Social Psychological Foundations of Health and Illness
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CHAPTER 4

The Information–Motivation–Behavioral Skills Model: A General Social Psychological Approach to Understanding and Promoting Health Behavior

William A. Fisher,

University of Western Ontario

Jeffrey D. Fisher and Jennifer Harman

University of Connecticut

Introduction

Over the past half-century, a number of conceptualizations (e.g., the Health Belief Model, Hochbaum, 1958, Rosenstock, 1990; the Transtheoretical Model, Prochaska and Velicer, 1997) have been developed as general theories of the determinants of the range of health-related behaviors. Other conceptualizations, such as the AIDS Risk Reduction Model (Catania et al., 1990), have been created for the specific purpose of understanding and changing a particular health behavior. In addition, social psychological conceptualizations such as the Theory of Reasoned Action (e.g., Fishbein and Ajzen, 1975; W. Fisher et al., 1995), the Theory of Planned Behavior (e.g., Ajzen, 1991; Godin and Kok, 1996), and Social-Cognitive Theory (e.g., Bandura, 1989; 1992) that have been formulated in contexts other than health behavior have been applied in efforts to understand and modify a range of health-related actions.

Building on existing work concerning the social and individual determinants of health behavior, and seeking to extend these efforts, the current chapter presents the Information–Motivation–Behavioral Skills (IMB) Model (J. Fisher and Fisher, 1992; 2000; W. Fisher and Fisher, 1993; 1999) as a general social psychological conceptualization for understanding and promoting

health-related behavior. We first describe the origins of the IMB model and the constructs and relationships it proposes. Next, we discuss procedures for translating the IMB approach into conceptually based, empirically targeted, and rigorously evaluated health promotion intervention efforts. We then review empirical support for the IMB model in the context of correlational and experimental intervention research in the area of HIV prevention. Based upon this conceptual and empirical foundation, we suggest the general utility of the IMB model as an approach to understanding social and psychological factors that influence the range of health-related behaviors. We support the general utility of the IMB approach with a literature review emphasizing the significance of the factors central to this model as critical elements in the prediction and promotion of health behavior broadly conceived. As examples of the general conceptual and empirical utility of the IMB approach to understanding and promoting health behaviors, we conclude with examples of its application in diverse health domains. Specifically, we review applications of the IMB model in the prediction and understanding of breast self-examination and motorcycle safety gear utilization, and end with an IMB model-based conceptualization of adherence to complex medication regimens.

The Information–Motivation–Behavioral Skills Model

The IMB model (J. Fisher and Fisher, 1992; 2000; W. Fisher and Fisher, 1993; 1999) conceptualizes psychological determinants of the performance of behaviors that have the capacity to impair or to improve health status. The model was originally developed to provide an account of the psychological determinants of HIV risk and preventive behavior (J. Fisher and Fisher, 1992; W. Fisher and Fisher, 1993), and is based on a critical review and integration of the constructs of relevant theories in social and health psychology (e.g., Bandura, 1989, Fishbein and Ajzen, 1975; Hochbaum, 1958) and on an analysis of successes and failures reported in the HIV prevention intervention literature (J. Fisher and Fisher, 1992). The IMB conceptualization seeks to address limitations of existing theory in social and health psychology (J. Fisher and Fisher, 1992). These include the absence of specification of the relationships among critical constructs (e.g., Bandura, 1989; Rosenstock, 1974; 1996); lack of predictive validity of key constructs (e.g., Rosenstock, 1974; 1996; Gerrard et al., 1996); lack of conceptual parsimony (e.g., Prochaska et al., 1994); and absence of constructs that may be central to understanding and changing health-related behavior (e.g., Fishbein and Ajzen, 1975; Ajzen, 1991). The IMB model was also designed to be easy to translate into theoretically based and empirically targeted intervention operations. (For current purposes, an empirically targeted intervention refers to an intervention that is directed specifically at objectively identified information, motivation, and behavioral skills needs of a particular population requiring health promotion efforts. See J. Fisher and Fisher, 1992; 2000, for a critical discussion of conceptual and methodological issues in health behavior change research).

The IMB model focuses comprehensively on the set of information (e.g., US Department of Health and Human Services, 1988), motivation (e.g., Fishbein and Ajzen, 1975), and behavioral skills (e.g., Kelly and St. Lawrence, 1988) factors that are conceptually and empirically associated with performance of health-related behavior, but which are often dealt with in isolation from one another in both conceptual and health promotion intervention efforts (J. Fisher and Fisher, 1992). The model specifies a set of causal relationships among these constructs (J. Fisher and Fisher, 1992) as well as a set of operations (W. Fisher and Fisher, 1993) that may be used for translating the IMB approach into health promotion interventions.

Assumptions of the IMB Model

The IMB model asserts that health-related information, motivation, and behavioral skills are fundamental determinants of performance of health behaviors. To the extent that individuals are well informed, motivated to act, and possess the requisite behavioral skills for effective action, they will be likely to initiate and maintain health-promoting behaviors and to experience positive health outcomes. In contrast, to the extent that individuals are poorly informed, unmotivated to act, and lack behavioral skills required for effective action, they will tend to engage in health risk behaviors and to experience negative health outcomes.

According to the IMB model, *information* that is directly relevant to the performance of health behavior and that can be easily enacted by an individual in his or her social ecology is a critical determinant of health behavior performance (J. Fisher and Fisher, 1992; 2000; W. Fisher and Fisher, 1993; 1999). Information can include specific facts about health promotion as well as relevant heuristics (simple rules which permit automatic and cognitively effortless – but often incorrect – decisions about whether or not to engage in a health promotion behavior). Health promotion information can also involve relatively elaborate implicit theories (complicated sets of beliefs that require cognitive effort to process and which are also often incorrect) in making decisions about health-related action. In the area of HIV preventive behavior, for example, specific facts (e.g., "Condom use prevents HIV transmission"), heuristics ("Monogamous sex is safe sex"), and implicit theories ("Known and trusted people who dress and act reasonably and who possess a variety of normative characteristics are safe partners") appear to exert powerful influences on HIV preventive behavior performance (Hammer et al., 1996; Misovich et al., 1996; Williams et al., 1992). In other areas of health behavior, such as disease prevention and screening, the IMB model asserts that information can be important as well. For example, the model would direct our attention to exploring the impact of possessing specific facts (e.g., "Genetic testing for BRCA1 and BRCA2 can clarify the risk of breast and ovarian cancer"); heuristics ("Ashkenezic Jewish woman should all seek BRCA1 and BRCA2 testing"); and implicit theories ("I have small breasts and women with small breasts don't get breast cancer") on individuals' levels of disease prevention and screening.

The IMB model specifies that *motivation* is an additional determinant of the performance of health-related behaviors, and influences whether even well-informed individuals will be inclined to undertake health promotion actions. According to the model, personal motivation (attitudes toward personal performance of health promotion behaviors) and social motivation (social support for enactment of health promotion behaviors) are critical influences on performance of health-related behavior. In the HIV prevention domain, for example, personal attitudes towards condom use and perceptions of social support for it are strongly predictive of condom use behavior (e.g., Albarracin et al., 2001). In parallel fashion, and consistent with the IMB model, in the area of disease screening and prevention, attitudes and social support regarding breast self-examination predict its performance (e.g., Champion, 1990; Lierman et al., 1991; Misovich et al., 2001). In the area of adherence to medical regimen, attitudes and social norms towards hormone replacement therapy are strong correlates of postmenopausal women's continued use of this therapy (e.g., W. Fisher et al., 2000b).

Behavioral skills for performance of health promotion actions are an additional critical determinant of whether well-informed and well-motivated individuals will be capable of effectively enacting health promotion behaviors. The IMB model's behavioral skills component focuses on an individual's objective abilities and his or her sense of self-efficacy (Rye, 1990; 1998) concerning performance of a given health-related behavior. Behavioral skills for the performance of HIV preventive behavior, for example, may include an individual's actual and perceived ability to bring up and negotiate HIV prevention with a partner; to acquire and use condoms comfortably; to maintain condom use over extended periods of time; and to shift prevention patterns appropriately. Behavioral skills are implicated in a wide range of health practices, from breast and testicular self-examination (actual and perceived tactile skills are required for effective self-examination), to medication adherence (actual and perceived ability to utilize naturally occurring daily life events to cue medication taking may be critical to adherence), to cardiovascular health (actual and perceived skills for smoking cessation and relapse prevention can be critical to maintaining lowered levels of cardiovascular risk).

