Psychological Bulletin
2006, Vol. 132, No. 2, 249–268

0033-2909/06/$12.00 DOI: 10.1037/0033-2909.132.2.249

Does Changing Behavioral Intentions Engender Behavior Change? A Meta-Analysis of the Experimental Evidence

Thomas L. Webb
The University of Manchester

Paschal Sheeran
The University of Sheffield

Numerous theories in social and health psychology assume that intentions cause behaviors. However, most tests of the intention–behavior relation involve correlational studies that preclude causal inferences. In order to determine whether changes in behavioral intention engender behavior change, participants should be assigned randomly to a treatment that significantly increases the strength of respective intentions relative to a control condition, and differences in subsequent behavior should be compared. The present research obtained 47 experimental tests of intention–behavior relations that satisfied these criteria. Meta-analysis showed that a medium-to-large change in intention ($d = 0.66$) leads to a small-to-medium change in behavior ($d = 0.36$). The review also identified several conceptual factors, methodological features, and intervention characteristics that moderate intention–behavior consistency.

Keywords: intention, behavior change, intervention, meta-analysis

Intentions are self-instructions to perform particular behaviors or to obtain certain outcomes (Triandis, 1980) and are usually measured by endorsement of items such as "I intend to do *X*!" Forming a behavioral or goal intention signals the end of the deliberation about what one will do and indicates how hard one is prepared to try, or how much effort one will exert, in order to achieve desired outcomes (Ajzen, 1991; Gollwitzer, 1990; Webb & Sheeran, 2005). Intentions thus are assumed to capture the motivational factors that influence a behavior (Ajzen, 1991). Theories of attitude–behavior relations, models of health behavior, and goal theories all converge on the idea that intention is the key determinant of behavior (summaries by Abraham, Sheeran, & Johnston, 1998; Austin & Vancouver, 1996; Conner & Norman, 1996; Eagly & Chaiken, 1993; Gollwitzer & Moskowitz, 1996; Maddux, 1999). However, reviews of intention–behavior relations to date have relied on correlational evidence and do not afford clear conclusions about whether intentions have a causal impact on behavior. The present review integrates for the first time experimental studies that manipulate intention and subsequently followup behavior. In so doing, the review quantifies the extent to which changes in intention lead to changes in behavior across studies.

The Role of Intention in Theories of Social and Health Behaviors

Models of attitude–behavior relations such as the theory of reasoned action (Fishbein, 1980; Fishbein & Ajzen, 1975), the theory of planned behavior (Ajzen, 1985, 1991; Ajzen & Madden, 1986), and the model of interpersonal behavior (Triandis, 1977, 1980) each accord intentions a key role in the prediction of behavior. An important impetus for the development of these models was a review by Wicker (1969) that showed that general attitudes (e.g., *X is good/bad*) only weakly predicted specific behaviors. Models of attitude–behavior relations attempted to explain this attitude–behavior discrepancy by pointing to the importance of measuring attitudes and behavior at the same level of specificity and by elucidating how attitudes combine with other factors to influence behavior. For instance, the theory of reasoned action (TRA; Fishbein & Ajzen, 1975) proposes that two additional constructs are needed to explain the relationship between attitude and behavior. First, a favorable attitude toward a behavior might not be translated into action because of social pressure from significant others not to perform the behavior. The theory therefore suggests that measures of subjective norm (e.g., *Most people who are important to me think that I should/should not do X*) should be taken alongside attitude measures in order to capture both social and personal influences on behavior. Second, Fishbein and Ajzen suggested that attitudes and subjective norms affect behavior by promoting the formation of a decision or intention to act. That is, the TRA proposes that behavioral intention is the proximal determinant of behavior and mediates the influence of both the theory's predictors (attitude and subjective norm) and external variables (e.g., personality and demographic characteristics). Thus, according to the TRA, intention is the most immediate and important predictor of behavior.

The TRA was designed to predict volitional behaviors, or behaviors over which the individual has a good deal of control. However, many behaviors require resources, skills, opportunities, or cooperation to be performed successfully (Liska, 1984). Consequently, a person may not (a) intend to perform a behavior unless the behavioral performance is perceived as under personal control or (b) enact their behavioral intention successfully unless they possess actual control over the behavior. To take account of these

Thomas L. Webb, School of Psychological Sciences, The University of Manchester; Paschal Sheeran, Department of Psychology, The University of Sheffield.

We thank Amanda Rivis and Vikkie Buxton for coding the study characteristics, Paul Norman and Richard Cooke for coding assessed control, and Gaston Godin and Ian Kellar for providing considerable additional information about their research.

Correspondence concerning this article should be addressed to Thomas L. Webb, School of Psychological Sciences, The University of Manchester, Oxford Road, Manchester M13 9PL, United Kingdom. E-mail: thomas.webb@manchester.ac.uk

issues, Ajzen (1985, 1991) added the concept of perceived behavioral control (PBC) to the TRA to form the theory of planned behavior (TPB). The TPB proposes that perceived behavioral control (e.g., *For me to do X would be easy/difficult*) is an additional predictor of intention alongside attitude and subjective norm. The theory assumes that intentions are the most important determinant of behavior but also suggests that PBC can directly predict behavior and/or moderate the relation between intention and behavior when PBC accurately reflects the amount of actual control over the performance (Ajzen & Madden, 1986; Sheeran, Trafimow, & Armitage, 2003).

The model of interpersonal behavior (MIP; Triandis, 1980) also construes intention as a key determinant of behavior. Like the TPB, the MIP assumes that successful realization of an intention requires control over the behavior (or appropriate "facilitating conditions"). However, the MIP also postulates a second potential moderator of intention realization, namely, the extent to which the behavior is habitual. According to Triandis (1980), frequently performed behaviors are likely to come under the control of habits, and the impact of intentions on behavior is thereby reduced. More recently, Wood and colleagues (Ouellette & Wood, 1998; Wood, Quinn, & Kashy, 2002; Wood & Quinn, 2005) drew upon research on skill acquisition and automaticity to outline a theoretical analysis of circumstances conducive to habitual versus intentional control of behavior. According to this analysis, frequency of behavioral performance and stability of the context of performance combine to determine how well intentions predict behavior.

Several models of health behavior also assume that intention is the proximal cause of behavior. Protection motivation theory (PMT; Rogers, 1983) proposes that two processes—threat appraisal and coping appraisal—determine "protection motivation." *Threat appraisal* refers to perceptions of vulnerability to and the severity of a disease, whereas *coping appraisal* refers to perceptions of the efficacy and costs of a recommended response. *Protection motivation* is operationally defined in terms of the person's intention to perform the recommended behavioral response and is considered the most immediate predictor of health behaviors (Rippetoe & Rogers, 1987; Rogers, 1983).

The prototype–willingness model (PWM; Gibbons, Gerrard, Blanton, & Russell, 1998; Gibbons, Gerrard, & Lane, 2003) posits two routes to behavior. The first *reasoned action* route is similar to the TRA and suggests that health-protective actions are determined by behavioral intentions, which in turn are a function of attitudes, norms, and past behavior. The second *social reaction* route pertains to health-risk behaviors that are performed in social contexts. The assumption is that people may not necessarily intend to perform behaviors such as smoke cigarettes or practice unsafe sex but might be willing to do so if circumstances were conducive. The PWM therefore includes the concept of *behavioral willingness* to capture the notion that social settings can afford opportunities to engage in risky behaviors that might overwhelm people's good intentions. Although attitudes, norms, and past behavior predict behavioral willingness, *prototype perceptions* are considered the key determinant of this motivational orientation. Prototypes are social images of the type of person who engages in a risk-behavior (e.g., the typical smoker is cool) the more favorable is the individual's image of the type of person who engages in the behavior; and the more similar that image is perceived to the self, the more likely it is that the person would be willing to perform the respective risk behavior. Thus, the PWM supposes that intentions are the most important predictor of health-protective behaviors but suggests that engaging in risky behavior is often more a reaction to risk-conducive circumstances (and determined by willingness) than a deliberate decision (determined by intention). The implication is that although intentions are good predictors of health actions, intentions may better predict health-protective behaviors compared with health-risk behaviors that are performed in social contexts.

The transtheoretical model (TTM; e.g., Prochaska & DiClemente, 1984) describes five distinct stages through which people progress and relapse in the pursuit and attainment of health goals. During the first two stages, people move from not thinking about the behavior (*precontemplation*) to deliberating about changing their behavior (*contemplation*). In the third stage (*preparation*), people prepare themselves and their social world to make behavioral changes. In the final two stages, the person initiates (*action stage*) and continues to perform the behavior (*maintenance stage*). Although behavioral intention is not an explicit component of the TTM, commentators have argued that the model implies that intention scores increase in a linear fashion across the first three stages of change at least (e.g., Godin, Lambert, Owen, Nolin, & Prud'homme, 2004; Sutton, 2000). Empirical studies of health behaviors also support this conclusion (Armitage & Arden, 2002; Armitage, Sheeran, Conner, & Arden, 2004; Courneya, Nigg, & Estabrooks, 1998; Courneya, Plotnikoff, Hotz, & Birkett, 2001). Thus, forward transitions from precontemplation, contemplation, and preparation stages of change can be interpreted in terms of increasing strength of respective behavioral intentions. The same reasoning also applies to progressions through key phases of other stage models such as the health action process approach (HAPA; Schwarzer, 1992, 1999) and the precaution adoption process (PAP; Weinstein, 1988; Weinstein & Sandman, 1992).

The intention construct is also central to theories of goal striving and self-regulation (reviews by Austin & Vancouver, 1996; Gollwitzer & Moskowitz, 1996; Oettingen & Gollwitzer, 2001). Control theory (Carver & Scheier, 1982, 1998) suggests that self-regulation is a continuous process of comparing ongoing performance with a desired standard and adjusting behavior accordingly. Standards of comparison are derived from the hierarchical structure of people's goals, with self-related goals (*system concepts*, e.g., *be a successful person*) at the top of the hierarchy, abstract action goals (*principles*, e.g., *work hard at my job*) in the middle, and courses of action (*programs*, e.g., *stay in the office after 5 p.m.*) at the bottom (Carver & Scheier, 1998). Thus, people's intentions can refer both to abstract endpoints as well as to behavioral means of reaching those endpoints (see also Kruglanski, Shah, Fishbach, Friedman, Chun, and Sleeth-Keppler, 2002). In either case, setting an intention or reference value for performance is the prime determinant of subsequent behavior change according to Carver and Scheier (1998).

Similarly, Locke and Latham's (1990) theory of goal setting considers forming an intention to undertake specific tasks as the key act of willing that promotes goal achievement (see Mento, Steel, & Karren, 1987, for an empirical demonstration). Although social–cognitive theory (SCT; e.g., Bandura, 1977, 1998) is concerned predominantly with the role of *self-efficacy beliefs* (perceptions of one's capacities to execute actions and to obtain outcomes) in self-regulation, the theory construes behavioral intentions (or *proximal goals*) both as a mediator of the impact of self-efficacy beliefs and as an important independent determinant of self-

regulatory success (Bandura, 1998). Finally, the model of action phases (MAP; Heckhausen & Gollwitzer, 1987; Heckhausen, 1991) provides a comprehensive temporal analysis of the phases of goal pursuit. The first action phase is termed *predecisional*. Here the person deliberates about the feasibility and desirability of her many varied wishes and desires and comes to a decision about which one(s) to pursue. Thus, the culmination of the predecisional phase of the MAP is the development of a goal intention that provides the starting point for subsequent goal striving. In summary, models of attitude–behavior relations, health behavior models, and goal theories all agree that intentions are a key determinant of behavioral performance and goal attainment.

Empirical Tests of Intention–Behavior Relations

Correlational studies show that intentions are reliably associated with behavior. For instance, in a meta-analysis of 185 studies that have used the TPB, Armitage and Connor (2001) found that the sample-weighted average correlation between measures of intention and behavior was .47 (see meta-analyses by Ajzen, 1991; Godin & Kok, 1996; Randall & Wolff, 1994; Sheppard et al., 1988; Trafimow, Sheeran, Conner, & Finlay, 2002; Van den Putte, 1991, for similar findings). In a meta-analysis of correlational studies of PMT, Milne, Sheeran, and Orbell (2000) found that the average correlation between protection motivation (intention) and future behavior was .40 (see also Floyd, Prentice-Dunn, & Rogers, 2000). Meta-analyses of correlations between intentions and specific behaviors have found similar effects. In a meta-analysis of studies of condom use, Sheeran, Abraham, and Orbell (1999) found that the average correlation between condom use intentions and condom use behavior was .39 (cross-sectional designs) and .46 (longitudinal designs; see also Albarracín, Johnson, Fishbein, & Muellerleile, 2001). In a meta-analysis of applications of the TRA and TPB to exercise behavior, Hausenblas, Caron, and Mack (1997) found that the average correlation between intention and behavior was .47 (see also Hagger, Chatzisarantis, & Biddle, 2002). To gain insight into the overall effect size in this type of research, Sheeran (2002) conducted a meta-analysis of 10 meta-analyses. Findings from 422 studies involving 82,107 participants showed that intentions accounted for 28% of the variance in behavior on average ($r_+ = .53$). Thus, meta-analyses of correlational studies have suggested that intentions have a large effect on behavior, according to standard estimates of effect size (Cohen, 1992).

