Suzuki, Hirota, Takasawa, & Shigemasa, 2003). Simply put, the SMH suggests that affective System 1 processing helps to provide a mental shortcut to enhance and hasten the more cognitive cost-benefit analyses conducted by System 2.

Though the affect heuristic and SMH propose that affective System 1 processing is advantageous to cognitive System 2 processing, others posit that the two types of processing can conflict, at least under certain conditions (Loewenstein, Weber, Hsee, & Welch, 2001; Slovic et al., 2004). In the *risk as feelings hypothesis*, Loewenstein and colleagues (2001) propose that, under times of stress or risk, the simultaneous processing of affect and cognition can lead to conflicts between the two, in which case the faster, more automatic and affectively-based System 1 is likely to dominate. Like others, the risk as feelings hypothesis proposes that cognitive and affective processing occur simultaneously and within a feedback loop, but diverges from other theories in suggesting that affective processing might thwart rather than complement cognitive processing during risky decision making. Researchers have shown that decisions that pose affective risk were more strongly influenced by feelings of hope or fear than by more probability-based cost-benefit decision making compared to decisions when the outcome had little impact on affect (Rottenstreich & Hsee, 2001).

When considered together, these theories provide testable hypotheses regarding the interaction of affective and cognitive processes and what outcomes would be expected as a result. Specifically, these theories propose two basic hypotheses regarding the interaction of Systems 1 and 2 for decision making—either System 1 leads to deficits in or lower System 2 processing (i.e., a mediational pathway) or System 1 interferes with or thwarts System 2 processing (i.e., a moderating pathway). For example, both the affect heuristic and SMH suggest that feelings are used to speed up the process through which decisions are made by biasing decision making towards focusing on risks or benefits of an outcome, with the SMH focusing on the role that bodily (i.e., somatic) feelings (i.e., markers) play in this process. These mediational hypotheses suggest that positive System 1 processing facilitates and hastens System 2 processing, leading to better outcomes and vice versa. While proposing a similarly central role for affect, the risk as feelings hypothesis diverges from the other two in suggesting that the need for fast processing under times of risk leads people to rely on System 1 rather than System 2, especially when the two are in conflict, causing System 1 to interfere with or trump System 2 processing. This moderation hypothesis may be particularly useful for sexual decision making as it has the potential to explain the reasons people may make decisions that are seemingly “illogical” as a result of focusing on avoiding short-term affective risk rather than maintaining longer-term goals and intentions. A better understanding whether and under what conditions these pathways operate is an important step in developing a model of sexual decision making.

Dual Process Models in Sexual Decision Making

As I review below, there are three important components of dual process models—in addition to the models themselves—that would be worth incorporating into the literature on sexual decision making. First, sex is a time of heightened affect and arousal and their role should be considered alongside of more cognitive or rational processes. Second, these models propose the investigation of these processes in interaction with each other rather than as independent, allowing for tests not only of main effects but also mediation and moderation. Finally, these models highlight the importance of carefully operationalizing the decisional target (i.e., that about which a decision is being made, for example, condom use) and the expected conditions under which resultant behavior(s) will or will not occur.

Sex is a time in which people experience heightened affect and arousal in addition to making decisions about behaviors in which to engage. The primary benefit of considering sexual decision making through the framework of a dual process model is that it provides a meaningful role for affect and arousal within the decision making process. During sex, people are likely to experience increases in affect not only from the physiological aspects related to sexual arousal itself but also from positive factors such as increased intimacy, pleasure, and affection as well as negative factors such as performance anxiety, fear of rejection, and conflict (Burlison, Trevathan, & Todd, 2007; Crabtree, 2012; Golub, Starks, Payton, & Parsons, 2011; McCabe, 2005; Wells, Golub, & Parsons, 2011). Given the centrality of affect and arousal to sex itself, their primary role in dual process models makes them an ideal model from which to enhance existing models of sexual decision making.