The IMB model specifies that health promotion information and motivation work primarily through health promotion behavioral skills to influence health promotion behavior. In essence, the effects of health promotion information and motivation are seen primarily as a result of the application of health promotion behavioral skills to the initiation and maintenance of health promotion behavior. The model also asserts that health promotion information and motivation may have direct effects on health promotion behavior performance, when complicated or novel behavioral skills are not required to enact the health promotion behavior in question. For example, acquiring information about the fact that anti-retroviral medication can prevent mother to child transmission of HIV might have a direct effect on HIV+ pregnant women seeking such treatment. Or, high levels of motivation could incline an individual to maintain an existing sexually abstinent pattern of behavior. In addition, we note that the IMB model regards health promotion information

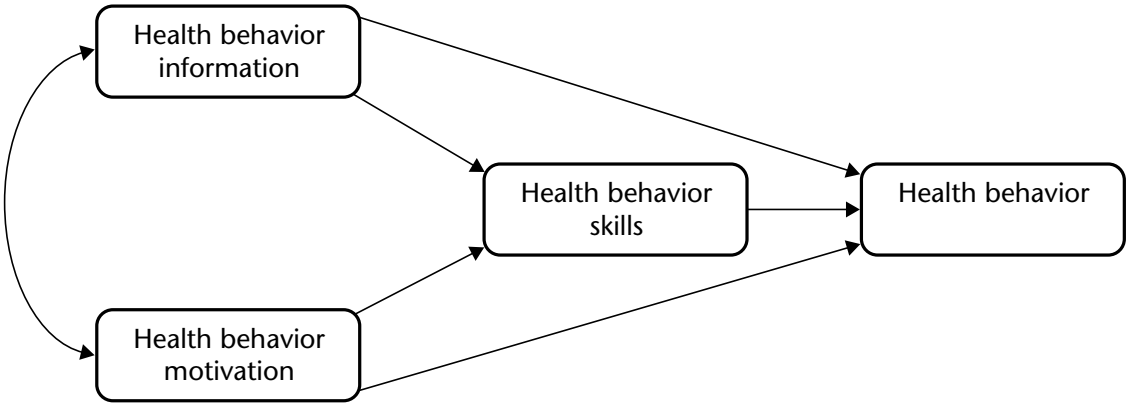

Figure 4.1 The Information–Motivation–Behavioral Skills Model of health behavior.
From J. D. Fisher and W. A. Fisher (1992). Changing AIDS risk behavior. *Psychological Bulletin*, 111, 455–74. Copyright by APA. Reprinted with permission.

and motivation as potentially independent constructs, insofar as well-informed individuals are not necessarily motivated to engage in health promotion behaviors, and highly motivated individuals are not necessarily well informed about health promotion practices (J. Fisher and Fisher, 1992; J. Fisher et al., 1994). The constructs and relationships of the IMB model are presented in Figure 4.1.

In the case of HIV preventive behavior, we would anticipate that in general, individuals who possess accurate and relevant information, and personal and social motivation to act on it, would assemble and apply requisite behavioral skills to initiate and maintain patterns of safer sexual behavior. We would also anticipate that in some cases, when complex behavioral skills may be less critical, HIV prevention information and HIV prevention motivation may have a direct effect on behavior, as noted above.

In another health domain – disease screening and prevention – the IMB analysis would suggest that in general, individuals who possess relevant information about breast or testicular self-examination and personal and social motivation to carry out these behaviors will assemble and utilize behavioral skills for doing so effectively, and will likely engage in these health promotion actions regularly. Nevertheless, there will be cases in which health promotion information concerning breast or testicular examination, or health promotion motivation concerning such examination, is directly linked with health behavior in a fashion not mediated by health promotion behavioral skills. Such a situation would occur when a well-informed or -motivated individual accepts a professional's offer to provide breast or testicular examination to screen for malignancy in the context of an annual physical examination.

The IMB model's information, motivation, and behavioral skills constructs and the relationships among them are regarded as highly generalizable determinants of health promotion behavior, across populations and health

promotion behaviors of interest (J. Fisher and Fisher, 1992; W. Fisher and Fisher, 1999). Within this approach, however, it is asserted that the model's information, motivation, and behavioral skills constructs will have specific content that is most relevant to specific populations' practice of specific health promotion behaviors. Thus, for example, specific sets of information, personal and social motives, and behavioral skills will be most relevant to understanding HIV preventive behavior for men (versus women), for heterosexual (versus homosexual) individuals, for African-American (versus Hispanic-American) individuals, etc. By the same token, particular sets of information, personal and social motives, and behavioral skills will be most relevant to understanding specific health promotion behaviors (e.g., safer sexual practices versus safer needle-use practices).

The IMB approach asserts that particular constructs of the model, and particular causal pathways among them, will emerge as more or less influential determinants of health promotion behavior for given populations and health promotion behaviors (J. Fisher and Fisher, 1992; 2000; W. Fisher and Fisher, 1993). The model specifies procedures that may be used to identify constructs and causal links among them that are especially influential in determining a given population's practice of a health promotion behavior of interest (J. Fisher and Fisher, 1992; 2000; J. Fisher et al., 1994; W. Fisher and Fisher, 1993). From the IMB perspective, specification of the information, motivation, and behavioral skills elements most relevant to a population's practice of a particular health-related behavior, and identification of model constructs which most strongly influence that population's practice of the behavior, is crucial to designing targeted interventions effective for the population and health promotion behavior of interest (J. Fisher and Fisher, 1992; 2000).

The IMB approach to understanding and promoting health behavior specifies a set of generalizable operations for constructing, implementing, and evaluating health promotion interventions for specific populations and health promotion behaviors of interest (J. Fisher and Fisher, 1992; 2000; W. Fisher and Fisher, 1993; 1999). The first step in the process of promoting health behavior – which can involve either initiation or maintenance of health promotion practices *or* the reduction of health risk behaviors – involves the conduct of *elicitation research* with a representative subsample of a target population. Elicitation research seeks to empirically identify the target population's information, motivation, and behavioral skills deficits and assets, and level of health promotion or health risk behavior per se, in a specific health domain. The use of open-ended data collection techniques such as focus groups is advocated, in addition to the use of close-ended techniques, in order to avoid prompting responses that may not be salient or ecologically valid representations of the information, motivation, and behavioral skills factors operating within a target population.

The second step in the IMB approach to health promotion involves the design and implementation of *conceptually based, empirically targeted, population-specific interventions* constructed on the basis of elicitation research findings. Such targeted interventions are designed to address empirically identified deficits in

health behavior information, motivation, and behavioral skills, relative to the health behavior at issue, and to capitalize on information, motivation, and behavioral skills assets that exist within a target population and that can be mobilized to encourage health behavior performance.

The third step in the IMB approach to health promotion involves the conduct of methodologically rigorous *evaluation research* to determine whether an intervention has had significant effects on the information, motivation, and behavioral skills determinants of a targeted health behavior, and whether it has had significant and sustained effects on the performance of this health behavior per se. The IMB approach advocates evaluation research which utilizes multiple convergent sources of evaluation outcome data, at least someof which are relatively non-reactive, and at least some of which are collected in a context that appears to intervention participants to be unrelated to the health promotion intervention itself. The IMB model's elicitation–intervention–evaluation approach to the promotion of health behavior is illustrated in Figure 4.2 and is discussed in detail in J. Fisher and Fisher (1992; 2000) and W. Fisher and Fisher (1993; 1999).

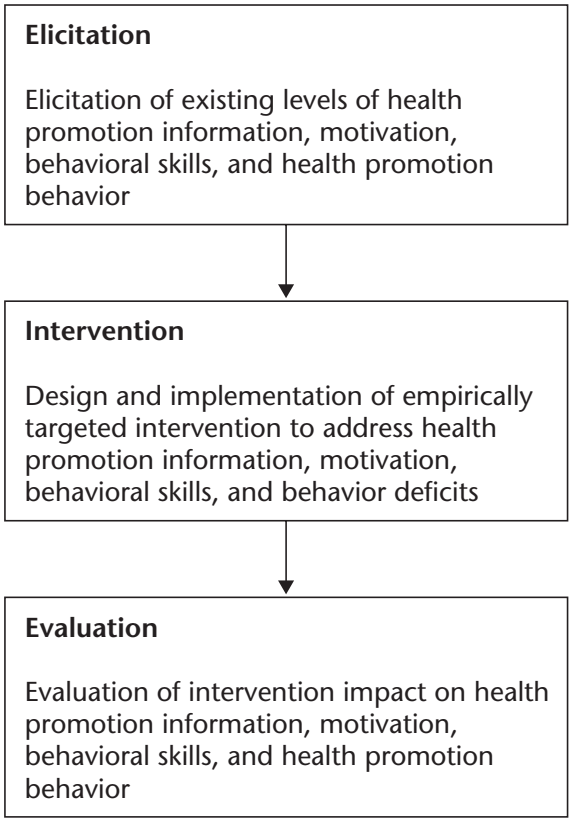

Figure 4.2 The Information–Motivation–Behavioral Skills Model approach to the promotion of health behavior.
From W. A. Fisher and J. D. Fisher (1993). A general social psychological model for changing AIDS risk behavior. In J. Pryor and G. Reeder (Eds.), *The Social Psychology of HIV Infection* (pp. 27–53). Copyright by Lawrence Erlbaum Associates. Reprinted with permission.