However, there are several problems with making inferences about causation on the basis of correlational studies. First, many correlational studies use cross-sectional designs that render reports of intention and behavior liable to consistency or self-presentational biases. These biases may inflate estimates of the strength of the relationship between intention and behavior (Budd, 1987). Second, and more serious, is the problem that cross-sectional studies cannot rule out the possibility that behavior caused intention. For instance, the person may infer her intention to exercise on the basis of the number of times she exercised last week through a process of self-perception (Bem, 1972); thus, behavior may be the cause of the reported intention rather than the other way round. Third, the path from behavior to intention is precluded by using longitudinal designs that correlate measures of intention taken at one time point with measures of behavior taken at a later time point (cross-lagged panel designs also take account of initial behavior scores). However, there is still a problem with inferring causation. This is because correlational designs (whether cross-sectional, longitudinal, or cross-lagged panel studies) are subject to the "third variable problem" (Mauro, 1990) or "spuriousness" (Kenny, 1979), whereby a third—unmeasured—variable is the potential cause of both intention and behavior. Thus, the intention–behavior correlation may be spurious because it is a product of the relationship between these variables and the true causal factor. In summary, correlational designs are not a valid way of determining whether intentions cause behavior.

To test the causal impact of intention on behavior it is necessary to change intention and observe whether there is a corresponding change in behavior. That is, an experimental manipulation that produces a statistically significant increase in intention strength should also produce a significant increase in subsequent behavior if there is a causal relation between intention and behavior. In fact, several studies have manipulated behavioral intentions in this way and examined changes in subsequent behavior. For example, Brubaker and Fowler (1990) used a persuasive message based on the TPB to encourage men to perform testicular self-examination (TSE). As expected, participants who had been exposed to the persuasive message had stronger intentions to perform TSE in the next month than did participants who were given only factual information about testicular cancer. Rates of TSE performance (assessed 1 month later) were also higher among participants who received the persuasive communication. Thus, in this study, a change in intention led to a change in subsequent behavior. The design of this study also rules out the problems associated with correlational tests because (a) intentions changed as a function of the manipulation and thus could not have been based on past behavior, and (b) random assignment of participants to conditions takes account of the potential impact of extraneous variables.

Although there are many experimental studies similar to Brubaker and Fowler's (1990) research, findings from these studies have not been integrated in a manner that permits inferences about whether changing intentions causes behavior change. This is because reviews of these experiments (e.g., evaluations of interventions and randomized controlled trials) do not address the issue of causality directly. These reviews start from important applied questions such as *Do smoking cessation programs promote quitting?* (e.g., Fiore et al., 1996; Silagy, Mant, Fowler, & Lodge, 1994) or *How effective are interventions to promote safer sexual behavior?* (e.g., Jemmott & Jemmott, 2000; Kalichman & Hospers, 1997). This focus presents two problems for understanding causation. First, these reviews include studies that measured subsequent behavior but did not measure intention. This means that even if an intervention is successful in modifying behavior, we have no insight into whether behavior change was the result of intention change (Michie & Abraham, 2004). Second, these reviews include studies that were not successful in changing intention. Such studies demonstrate only that it can be difficult to change people's behavioral intentions—they provide no insight into the question of whether changing intention causes changes in behavior.

There are theoretical and practical grounds for conducting a review to estimate the causal impact of intentions on behavior. At the theoretical level, several theories of attitude–behavior relations, models of health behavior, and goal theories assume that changing intentions will change behavior. Estimating the size of intention–behavior effects therefore affords a critical test of these

theories. Estimates of effect size could illuminate whether the concept of intention is needed to understand the process of behavior change, whether additional concepts are needed, or whether researchers need to look to other constructs to understand behavior change. At the applied level, numerous surveys have been conducted to establish what factors should be targeted by interventions in order to change behavioral intentions (e.g., Astrom & Rise, 2001; Conner & McMillan, 1999; Sheeran & Orbell, 2000; Smith & Stasson, 2000). Moreover, many interventions consider intention a valid outcome variable because it is assumed that intention change will be translated into behavior change (e.g., Gagnon & Godin, 2000; Maddux & Rogers, 1983; Steffen, 1990). Thus, a substantial proportion of intervention research rests on the—untested—assumption that intentions cause behavior.

Moderators of the Intention–Behavior Relation

Several variables may influence intention–behavior consistency (see Sheeran, 2002; Sutton, 1998, for reviews) and the impact of these variables needs to be assessed in order to characterize accurately the impact of intention on behavior. For present purposes, it is useful to delineate three classes of moderator variables, namely, conceptual factors, measurement features, and study characteristics. *Conceptual factors* refer to theoretically specified variables that are predicted to affect how well intentions are realized in behavior. Three conceptual factors were mentioned in the exposition of attitude, health, and goal theories above and are examined in the present review. The first concerns *volitional control*. Several theories predict that greater perceived or actual control over behaviors should be associated with improved prediction of behavior by intention (e.g., TPB, MIP, SCT). Thus, participants' perceived behavioral control or self-efficacy is assessed. The type of intention measure can also index control perceptions. Whereas *behavioral intention* refers to what one intends to do (e.g., *Do you intend to use a condom the next time you have sexual intercourse?*), *behavioral expectation* (BE) refers to self-predictions about what one is likely to do (e.g., *How likely is it that you will use a condom the next time you have sexual intercourse?*). Measures of BE are thought to encompass people's perceptions of factors that may facilitate or impede performance of a behavior, and thus BE may be a better predictor of behavior than traditional measures of intention (e.g., Sheppard et al., 1988). However, evidence indicates that people may overestimate the amount of control they possess over behaviors (e.g., Langer, 1975; Sheeran, Trafimow, & Armitage, 2003). For this reason, two objective assessments of volitional control are taken: (a) effect sizes are computed for interventions that change both intentions and PBC/self-efficacy and for interventions that change intention only, and (b) independent raters are asked to assess how much control each sample is likely to have over performance of the focal behaviors.

The second conceptual factor concerns the PWM analysis of reasoned actions versus social reactions (e.g., Gibbons et al., 1998). This analysis implies that intentions should better predict health-protective behaviors (e.g., exercise, testicular self-examination) than health-risk behaviors (especially risky behaviors that are performed in social contexts and involve clear images of about the type of person who engages in the behavior; e.g., smoking, condom use). This is because health-protective behaviors are assumed to be under intentional control whereas risky behaviors may be determined more by what the person is willing to do in risk-conducive circumstances than by intention. Thus, whether the focal behavior has the potential to engender *social reaction* is assessed.

The third conceptual factor is whether circumstances of the behavioral performance promote *habitual control* of behavior. According to Wood and colleagues (Ouellette & Wood, 1998; Wood & Quinn, 2005; Wood et al., 2002), behaviors that are performed frequently in stable contexts support the development of habits, and thus the impact of intention on behavior is attenuated. A meta-analysis by Ouellette and Wood (1998) showed that when behavior is practiced repeatedly and the context of performance is stable, past behavior is a better predictor of future behavior than is intention whereas the reverse was true when behaviors were performed infrequently in unstable contexts. Similarly, Verplanken, Aarts, van Knippenberg, and Moonen (1998) found an interaction between habit and intention such that intentions were only significantly related to behavior when habit strength was weak. When participants possessed moderate or strong habits, their intentions had little influence on their subsequent behavior (see also Ferguson & Bibby, 2002; Klockner, Matthies, & Hunecke, 2003; however, see Ajzen, 2002, for a different view). Thus, whether behaviors have the potential to be controlled by habit could be an important moderator of intention–behavior relations.

The second category of moderator variables relates to measurement factors that could potentially influence the intention–behavior relationship. The first is the *time interval* between the measure of intention and behavior. Ajzen (e.g., Ajzen, 1985; Ajzen & Fishbein, 1980; Ajzen & Madden, 1986) repeatedly asserted that to obtain accurate prediction of behavior, intention must be measured as close in time as possible to the measure of behavior. This is because intervening events (e.g., new information) can produce changes in intentions such that the original measure may no longer predict behavior. Meta-analysis supports the idea that temporal contiguity affects how well intentions predict behavior. Sheeran and Orbell (1998) found a significant negative correlation between time interval (measured in weeks) and the strength of the intention–behavior association ($r_+ = -.53$). The second measurement factor that may influence the intention–behavior relation is the *type of behavior measure* (objective vs. self-report). Self-report measures of behavior may overestimate intention–behavior associations because of consistency, social desirability, or memory biases (Kiesler, 1971; Hessing, Elffers, & Wiegel, 1988; Randall & Wolff, 1994). Consistent with this idea, Armitage and Conner (2001) found that intentions had a larger effect on self-reported ($r = .56$) compared with objective measures of behavior ($r_+ = .45$). Finally, the *nature of the control group* could influence the extent of intention and behavior change as a function of the intervention. In particular, effect sizes might be smaller when interventions are compared with an alternative intervention as opposed to a no-treatment control condition.

Study characteristics constitute the final category of moderator variables. Two such characteristics warrant attention. First, the *type of sample* has the potential to moderate intention–behavior relations (e.g., Sheeran & Orbell, 1998). Compared with nonstudents, students may have superior cognitive test-taking abilities and greater motivation to answer questionnaires consistently and rationally (reviews by Foot & Sanford, 2004; Sears, 1986). Consequently, intention–behavior consistency might be greater among undergraduate samples. Second, the *publication status* of respec-

tive studies should be considered. On the one hand, studies with large effect sizes may have a better chance of publication compared with studies with small or nonsignificant effects (the "file drawer problem"; Rosenthal, 1979). On the other hand, unpublished studies may use less rigorous procedures that produce larger effect sizes compared with the effect sizes reported in published research. Given these possibilities, it is important to compare effect sizes for published versus unpublished studies.

Intervention Characteristics

The present research examines intervention studies that assess changes in both intention and subsequent behavior. Thus, the review affords an excellent opportunity to identify characteristics of effective interventions. Three key features appear to determine the impact of an intervention on behavior change according to previous research (e.g., Bootzin, 1975; Kanfer & Goldstein, 1986; Hardeman, Griffin, Johnston, Kinmonth, & Wareham, 2000). These features are (a) the theoretical basis of the intervention, (b) the behavior change methods used, and (c) the mode of delivery. The *theoretical basis* refers to the theory(s) that were used to develop the respective intervention. For example, Fitzgerald et al. (1999) developed an intervention to promote condom use based on protection motivation theory, whereas the intervention to promote the same behavior developed by Bryan, Aiken, and West (1996) was based on the health belief model (Rosenstock, 1974). *Behavior change methods* refer to the specific strategies used in the intervention to promote behavioral intentions. For example, both Fitzgerald et al. and Bryan et al. included materials designed to increase participants' level of skill, but only Bryan et al. provided participants with an opportunity to rehearse these skills. Finally, mode of delivery can be subdivided into two aspects: (a) the *intervention format*, which refers to whether the intervention was delivered one-to-one or on a group basis and (b) the *source of the intervention*, which refers to whether the intervention was delivered by an expert (health educator, trained facilitator, or teacher) or nonexpert. Examination of the effect sizes for these different intervention characteristics has the potential to inform future interventions designed to change intentions and behavior.

The Present Review

The present review aims to test the assumption made by several models of attitude–behavior relations, accounts of health behavior, and goal theories that people's intentions to act have a causal influence on their subsequent behavior. To achieve this aim, meta-analysis is used to integrate experimental studies that manipulated intention and assessed the effect of this manipulation on subsequent behavior. The key test of the causal link between intention and behavior involves estimating the size of behavioral effects that accrue from successful intention-change interventions (i.e., interventions that produce significant changes in intentions). This is because there must be a significant difference in intention scores between treatment and control conditions in order to make meaningful inferences about the impact of changing intention on subsequent behavior change.