More important than simply considering affective processes and arousal as variables within models of sexual decision making is acknowledging the role that they play via their interaction with System 2 processes (e.g., intentions, self-efficacy) that are prominent within existing models of sexual behavior. The dual process models reviewed previously provide frameworks with testable hypotheses that can be used to examine how and why a specific sexual decision is made. For example, consider the question of why a man with high intentions to use condoms might nonetheless engage in sexual behavior without them, even with partners he considers to be potentially risky for HIV. This type of situation suggests that something may be interrupting his ability to act on his intentions. The risk as feelings hypothesis might suggest a potential reason for this—one might hypothesize that increased levels of affect or arousal during decision making would thwart the more cognitively-based System 2 processing, leading to disruptions with the execution of a traditional-cost benefit analysis and outcomes inconsistent with his intentions. For example, with this partner he may be concerned that he will not be able to perform as well with a condom, thus developing anxiety-reducing motivations that override his condom use intentions. Utilizing existing dual process theories such as the risk as feelings hypothesis for an investigation of sexual decision making will allow for the specification and testing of hypotheses such as a statistical interaction between Systems 1 and 2 which might later be refined into theories specific to sexual behavior.

The third reason dual process models provide a strong framework for further developing models of sexual decision making is that—owing to their primary development within experimental research—they encourage careful operationalization of constructs and outlining of conditions. In both experimental and real world research on decision making, the decision itself largely goes unobserved. That is, the decision is often inferred from something that is more easily observed or reported, such as a behavior. In the case of sexual behavior, this means that the sexual decision is not seen but is inferred from a sexual behavior that presumably occurs as a result of the decision. However, the fact that the same behavior can result from different decisions—and by extension, decisional processes—and that the same process can lead to different behaviors often goes undiscussed. As such, the use of dual process theories may help to push for more careful operationalization of the exact behavior of interest—condom use is likely too general, and one might need to go further to define the characteristics of the act such as the partner with whom it occurs, the type of act during which it occurs, or the situation in which it occurs in order to more carefully ensure it measures similar processes. For example, the type of decisional process that leads to non-condom use with a main partner versus a casual partner is likely very different, where the former may result from feelings of intimacy or trust and the latter may result from fear or anxiety about performance or rejection. Similarly, the independent variables—in this case, the variables which correspond to System 1 and System 2 processing—need to be carefully defined. For example, throughout this review I have typically relied on overly generalized notions of affect and arousal as homogenous and interchangeable. Rather, at the very least, both exist with a valence that can range from positive to negative, and one would expect that feeling positively versus negatively would lead to distinct if not opposite decisions. Some areas of research suggest that affect exists along other dimensions such as tendencies towards appraisal (Lerner & Keltner, 2000), and that two forms of

negative affect with distinct appraisals, such as anger-based versus fear-based feelings would lead to distinct decision making patterns based on tendencies to decrease or increase risk perception, respectively. The operational definitions of affect/arousal and the decisional outcome of interest are critical to the development of the subsequent hypotheses and models to test. Finally, as I will discuss in the next section, the extent to which both of these definitions impacts the overall findings is likely to differ across individuals and contexts, and thus it is important to consider the role of individual-level and situational/contextual variables in models of decision making that may account for the strength of association between decision making processes and behavior.

Multiple Levels of Decision Making

Researchers studying decision making in general and those examining sexual behavior specifically may benefit from considering behavior to be the result of interactions between individual-level and event-level characteristics. Although there is a degree of consistency in behavior that can be investigated within an individual differences paradigm, people typically have considerable situational variability in their behavior that results from adaptations made to specific contexts and environments. Decision making itself is a situational process that occurs within a specific event in which a choice must be made, though the literature on cognitive styles has long demonstrated that there are also individual—or between-person—differences in the ways in which people execute decision making tasks (Henderson & Nutt, 1980; Hunt, Krzystofiak, Meindl, & Yousry, 1989; Myers, 1987; Phillips, Paziienza, & Ferrin, 1984). For example, some people may be higher than others in self-efficacy and show higher levels of condom use as a result (i.e., individual or between-person differences). Similarly, those same people may experience days or moments when they are feeling substantially less self-efficacious than usual and stray from their typical pattern of condom use (i.e., situational or within-person differences). As a result, an approach that takes both levels of influence into account might best capture the sexual decision making process.