Empirical Support for the IMB Model

Considerable empirical support for the assumptions of the IMB model has been accumulated in multivariate correlational research concerning information, motivation, and behavioral skills determinants of HIV preventive behavior, across populations and behaviors of interest (e.g., Bryan et al., 2001; J. Fisher et al., 1994; W. Fisher et al., 1999; see J. Fisher and Fisher, 2000, for a review of this literature). For example, J. Fisher et al. (1994) examined the determinants of HIV preventive behavior, from the perspective of the IMB model, in a sample of heterosexual university students. Structural equation modeling revealed that HIV prevention information and HIV prevention motivation were statistically independent constructs; each was significantly related to HIV prevention behavioral skills; and HIV prevention behavioral skills were significantly related to HIV preventive behavior performance per se, precisely as predicted by the IMB conceptualization. In an additional IMB model-based study, J. Fisher et al. (1994) examined HIV preventive behavior in a sample of homosexual men. Once again, structural equation modeling indicated that HIV prevention information and HIV prevention motivation were statistically independent constructs; each was related to HIV prevention behavioral skills; and HIV prevention behavioral skills were again related to performance of HIV preventive behavior. In addition, and also as predicted by the model, in this sample, a direct link was observed between HIV prevention motivation and HIV preventive behavior. Additional research has confirmed the assumptions of the IMB model in research concerning the information, motivation, and behavioral skills determinants of HIV preventive behavior in samples of sexually active minority high school students (Bryan et al., 2001; W. Fisher et al., 1999), African-American and white very low income women (Anderson et al., 1997), Dutch homosexual men (DeVroome et al., 1996), and truck drivers from the Indian subcontinent (Bryan et al., 2000; 2001).

Empirical tests of the IMB model's assumptions, in the context of correlational research concerning HIV preventive behavior, are summarized in Table 4.1. It can be seen that, as predicted by the IMB model, HIV prevention information and HIV prevention motivation are associated with the application of HIV prevention behavioral skills to promote HIV preventive behavior. It is also apparent that there is often a direct link between HIV prevention motivation and HIV preventive behavior, consistent with the model's assertion that motivation may directly affect behavior when complicated or novel behavioral performances are not necessary for prevention. As can also be seen in Table 4.1, across diverse populations under study, the IMB model's information, motivation, and behavioral skills components generally account for a substantial proportion of the variance in health behavior performance.

Confirmation of the IMB model's health promotion implications has been provided in model-based experimental intervention research. This work, which has targeted population-specific deficits in HIV prevention information, motivation, and behavioral skills, has resulted in significant and sustained increases

Table 4.1 Tests of the Information–Motivation–Behavioral Skills Model: summary of reported associations

Sample	Information–motivation	Information–behavioral skills	Motivation–behavioral skills	Behavioral skills–behavior	Information–behavior	Motivation–behavior	Percentage variance
Heterosexual university males and females (Fisher et al., 1994)		✓	✓	✓		✓	10
Homosexual adult males (Fisher et al., 1994)		✓	✓	✓		✓	35
Urban minority high school males (Fisher et al., 1999)			✓	✓		✓	75
Urban minority high school females (Fisher et al., 1999)		✓	✓	✓			46
Netherland adult homosexual males (deVroom et al., 1996)	✓	✓	✓	✓	✓	✓	26
Low-income African-American females (Anderson et al., 1997)	✓	✓	✓	✓		✓	36
Low-income white female (Anderson et al., 1997)	✓		✓	✓		✓	57
Indian truck drivers[a] (Bryan et al., in press)				✓	✓	✓	40–51

[a] Findings from Bryan et al. (in press) represent tests of relationships of information, motivation, behavioral skills with behavior, and percent of variance accounted for in condom use with wives and with commercial sex workers.

Source: J. D. Fisher and W. A. Fisher (2000). Theoretical approaches to individual level change in HIV risk behavior. In J. L. Peterson and R. J. DiClemete (Eds.), *Handbook of HIV Prevention* (pp. 3–55). New York: Kluwer Academic/Plenum. Reprinted with permission.

in HIV preventive behavior across a number of intervention target populations (e.g., Carey et al., 1997; J. Fisher et al., 1996; J. Fisher et al., 2002; Kalichman et al., 1999a; 1999b, 2001; see also J. Fisher and Fisher, 2000, for a review of this literature). For example, J. Fisher et al. (1996) conducted IMB model-based experimental intervention research with samples of primarily heterosexual university students. In this work, elicitation research was used to identify HIV prevention information deficits, motivational obstacles, and behavioral skills limitations that were related to patterns of HIV risk behavior observed in this population. Based on elicitation findings, an IMB model-based population-specific intervention was created and delivered to remediate identified gaps in HIV prevention information, motivation, and behavioral skills. The intervention was delivered in the context of a field experiment in male and female dormitories and included slide shows, videos, group discussions, and role-plays conveyed by a health educator and peer educators. Rigorous evaluation outcome research showed that the intervention had a significant impact on multiple indicators of HIV prevention information, motivation, and behavioral skills at four weeks post-intervention. At a 2–4 month follow-up, the intervention had significant effects on HIV prevention behavioral performance, including condom accessibility (keeping condoms available for use), condom use during intercourse, and the seeking of HIV antibody testing.

Recent research (J. Fisher et al., 2002) has indicated that an IMB model-based intervention, guided by elicitation research and delivered in entire, intact inner-city high school classes, had significant effects on HIV prevention information, motivation, and behavioral skills at one month post-intervention. More importantly, the intervention had significant, sustained effects on HIV preventive behaviors such as condom use fully one-year post-intervention. Additional IMB model-based intervention research has demonstrated outcome efficacy in a sample of African-American economically disadvantaged urban women (Carey et al., 1997), with experimental (versus control) participants showing reductions in unprotected vaginal intercourse three months post-intervention. In further work, St. Lawrence et al. (1995) found strong support for the efficacy of an IMB model-based HIV prevention intervention with minority adolescents, and Weinhardt et al. (1997) report encouraging results of an IMB model-based pilot intervention for the reduction of HIV risk behavior in a sample of chronically mentally ill individuals. Kalichman et al. (1999a) also report that an IMB model-based intervention led to lower rates of unprotected vaginal intercourse and higher condom use among minority men recruited from a public clinic, and Kalichman et al. (1999b) observed that an intervention with information, motivation, and skills elements led to greater use of female condoms among women. Recent research by Kalichman and associates (Kalichman et al., 2001) also found that an intervention containing IMB elements was effective at reducing HIV transmission risk behaviors among HIV+ individuals. Finally, meta-analytic work has strongly supported the efficacy of including information, motivation, and behavioral skills-based elements in HIV risk behavior change interventions (Johnson et al., 2001).

Establishing the Generality of the IMB Model as an Approach to Understanding and Promoting Health Behavior

Beyond its empirical strength in the prediction and promotion of HIV preventive behavior, the IMB model is viewed as a highly generalizable approach to understanding and promoting health behavior across health behavior domains. As an initial step in establishing the generality of the model, we have conducted a systematic review of the literature concerning psychological factors linked to health behavior performance and change in a number of areas. The findings of this review are reported in the following section, and their implications for the generalizability of the IMB model across health behaviors are considered.