Meta-analysis is used to estimate a series of effect sizes relevant to characterizing the intention–behavior relation. First, we quantify the overall impact of the interventions on intention change. Second, the impact of interventions on behavior change is quantified. These two effect sizes indicate the extent to which interventions that change intention also engender changes in behavior. Mediation analysis is then undertaken to determine whether the behavior change produced by respective interventions is the result of changes in intention. Third, meta-analysis is used to examine whether conceptual factors, measurement features, and study characteristics moderate the impact of intention on behavior. Finally, the review estimates effect sizes for different theoretical models, behavior change methods, and modes of delivery.

Method

Selection of studies. The following methods were used to generate the sample of studies: (a) computerized searches of social scientific databases (Web of Science, PsycINFO, UMI Dissertation Abstracts) for articles written between January 1981 and December 2004 on the search terms *intention/goal/plan/expectation/decision* and *intervention/program/training/behavior change/experiment* (studies had to include respective terms in either the title or abstract); (b) reference lists in each article were evaluated for inclusion (ancestry approach; Johnson, 1993); and (c) authors were contacted and requests were made for unpublished and in-press studies. There were three inclusion criteria for the meta-analysis. First, the studies had to involve random assignment of participants to a treatment group who received an intervention and a comparison group who received either a control intervention or no intervention. Second, the intervention had to have produced a significant difference in intention between the treatment and control groups. Finally, a measure of behavior had to have been taken after the intention measure.

The literature search identified 221 studies that could be potentially included in the review. Of these, 64 studies (29%) were rejected because they did not include a measure of intention (e.g., Fishbein, Ajzen, & McArdle, 1980), 40 studies (18%) did not measure behavior (e.g., Evans, Edmundson-Drane, & Harris, 2000), 23 studies (10%) measured intentions and behavior at the same time (e.g., Brug, Steenhuis, van Assema, & de Vries, 1996), 17 studies (8%) did not include a comparison group (e.g., Palmer, Burwitz, Smith, & Barrie, 2000), 15 interventions (7%) did not lead to significant intention differences (e.g., Banks et al., 1995), 12 studies (6%) measured intentions but did not report relevant data (e.g., Plotnikoff & Higginbottom, 1995), 2 studies reported a subset of data from a larger study already included in the analysis (e.g., Tedesco, Keffer, Davis, & Christersson, 1993), and 1 study used a different sample for the intention measure and the behavior measure (Pierce et al., 1986).

In total, $k = 47$ tests of the association between intention change and behavior change met the inclusion criteria for the review. These 47 tests come from 45 reports. Table 1 presents the characteristics and effect sizes in each study. (An asterisk precedes each of these reports on the reference list.)

Meta-analytic strategy. Of the 47 studies that reported significant intention differences, 37 studies (79%) reported data suitable for computing precise effect sizes for intention and behavior, 4 studies (9%) provided effect sizes for intention only, 4 studies provided effect sizes for behavior only, and the final 2 studies (4%) did not report precise information for either intention or behavior. When effect sizes could not be computed precisely on the basis of information in the report or correspondence with authors, we estimated values based on the significance levels reported. For example, if the effect was nonsignificant we assumed zero difference ($d = 0.00$). If the effect was significant at $p < .05$ we used the smallest value of d (given the sample size) that was significant at this level of alpha.[1] Where

[1] To ensure that these estimation procedures did not bias the results, we compared the effect sizes for intentions and behavior when estimated values were included versus excluded from respective computations. Findings showed that including estimated values did not influence the effect sizes obtained ($Q = 2.84$ and 1.05, *ns*, for intention and behavior, respectively).

Table 1
Characteristics and Effect Sizes for Intention and Behavior Change for Studies Included in the Meta-Analysis

Author	Behavior	N_C	N_E	Effect size (*d*)	
				Intention	Behavior
Ajzen (1971)	Prisoners dilemma	35	35	1.91**	2.23**
Basen-Engquist (1994)	Condom use	24	19	0.39*	−0.25
Beck & Lund (1981)	Use of dental tablets	40	40	0.56*	0.00[b]
Brubaker & Fowler (1990)	Testicular self-examination	29	59	1.54***	0.94*
Bryan, Aiken, & West (1996)	Condom use	41	42	1.16***	0.38*
Burgess & Wurtele (1998)	Parent-child communication	13	6	1.14***	2.31***
Caron, Godin, Otis, & Lambert (2004)	Condom use	159	147	0.54***	0.32**
Chatrou, Maes, Dusseldorp, & Seegers (1999)	Smoking	292	248	0.23**	0.02
Cody & Lee (1990)	Skin examination	90	108	0.53***	0.34*
Crawley & Koballa (1992)	Course enrollment	111	135	0.32*	0.20
D'Onofrio, Moskowitz, & Braverman (2002)	Smoking	557	557	0.12*[a]	0.00[b]
Das, de Wit, & Stroebe (2003) Study 2	Course enrollment	55	56	1.44***	1.04***
Das, de Wit, & Stroebe (2003) Study 3	Course enrollment	59	59	0.59**	0.25*
Detweiler, Bedell, Salovey, Pronin, & Rothman (1999)	Sunscreen use	33	26	2.97***	0.68*
Dholakia & Bagozzi (2003) Study 2	Visiting an Internet site	74	74	1.27***	0.46*
Dukeshire (1995) Study 2B	Sunscreen use	51	51	1.03***	0.33*
Fitzgerald, Stanton, Terreri, Shipena, Xiaoming, Kahihuata, Ricardo, Galbraith, & DeJaeger (1999)	Contraceptive use	222	230	0.28	0.31*
Godin, Desharnais, Jobin, & Cook (1987)	Exercise	65	65	0.44**[b]	0.29
Graham-Clarke & Oldenberg (1994)	Exercise	191	191	0.30*	0.00[b]
Hillhouse & Turrisi (2002)	Indoor tanning	53	53	0.58***	0.35*
Hine & Gifford (1991)	Donating behavior	49	55	0.60**	0.40*
Irvine, Ary, Grove, & Gilfillan-Morton (2004)	Low fat diet	234	229	0.32***	0.13
Jackson (1997)	Sun protective	65	73	0.64**	0.37*
Jemmott, Jemmott, & Fong (1998)	Sexual behavior	204	200	0.24*	0.11
Jones, Sinclair, & Courneya (2003)	Exercise	45	45	0.39*	0.03
Lescano (1998)	Sun protection	54	71	0.43*	−0.32
Luszczynska & Schwarzer (2003)	Breast self-examination	173	244	0.55***	0.38**
Mahler, Fitzpatrick, Barker, & Lapin (1997)	Sun protection	17	29	0.73**	0.14
Mahler, Kulik, Gibbons, Gerrard, & Harrell (2003)	Sun protection	35	28	0.56*	0.00[b]
Main, Iverson, & McGloin (1994)	Sexual behavior	176	151	0.25*	0.15
Martinez (1999)	Condom use	35	88	0.40*	0.00[b]
Martinez, Levine, Martin, & Altman (1996)	Seat belt use	44	126	0.51**	0.24
Melendez, Hoffman, Exner, Leu, & Ehrhardt (2003)	Sexual behavior	116	109	0.72***	0.44**
Milne, Orbell, & Sheeran (2002)	Exercise	76	93	0.76***	0.11
Murphy & Brubaker (1990)	Testicular self-examination	49	50	0.96***	0.67**
Quine, Rutter, & Arnold (2001)	Cycle helmet use	49	48	0.57*	0.70***
Sanderson & Jemmott (1996)	Condom use	47	86	0.65**	0.22
Sheeran, Webb, & Gollwitzer (2003)	Study behavior	39	46	1.96***	0.66**
Slonim-Nevo, Auslander, Ozawa, & Jung (1996)	AIDS-risk behavior	58	25	0.45*	0.27
Stanton, Li, Ricardo, Galbraith, Feigelman, & Kaljee (1996)	Condom use	39	40	0.39*[a]	0.16
Steffen, Sternberg, Teegarden, & Shepherd (1994)	Testicular self-examination	138	139	0.48**[a]	0.48**[a]
Sutton & Hallet (1988) Study 1	Smoking	44	33	0.39*[a]	0.48*
Sutton & Hallet (1988) Study 2	Smoking	46	50	0.26*[a]	0.21
Tesar (1996)	HIV-preventive behavior	74	170	0.30*	0.23
Thompson, Kyle, Swan, Thomas, & Vrungos (2002)	Condom use	17	16	0.50**	0.81*
Wurtele (1988)	Calcium intake	40	40	0.75***	0.73***
Wurtele & Maddux (1987)	Exercise	80	80	0.75***	0.30

Note. N_C = number of participants in the control group, N_E = number of participants in the experimental group.
[a] Estimated effect size from probability. [b] Estimated effect size based on nonsignificant difference.
* $p < .05$. ** $p < .01$. *** $p < .001$.

studies used more than one treatment condition, we selected the treatment group that produced the largest difference in intention scores compared with the control group.[2]

The present meta-analysis used the unbiased effect size estimator *d* (Hedges & Olkin, 1985). The *d* statistic is calculated using the following formula:

$$d = \frac{x_1 - x_2}{(sd_1 + sd_2)/2}$$

where x_1 = mean of Condition 1, x_2= mean of Condition 2, sd_1 = standard deviation of Condition 1, and sd_2 = standard deviation of Condition 2.

[2] Treatment groups were selected from 13 studies (28%). Selecting the treatment group that produced the largest difference in intention scores compared with the control condition is consistent with the review's aim of estimating how big an effect on behavior successful intention-change interventions have. Selecting the treatment group also permits more precise characterization of the intervention's theoretical basis, behavior change method, and mode of delivery than would be achieved by aggregating effect sizes from different interventions within the same study. To check whether selection of treatment groups biased the results for intentions and

The small sample correction factor (see Hedges, 1981) was not applied because of the relatively large sample sizes used by the primary studies (sample size: $M = 187$). Computations were undertaken using Schwarzer's (1988) META program. Sample-weighted average effect sizes (d_+) are based on a random effects model. A random effects model was chosen because studies were likely to be "different from one another in ways too complex to capture by a few simple study characteristics" (Cooper 1986, p. 526). Cohen (1992) provided useful guidelines for interpreting average effect size values. According to Cohen's power primer, $d = 0.20$ should be considered a small effect size, $d = 0.50$ is a medium effect size, and $d = 0.80$ is a large effect size. We use these qualitative indexes to interpret the findings.

Study characteristics were coded by Thomas L. Webb and by a second, independent coder. Reliabilities were acceptable (categorical characteristics: *Mdn* $\kappa = .67$; continuous characteristics: *Mdn* $r = .78$) and disagreements were jointly resolved. Each study was coded for the following characteristics:

(a) the sample size for experimental and control groups (N_E and N_C, respectively)—defined as the number of participants in each condition at the time of the final behavior measure;

(b) the effect size for postintervention intention differences between the conditions. Where studies examined more than one behavior (e.g., study of seat belt use measured intentions to use a seat belt both as a driver and as a passenger), the effect sizes within the study (across behaviors) were computed prior to inclusion in the main data set. This procedure captures the richness of the data while maintaining the independence of samples that is central to the validity of meta-analysis (Hunter & Schmidt, 1990);[3]

(c) the effect size for the difference in behavior between the conditions in the wake of the intervention (covariate-adjusted effect sizes were used where available). In the same manner as intention, where studies examined more than one behavior (e.g., study of donating behavior measured donations of both money and time), the within-study findings were meta-analyzed in their own right first;[4]

(d) the mean PBC for the treatment (intervention) condition. To permit comparisons across studies, PBC scores were converted to the standard 1–7 scale used in TPB studies wherever PBC measures used a different number of scale points;

(e) whether the intervention produced significant differences in both intention and PBC/self-efficacy or a significant difference in intention only;

(f) the type of intention measure (behavioral intention vs. behavioral expectation);

(g) the assessed control. This moderator was coded by two independent faculty members. Coders were given details of the sample and focal behavior used by each study and asked to rate how much control each sample was likely to possess over each behavior on a 7-point scale (where 1 = *no control* and 7 = *complete control*);

(h) whether the behavior was health-protective (e.g., exercise, testicular self-examination) versus a health-risk behavior performed in social contexts (smoking, condom use);

(i) whether the behavior was likely to be under habitual control. Following Wood's analysis (Ouellette & Wood, 1998; Wood et al., 2002) behaviors were coded as under habitual control if there were both multiple opportunities to perform the behavior and the environmental context in which the behavior was performed was stable (e.g., seat belt use). All other combinations of opportunity and context stability were considered antithetical to the development of habits;

(j) the nature of the control group (no treatment vs. alternative intervention);

(k) the time interval between intention and behavior measures (in weeks);

(l) the sample type (student vs. nonstudent);

(m) the behavior measure (objective vs. self-report); and

(n) the publication status (published vs. unpublished).