Challenges in Examining Sexual Behavior at the Individual Level

The SCT-based models of decision making that have been widely used in the sexual behavior literature rely primarily on individual-level variables such as attitudes and intentions that are generally presumed to be stable. This methodological approach may be one potential limitation of the existing literature on sexual decision making. For example, inconsistencies in the utility of these SCT-based models may stem from limitations of the research, including a focus on cross-sectional and aggregated sexual behavior data rather than longitudinal models that account for situational variation (Cooper, 2010; J. D. Fisher & Fisher, 2000). To the extent that people are more influenced by how they feel in the moment than how they feel in general, they may rely more on momentary states of affect and cognition. In fact, research measuring daily affect has shown that there is often a higher amount of within-person than between-person variability (Groves, Golub, Mustanski, & Parsons, 2010; Röcke, Li, & Smith, 2009; Russell, Moskowitz, Zuroff, Sookman, & Paris, 2007), suggesting the potential for added predictive power from the examination of both fluctuating (i.e., state) and dispositional (i.e., trait) measurements. Similarly, to the extent that peoples' sexual behavior is inconsistent across situations, partners, and time, its

fluctuations are likely to be associated with other fluctuating factors such as situational affect and cognition. Examining within-person processes by aggregating them to the individual level is known as the ecological fallacy (Robinson, 1950), and has the potential to produce results that may sometimes be drastically different from what would be obtained in a non-aggregated, event-level analysis. This results from several factors, one of which is the fact that aggregation relies on modeling averages and ignores within-person variability around those averages.

Examining Behavior from Multiple Levels

Not surprisingly, there has long been a call for an approach to psychological theory that accounts for *both* stable individual (i.e., trait) differences and fluctuating (i.e., state) within-person processes. For example, in their cognitive-affective system theory, Mischel and Shoda (1995) describe a theoretical framework to unify the investigation of the dynamics of human behavior at both the individual and the situational level. In this paper, the authors described a framework for understanding how dispositional traits, environmental stimuli, and affective and cognitive processing interact to produce situational variability in behavior. They suggested that personality differences lead to differences in the perception of situational cues, which ultimately lead to changes in affective and cognitive processing that produce behavior. Building on this work, Metcalfe and Mischel (1999) outlined environmental characteristics such as acute and chronic stressors that influence cognitive and affective processing that lead “hot” (i.e., affective, System 1) processing to interrupt “cool” (i.e., cognitive, System 2) processing. These interruptions ultimately lead to situational departures from more long-term, stable intentions and goals. This work provides a framework through which to better understand the interactions of persons and their environments and how this influences decision making.

There has recently been a similar call for an acknowledgement of the role of multiple levels of influence within the literature on sexual behavior. For example, Cooper (2010) describes the ways in which sexual behavior meaningfully differs at both the level of the individual and the level of the sexual situation or event. Although the author found that there were predictable individual differences in sexual risk behavior, her work demonstrated that a majority of the variation in behavior existed at the level of the sexual event. Moreover, this situational (i.e., within-person, state) variability in behavior was predicted more strongly by within-person variation in situational characteristics than characteristics of the individual. Cooper ended by echoing similar concerns as Mischel and his colleagues for sex researchers — sexual behavior is best understood as an interaction between persons and contexts over time.