Review of Correlational and Intervention Research Concerning Information, Motivation, Behavioral Skills, and Health-related Behavior

We have surveyed correlational and experimental intervention research across several areas of health behavior, published since 1990, from the perspective of the IMB model. (For a detailed description of the method, scope and findings of this literature review, see the publications section of http://psych.uconn.edu/chip.html. Space considerations preclude our presenting this information fully in the text of this chapter). Our review of the correlational literature clearly indicates that information, motivation, and behavioral skills are consistently correlated with health behavior performance across diverse domains such as exercise behavior, smoking cessation, nutrition, breast health, cardiovascular health, and other areas. Findings revealed that information was correlated with health behavior performance in 19 of 25 (76 percent) associations of these factors that were examined; motivation was associated with health behavior performance in 41 of 46 (89 percent) of associations examined; and behavioral skills were associated with health behavior performance in 37 of 41 (90 percent) of associations examined. Our review of the correlational literature was highly consistent with the IMB model's assertion that information, motivation, and behavioral skills are fundamental determinants of health behavior across broad domains of such behavior that extend well *outside* the HIV prevention literature in which the IMB model was initially developed and tested. The relatively more modest consistency with which information is correlated with health behavior performance (compared to motivation and behavioral skills) is in accord with the IMB model's assertion (J. Fisher and Fisher, 1992; W. Fisher and Fisher, 1993) that only information which is easily translated into health behavior in an individual's social ecology is expected to be related to health behavior performance. Unfortunately, much of the information disseminated by public health officials and assessed in health promotion research is actually irrelevant to the practice of health behavior and would not be expected to predict such behavior (J. Fisher and Fisher, 1992).

We next reviewed experimental health promotion intervention research across several health behavior domains (again, for a summary table and a detailed description of the method, scope, and results of this literature search, see the publications section of http://psych.uconn.edu/chip.html). Our review provided a basis for several important conclusions relevant to the IMB conceptualization and to health behavior change research in general. First, although the IMB approach emphasizes the critical importance of health promotion interventions which are conceptually based and targeted at identified needs of an intervention population, little more than half (35 out of 59, or 59 percent) of the interventions reviewed were based on a formally stated theory or conceptualization. Further, very few (7 out of 59, or 12 percent) were based on formal elicitation research conducted to identify target population characteristics or needs which can be critical to creating an effective health promotion intervention for a specific population and preventive behavior of interest.

Second, although the IMB model asserts that successful interventions to promote health behavior change will generally require information, motivation, *and* behavioral skills components, many of the intervention efforts reviewed contained only informational content, with motivation- and behavioral skills-related intervention content far less often present. There is consistent evidence in the literature that "information only" interventions are unlikely to change health behavior (J. Fisher and Fisher, 2000). Further, we found that interventions with information *and* motivation *and* behavioral skills content were more effective in promoting health behavior change than interventions that did not have all three elements. To quantify, at least crudely, our impression that interventions that contained all three components had a greater impact than those that did not, intervention effects were rated on a 3-point scale of intensity (0 = no effects observed, 3 = strongest effects observed). We then compared the average intensity of intervention effects in health promotion interventions that contained information, motivation, and behavioral skills elements versus those that did not contain all three elements. When all three intervention elements specified by the IMB model were present, the average intensity of intervention effect observed (1.80) was significantly greater than when these three elements were not all present (1.13), $t = -2.39$, $df = 27.50$, $p = 0.027$.

In another approach to quantify the relationships between health promotion intervention information, motivation, and behavioral skills content and health promotion intervention impact, the strength of the information, motivation, and behavioral skills content reflected within an intervention was rated (0 = no content present to 3 = content strongly represented). We then compared the strength of the information, motivation, and behavioral skills content represented in those health promotion interventions that had strong or relatively strong effects (3 or 2 on our scale of intervention effect intensity) versus those with weak or null effects (1 or 0 on our scale of intervention effect intensity). Statistical tests indicated that interventions that had stronger compared to weaker effects also possessed stronger information (2.29 versus 1.65, $t = -2.51$, $df = 32.27$, $p = 0.017$), motivation (2.00 versus 1.30, $t = -3.19$,

df = 50.56, *p* = 0.002), and behavioral skills (2.35 versus 1.30, *t* = −3.54, *df* = 33.70, *p* = 0.001) content.

The experimental intervention literature reviewed is highly consistent with the IMB model's assertions concerning information, motivation, and behavioral skills as fundamental determinants of health promotion behavior change across widely varying domains of behavior. Our review of the literature detected these findings outside of the HIV prevention context in which the IMB model has been developed and extensively tested. In a broad sense, then, the presence of health promotion information, motivation, and behavioral skills elements appears to be associated with health promotion intervention impact, and the more strongly these elements are represented, the greater the intervention's impact on health promotion behavior change.

Application of the IMB Model to Breast Self-examination Behavior

As an additional step in establishing the generality of the IMB model across health behavior domains, we report the findings of model-based research concerning information, motivation, and behavioral skills determinants of breast self-examination (BSE) practices (Misovich et al., 2001). BSE is a critical health behavior for our purposes, both because it is regarded as potentially effective in the early detection and cure of breast cancer (American Cancer Society, 1998) and because it is presently practiced by relatively few women (W. Fisher et al., 2000a; Misovich et al, 2001). Moreover, for the purpose of establishing the generality of the IMB model, we note that BSE takes place in the domain of disease detection and screening, while most work on the IMB model, in the area of HIV prevention, has focused on disease prevention.

In research reported by Misovich et al. (2001), women (*N* = 166) aged 22 to 64 (*M* = 42.6) were recruited in workplace settings and completed questionnaire measures of BSE related information, motivation, behavioral skills, and behavior (practice of BSE, discussion of BSE, and having a friend remind the individual to engage in BSE). Findings from this cross-sectional study revealed that women had significant information deficits relative to BSE (women's average score on a 40-item information measure concerning BSE was 67 percent and important gaps existed with respect to items such as the correct time during the menstrual cycle to examine one's breasts). Motivation concerning BSE practice ranged from neutral to positive, with more positive attitudes and social norms toward learning and practicing BSE and less positive attitudes and social norms toward discussing BSE and being prompted by friends to practice BSE. A parallel pattern emerged for assessments of women's BSE-related behavioral skills. Women perceived high levels of skills for learning and practicing BSE and lower levels of skills for discussing or asking others to remind them to practice BSE. Women's practice of BSE was modest, with only 54 percent indicating BSE at a level even approaching monthly frequency.

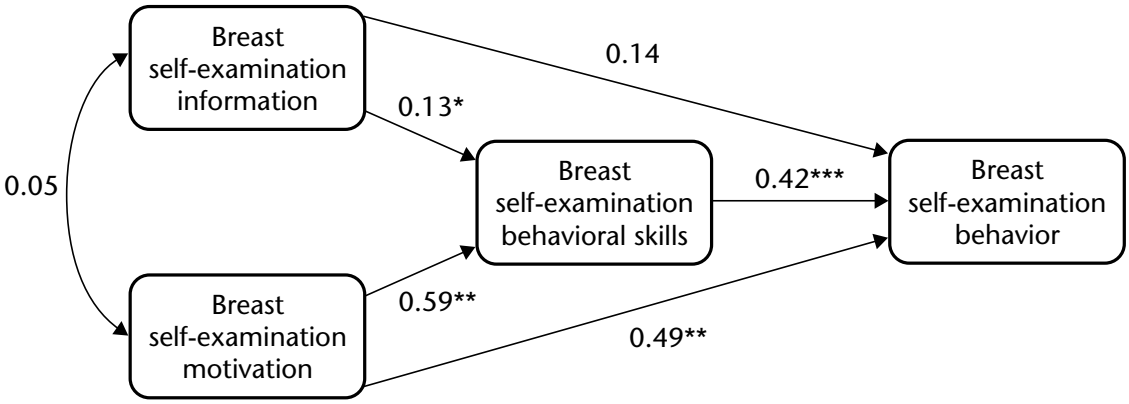

Figure 4.3 Empirical test of the Information–Motivation–Behavioral Skills Model of the determinants of breast self-examination behavior (after Misovich et al., 2001).

Determinants of BSE, from the perspective of the IMB model, were examined using structural equation modeling. Results showed that each of the relationships specified by the model was confirmed, and that it provided an acceptable fit to the data (CFI = 0.96, RMSEA = 0.07). As can be seen in Figure 4.3, BSE information and motivation are statistically independent constructs; each is significantly linked with BSE behavioral skills; and BSE behavioral skills are significantly associated with performance of BSE-related behavior, all as specified by the IMB model. In addition, and also predicted by the model, there is an independent link between BSE motivation and BSE-related behavioral performance. The three components of the IMB model account for 70 percent of the variance in BSE-related behaviors, which is regarded as a large effect size for a prediction model in the behavioral sciences (Cohen, 1988).

These findings illustrate the generalizability and strength of the IMB model across domains of health behavior including preventive behavior (e.g., HIV prevention) and screening and detection behaviors (e.g., BSE-related behaviors). Moreover, these findings can serve as elicitation research to guide future intervention efforts to increase BSE. On the basis of our observations, such interventions should focus comprehensively on the set of information, motivation, and behavioral skills factors and their interrelations that have been empirically demonstrated to account for substantial variance in BSE-related behaviors. The present work can also serve to assist with the identification of specific information, motivation, and behavioral skills intervention deficits that are relevant to BSE and that could be targeted in health promotion interventions to encourage initiation and maintenance of this practice.