Results

Effect sizes for intention and behavior change. We began by computing the effect size for the differences in intention between conditions following the intervention (see Figure 1). Effect sizes (d) ranged from 0.12 to 2.97 and had a standard deviation of 0.54. The sample-weighted average effect size derived from these studies was $d_+ = 0.66$ with a 95% confidence interval from .51 to .82, based on 47 studies and a total sample size of 8,802. This means that the interventions had, on average, a medium-to-large effect on intention according to Cohen's (1992) criteria.

Next, the average effect size representing the impact of the interventions on behavior was computed (see Figure 1). Effect sizes for behavior ranged from −.25 to 2.31 and had a standard deviation of .48. The sample-weighted effect size for behavior derived from these studies was $d_+ = 0.36$ with a 95% confidence interval from .22 to .50 ($k = 47$; $N = 8{,}802$). These findings indicate that successful intention-change interventions lead to a small-to-medium change in behavior, on average.[5]

behavior, we compared the effect sizes when studies involving treatment selection were included versus excluded in the analyses. Findings revealed no differences in the effect sizes for intention or behavior ($Q = 1.39$ and 0.02, *ns*, respectively). A table describing the intervention versus control condition selected from each of the 13 studies can be obtained from Thomas L. Webb.

[3] Five effect sizes for intention were meta-analyzed in their own right before inclusion in the main analysis (Dukeshire, 1995; Godin et al., 1987; Mahler et al., 1997; Martinez et al., 1996; Wurtele, 1988).

[4] Six effect sizes for behavior were meta-analyzed in their own right prior to inclusion in the main analyses (Das et al., 2003, Studies 2 and 3; Dholakia & Bagozzi, 2003; Hine & Gifford, 1991; Mahler et al., 1997; Martinez et al., 1996).

Five studies reported covariate-adjusted effect sizes for behavior. Sensitivity analyses showed that the sample-weighted average effect size for behavior did not differ between studies that reported covariate-adjusted effect sizes and studies that reported nonadjusted effect sizes, $Q(1) = .78$, *ns*.

[5] This finding indicates that interventions that change intentions engender changes in behavior. An implication of this analysis is that interventions that do not generate intention change would not be expected to produce changes in behavior. To investigate this prediction we computed the average effect sizes for intention and behavior in the 15 studies (13 reports) that did not genderate significant intention differences (Bamberg, 2002, Study 2; Banks et al., 1995; Brown et al., 2003; Caplan, Vinokur, Price, & van Ryn, 1989; Dukeshire, 1995, Studies 1, 2a, & 3; James, Gillies, & Bignell, 1998; Kamal, 1999; Kellar & Abraham, 2004; Meyer

Intention		Behavior	
−0.3		−0.3	
−0.2		−0.2	5
−0.1		−0.1	
0.0		0.0	023
0.1	2	0.1	113456
0.2	34568	0.2	01234579
0.3	00229999	0.3	0122345788
0.4	03458	0.4	04688
0.5	0134566789	0.5	
0.6	045	0.6	678
0.7	23556	0.7	03
0.8		0.8	1
0.9	6	0.9	4
1.0	3	1.0	4
1.1	46	1.1	
1.2	7	1.2	
1.3		1.3	
1.4	4	1.4	
1.5	4	1.5	
1.6		1.6	
1.7		1.7	
1.8		1.8	
1.9	1	1.9	
2.0		2.0	
2.1		2.1	
2.2		2.2	3
2.3		2.3	1
.		.	
.		.	
2.9	7	2.9	

Figure 1. Stem-and-leaf plots of effect sizes (*d*s) for intention change and behavior change. Digits to the left of the vertical line (stems) are read as ones and tenths place of each effect size. Numbers to the right of the vertical line (leafs) are the hundredths place for each effect size. Multiple leafs indicate that there were multiple effect sizes with the same stem (e.g., 0.24, 0.25, 0.26).

owitz & Chaiken, 1987; Raats, Sparks, Geekie, & Shepherd, 1999; Tedesco, Keffer, Davis, & Christersson, 1993; a table describing characteristics and effect sizes from each study can be obtained from Thomas L. Webb). The sample-weighted average effect size for intention derived from these studies was $d_+ = 0.07$ with a 95% confidence interval from .00 to .13 ($k = 15$; $N = 3{,}588$). The sample-weighted average effect size for behavior obtained in these studies was $d_+ = 0.20$ with a 95% confidence interval from .08 to .32 ($k = 15$; $N = 3{,}588$). These findings indicate that interventions that do not generate significant differences in intention scores, nonetheless, produce a small change in behavior. Of importance, however, is the finding that unsuccessful intention-change interventions engendered a significantly smaller effect size for behavior compared to successful intention-change interventions ($d_+ = 0.20$ and 0.36, respectively), $Q(1) = 15.42$, $p < .001$.

Table 2
Mediation of the Intervention–Behavior Change Relation by Intention Change ($N = 1{,}875$)

	Without mediator		Intention change as mediator	
Relation	β	t	β	t
Intervention–behavior change	0.21	9.14***	0.08	3.65***
Intention change–behavior change			0.37	16.29***

*** $p < .001$.

Mediation analyses. The correlation between the effect size for intention and the effect size for behavior was .57, which suggests that interventions that produced greater intention change had a corresponding greater effect on effect on behavior. In order to ensure that changes in intention were responsible for the impact of the interventions on behavior, we conducted a mediation analysis by using data from 15 studies ($N = 1{,}875$) where the correlation between intention and behavior could be retrieved.[6] In line with Kenny, Kashy, and Bolger's (1998) recommendations, four multiple regressions were conducted to establish mediation (*d* values were converted to *r*s for this purpose, and the sample-weighted average intercorrelations between intervention, intention change, and behavior change were used in the matrix input function in SPSS). These regressions test (a) the effect of the independent variable on the dependent variable, (b) the effect of the independent variable on the mediating variable, (c) the effect of the mediating variable on the dependent variable, and (d) the simultaneous effect of the independent variable and the mediator on the dependent variable, respectively.

Regression analyses showed that intervention (the independent variable) predicted both changes in behavior (the dependent variable) and changes in intention (the proposed mediator), $F(1, 1873) = 83.57$ and 244.74, respectively (ps $< .001$). Changes in intention also predicted changes in behavior, $F(1, 1873) = 345.04$, $p < .001$. Most important, however, findings showed that intention change attenuated the relationship between intervention and behavior in a simultaneous regression analysis (see Table 2). This

[6] The 15 studies used in the mediation analysis were: Brubaker and Fowler (1990); Bryan et al. (1996); Burgess and Wurtele (1998); Crawley and Koballa (1992); Das, deWit, and Stroebe (2003, Studies 2 and 3), Dholakia and Bagozzi (2003); Jackson (1997); Lescano (1998); Quine et al. (2001); Sanderson and Jemmott (1996); Sheeran, Webb, and Gollwitzer (2003); Tesar (1996); Wurtele (1988), and Wurtele and Maddux (1987). These 15 studies differed significantly from excluded studies in both intention effect sizes ($d_+ = 0.87$ and 0.57, respectively), $Q(1) = 29.42$, $p < .001$, and behavior effect sizes ($d_+ = 0.53$ and 0.28, respectively), $Q(1) = 21.79$, $p < .001$. A potential explanation of these differences is that studies that found large group differences in intention and behavior were also more likely to report the correlation between intention and behavior (and therefore could be included in the mediation analysis). It is also worthwhile noting that because the mediation analysis relies on reported correlations between intention and behavior, third variable effects cannot be ruled out (Mauro, 1990).

Table 3
Moderators of the Intention Change–Behavior Change Relation

Moderator	Level 1	*N*	*k*	*Q*	*d*	Level 2	*N*	*k*	*Q*	*d*	*Q*
Conceptual factors											
Volitional control											
Assessed control	Low	4,996	21	48.38***	.25	High	3,806	26	89.70***	.45	22.42***
PBC	Low	1,913	9	13.47	.32	High	1,610	10	20.84*	.51	8.14*
Intervention effect	BI only	1,426	8	15.44*	.55	BI + PBC	2,097	11	19.92*	.33	10.54*
Intention measure	BI	4,339	26	93.17***	.38	BE	2,737	14	26.97*	.35	0.58
Habitual control	Unlikely	1,992	12	59.81***	.74	Likely	6,880	35	55.38**	.22	96.30***
Social reaction	Unlikely	4,440	30	105.75***	.45	Likely	4,362	17	27.58*	.19	36.46***
Measurement factors											
Time interval (weeks)	≤ 11.5	2,887	25	95.08***	.46	> 11.5	5,915	22	45.19**	.23	23.51***
Behavior measure	Self-report	7,844	39	89.26***	.30	Objective	958	8	47.33***	.67	28.24***
Comparison intervention	None	3,502	14	13.44	.25	Alternative	5,300	33	139.05***	.41	12.79***
Study characteristics											
Publication status	Published	8,070	42	150.20***	.38	Unpublished	732	5	2.37	.25	2.51
Type of sample	Nonstudent	2,856	12	34.67***	.33	Student	5,946	35	104.54***	.38	0.99

Note. Bonferroni correction has been applied when evaluating significance of *Q* statistics comparing the two levels of the moderator (new p [.0045] = old p [.05] ÷ 11). BI = behavioral intention; BE = behavioral expectation; PBC = perceived behavioral control.
* $p < .05$. ** $p < .01$. *** $p < .001$.

conclusion was confirmed by a highly significant value on Kenny et al.'s (1998) modification of the Sobel (1982) test ($Z = 11.95$, $p < .001$) which shows that changes in intention engendered a significant reduction in the association between intervention and behavior. Although intention change attenuated the relationship between intervention and behavior, it is notable that the intervention–behavior association remained significant even after intention change had been taken into account ($\beta = .08$, $t[1873] = 3.65$, $p < .001$).[7]

Moderators of the intention–behavior relationship. The homogeneity statistic for the behavior effect sizes was significant, $Q(46) = 152.58$, $p < .001$, indicating that the data set is heterogeneous (i.e., there is significant variation in the effect sizes derived from the primary studies). This encourages a search for moderators of the relationship between successful intention-change interventions and behavior. In order to test the influence of 11 moderators, each moderator was treated as a dichotomous variable and the effect sizes from each study were coded into one of two levels of the moderator (see Eagly & Wood, 1994). For example, studies with PBC scores below the median were coded as low on PBC, PBC scores above the median were coded as high. Next, the sample-weighted effect size (d_+) and homogeneity statistic (Q) were calculated separately for the two groups. The Q statistic (with Bonferroni adjustment) was used to compare the coefficients (see Table 3).

We began by examining moderation by conceptual factors. There were four indexes of volitional control. Assessed control moderated intention–behavior relations. Changes in intention had a larger effect on behavior when participants were rated as possessing more control over the behavior ($d_+ = 0.45$) than when they were rated as having less control ($d_+ = 0.25$). Participants' own perceptions of control (PBC) moderated intention–behavior relations in a similar manner. Effect sizes for behavior were larger when PBC was high ($d_+ = 0.51$) rather than when it was low ($d_+ = 0.32$). The type of intention measure (behavioral intention vs. behavioral expectation) did not influence effect sizes for behavior ($d_+ = 0.38$ vs. 0.35). Contrary to expectations, however, greater behavior change was observed when interventions produced significant changes in intention only ($d_+ = 0.55$) compared with interventions that generated significant changes in both intention and PBC ($d_+ = 0.33$).

Habitual control had a strong effect on intention–behavior relations. Intention change had less impact on behavior change when circumstances supported the development of habits ($d_+ = 0.22$) compared with when circumstances did not support habit formation ($d_+ = 0.74$). There was also a significant social reaction effect. Intentions engendered smaller effects on behavior in the case of risky behaviors performed in social contexts ($d_+ = 0.19$) compared with health-protective behaviors ($d_+ = 0.45$).

[7] The theory of planned behavior suggests that the effect of interventions on behavior should be mediated by both intention and PBC/self-efficacy. In order to test the idea that PBC mediates the effect of interventions on behavior, we conducted mediation analysis on the three studies that reported correlations between PBC/self-efficacy and behavior (Brubaker & Fowler, 1990; Bryan et al., 1996; Crawley & Koballa, 1992). Regression analyses revealed that, although the intervention predicted changes in PBC ($\beta = .13$, $p < .05$) and changes in PBC predicted behavior ($\beta = .12$, $p < .05$), Sobel's (1982) test revealed that changes in PBC did not attenuate the relationship between intervention and behavior in a simultaneous regression analysis ($Z = 0.30$, *ns*).