Existing Research on Sexual Behavior Incorporating Dual Processes and Levels

Throughout this review I have suggested that the literature on sexual decision making primarily ignores dual process and multilevel approaches to research. However, studies on the role of affective processes and/or situational variability exist within the sexual behavior literature and their findings are worth reviewing. For example, research investigating

associations between affective processes and sexual behavior has been conducted, though researchers have not typically utilized dual process theories of decision making to do so. One meta-analysis conducted nearly 15 years ago examined 34 different studies that included an examination of the association between negative mood and sexual behavior and found mixed results (Crepaz & Marks, 2001). As is common in meta-analyses, the authors found that there was significant variability in both the magnitude and the sign of the association between negative mood and behavior. The authors found that the weighted average of two types of negative mood—*anxious and depressive symptoms*—did not significantly predict sexual behavior, nor did they differ significantly in their effects on sexual behaviors, and concluded that there was not sufficient evidence to establish that negative mood was associated with sexual risk behavior. In a response to the meta-analysis, Kalichman and Weinhardt (2001) described several limitations of the studies that were reviewed, including a reliance on global mood assessments rather than the role of affect at the time of sexual behavior as well as an overwhelming focus on cross-sectional rather than longitudinal or multilevel data. Though these findings might contradict the need for an inclusion of affect in models of sexual decision making, some longitudinal and experimental research has suggested otherwise.

Despite the lack of consistent findings for individual-level negative mood in the meta-analysis described above, research looking at the association of state levels of affect and sexual behavior has shown its utility. A small but significant body of literature has begun to develop regarding the association of fluctuating levels of state affect with situational (i.e., within-person) variability in sexual behavior by using methodologies such as daily diary research. Studies that have involved an assessment of specific, fluctuating affect have found them to influence sexual decisions made on an event-level basis (Fortenberry et al., 2005; Grov et al., 2010; Mustanski, 2004, 2007; Shrier, Shih, & Beardslee, 2005). Grov et al. (2010) found that higher daily negative affect reduced the risk of condomless sex on a given day among highly sexually active gay and bisexual men. Mustanski (2007) investigated the role of anxious, negative, and positive affect on a composite variable of sexual risk behavior within a diary study of MSM. Utilizing both trait and state measures of affect, he found that state measures of affect (i.e., within-person fluctuations) were sometimes associated with risk in ways that trait affect (i.e., between-person differences) was not, and in some cases the two interacted to predict risk. These findings suggest that dual process models of sexual decision making that incorporate the role of affect at the event level (i.e., within-person) may provide more promising results than those that investigate only more global, individual-level tendencies towards negative mood.

Another process falling under the umbrella of System 1 is sexual arousal, which has also been considered within the literature, particularly in experimental contexts. Several studies have shown results that are in line with the risk as feelings hypothesis—namely, that the experience of sexual arousal appears to thwart more conscious intentions to use condoms. One early study demonstrated an association between sexual arousal and condom use, showing that higher levels of sexual arousal at the initiation of sex were associated with less usage of condoms (Boldero, Moore, & Rosenthal, 1992). Following that, several experimental studies have shown the impact that arousal can have on sexual decision making. Blanton and Gerrard (1997) demonstrated that sexual arousal may influence the

cognitive processing of risk estimates and Loewenstein, Nagin, and Paternoster (1997) confirmed their hypothesis that men who were sexually aroused were subsequently more willing to engage in forceful and coercive means to achieve sex. Ariely and Loewenstein (2006) found support for the notion that individuals under states of sexual arousal become increasingly myopic, focusing more on momentary desires and threats and less on long-term goals and consequences. In another study, researchers found that participants in a low arousal condition predicted future sexual behavior that was consistent with their past behavior, while those in a high sexual arousal condition reported a significantly greater likelihood of engaging in sexual risk behavior in the future than they had previously engaged in (Ditto, Pizarro, Epstein, Jacobson, & MacDonald, 2006). Taken together, these studies suggest that individuals who are “in the moment” and under states of arousal act in ways that are inconsistent with their intentions and focused on short-term rather than long-term outcomes. These findings lend support to dual process concepts such as the risk as feelings hypothesis and show their applicability within research on sexual decision making.