Application of the IMB Model to Motorcycle Safety Gear Utilization

As a further step in establishing the IMB model as a generalizable account of the psychological determinants of health behavior performance, we report the

findings of IMB model-based research concerning the determinants of motorcycle safety gear utilization (Murray, 2000). Motorcycle accidents and associated injury and death are very common occurrences (US Department of Transportation, 1997). Although motorcycle safety gear has the potential to save hundreds of lives annually (US Department of Transportation, 1997), it is inconsistently used by those at risk. For the purpose of broadening the generality of the IMB model, we note that motorcycle safety gear use represents a very different type of health behavior than those in our previous studies (i.e., it is an *injury prevention* behavior, as opposed to a disease prevention or disease detection practice). Findings that the IMB approach can provide an empirically strong account of motorcycle safety gear use would provide additional evidence of the general utility of this model for understanding health behavior performance.

In a correlational study reported by Murray (2000), elicitation research-based sets of information, motivation, behavioral skills and behavior items relating to motorcycle safety gear use were generated and pilot tested. Data collection from an Internet-based sample of motorcycle riders took place through motorcycle-related websites and web-based mailing lists, and questionnaires which were completed through the Internet were returned by email.

Findings from this cross-sectional study revealed that motorcycle riders had significant information deficits relative to motorcycle safety gear utilization (the average score on a 33-item information measure was 73 percent). Mean motivation (attitudes, social norms, and intentions) and behavioral skills (4.37, 3.90, 3.93, and 4.11, respectively, on 1–5 scales) concerning motorcycle safety gear use were generally high. However, motorcycle safety helmet utilization, which is critical for saving lives, was variable, with mean use of helmets 81 percent of the time when riding, and a range of 0–100 percent.

Structural equation modeling was employed to examine determinants of motorcycle safety helmet use among respondents who resided in states that did not have laws *requiring* them to wear helmets ($N = 197$). Comfortable and non-intrusive motorcycle safety helmet use can require application of complex and novel behavioral skills, since it can be difficult to find the "right fit" for helmets, they can be challenging to put on comfortably, and they can impair one's sense of control and mobility when riding. For health-related behaviors that involve the application of significant behavioral skills, the IMB model specifies a mediational relationship between information and motivation and behavioral skills and behavior.

Results of structural equation modeling showed that the relationships specified by the IMB model were confirmed, and suggested that the model may provide an acceptable fit to the data (CFI = 0.93; RMSA = 0.13). As can be seen in Figure 4.4, information and motivation concerning motorcycle safety gear use were statistically related constructs. (While the IMB model suggests that information and motivation may be independent constructs, because well-informed persons are not necessarily well motivated to practice health behaviors, the model does not require the statistical independence of the information and motivation constructs). Further, and as predicted by

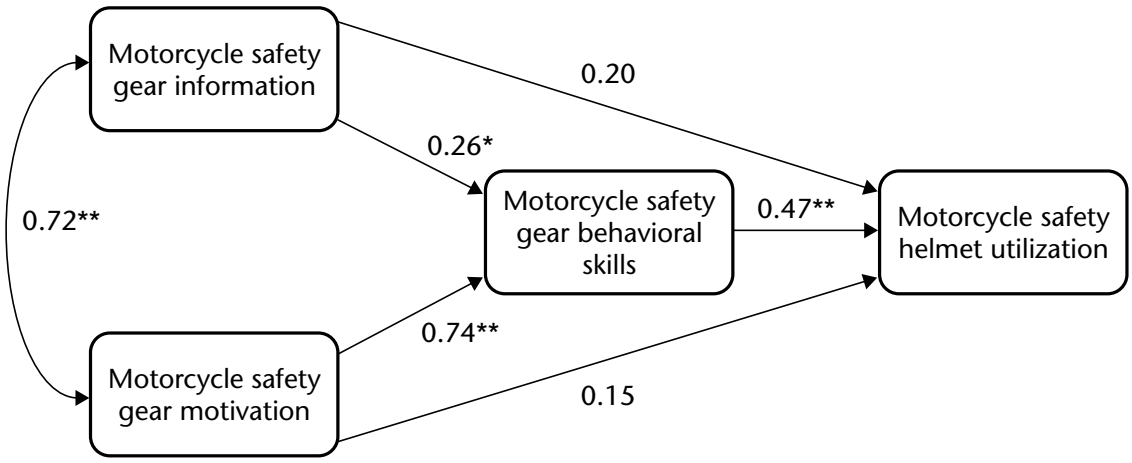

Figure 4.4 Empirical test of the Information–Motivation–Behavioral Skills Model of the determinants of motorcycle safety helmet utilization (based upon data collected by Murray, 2000).

the IMB model, information and motivation were associated with behavioral skills for motorcycle safety gear use, and behavioral skills were significantly associated with the criterion of motorcycle safety helmet use per se. The information, motivation, and behavioral skills components of the IMB model accounted for 61 percent of the variance in motorcycle safety helmet utilization, indicating substantial predictive power of the IMB model in this health behavior domain. Once again, this IMB model-based exploration of the determinants of motorcycle safety gear use can serve as elicitation research to guide targeted interventions to encourage motorcycle safety gear utilization. Moreover, these findings further establish the generalizability and strength of the IMB model across domains of health behavior, including disease preventive behavior (e.g., HIV prevention), disease detection behavior (e.g., BSE), and injury prevention behavior (e.g., motorcycle safety helmet use).

An IMB Model Analysis of Adherence to Medication Regimen

In addition to establishing the empirical generalizability of the IMB model, we wish to demonstrate conceptual utility as a basis for analysis of the determinants of still other health-related behaviors. To illustrate, we present an IMB model conceptualization of factors implicated in adherence to anti-retroviral therapy among people living with HIV infection. Understanding and promoting adherence to anti-retroviral therapy among HIV+ individuals is of enormous individual health and public health significance. On the one hand, anti-retroviral therapy has proven dramatically effective in reducing the viral load and associated morbidity among persons living with HIV, and has contributed directly to dramatic declines in HIV-related mortality (Greenberg et al., 1999;