The second category of moderators pertained to measurement characteristics. Changing participants' intentions had a greater impact on behavior when the time interval between the intention and behavior measures was *short* (i.e., less than or equal to the median value of 11.5 weeks) as compared with *long* ($d_+ = 0.46$ vs. 0.23). Perhaps surprisingly, manipulating intention had a greater impact when behavior was measured objectively ($d_+ = 0.67$) rather than by self-report ($d_+ = 0.30$). Intention-change interventions also had a greater impact on behavior when the control group received an alternative intervention ($d_+ = 0.41$) than when the control group received no treatment ($d_+ = 0.25$).

Finally, we evaluated two study characteristics as moderators of the relationship between intention-change interventions and behavior. Findings showed that there were no significant differences between the effect sizes from published versus unpublished studies ($d_+ = 0.38$ vs. 0.25) or between the effect sizes for student versus nonstudent samples ($d_+ = 0.38$ vs. 0.33). None of the moderators led to homogenous effect sizes (nonsignificant Q statistics) at both levels of the moderator, though effect sizes in three cases were homogenous (low PBC, no-treatment control groups, and unpublished studies). This finding suggests that the observed effect sizes for behavior are influenced by multiple factors.[8]

Intervention characteristics. Characteristics of the interventions were categorized by using a taxonomy adapted from Hardeman et al. (2000).[9] Thomas L. Webb and a second independent rater coded the interventions. Reliabilities were acceptable (independent characteristics: *Mdn* $\kappa = .73$; agreement for nonindependent characteristics: *Mdn* = 77%) and disagreements were resolved jointly. To examine the impact of intervention characteristics, we computed the respective sample-weighted average effect sizes for intention and behavior (see Table 4). Studies that reported significant intention differences and studies that reported nonsignificant intention differences both were included in these analyses ($k = 62$) to permit stronger inferences about the characteristics of effective interventions. Because interventions that had a large effect on intention also had a large effect on behavior ($r = .57$), we focus on the effect sizes for behavior.

The first intervention characteristic concerned the theoretical basis of the research. Twelve models provided the basis for the interventions according to respective reports. The most frequently used models were the theories of reasoned action/planned behavior (29%), social–cognitive theory/social learning theory (21%), protection motivation theory (18%), and the health belief model (13%). To gain insight into the effect sizes for interventions with different theoretical bases, disjoint cluster analysis (Hedges & Olkin, 1985) was used to decompose the 12 effect sizes into smaller subsets. Two clusters were identified by using a 5% level of significance for differences between effect sizes. Cluster 1 comprised interventions based on protection motivation theory, the theory of reasoned action/planned behavior, gain versus loss framed messages, the elaboration likelihood model, the health belief model, stage models, cognitive–behavioral principles, social–cognitive theory/social learning theory, and motivational interviewing. Interventions in Cluster 1 tended to have small to medium effects on behavior (*Mdn* $d_+ = 0.30$), according to Cohen's (1992) criteria. Cluster 2 comprised interventions based on the parallel response model and the information, motivation, behavioral skills model, which had negligible effects on behavior (*Mdn* $d_+ = 0.01$).

Interventions used the following behavior change methods most frequently: information regarding the behavior and outcome (58%), risk awareness material (50%), skills enhancement (42%), and goal or target setting (40%). Disjoint cluster analysis indicated that the effects sizes for behavior change methods could be grouped into five distinct clusters ($p < .05$). Cluster 1 included interventions that incorporated incentives for behaving or remaining in the program and social encouragement or support, which tended to have medium effects on behavior (*Mdn* $d_+ = 0.56$). Cluster 2 consisted of interventions that provided information regarding behavior and outcome, that specified a goal or target, included questions on the material, persuasive communication, modeling or demonstration by others, environmental changes, efforts to increase relevant skills, a personalized message, or risk awareness material. Behavior change methods in Cluster 2 had small-to-medium effects on behavior (*Mdn* $d_+ = 0.26$). Cluster 3 comprised three behavior change methods (planning, experiential tasks, and rehearsal of relevant skills) that tended to have small effects on behavior (*Mdn* $d_+ = 0.20$). Cluster 4 was made up of interventions that incorporated monitoring and homework (*Mdn* $d_+ = 0.12$). Finally, Cluster 5 consisted of interventions that used personal experiments ($d_+ = 0.06$).

Effect sizes for modes of delivery were independent so the homogeneity statistic (Q) was used to test variability among the effect sizes. There was no variability in effect sizes for different intervention formats, $Q(2) = 5.39$, *ns*. In other words, interventions delivered one to one ($d_+ = 0.38$) were no more effective than were interventions delivered in group ($d_+ = 0.31$) or classroom settings ($d_+ = 0.28$). However, homogeneity analysis did reveal significant variability in effect sizes as a function of the source of the intervention, $Q(4) = 37.09$, $p < .001$. Pairwise comparisons (with Bonferroni adjustment) revealed that, whereas interventions delivered by research assistants and health educators were similarly effective ($d_+ = 0.41$ and .33, respectively), research-assistant delivered interventions had larger effects on behavior compared with interventions delivered by either trained facilitators or teachers ($d_+ = 0.18$ and 0.15, respectively).[10]

[8] The present analysis investigated the factors that moderate the impact of successful intention-change interventions on behavior ($k = 47$). However, to confirm the validity of these analyses we also evaluated moderators with respect to the full sample of ($k = 62$) successful and unsuccessful interventions. Findings for each moderator were identical with the exception of publication status. Across the full sample of 62 studies, published studies had larger effects on behavior ($d_+ = 0.35$) than unpublished studies ($d_+ = 0.17$). One explanation for this finding is that interventions that did not change intention were less likely to be published (67% unpublished) than interventions that did change intention (89% published), $\chi^2(1) = 4.33$, $p < .05$. A table describing these analyses is available from Thomas L. Webb.

[9] A table describing the theoretical basis, behavior change methods, and modes of delivery for each study can be obtained from Thomas L. Webb.

[10] Effect sizes from 13 of the studies in our analyses of intervention characteristics were based on selecting the treatment group that produced the largest difference in intention scores compared with the control condition (see Footnote 2). To confirm the validity of this approach, we reran the analyses substituting effect sizes representing differences across multiple conditions for these 13 studies. As expected, the findings were virtually identical. A table describing these analyses can be obtained from Thomas L. Webb.

Table 4
Effect Sizes for Intervention Characteristics (k = 62)

Intervention characteristic	*N*	*k*	d_+ Intention	d_+ Behavior
Theoretical basis				
Protection motivation theory	1,510	11	0.69	0.46_a
Theory of reasoned action/planned behavior	3,548	18	0.58	0.40_a
Gain versus loss framed messages	761	6	0.68	0.34_a
Model of interpersonal behavior	444	2	0.57	0.33_a
Elaboration likelihood model	433	3	0.39	0.30_a
Health belief model	1,090	8	0.52	0.29_a
Stage models (MAP, TTM, HAPA, ARRM)	1,654	5	0.53	0.22_a
Cognitive behavioral principles	1,422	3	0.40	0.19_a
Social cognitive / social learning theory	4,409	13	0.28	0.15_a
Motivational interviewing	463	1	0.32	0.13_a
Parallel response model	540	1	0.23	0.02_b
Information, motivation, behavioral skills model	123	1	0.40	0.00_b
Behavior change methods				
Incentives for behaving or remaining in program	1,153	6	0.96	0.58_a
Social encouragement, social pressure, social support	2,365	8	0.64	0.54_a
Information regarding behavior and outcome	7,393	36	0.60	0.32_b
Goal or target specified	4,575	25	0.64	0.31_b
Questions on the material	353	3	0.55	0.30_b
Persuasive communication	2,621	16	0.38	0.29_b
Modeling / demonstration by others	3,592	14	0.41	0.28_b
Environmental changes	162	2	0.77	0.27_b
Increasing skills	6,302	26	0.38	0.27_b
Personalized message	2,044	8	0.10	0.26_b
Risk awareness material	5,345	31	0.56	0.25_b
Planning, implementation	787	4	0.68	0.20_c
Experiential tasks	3,032	12	0.33	0.20_c
Rehearsal of relevant skills	4,780	15	0.35	0.19_c
Monitoring, self-monitoring	1,721	3	0.36	0.13_d
Homework	1,239	2	0.23	0.11_d
Personal experiments	1,488	4	0.25	0.06_e
Modes of delivery: Group format				
One-to-one	4,834	24	0.66	0.38
Group	4,177	23	0.42	0.31
Classroom	2,839	14	0.48	0.28
Modes of delivery: Expert behavior change				
Research assistant	4,774	36	0.62	0.41_a
Health educator	1,567	6	0.45	0.33
Trained facilitator	5,355	17	0.38	0.18_b
Teacher	694	3	0.26	0.15_b
Clinical	174	1	0.06	0.13

Note. Because interventions could be based on more than one theory and/or use multiple methods of behavior change, classifications of theoretical basis and behavior change methods are not mutually exclusive. Bonferroni correction has been applied when evaluating significance of pairwise comparisons between modes of delivery. MAP = Model of action phases; TTM = Transtheoretical model; HAPA = Health action process approach; ARRM = Aids risk reduction model. Behavior effect sizes with different subscripts differ significantly (within each category).

Discussion

The present review provides the first systematic integration of experimental studies that tested the impact of changing participants' intentions on subsequent behavior change. Previous meta-analyses of intention–behavior relations integrated findings from correlational studies (e.g., Armitage & Conner, 2001; Godin & Kok, 1996; Randall & Wolff, 1994; Sheppard et al., 1988; Sheeran, 2002), and showed that intentions have strong associations with behavior. For instance, Sheeran's (2002) meta-analysis of 422 studies showed that the impact of intentions on behavior was equivalent to $d = 1.47$; this value easily exceeds the criterion for a large effect size according to Cohen's (1992) power primer ($d =$

0.80). However, correlational tests of intention–behavior consistency cannot rule out the possibility that a third variable is responsible for the observed associations (Mauro, 1990). To deal with this problem, the present review integrated experimental studies that (a) randomly assigned participants to experimental and control groups, (b) generated a significant difference in intention scores between the groups, and (c) followed up behavior. The key finding is that a medium-to-large change in intention ($d = 0.66$) engenders a small-to-medium change in behavior ($d = 0.36$). Thus, intention has a significant impact on behavior, but the size of this effect is considerably smaller than correlational tests have suggested.

The theoretical significance of these findings resides in the fact that several important conceptual frameworks in social and health psychology propose that changing behavioral intentions will engender behavior change (e.g., Ajzen, 1991; Bandura, 1989; Carver & Scheier, 1998; Fishbein, 1980; Gibbons et al., 1998; Heckhausen & Gollwitzer, 1987; Locke & Latham, 1990; Rogers, 1983; Triandis, 1980). The present meta-analysis supports this proposal. Moreover, most of the studies included in the review concerned the performance of consequential health-related behaviors (condom use, exercise, smoking) over substantial time periods ($M = 15$ weeks between measurement of intention and behavior). It was also the case that when behavior was measured objectively (rather than by self-report), the effect size for behavior change was medium-to-large rather than small-to-medium ($d = 0.67$). Thus, several aspects of the review serve to bolster the idea that intention determines behavior.

However, as Ajzen and Fishbein (2004) pointed out, how well self-reports reflect actual behavior is an empirical matter, and so it cannot be assumed that self-reports underestimate the impact of intention on behavior in the present meta-analysis. In fact, evidence indicates that self-reports for several of the behaviors reviewed here generally are reliable and valid (condom use, e.g., Jaccard, McDonald, Wan, Dittus, & Quinlan, 2002; exercise, e.g., Godin, Jobin, & Bouillon, 1986; smoking, e.g., Dolcini, Adler, Lee, & Bauman, 2003; Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989). It is also important to acknowledge that the effect size for behavior obtained in the present review ($d = 0.36$) captures not only the impact of intentions on behavior but also the direct effect of interventions on behavior. Mediation analyses showed that although intention change significantly attenuated the impact of interventions on behavior, the effect of the intervention remained significant even after controlling for intention. Thus, even the modest overall effect observed here ($d = 0.36$ is equivalent to $r = .18$) overestimates the impact of a medium-to-large change in intention on subsequent behavior change. The implication is that, although the present meta-analysis supports the view that intentions determine behavior, intentional control of behavior is a great deal more limited than previously supposed.