An Example of Combining Dual Processes and Levels with Sex Research

To illustrate the concepts discussed thus far, I will utilize an example. Consider that Mike has higher self-efficacy for using condoms than the average man. This tendency can be considered reflective of general patterns in the way Mike processes sexual decisions, and thus can be thought of as his more global disposition toward System 2 processing during sexual situations. Researchers might wish to examine whether Mike’s higher levels of self-efficacy lead him to a general tendency toward greater condom use than other men. In contrast to this analysis, researchers could examine the same sexual behavior as it occurs on an event-by-event basis. In addition to Mike having dispositions towards higher self-efficacy (i.e., trait levels), his level of self-efficacy fluctuates from day-to-day and across the various sexual situations he may encounter (i.e., state levels). As such, it is possible to examine whether Mike’s state fluctuation from his higher-than-average trait level of self-efficacy *at the time the sex occurs* is predictive of whether or not he wears a condom during a given event. For example, when Mike is feeling less self-efficacy for condom use because he is having sex with Frank, a guy he really likes, he may decide to skip using them.

Conducting an analysis where sexual behavior—which by definition occurs at an event-level basis—is aggregated to indicate an individual tendency toward a certain behavior and looked at in relation to other dispositional (i.e., trait) variables such as self-efficacy and sexual arousal is depicted in Figure 1. This aggregated analysis is the most common type of analysis in the sexual behavior literature, and assumes that Mike’s higher-than-average level of self-efficacy is associated with a discernable pattern of sexual behavior such as greater condom use. In contrast, Figure 2 displays the second scenario described above, in which event-level data on Mike’s event-level (i.e., state) fluctuation in self-efficacy from his average (i.e., trait) level is used to predict the sexual behavior he engages in *during that event*.

The ability to combine across these two types of models, however, may be the most ideal way of analyzing data from multiple levels. For example, we might hypothesize that Mike’s lower than usual level of self-efficacy at the time of a sexual event with Frank leads him to

not use a condom that time, but that because of his higher than average levels of self-efficacy in general, this type of situation occurs less often for him. In this case, we might see a cross-level interaction whereby Mike's higher levels of dispositional (i.e., trait) self-efficacy reduce the impact of his lower situational (i.e., state) self-efficacy within a given event.

Finally, the inclusion of both systems at both levels can add further to testing decision making models. For example, consistent with the risk as feelings hypothesis, we might hypothesize that the association between Mike's higher dispositional-level (i.e., trait) self-efficacy and condom use is ameliorated during *events* when he is more sexually aroused (i.e., state arousal), such as when he is having sex with Frank (see Figure 3). In this way, the influence of different variables at different levels can be integrated in a variety of ways to test models about the interaction of System 1 and System 2 from both dispositional and momentary/situational standpoints.

Future Directions

In the previous sections I have suggested that investigating dual processes of sexual decision making at both the individual and situational level is important because not doing so may inadvertently mask, exaggerate, diminish, or even reverse the true processes underlying the data observed. However, this is not the only reason for taking such an approach. This dual process, dual level perspective also provides unique opportunities for new discoveries. I have reviewed existing research that points to prominent cognitive variables for consideration within such a framework, particularly self-efficacy. An investigation of self-efficacy alongside affective/automatic processes and as an individual trait that may fluctuate from situation-to-situation around this typical trait level would allow for new questions to be answered. For example, to what extent do we capture additional variance in sexual behavior by examining both trait-level averages and situation-level variability in self-efficacy? Similarly, to what extent might some of the lack of predictive power be due not to a lack of importance of self-efficacy itself but to a moderator such as sexual arousal, which may diminish its influence when high but allow it to operate strongly when low? The answers to such questions and others like them will no doubt bring added clarity and sophistication to theories that have been the hallmark of HIV research for decades.