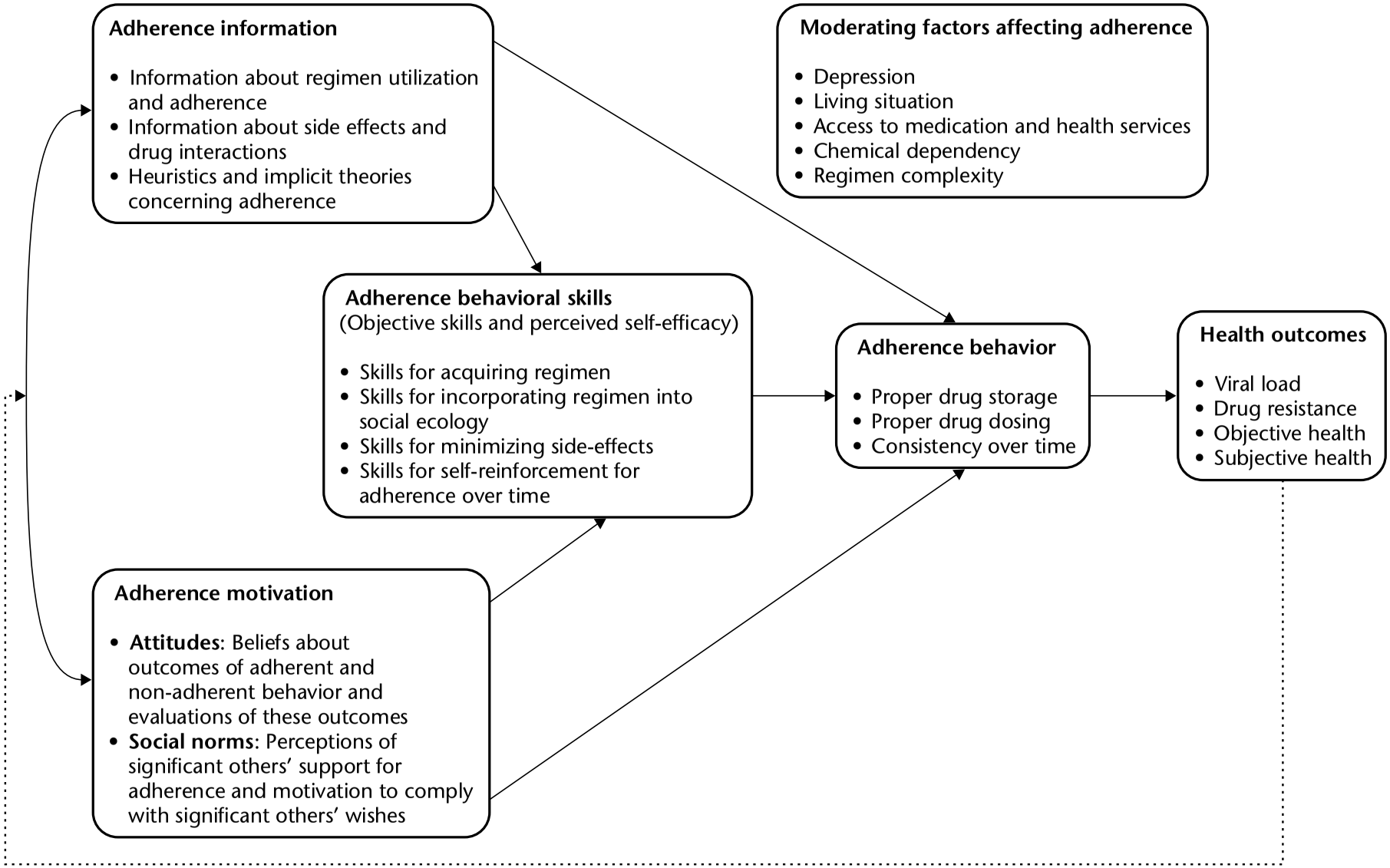

Figure 4.5 An Information–Motivation–Behavioral Skills Model analysis of adherence to anti-retroviral medication.
From J. D. Fisher, W. A. Fisher, K. Amico and J. Harman (2001). An information–motivation–behavioral skills model of adherence to highly active antiretroviral therapy. Manuscript submitted for publication. Reprinted with permission.

Montaner et al., 1998). On the other hand, anti-retroviral therapy adherence – which can involve taking numerous pills per day, some fasting and some with food, many of which produce significant side effects, and all of which are expensive and can indirectly disclose one's illness to others – must occur with a great deal of consistency and for an HIV+ individual's entire foreseeable future.

Although adherence to anti-retroviral therapy must be in the 95 percent range, in actuality adherence to therapy is often much lower (W. Fisher et al., 2002; Montessori et al., 2000). When anti-retroviral adherence is suboptimal, treatment failure, viral mutation, and development of multidrug resistant HIV may take place (Boden et al., 1999; Eron, 2000; Hogg et al., 2000). HIV+ individuals who are intermittently adherent therefore are at significant personal health risk and may pose a substantial public health risk involving the potential development and transmission of multidrug resistant HIV to others.

From the perspective of the IMB model, adherence to medication regimen shares much in common with maintenance of other critical health behaviors. Therefore, anti-retroviral adherence is conceptualized to occur as a function of the presence of a specific set of relevant information, motivation, and behavioral skills elements. All else being equal, to the extent that an HIV+ individual is well informed about anti-retroviral therapy, motivated to act, and possesses the requisite behavioral skills to act effectively, he or she will be likely to adhere to anti-retroviral regimens, and to reap the substantial health benefits of adherence. To the extent that HIV+ individuals are poorly informed, unmotivated to act, and lack the requisite behavioral skills for effective adherence, they are expected to be non-adherent to anti-retroviral therapy and will fail to realize the substantial health benefits of this therapy. An IMB model analysis of anti-retroviral adherence is presented in Figure 4.5, which describes specific information, motivation, behavioral skills, and adherence behavior parameters and the relationships among them, as well as a set of moderating factors that are relevant in the context of anti-retroviral adherence.

According to the IMB model, *information* which is directly relevant to anti-retroviral medication utilization is a prerequisite for adherence. At a minimum, information about one's anti-retroviral regimen, including when (e.g., dosing intervals) and how (e.g., food and fasting requirements) to take the regimen, is required for adherent behavior. In addition, information about adequate adherence levels (e.g., about the relative effectiveness of anti-retroviral medication at 95 percent versus 50 percent adherence), information about side effects, and information about interactions with other prescription or recreational drugs are also thought to be critical to anti-retroviral adherence (J. Fisher et al., 2001). In addition to specific information that is fundamental to anti-retroviral adherence, the IMB model also directs our attention to adherence-related heuristics that permit automatic and cognitively effortless (but often incorrect) adherence-related decision making (e.g., "If I feel good I must be adhering at a sufficient level"). Adherence-related implicit theories – more complicated sets of beliefs that require cognitive effort to apply to anti-retroviral therapy decision-making – may also affect behavior. For example,

the adherence-related implicit theory reflected in the view that "Periodic drug holidays (e.g., not taking drugs on weekends or vacations) approximate the structured interruptions of therapy that cutting edge science is experimenting with, so they are not only acceptable but desirable adherence interruptions" might exert a substantial effect on adherence behavior.

Motivation to adhere to anti-retroviral therapy is an additional factor which is expected to strongly influence whether even well-informed individuals will be inclined to adhere to therapy (e.g., J. Fisher et al., 2001; Richter et al., 1998). From an IMB model perspective, personal attitudes towards adherence – based upon perceptions of the outcomes of adherent behavior and evaluations of these outcomes (Fishbein and Ajzen, 1975) – represent an individual's personal motivation to adhere to anti-retroviral therapy. Social motivation – based upon perceived support for adherence to anti-retroviral therapy from salient referent others and motivation to comply with these referents' wishes – represents an individual's source of social motivation to adhere to therapy. Examination of circumstances under which personal motivation, social motivation, or both serve as especially strong influences on adherence will be an important focus for understanding and, critically, for promoting adherence to anti-retroviral therapy.

Behavioral skills for adhering to complicated, costly, side effect laden, and potentially illness-disclosing anti-retroviral regimens are an additional critical influence on adherence and determine whether well-informed and motivated individuals will be capable of adhering effectively to therapy over time (Albert et al., 1999; J. Fisher et al., 2001; Gallant and Block, 1998). Behavioral skills include objective abilities and perceptions of self-efficacy (J. Fisher and Fisher, 1992; J. Fisher et al., 2001) for performing a sequence of critical adherence behaviors. These may include acquiring anti-retroviral medication in an affordable and timely fashion and storing it appropriately; incorporating adherence into the social ecology of daily life (e.g., utilizing routine events to self-cue medication dosing; taking medication while at work without disclosing that one is HIV+); avoiding or minimizing side-effects and drug interactions; continuously updating adherence-related knowledge; and reinforcing one's self for adhering to anti-retroviral therapy over time and in the face of the multiple challenges that adherence to therapy represents.

As is the case for other health behaviors, the IMB model specifies that adherence information and motivation are often statistically independent factors that work primarily through behavioral skills to affect adherence behavior per se (see Figure 4.5). In essence, effects of adherence information and motivation will be expressed primarily through the application of adherence behavioral skills to the task of maintaining adherence to anti-retroviral therapy over time. As with other health behaviors, the model also specifies that adherence information and motivation may potentially have direct effects on adherence behavior, in situations in which novel or complicated behavioral skills are not required for adherence. At present, anti-retroviral therapy adherence clearly *does* require complex behavioral skills. If in the future, however, anti-retroviral regimens are developed which are delivered via once a day or weekly dosages or transdermal patches, and which have

very low cost and few side effects, the IMB model would anticipate that adherence information and/or motivation could have direct effects on adherence behavior.

The IMB approach described in Figure 4.5 includes some critical additional elements. Clearly, adherence behaviors ultimately have direct effects on individual health outcomes (e.g., viral load, objective health, subjective health; Arnsten et al., 2000; Bangsberg et al., 2000). These outcomes, in turn, can feed back into the system and influence the information, motivation, and behavioral skills determinants of adherence behavior (see Figure 4.5). Thus, a positive objective and/or subjective health outcome may strengthen individuals' reliance on their adherence information, strengthen their personal and social motivation to adhere to therapy, and strengthen their objective and perceived efficacy for applying their behavioral skills to maintain adherent behavior. Such positive feedback should result in the maintenance and strengthening of anti-retroviral adherence among HIV+ patients in the context of good health outcomes. In contrast, a poor objective and/or subjective health outcome could cause weakened reliance on adherence information, lessened motivation to adhere, and lower objective and perceived self-efficacy with respect to applying behavioral skills to the challenge of anti-retroviral adherence. Such a negative feedback process could ultimately result in weakened adherence to therapy. Potential time lags between an individual's adherent or non-adherent behavior and his or her health outcomes are also accommodated within this IMB model analysis. For example, a fully adherent individual who does not achieve a discernable positive health outcome due to a medication response time lag may lose confidence in his or her adherence information base, lose motivation to adhere, and suffer a decline in perceived adherence behavioral skills, all of which will effect a decrease in adherence. By the same token, an intermittently adherent individual who does not observe a linked health decline may conclude that intermittent adherence is acceptable and may alter his or her adherence-related information, motivation, and behavioral skills in a way that results in continued deterioration of adherence to therapy.