What factors explain the direct effects of interventions on behavior? Why did successful interventions affect behavior even after changes in intention had been taken into account? And why did unsuccessful interventions, that did not produce significant changes in intention scores, nonetheless have a small effect on behavior? (see Footnote 5). One explanation of these findings that can be derived from the theory of planned behavior, protection motivation theory, and social–cognitive theory is that the interventions increased perceived behavioral control (PBC) or self-efficacy and that these variables, in turn, had direct effects on behavior. However, the idea that changes in PBC/self-efficacy explained the direct effect of interventions on behavior is not supported by mediation analysis using data from studies that reported correlations between PBC and behavior (Footnote 7). This finding is consistent with previous meta-analyses that indicate that PBC/self-efficacy captures at most a small increment in the variance in behavior after intention has been taken into account (e.g., Armitage & Conner, 2001; Trafimow et al., 2002).

A second possible explanation is that interventions affected behavior by a route that did not involve either intentions or PBC/self-efficacy. For instance, the interventions could have activated behavior-relevant goals outside of participants' conscious awareness and initiated behavior automatically. The automotive model (Bargh, 1990; reviews by Chartrand & Bargh, 2002; Gollwitzer & Bargh, 2005) proposes that goals do not have to be consciously held to affect behavior. Situational features can directly activate goals and goal-directed behaviors such that relevant actions are initiated and run to completion without the person ever consciously intending to pursue the goal. For instance, Chartrand and Bargh (1996) used the scrambled sentence task (Srull & Wyer, 1979) to activate goals either to memorize presented material or to form an impression of a target person described in the material. Even though participants reported no awareness of activation of the goals during debriefing and did not believe that completing scrambled sentences could have influenced their behavior, findings reproduced the results of a previous experiment (Hamilton, Katz, & Leirer, 1980) in which participants had formed conscious intentions to memorize or form an impression (for equivalent findings, see Aarts, Gollwitzer, & Hassin, 2004; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Fitzsimons & Bargh, 2003). Other experiments have demonstrated that nonconscious goal pursuit operates in the same way as does conscious goal pursuit. Goals activated outside of awareness increase in strength until they are acted upon, they are characterized by task persistence in the face of obstacles, and goal-directed behavior is resumed in the wake of disruption even when tempting alternatives are available (Aarts et al., 2004; Bargh et al., 2001). These features are known to characterize people's striving for consciously chosen goals (Atkinson & Birch, 1970; Lewin, 1935). Thus, it is possible that interventions directly affected behavior because goal activation occurred outside of participants' awareness—in a manner that bypassed participants' self-reported intentions.

Why does intention not have greater impact on behavior? Several findings from the present review are relevant to understanding why successfully changing intention engenders only a small-to-medium change in behavior. We assessed three conceptual moderators derived from relevant theories in social and health psychology. According to several models (e.g., the theory of planned behavior, the model of interpersonal behavior, and social–cognitive theory), intentions can only be expected to find expression in behavior if the person possesses actual control over the behavior. The moderating roles of four indicators of volitional control were therefore assessed. As expected, participants' perceptions of control (PBC) moderated intention change–behavior change relations such that intention had a larger effect on behavior

when perceptions of control were high. Similarly, assessments of volitional control from independent raters indicated that greater actual control over behavior is associated with more effective translation of intentions into action. These findings support the importance of volitional control as a moderator of intention–behavior relations.

Meta-analysis indicated that measures of behavioral expectation (that are assumed to capture factors that might facilitate or inhibit performance of a behavior) had similar effects on behavior as measures of behavioral intention. Although certain meta-analyses of correlational studies indicate that expectations have superior predictive validity compared with intentions (e.g., Sheppard et al., 1988), other meta-analyses found that the type of intention measure does not moderate intention–behavior relations (e.g., Randall & Wolff, 1994; Sheeran & Orbell, 1998). Further research is needed to identify what factors determine the relative strength of expectations versus intentions as predictors of behavior.

The final indicator of volitional control concerned whether the intervention changed both intention and PBC versus changed intention only. We anticipated that interventions that generated significant changes in both intention and PBC would have larger effects on behavior compared with intention-only interventions. However, the results showed the opposite effect—interventions that were successful only in changing intention had stronger effects on behavior. Post hoc analyses revealed an important asymmetry in the effectiveness of the two types of intervention in changing intentions. Interventions that changed both PBC and intention had a smaller effect on intention compared with the intention-change-only interventions ($d_+ = 0.69$ and 0.84, respectively), $Q(1) = 4.58$, $p < .05$. Thus, findings for this moderator do not provide clear evidence about volitional control because the potential additional impact of changing PBC (after generating equivalent change in intention) cannot be assessed.

Wood and colleagues' (Ouellette & Wood, 1998; Wood et al., 2002) analysis of the circumstances conducive to habit formation was used to designate behaviors as likely (or not) to come under habitual control. Consistent with expectations, this conceptual factor moderated intention–behavior consistency. When behaviors were performed frequently in stable contexts (e.g., seat belt use), intention-change interventions had less impact on action than when respective behaviors were performed infrequently and/or in unstable contexts (e.g., course enrolment). According to Wood, behaviors that are instigated repeatedly and consistently in the presence of particular environmental cues gradually come under stimulus control and can be initiated and executed without needing the person's conscious intent and guidance. In contrast, when behaviors are performed infrequently, or if the time, place, and other circumstances of performance are liable to change, then intentions are likely to guide behavior.

The final conceptual factor came from the prototype/willingness model (PWM) and concerned the idea that certain health-risk behaviors may be determined more by people's willingness to engage in those activities (*the social reaction route*) than by their behavioral intentions (*the reasoned action route*). Smoking and condom nonuse may be determined more by social reaction than by intention because they are risky behaviors that generally are performed in social contexts and about which people have clear images according to previous research (e.g., Blanton et al., 2001; Gibbons, Gerrard, Lando, & McGovern, 1991; Thornton, Gibbons, & Gerrard, 2002; Wills, Gibbons, Gerrard, & Brody, 2000). These risk-behaviors were compared with health-protective behaviors (e.g., testicular self-examination) because it is unlikely that the latter behaviors involve a social reaction route (Gibbons et al., 1998). Findings supported PWM predictions. Intention change engendered less change in behavior when the respective activity was potentially socially reactive. Of course, the present review cannot clarify whether changing behavioral willingness would have had greater impact on these behaviors compared with intention change interventions. Future studies should compare the impact of these two types of intervention to assess the relative importance of reasoned action versus social reaction routes to health-risk behaviors.

The foregoing analysis indicates that lack of control over the behavior, circumstances conducive to habit formation, and potential for social reaction each can reduce the impact of intention on behavior. Findings from the meta-analysis also illuminate other contexts in which intentions have less impact on behavior. For instance, when the behavioral follow-up was taken more than 11.5 weeks after the intention change intervention the effect size reduced to $d = 0.23$—which is consistent with the idea that there is often a substantial "gap" between intention and action (Orbell & Sheeran, 1998; Sheeran, 2002). However, it is important to acknowledge that the moderator analyses are based on only 47 effect sizes and that effect sizes within each level of moderator variables generally were heterogenous; this may indicate that respective effects are moderated by multiple factors potentially in interaction with one another. Further studies are needed to increase statistical power and thus afford firmer conclusions about moderation.

What are the characteristics of interventions that successfully change intentions and behavior? The final aim of the present review was to identify the characteristics of effective intention and behavior change interventions. Findings showed that there was a strong relationship between the effect size for intention and the effect size for behavior, indicating that interventions that engendered greater changes in intention also produced greater impacts on behavior. Analyses of relevant effect sizes suggested that an intervention is likely to be most successful in generating intention and behavior change if the treatment (a) is based on protection motivation theory (Rogers, 1983) or the theory of reasoned action/planned behavior (Fishbein & Ajzen, 1975; Ajzen, 1991), (b) uses social encouragement and incentives for behaving or remaining in the program as behavior change methods, and (c) is delivered by a health educator or research assistant.

The most frequently used theoretical frameworks for designing interventions were protection motivation theory (PMT), the theories of reasoned action and planned behavior (TRA/TPB), the health belief model, and social–cognitive theory (57% of tests). It is notable that two of these theoretical frameworks (PMT and TRA/TPB) also produced the largest changes in intention and behavior. The importance of PMT in the present review is consistent with previous reviews concerning the usefulness of this model in behavior change interventions (e.g., Milne et al., 2000). Similarly, the effect sizes obtained for the TRA/TPB suggest that this model provides a worthwhile basis for developing interventions in addition to its role in identifying useful process and outcome variables (see also Hardeman, Johnston, Johnston, Bonnetti, Wareham, & Kinmonth, 2002).

The findings for behavior change methods are also consistent with previous research on these issues. The provision of incentives either for behavior change or for program participation was highly effective, perhaps because incentives boost participants' commitment to their intentions and thereby increase the likelihood that decisions will be acted upon (Erez & Zidon, 1984). However, it is worth noting that the impact of incentives on behavioral performance is not straightforward and may depend both on the nature of the reward (task-dependent vs. task-independent) and goal difficulty (Locke & Latham, 1990). For instance, Mowen, Middlemist, and Luther (1981) found that task-independent rewards benefited the performance of difficult goals, whereas the performance of easy or moderate goals was enhanced by task-dependent rewards. Social support or encouragement is well established as an effective method for promoting goal attainment (Povey, Conner, Sparks, James, & Shepherd, 2000; Rutter, Quine, & Chesham, 1993). For example, in a study of married cigarette smokers, Mermelstein, Lichtenstein, and McIntyre (1983) found a positive relationship between partner support and the success of quitting attempts.

Finally, some interesting findings emerged for the mode by which the intervention was delivered. Evidence supports the idea that source expertise enhances the impact of interventions on behavior (e.g., Hovland & Weiss, 1952; Pornpitakpan, 2004). However, in the present analysis, behavioral effects were comparable when interventions were delivered by health educators versus research assistants. One explanation for these findings is that source expertise was confounded with the nature of the focal behavior. That is, health educators were employed to deliver interventions designed to change important health behaviors (e.g., testicular self-examination and condom use), whereas research assistants delivered interventions targeted at less consequential behaviors (e.g., responses in the prisoners dilemma and visiting an Internet site). In support of this idea, when source expertise was evaluated in relation to the same behavior (cancer self-examination), health educators were more persuasive ($k = 2$, $N = 187$, $d_+ = 0.79$) than were research assistants ($k = 2$, $N = 496$, $d_+ = 0.42$), $Q(1) = 4.31$, $p < .05$.

There is a paucity of research comparing one-to-one versus group-based interventions (Emmons, 2000) and it was notable that no difference emerged between these two modes of delivery in the present review. This is encouraging for intervention programs that target large populations. However, it is important to note that this finding does not undermine the value of tailored interventions (Kreuter & Skinner, 2000), as delivering an intervention one-to-one is not the same thing as tailoring an intervention to the characteristics of particular individuals.

How might the impact of intention on behavior be enhanced in future behavior change interventions? It is worthwhile to consider two recent developments that are relevant to understanding how the impact of intention on behavior might be enhanced in future behavior change interventions. First, research on strength-related properties of behavioral intentions (reviews by Cooke & Sheeran, 2004a; Sheeran, 2002) suggests that important aspects of people's motivation to perform a behavior are not captured by standard −3 to 3 intention scales (that measure only the valence of the intention) and that additional measures of the strength or priority of the intention are needed to understand whether decisions will be implemented successfully. Temporal stability of intention is a key index of intention strength and is characteristically measured by within-participants correlations between measures of intention taken at two time points prior to the performance of the behavior (e.g., Doll & Ajzen, 1992; Sheeran, Orbell, & Trafimow, 1999). Meta-analysis indicates that temporal stability of intention has greater impact on intention–behavior consistency compared with other properties of intention (Cooke & Sheeran, 2004a) and mediates the effects of other moderators of behavioral intentions (Sheeran & Abraham, 2003). Temporal stability is a useful index of intention strength because stable intentions can withstand contextual threats (Cooke & Sheeran, 2004b), attenuate the impact of past behavior (habit) on future performance (Conner, Sheeran, Norman, & Armitage, 2000; Sheeran, Orbell, & Trafimow, 1999), and facilitate maintenance of behavior change (Conner, Norman, & Bell, 2002). The implication is that interventions that promote changes in both the valence and stability of intention are likely to have larger behavioral effects compared with interventions that only change the valence of intention.