Benefits notwithstanding, this approach is has its challenges. While it may be relatively clear how to measure individual-level traits, the measurement of momentary variables is a developing area of research. New measurement techniques including daily diaries, ecological momentary assessment, and ambulatory assessment (Bolger & Laurenceau, 2013; Mehl & Conner, 2012) make it possible to explore psychological, biological, and behavioral phenomena in new ways like never before. However, these methods provide new complications as well, such as the potential for greater reactivity to assessments, new issues in handling missing data, the need for increased brevity of measurement instruments, and an increasing reliance on technology that may not be feasible for certain populations, to name a few. Similarly, utilizing the proposed framework will require advanced statistical analyses that are beyond the scope of those commonly required within psychology doctoral training (Aiken, West, & Millsap, 2008), which may require researchers to rely increasingly on

statistical specialists. These new methods bring with them new questions, as well. For example, how can we use these techniques to repeatedly measure automatic processes that have previously only been measured in complicated lab-based tasks? From a public health perspective, how can we optimize these methods for use in large, population-based studies and not just smaller convenience samples? To truly benefit from these methods and the power they have to offer will require an increasing reliance on interdisciplinary training and collaboration.

The past several decades of research have had both strengths and limitations, as I have reviewed throughout this manuscript. Most importantly, however, they have provided a foundation upon which to build the next generation of sexual decision making models. Combining ongoing theoretical advances with new tools for measurement and analysis will allow both existing and new sex researchers to answer questions in ways that have only begun to be tested. Training models for psychologists and others interested in sexual decision making should incorporate an interdisciplinary approach that includes multiple models from social and clinical to cognitive and neuropsychological disciplines. Similarly, teams of researchers are needed that bring diverse and complementary backgrounds to the science of studying sexual behavior. More importantly, methodological and statistical training must continue to advance with the techniques in the field, and scientific societies and associations should push to offer post-graduate training in these topics that will allow individuals to continue to develop beyond graduate training. This dual process, dual level approach is likely one of many ways toward advancements in the psychology of sexual behavior, and researchers should continue to examine behavior from all levels and angles to continue to push the envelope in developing and testing new models of behavior.

Conclusions

Decisions about sexual risk behavior are no doubt complicated, involving the interplay of bodily states such as arousal (Ariely & Loewenstein, 2006), intimacy (Golub et al., 2011), and affect (Mustanski, 2007), among others, in addition to more traditional cognitive influences, such as a sense of self-efficacy. Importantly, researchers would do well to examine decisions about sexual behavior as being made on an event-by-event basis, and to take into consideration the substantial situational variation in sexual behavior by utilizing event-level models (Cooper, 2010). This approach certainly does not require the abandonment of previous models, but rather allows for an opportunity to expand upon them in new and creative ways. Examining the contribution of multiple forms of influence on behavior at both the situational (i.e., state, within-person) and individual (i.e., trait, between-person) levels has the potential to provide a more complete examination of sexual decision making that may help to push the field toward greater predictive power and understanding of behavior. Interdisciplinary collaboration will allow for the development of new models, methods, and statistical techniques for investigating sexual behavior as the result of multiple processes at multiple levels.

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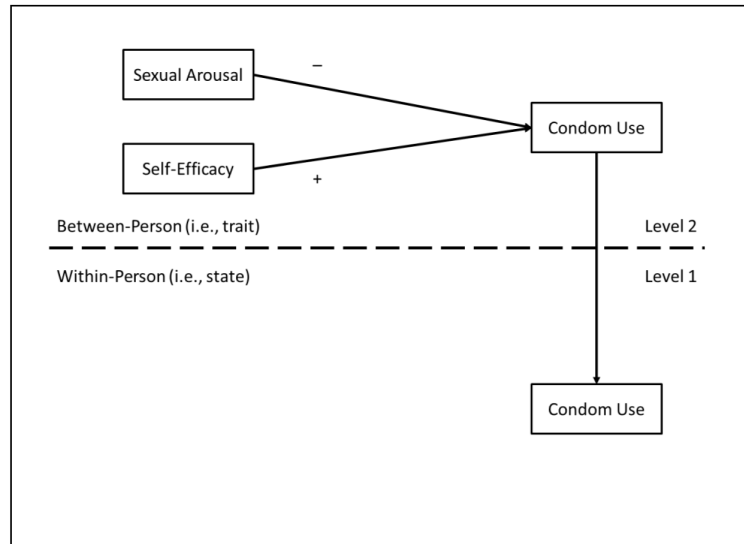