Beyond these relationships, the IMB model of adherence also recognizes that relevant situational and individual factors will moderate the relationships in the model. Situational and personal affordances such as supportive and stable versus unstable living situations, easy versus limited access to medication and medical care, positive versus distressed psychological health status, and simplicity versus complexity of medication regimen will act to moderate effects of adherence information, motivation and behavioral skills on adherence behavior and health outcomes. For example, in the context of stable and supportive living circumstances (versus homelessness), adherence information, motivation, and behavioral skills are expected to be relatively strongly related to adherence behavior and health outcomes and should account for a substantial proportion of the variance in these parameters. In contrast, in the context of a non-supportive living situation such as homelessness, adherence information, motivation and behavioral skills are not expected to be capable of having strong effects on adherence behavior and health outcomes unless

and until homelessness is remedied. Similarly, good access to medication, psychological health, and a lack of alcohol or drug dependence are expected to moderate strong relationships of adherence information and motivation through behavioral skills to adherence behavior and health outcomes. Conversely, poor access to medication, psychological ill health, and presence of alcohol or drug addiction are expected to moderate weak relationships of adherence information, motivation, behavioral skills, behavior, and health outcomes.

Finally, following the IMB analysis of the determinants of health behavior, we note that the model's information, motivation, and behavioral skills constructs are expected to have specific content that is especially relevant to the understanding and promotion of anti-retroviral adherence for particular populations and adherence behaviors of interest. For example, within the IMB approach, it is expected that specific adherence-related information, motivation, and behavioral skills factors will have special relevance to understanding and promoting adherence among individuals who have or who have not disclosed their HIV status, and among individuals who differ in gender, ethnicity, sexual orientation, chemical dependency, and like characteristics. For example, specific information about anti-retroviral medication and methadone interactions might be crucial to a heroin-addicted individual's adherence to anti-retroviral therapy; specific motivational factors might be associated with anti-retroviral adherence among HIV+ men and women with young children; and specific behavioral skills might be implicated in adherence behavior for individuals who have not disclosed their HIV status. Similarly, specific information, motivation, and behavioral skills may prove to be relevant to specific adherence behaviors, such as obtaining anti-retroviral medications, self-dosing at correct intervals, and avoiding or addressing drug side-effects.

Concluding Comments

The current chapter has outlined constructs and relationships of the IMB approach to understanding and promoting health behavior performance. We have reviewed considerable empirical evidence establishing the conceptual and predictive utility of the IMB approach in the context of understanding and promoting HIV preventive behavior. In addition, we have asserted that the IMB approach is a conceptually and empirically generalizable approach across health behavior domains. This assertion of generalizability has consistently been supported with evidence from reviews of the correlational and intervention literature across domains of health behavior, in focused empirical studies of health behaviors as diverse as breast self-examination and motorcycle safety gear use, and in focused conceptual efforts such as an IMB analysis of adherence to complex medication regimens. It is hoped that this evidence for the generalizability of the IMB approach will stimulate applications of the model to understanding and promoting health behavior across diverse domains of health related action.

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Correspondence should be directed to William A. Fisher, PhD, Department of Psychology and Department of Obstetrics and Gynaecology, Social Sciences Centre 6430, University of Western Ontario, London, Ontario, Canada, N6A 5C2; e-mail: fisher@uwo.ca.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.

Albarracin, D., Johnson, B. T., Fishbein, M., and Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: A meta-analysis. *Psychological Bulletin*, 127(1), 142–61.

Albert, S. M., Weber, C. M., Todak, G. et al. (1999). An observed performance test of medication management ability in HIV: Relation to neuropsychological status and medication adherence outcomes. *AIDS and Behavior*, 3, 121–8.

American Cancer Society (1998). *What are the key statistics about breast cancer?* http://www.cancer.org/ben/info/brstats.html.

Anderson, E. S., Wagstaff, D. A., Sikkima, K. J., et al. (1997). AIDS prevention among low-income, urban African-American and white women: Testing the Information–Motivation–Behavioral Skills model. Poster presented at the 18th Annual Scientific Sessions of the Society of Behavioral Medicine, San Francisco, CA, April, 1997.

Arnsten, J., Demas, P., Gourevitch, M., Buono, D., Farzadegan, H. and Schoenbaum, E. (2000). Adherence and viral load in HIV-infected drug users. Comparison of self-report and medication event monitors (MEMS). 7th Conferences on Retroviruses and Opportunistic Infections. San Francisco, CA.

Bandura, A. (1989). Perceived self-efficacy in the exercise of control over AIDS infection. In V. M. Mays, G. W. Albee, and S. M. Schneider (Eds.), *Primary Prevention of AIDS* (pp. 128–41). Newbury Park, CA: Sage.

Bandura, A. (1992). A social cognitive approach to the exercise of control of AIDS infection. In R. J. DiClemente (Ed.), *Adolescents and AIDS: A Generation in Jeopardy* (pp. 89–116). Newbury Park, CA: Sage.

Bangsberg, D. R., Hecht, F. M., Charlebois, E. D. et al. (2000). Adherance to protease inhibitors, HIV-1 viral load, and development of drug resistance in an indigent population. *AIDS*, 14 (4), 357–66.

Boden, D., Hurley, A., Zhang, L. et al. (1999). HIV-1 drug resistance in newly infected individuals. *Journal of the American Medical Association*, 282(12), 1135–41.

Bryan, A. D., Fisher, J. D., and Benziger, T. J. (2000). HIV prevention information, motivation, behavioral skills and behaviour among truck drivers in Chennai, India. *AIDS*, 14(6), 756–8.

Bryan, A. D., Fisher, J. D., and Benziger, T. J. (2001). Determinants of HIV risk among Indian Truck drivers: An Information-Motivation-Behavioral Skills approach. *Social Science and Medicine*, 53, 1413–26.

Carey, M. P., Maisto, S. A., Kalichman, S. C., Forsyth, A. D., Wright, E. M., and Johnson, B. T. (1997). Enhancing motivation to reduce the risk of HIV infection for

economically disadvantaged urban women. *Journal of Consulting and Clinical Psychology*, 65(4), 531–41.

Catania, J. A., Kegeles, S. M., and Coates, T. J. (1990). Towards an understanding of risk behavior: An AIDS risk reduction model (ARRM). *Health Education Quarterly*, 17, 53–72.

Catz, S. L., Kelly, J. A., Bogart, L. M., Benotsch, E. G., and McAuliffe, T. L. (2000). Patterns, correlates, and barriers to medication adherence among persons prescribed new treatments for HIV disease. *Health Psychology*, 19(2), 124–33.

Champion, V. L. (1990). Breast self-examination in women 35 and older: A prospective study. *Journal of Behavioral Medicine*, 13(6), 523–38.

Centers for Disease Control (2000). http://www.cdc.gov/health/injuries.htm.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd edn.). Hillsdale, NJ: Erlbaum.

DeVroome, E. M., deWit, J. B., Sandfort, T. G., et al. (1996). Comparing the Information–Motivation–Behavioral Skills Model and the Theory of Planned Behavior in Explaining Unsafe Sex Among Gay Men. Unpublished manuscript, Utrecht University, Department of Gay and Lesbian Studies and Department of Social and Organizational Psychology, Utrecht, Netherlands.

Eron, J. (2000). *The Prospect for New Agents in the Management of Treatment Failure*. Program and abstracts of the 7th Conference on Retroviruses and Opportunistic Infections, San Francisco, CA, January 30–February 2, 2000, Abstract S34.

Fishbein, M., and Ajzen, I. (1975). *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley.

Fisher, J. D., and Fisher, W. A. (1992). Changing AIDS risk behavior. *Psychological Bulletin*, 111, 455–74.

Fisher, J. D., and Fisher, W. A. (2000). Theoretical approaches to individual level change in HIV risk behavior. In J. L. Peterson and R. J. DiClemente (Eds.), *Handbook of HIV Prevention.* Kluwer Academic/Plenum: New York.

Fisher, J. D., Fisher, W. A., Amico, K., and Harman, J. (2001). An information–motivation–behavioral skills model of adherence to highly active antiretroviral therapy. Manuscript submitted for publication.

Fisher, J. D., Fisher, W. A., Misovich, S. J., and Bryan, A. D. (2002). Information–motivation–behavioral skills model-based HIV risk behavior change intervention for inner-city high school youth. *Health Psychology*, 21(2), 177–86.