Second, Gollwitzer's (1993, 1999; Gollwitzer & Sheeran, in press) concept of implementation intentions is also relevant to promoting intention realization. Implementation intentions are plans that specify when, where, and how one will perform goal-directed behaviors and take the format *If situation Y arises, then I will perform behavior Z!* Thus, whereas a behavioral intention might state *I intend to exercise this week!*, a corresponding implementation intention might be *When I get home from work on Monday, then I will jog round the park for 20 minutes!* Implementation intentions elaborate behavioral intentions by spelling out both a good opportunity to act and an appropriate action to initiate in order to promote the behavioral performance. Meta-analysis indicates that forming an implementation intention improves rates of behavioral enactment and goal attainment compared with the formation of a behavioral intention on its own (Gollwitzer & Sheeran, in press; Sheeran, 2002). These benefits in performance come about because implementation intentions delegate control of behavior to specified situational cues that serve to elicit behavior automatically (e.g., Brandstätter, Lengfelder, & Gollwitzer, 2001; Gollwitzer, 1993; Sheeran, Webb, & Gollwitzer, 2005). By forming an *if–then* plan, action control switches from a conscious effortful mode that is dependent upon the activation level of intention (action control by behavioral intentions) to control of behavior by preselected situational cues (action control by implementation intentions). In summary, future interventions that enhance the temporal stability of behavioral intentions and prompt formation of respective implementation intentions are likely to enhance the impact of intention on behavior.

Conclusion

The present meta-analysis provides the first estimate of the overall impact of changing behavioral intentions on subsequent behavior change in experiments to date. An integration of 47 tests showed that a medium-to-large sized change in intention engenders only a small-to-medium change in behavior. Findings also showed that intentions have less impact on behavior when participants lack control over the behavior, when there is potential for social reaction, and when circumstances of the performance are conducive to habit formation. Thus, this review suggests that intentional control of behavior is a great deal more limited than previous meta-analyses of correlational studies have indicated.

Future behavior change interventions should aim not only to identify more effective methods of changing intentions but also to facilitate the translation of intentions into action by promoting intention stability and implementation intention formation. The present findings also suggest, however, that future behavior change efforts might do well to give greater consideration to nonintentional routes to action such as prototype perceptions (e.g., Gibbons et al., 2003) and automotives (e.g., Gollwitzer & Bargh, 2005).

References

An asterisk precedes studies that were included in the meta-analysis.

Aarts, H., Gollwitzer, P. M., & Hassin, R. R. (2004). Goal contagion: Perceiving is for pursuing. *Journal of Personality and Social Psychology, 87,* 23–37.

Abraham, C., Sheeran, P., & Johnston, M. (1998). From health beliefs to self-regulation: Theoretical, advances in the psychology of action control. *Psychology and Health, 13,* 569–591.

Ajzen, I. (1985). From intentions to action: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action-control: From cognition to behavior* (pp. 11–39). New York: Springer.

*Ajzen, I. (1971). Attitudinal vs. normative messages: An investigation of the differential effects of persuasive communications on behavior. *Sociometry, 34,* 263–280.

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

Ajzen, I. (2002). Residual effects of past on later behavior: Habituation and reasoned action perspectives. *Personality and Social Psychology Review, 6,* 107–122.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice Hall.

Ajzen, I., & Fishbein, M. (2004). Questions raised by a reasoned action approach: Comment on Ogden (2003). *Health Psychology, 23,* 431–434.

Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behavior: Attitudes, intentions and perceived behavioral control. *Journal of Personality and Social Psychology, 22,* 453–474.

Albarracín, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: A meta-analysis. *Psychological Bulletin, 127,* 142–161.

Armitage, C. J., & Arden, M. A. (2002). Exploring discontinuity patterns in the transtheoretical model: An application of the theory of planned behavior. *British Journal of Health Psychology, 7*, 89–104.

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40,* 471–500.

Armitage, C. J., Sheeran, P., Conner, M., & Arden, M. (2004). Stages of change or changes of stage? Predicting transitions in transtheoretical model stages in relation to healthy food choice. *Journal of Consulting and Clinical Psychology, 72,* 491–499.

Astrom, A. N., & Rise, J. (2001). Young adults' intention to eat healthy food: Extending the theory of planned behavior. *Psychology and Health, 2,* 223–237.

Atkinson, J. W., & Birch, D. (1970). *A dynamic theory of action.* Cambridge, MA: Harvard University Press.

Austin, J. J., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process, and content. *Psychological Bulletin, 120,* 338–375.

Bamberg, S. (2002). Effects of implementation intentions on the actual performance of new environmentally friendly behaviors. Results of two field experiments. *Journal of Environmental Psychology, 22,* 399–411.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist, 44,* 1175–1184.

Bandura, A. (1998). Exploration of fortuitous determinants of life paths. *Psychological Inquiry, 9,* 95–99.

*Banks, S. M., Salovey, P., Greener, S., Rothman, A. J., Moyer, A., Beauvais, J., & Epel, E. (1995). The effects of message framing on mammography utilization. *Health Psychology, 14,* 178–184.

Bargh, J. A. (1990). Auto-motives: Preconscious determinants of social interaction. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of Motivation and Cognition* (Vol. 2, pp. 93–130). New York: Guilford Press.

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: Non-conscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology, 68,* 768–781.

*Basen-Engquist, K. (1994). Evaluation of a theory based HIV prevention intervention for college students. *AIDs Education and Prevention, 6,* 412–424.

*Beck, K. H., & Lund, A. K. (1981). The effects of health threat seriousness and personal efficacy upon intentions and behavior. *Journal of Applied Social Psychology, 11,* 401–415.

Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 6, pp. 1–62). San Diego: Academic Press.

Blanton, H., van den Eijnden, R. J. J. M., Buunk, B. P., Gibbons, F. X., Gerrard, M., & Bakker, A. (2001). Accentuate the negative: Social images in the prediction and promotion of condom use. *Journal of Applied Social Psychology, 31,* 274–295.

Bootzin, R. (1975). *Behavior modification and therapy: An introduction.* Cambridge, MA: Winthrop.

Brandstätter, V., Lengfelder, A., & Gollwitzer, P. M. (2001). Implementation intentions and efficient action initiation. *Journal of Personality and Social Psychology, 81,* 946–960.

Brown, R. A., Ramsey, S. E., Strong, D. R., Myers, M. G., Kahler, C. W., Lejuez, C. W., et al. (2003). Effects of motivational interviewing on smoking cessation in adolescents with psychiatric disorders. *Tobacco Control, 12*(Suppl IV), *iv*3–*iv*10.

*Brubaker, R. G. & Fowler, C. (1990). Encouraging college males to perform testicular self-examination: Evaluation of a persuasive message based on the revised theory of reasoned action. *Journal of Applied Social Psychology, 20,* 1411–1422.

Brug, J., Steenhuis, I., van Assema, P., & de Vries, H. (1996). The impact of a computer-tailored nutrition intervention. *Preventive Medicine, 25,* 236–242.

*Bryan, A. D., Aiken, L. S. & West, S. G. (1996). Increasing condom use: Evaluation of a theory based intervention to prevent sexually transmitted diseases in young women. *Health Psychology, 15,* 371–382.

Budd, R. J. (1987). Response bias and the theory of reasoned action. *Social Cognition, 5,* 95–107.

*Burgess, E. S., & Wurtele, S. K. (1998). Enhancing parent–child communication about sexual abuse: A pilot study. *Child Abuse and Neglect, 22,* 1167–1175.

Caplan, R. D., Vinokur, A. D., Price, R. H. & Van Ryn, M. (1989). Job seeking, reemployment, and mental health: A randomized field experiment in coping with job loss. *Journal of Applied Psychology, 74,* 759–769.

*Caron, F., Godin, G., Otis, J., & Lambert, L. D. (2004). Evaluation of a theoretically based AIDS/STD peer education program on postponing sexual intercourse and on condom use among adolescents attending high school. *Health Education Research, 19,* 185–197.

Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality, social, clinical, and health psychology. *Psychological Bulletin, 92,* 111–135.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior.* Cambridge, UK: Cambridge University Press.

Chartrand, T. L., & Bargh, J. A. (1996). Automatic activation of impres-

sion formation and memorization goals: Nonconscious goal priming reproduces effects of explicit task instructions. *Journal of Personality and Social Psychology, 71,* 464–478.

Chartrand, T. L., & Bargh, J. A. (2002). Nonconscious motivations: Their activation, operation, and consequences. In A. Tesser, D. Stapel, & J. Wood (Eds.), *Self and motivation: Emerging psychological perspectives* (pp. 13–41). Washington, DC: American Psychological Association.

*Chatrou, M., Maes, S., Dusseldorp, E., & Seegers, G. (1999). Effects of the Brabant smoking prevention programme. A replication of the Wisconsin programme. *Psychology and Health, 14,* 159–178.

*Cody, R., & Lee, C. (1990). Behaviors, beliefs, and intentions in skin cancer prevention. *Journal of Behavioral Medicine, 13,* 373–389.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112,* 155–159.

Conner, M., & McMillan, B. (1999). Interaction effects in the theory of planned behaviour: Studying cannabis use. *British Journal of Social Psychology, 38,* 195–222.

Conner, M., & Norman, P. (1996). *Predicting health behaviour.* Buckingham, UK: Open University Press.

Conner, M., Norman, P., & Bell (2002). The theory of planned behavior and healthy eating. *Health Psychology, 21,* 194–201.

Conner, M., Sheeran, P., Norman, P., & Armitage, C. J. (2000). Temporal stability as a moderator of relationships in the theory of planned behaviour. *British Journal of Social Psychology, 39,* 469–493.

Cooke, R., & Sheeran, P. (2004a). Moderation of cognition-intention and cognition–behaviour relations: A meta-analysis of properties of variables from the theory of planned behaviour. *British Journal of Social Psychology, 43,* 159–187.

Cooke, R., & Sheeran, P. (2004b). *Properties of behavioral intentions: Factor structure and implications for behavior, information processing, and resistance to attack*. Manuscript submitted for publication.

Cooper, H. M. (1986). *Integrating research: A guide for literature reviews.* London: Sage.

Courneya, K. S., Nigg, C. R., Estabrooks, P. A. (1998). Relationships among the theory of planned behavior, stages of change, and exercise behavior in older persons over a three year period. *Psychology and Health, 13,* 355–367.

Courneya, K. S., Plotnikoff, R. C., Hotz, S. B., & Birkett, N. J. (2001). Predicting exercise stage transitions over two consecutive 6-month periods: A test of the theory of planned behaviour in a population-based sample. *British Journal of Health Psychology, 6,* 135–150.

*Crawley, F. E., & Koballa, T. R. (1992). Hispanic-American students' attitudes toward enrolling in high school chemistry. A study of planned behaviour and belief-based change. *Hispanic Journal of Behavioural Sciences, 14,* 469–486.

*D'Onofrio, C. N., Moskowitz, J. M., & Braverman, M. T. (2002). Curtailing tobacco use among youth: Evaluation of Project 4-Health. *Health Education and Behavior, 29,* 656–682.

*Das, E. H. J., de Wit, J. B. F., & Stroebe, W. (2003). Fear appeals motivate acceptance of action recommendations: Evidence for a positive bias in the processing of persuasive messages. *Personality and Social Psychology Bulletin, 29,* 650–664.

*Detweiler, J. B., Bedell, B. T., Salovey, P., Pronin, E., & Rothman, A. J. (1999). Message framing and sunscreen use: Gain-framed messages motivate beach-goers. *Health Psychology, 18,* 189–196.

*Dholakia, U. M., & Bagozzi, R. P. (2003). As time goes by: How goal and implementation intentions influence enactment of short-fuse behaviors. *Journal of Applied Social Psychology, 33,* 889–922.

Dolcini, M. M., Adler, N. E., Lee, P., & Bauman, K. E. (2003). An assessment of the validity of adolescent self-reported smoking using three biological indicators. *Nicotine and Tobacco Research, 5,* 473–483.

Doll, J., & Ajzen, I. (1992). Accessibility and stability of predictors in the theory of planned behavior. *Journal of Personality and Social Psychology, 51,* 754–765.

*Dukeshire, S. R. (1995). Turning up the head: The effects of fear appeals on sun-protective attitudes, intentions, and behaviors. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 57*(6B), 4019.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes.* Fort Worth: Harcourt Brace Jovanovich.

Eagly, A. H., & Wood, W. (1994). Using research synthesis to plan future research. In H. Cooper & L. V. Hedges (Eds.), *The handbook of research synthesis* (pp. 485–500). New York: Russell Sage Foundation.

Emmons, K. E. (2000). Behavioral and social science contributions to the health of adults in the United States, In B. R. Smedley & S. L. Syme (Eds.), *Promoting health: Intervention strategies from social and behavioral research.* Washington, DC: National Academy Press.