Figure 1. Between-person differences in System 1 (sexual arousal) and System 2 (self-efficacy) processing during sexual decision making.

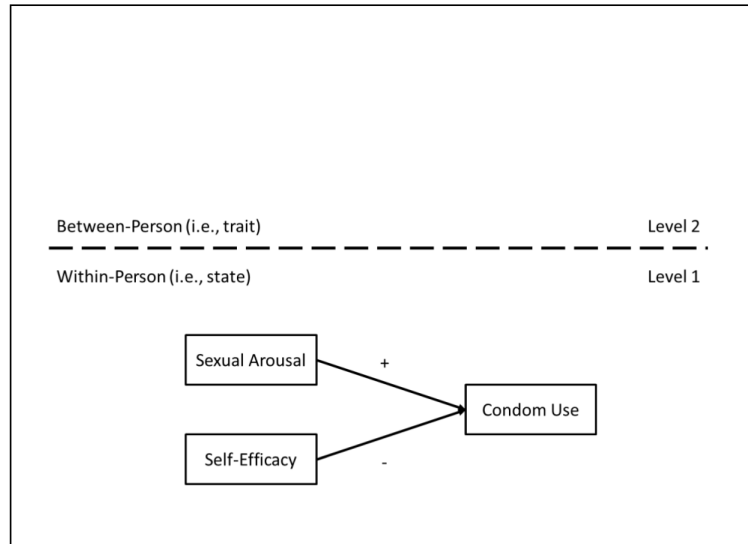


Figure 2. Within-person influences of System 1 (sexual arousal) and System 2 (self-efficacy) processing during sexual decision making.

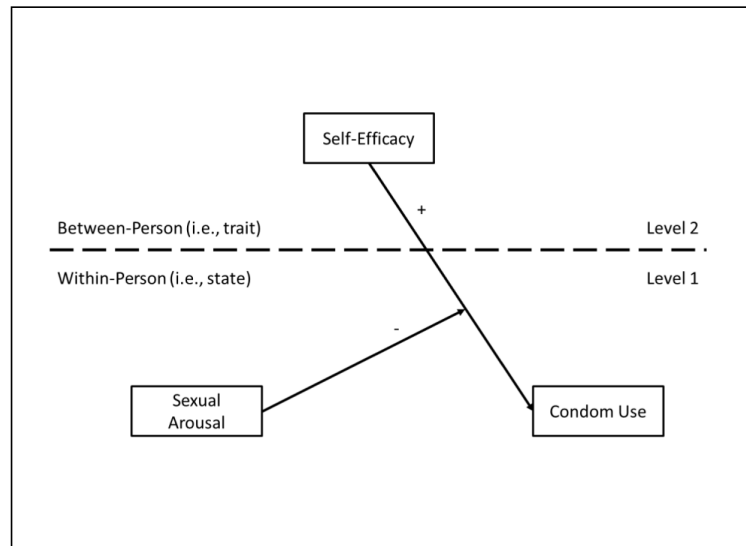


Figure 3. Cross-level interaction depicting both the main effects of event-level sexual arousal (System 1) and dispositional self-efficacy (System 2) as well as the risk as feelings hypothesis that System 1 processing interacts with (i.e., interrupts) System 2 processing.