Fisher, J. D., Fisher, W. A., Misovich, S. J., Kimble, D. L., and Malloy, T. E. (1996). Changing AIDS risk behavior: Effects of an intervention emphasizing AIDS risk reduction information, motivation, and behavioral skills in a college student population. *Health Psychology*, 15, 114–23.

Fisher, J. D., Fisher, W. A., Williams, S. S., and Malloy, T. E. (1994). Empirical tests of an information–motivation–behavioral skills model of AIDS preventive behavior with gay men and heterosexual university students. *Health Psychology*, 13(3), 238–50.

Fisher, W. A., Dervatis, K. A., Bryan, A. D., Silcox, J. and Kohn, H. (2000a). Sexual health, reproductive health, sexual coercion, and partner abuse indicators in a Canadian obstetrics and gynaecology outpatient population. *Journal of the Society of Obstetricians and Gynaecologists of Canada*, 22, 714–24.

Fisher, W. A., and Fisher, J. D. (1993). A general social psychological model for changing AIDS risk behavior. In J. Pryor and G. Reeder (Eds.), *The Social Psychology of HIV Infection* (pp. 27–53). Hillsdale, NJ: Erlbaum.

Fisher, W. A., and Fisher, J. D. (1999). Understanding and promoting sexual and reproductive health behavior: Theory and method. In R. Rosen, C. Davis, and

H. Ruppel (Eds.) *Annual Review of Sex Research* (Vol. IX, pp. 39–76). Mount Vernon, IO: Society for the Scientific Study of Sexuality.

Fisher, W. A., Fisher, J. D., and Rye, B. J. (1995). Understanding and promoting AIDS preventive behavior: Insights from the Theory of Reasoned Action. *Health Psychology*, 14, 255–64.

Fisher, W. A., Gilmore, J., Clark, F. et al. (2002). Patterns and correlates of HIV transmission risk behavior among HIV+ patients in clinical care. Manuscript in preparation.

Fisher, W. A., Sand, M., Lewis, W., and Boroditsky, R. (2000b). Canadian Menopause Study – I. Understanding women's intentions to utilize hormone replacement therapy. *Maturitas*, 37, 1–14.

Fisher, W. A., Williams, S. S., Fisher, J. D., and Malloy, T. E. (1999). Understanding AIDS risk behavior among sexually active urban adolescents. An empirical test of the Information–Motivation–Behavioral Skills model. *AIDS and Behavior*, 3, 13–23.

Gallant, J. E., and Block, D. S. (1998). Adherence to antiretroviral regimens in HIV-infected patients: Results of a survey among physicians and patients. *Journal of the International Association of Physicians in AIDS Care*, 4, 32–5.

Gerrard, M., Gibbons, F. X., and Bushman, B. J. (1996). Relation between perceived vulnerability to HIV and precautionary sexual behavior. *Psychological Bulletin*, 119, 390–409.

Godin, G., and Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion*, 11, 87–98.

Greenberg, B., Berkman, A., Thomas, R. et al. (1999). Evaluating supervised HAART in late-stage HIV among drug users: a preliminary report. *Journal of Urban. Health*, 76(4), 468–80.

Hammer, J. C., Fisher, J. D., Fitzgerald, P. C. (1996). When two heads aren't better than one: AIDS risk behavior in college-age couples. *Journal of Applied Social Psychology*, 26, 375–97.

Hochbaum, G. M. (1958). *Public Participation in Medical Screening Programs: A Sociopsychological Study*. (PHS Publication No. 572). Washington, DC: US Government Printing Office.

Hogg, R. S., Yip, B. K. C., O'Shaughnessy, M. V., and Montaner, S. G. (2000). *Nonadherence to Triple Combination Therapy is Predictive of AIDS Progression and Death in HIV-positive Men and Women*. Program and abstracts of 7th Conference on Retroviruses and Opportunistic Infections. San Francisco, CA. January 30–February 2, 2000.

Johnson, B. T., Marsh, K. L., and Carey, M. P. (2001). Factors underlying the success of behavioral interventions to reduce sexual HIV transmission. Paper presented at the 5th International Conference of AIDS Impact, Brighton, UK.

Kalichman, S. C., Cherry, C., and Browne-Sperling, F. (1999a). Effectiveness of a video-based motivational skills-building HIV risk-reduction intervention for inner-city African American men. *Journal of Consulting and Clinical Psychology*, 67(6), 959–66.

Kalichman, S. C., Rompa, D., Cage, M. et al. (2001). Effectiveness of an intervention to reduce HIV transmission risks in HIV-positive people. *American Journal of Preventive Medicine*, 21(2), 84–92.

Kalichman, S. C., Williams, E., and Nachimson, D. (1999b). Brief behavioral skills building intervention for female controlled methods of STD-HIV prevention: outcomes of a randomized clinical field trial. *International Journal of STD and AIDS*, 19, 174–81.

Kelly, J. A., and St. Lawrence, J. S. (1988). *The AIDS Health Crisis: Psychological and Social Interventions*. New York: Plenum Press.

Lierman, L. M., Kasprzyk, D., and Benoliel, J. Q. (1991). Understanding adherence to breast self-examination in older women. *Western Journal of Nursing Research*, 13(1), 46–61.

Misovich, S. J., Fisher, J. D., and Fisher, W. A. (1996). The perceived AIDS-preventive utility of knowing one's partner well: A public health dictum and individual's risky sexual behaviour. *Canadian Journal of Human Sexuality*, 5, 83–90.

Misovich, S. J., Martinez, T., Fisher, J. D., Bryan, A. D., and Catapano, N. (2001). Breast self-examination: A test of the Information, Motivation, and Behavioral Skills Model. Manuscript submitted for publication.

Montessori, V., Heath, K. V., Yip, B., Hogg, R. S., O'Shaughnessy, M. V., and Montaner, S. G. (2000). *Predictors of Adherence with Triple-combination Antiretroviral Therapy*. Program and abstracts of the 7th Conference on Retroviruses and Opportunistic Infections, Abstract 72.

Montaner, J. D., Reiss, P., Cooper, D. et al. (1998). A randomized, double-blind trial comparing combinations of nevirapine, didanosine, and zidovudine for HIV-infected patients. *Journal of the American Medical Association*, 279, 930–7.

Murray, D. M. (2000). Exploring motorcycle safety gear use: A theoretical approach. Unpublished master's thesis, Department of Psychology, University of Connecticut, Storrs, CT.

Prochaska, J. O., and Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, 12, 38–48.

Prochaska, J. O., Velicer, W. F., Rossi, J. S. et al. (1994). Stages of change and decisional balance for 12 problem behaviors. *Health Psychology*, 13, 39–46.

Richter, R., Michaels, M., Carlson, B., and Coates, T. J. (1998). Motivators and barriers to use of combination therapies in patients with HIV disease. HIV InSite Knowledge Base. [On-Line]. http://hivinsite.ucsf.edu/InSite?page=KB.

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs*, 2, 328–35.

Rosenstock, I. M. (1990). The health belief model: Explaining health behavior through expectancies. In K. Glanz, F. M. Lewis, and B. K. Rimer (Eds.), *Health Behavior and Health Education* (pp. 39–62). San Francisco: Jossey-Bass.

Rosenstock, I. M. (1996). Why people use health services. *Milbank Mem Fund Quarterly*, 44, 94–124.

Rye, B. J. (1990). Affective and cognitive predictors of AIDS preventive behaviors among female university students. Unpublished master's thesis, University of Western Ontario, London, Ontario, Canada.

Rye, B. J. (1998). Impact of an AIDS prevention video on AIDS-related perceptions. *Canadian Journal of Human Sexuality*, 7(1), 19–30.

St. Lawrence, J. S., Brasfield, T. L., Jefferson, K. W., et al. (1995). Cognitive-behavioral intervention to reduce African American adolescents' risk for HIV infection. *Journal of Consulting and Clinical Psychology*, 63, 221–37.

US Department of Transportation: National Highway Traffic Safety Administration (1997). Traffic safety facts: Motorcycles.

US Department of Health and Human Services (1988). *Understanding AIDS*. HHS-88-8404. Rockville, MD: Centers for Disease Control.

Weinhardt, L. S., Carey, M. P., and Carey, K. B. (1997). HIV risk reduction for the seriously mentally ill: Pilot investigation and call for research. *Journal of Behavior Therapy and Experimental Psychiatry*, 28 (2), 87–95.

Williams, S. S., Kimble, D., Covell, N. et al. (1992). College students use implicit personality theory instead of safer sex. *Journal of Applied Social Psychology*, 22, 921–33.