Erez, M., & Zidon, I. (1984). Effect of goal acceptance on the relationship of goal difficulty to performance. *Journal of Applied Psychology, 69,* 69–78.

Evans, A. E., Edmundson-Drane, E. W., & Harris, K. K. (2000). Computer-assisted instruction: An effective instructional method for HIV prevention education? *Journal of Adolescent Health, 26,* 244–251.

Ferguson, E., & Bibby, P. A. (2002). Predicting future blood donor returns: Past behavior, intentions, and observer effects. *Health Psychology, 21,* 513–518.

Fiore, M. C., Bailey, W. C., Cohen, S. J., Dorfman, S. F., Goldstein, M. G., Gritz, E. R., et al. (1996). *Smoking cessation.* Rockville, MD: Agency for Health Care Policy and Research, U.S. Department of Health and Human Services (Clinical practice guideline No. 18. Publication No 96–0692).

Fishbein, M. (1980). A theory of reasoned action: Some applications and implications. In H. Howe & M. Page (Eds.), *Nebraska Symposium on Motivation* (Vol. 27, pp. 65–116). Lincoln, NB: University of Nebraska Press.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research.* Reading, MA: Addison Wesley.

Fishbein, M., Ajzen, I., & McArdle, J. (1980). Changing the behavior of alcoholics: Effects of persuasive communication. In I. Ajzen & M. Fishbein (Eds.), *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice Hall.

*Fitzgerald, A. M., Stanton, B. F., Terreri, N., Shipena, H., Xiaoming, L., Kahihuata, J., et al. (1999). Use of western-based HIV risk reduction interventions targeting adolescents in an African setting. *Journal of Adolescent Health, 25,* 52–61.

Fitzsimons, G. M., & Bargh, J. A. (2003). Thinking of you: Nonconscious pursuit of interpersonal goals associated with relationship partners. *Journal of Personality and Social Psychology, 84,* 148–164.

Floyd, D. L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology, 30,* 407–429.

Foot, H., & Sanford, A. (2004). The use and abuse of student participants. *The Psychologist, 17,* 256–259.

Gagnon, M. P., & Godin, G. (2000). The impact of new antiretroviral treatments on college students' intentions to use a condom with a new sexual partner. *AIDS Education and Prevention, 12,* 239–251.

Gibbons, F. X., Gerrard, M., Blanton, H., & Russell, D. W. (1998). Reasoned action and social reaction: Willingness and intention as independent predictors of health risk. *Journal of Personality and Social Psychology, 74,* 1164–1180.

Gibbons, F. X., Gerrard, M., Lando, H. A., & McGovern, P. G. (1991). Social-comparison and smoking cessation - the role of the typical smoker. *Journal of Experimental Social Psychology, 27,* 239–258.

Gibbons, F. X., Gerrard, M., & Lane, D. J. (2003). A social-reaction model of adolescent health risk. In J. J. Suls & K. A. Wallston (Eds.), *Social Psychological Foundations of Health and Illness* (pp. 107–136). Oxford, England: Blackwell.

*Godin, G., Desharnais, R., Jobin, J., & Cook, J. (1987). The impact of

physical fitness and health-age appraisal upon exercise intentions and behavior. *Journal of Behavioral Medicine, 10,* 241–250.

Godin, G., Jobin, J., & Bouillon, J. (1986). Assessment of leisure time exercise behavior by self-report: A concurrent validity study. *Canadian Journal of Public Health, 77,* 259–262.

Godin, G., & Kok, G. (1996). The theory of planned behavior: A review of it's applications in health related behavior. *American Journal of Health Promotion, 11,* 87–98.

Godin, G., Lambert, L. D., Owen, N., Nolin, B., & Prud'homme, D. (2004). Stages of motivational readiness for physical activity: A comparison of different algorithms of classification. *British Journal of Health Psychology, 9,* 253–267.

Gollwitzer, P. M. (1990). Action phases and mindsets. In E. T. Higgins & R. M. Sorrentino (Eds.), *The handbook of motivation and cognition: Foundations of social behavior* (Vol. 2, pp. 53–92). New York: Guilford Press.

Gollwitzer, P. M. (1993). Goal achievement: The role of intentions. *European Review of Social Psychology, 4,* 141–185.

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54,* 493–503.

Gollwitzer, P. M., & Bargh, J. A. (2005). Automaticity in goal pursuit. In A. Elliot & C. Dweck (Eds.), *Handbook of competence and motivation.* New York: Guilford Press.

Gollwitzer, P. M., & Moskowitz, G. B. (1996). Goal effects on action and cognition. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 361–399). New York: Guilford Press.

Gollwitzer, P. M., & Sheeran, P. (in press). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology.*

*Graham-Clarke, P., & Oldenberg, B. (1994). The effectiveness of a general-practice-based physical activity intervention on patient physical activity status. *Behavior Change, 11,* 132–144.

Hagger, M. S., Chatzisarantis, N. L. D., & Biddle, S. J. H. (2002). The influence of autonomous and controlling motives on physical activity intentions within the theory of planned behaviour. *British Journal of Health Psychology, 7,* 283–298.

Hamilton, D. L., Katz, L. B., & Leirer, V. O. (1980). Cognitive representation of personality impression: Organizational processes in first impression formation. *Journal of Personality and Social Psychology, 39,* 1050–1063.

Hardeman, W., Griffin, C., Johnson, M., Kinmonth, A. K., & Wareham, N. J. (2000). Interventions to prevent weight gain: A systematic review of psychological models and behavior change methods. *International Journal of Obesity and Related Metabolic Disorders, 24,* 131–143.

Hardeman, W., Johnston, M., Johnston, D. W., Bonnetti, D., Wareham, N. J., & Kinmonth, A. L. (2002). Application of the theory of planned behaviour in behaviour change interventions: A systematic review. *Psychology and Health, 17,* 123–158.

Hausenblas, H. A., Caron, A. V., & Mack, D. E. (1997). Application of the theories of reasoned action and planned behavior to exercise behavior: A meta-analysis. *Journal of Sport and Exercise Psychology, 19,* 36–51.

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., Rickert, W., & Robinson, J. (1989). Measuring heaviness of smoking: Using self-reported time to first cigarette of the day and number of cigarettes smoked per day. *British Journal of Addiction, 84,* 791–800.

Heckhausen, H. (1991). *Motivation and action.* Berlin: Springer-Verlag.

Heckhausen, H., & Gollwitzer, P. M. (1987). Thought contents and cognitive functioning in motivational versus volitional states of mind. *Motivation and Emotion, 11,* 101–120.

Hedges, L., & Olkin, I. (1985). *Statistical methods for meta-analysis.* New York: Academic Press.

Hedges, L. V. (1981). Distribution theory for Glass's estimator of effect size and related estimators. *Journal of Educational Statistics, 6,* 107–128.

Hessing, D. J., Elffers, H., & Wiegel, R. H. (1988). Exploring the limits of self-reports and reasoned action: An investigation of the psychology of tax-evasion behavior. *Journal of Personality and Social Psychology, 54,* 405–413.

*Hillhouse, J. J., & Turrisi, R. (2002). Examination of the efficacy of an appearance-focused intervention to reduce UV exposure. *Journal of Behavioral Medicine, 25,* 395–409.

*Hine, D. W. & Gifford, R. (1991). Fear appeals, individual differences and environmental concern. *Journal of Environmental Education, 23,* 36–41.

Hovland, C. I., & Weiss, W. (1952). The influence of source credibility in communication effectiveness. *Public Opinion Quarterly, 15,* 635–650.

Hunter, J. E., & Schmidt, E. L. (1990). *Methods of meta-analysis: Correcting error and bias in research findings.* Newbury Park, CA: Sage.

*Irvine, A. B., Ary, D. V., Grove, D. A., & Gilfillan-Morton, L. (2004). The effectiveness of an interactive multimedia program to influence eating habits. *Health Education Research, 19,* 290–305.

Jaccard, J., McDonald, R., Wan, C. K., Dittus, P. J., & Quinlan, S. (2002). The accuracy of self-reports of condom use and sexual behavior. *Journal of Applied Social Psychology, 32,* 1863–1905.

*Jackson, K. M. (1997). Psychosocial model and intervention to encourage sun protective behavior. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58,* 3368.

James, N. J., Gillies, P. A., & Bignell, C. J. (1998). Evaluation of a randomized controlled trial of HIV and sexually transmitted disease prevention in a genitourinary medicine clinic setting. *AIDS, 12,* 1235–1242.

Jemmott, J. B., & Jemmott, L. S. (2000). HIV risk reduction behavioral interventions with heterosexual adults. *AIDS, 14*(Suppl. 2), S40–S52.

*Jemmott, J. B., Jemmott, L. S. & Fong, G. T. (1998). Abstinence and safer sex. HIV risk interventions for African American adolescents. *Journal of the American Medical Association, 279,* 1529–1536.

Johnson, B. T. (1993). *DSTAT. Software for the meta-analytic review of research literatures* (rev. ed.). [Computer software]. Hillsdale, NJ: Erlbaum.

*Jones, L. W., Sinclair, R. C., & Courneya, K. S. (2003). The effects of source credibility and message framing on exercise intentions, behaviors, and attitudes: An integration of the Elaboration Likelihood Model and Prospect Theory. *Journal of Applied Social Psychology, 33,* 179–196.

Kalichman, S. C., & Hospers, H. J. (1997). Efficacy of behavioral skills enhancement HIV risk-reduction interventions in community settings. *AIDS, 11*(Suppl. A), S191–S199.

Kamal, A.S. (1999). Adult awareness strategies in AIDS health education. *Dissertation Abstracts International: Section A: Humanities and Social Sciences, 60*(3A), 0617.

Kanfer, F. H. E., & Goldstein, A. P. E. (1986). *Helping people change: A textbook of methods.* New York: Pergamon Press.

Kellar, I., & Abraham, C. (2004). *Can the theory of planned behavior mediate effects of age and gender on exercise performance and participation among school children?* Unpublished manuscript.

Kenny, D. A. (1979). Correlation and causality. New York: Wiley.

Kenny, D. A., Kashy, D. A., & Bolger, N. (1998). Data-analysis in social psychology. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (Vol. 4, pp. 233–265). New York: Oxford University Press.

Kiesler, C. A. (1971). *The psychology of commitment: Experiments linking behavior to belief.* New York: Academic Press.

Klockner, C. A., Matthies, E., & Hunecke, M. (2003). Problems of operationalising habits and integrating habits in normative decision-making models. *Journal of Applied Social Psychology, 33,* 396–417.

Kreuter, M. W., & Skinner, C. S. (2000). Tailoring: What's in a name? *Health Education Research, 15,* 1–4.

Kruglanski, A. W., Shah, J. Y., Fishbach, A., Friedman, R., Chun, W. Y., & Sleeth-Keppler, D. (2002). A theory of goal-systems. *Advances in Experimental Social Psychology, 34,* 311–378.

Langer, E. J. (1975). The illusion of control. *Journal of Personality and Social Psychology, 32,* 311–328.

*Lescano, C. M. (1999). Promoting sun-protective behaviors through a school plus home intervention. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 60,* 835.

Lewin, K. (1935). *A dynamic theory of personality.* New York: McGraw-Hill.

Liska, A. E. (1984). A critical examination of the causal structure of the Fishbein/Azjen attitude–behavior model. *Social Psychology Quarterly, 47,* 61–74.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal-setting and task performance.* Englewood Cliffs, NJ: Prentice Hall.

*Luszczynska, A., & Schwarzer, R. (2003). Planning and self-efficacy in the adoption and maintenance of breast self-examination: A longitudinal study on self-regulatory cognitions. *Psychology and Health, 18,* 93–108.

Maddux, J. E. (1999). Expectancies and the social cognitive perspective: Basic principles, processes, and variables. In I. Kirsch (Ed.), *How expectancies shape experience* (pp. 17–40). Washington, DC: American Psychological Association.

Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology, 19,* 469–479.

*Mahler, H. I. M., Fitzpatrick, B., Barker, P., & Lapin, A. (1997). The relative effects of a health-based versus an appearance-based intervention designed to increase sunscreen use. *American Journal of Health Promotion, 11,* 426–429.

*Mahler, H. I. M., Kulik, J. A., Gibbons, F. X., Gerrard, M., & Harrell, J. (2003). Effects of appearance-based interventions on sun protective intentions and self-reported behaviors. *Health Psychology, 22,* 199–209.

*Main, D. S., Iverson, D. C., & McGloin, J. (1994). Preventing HIV infection among adolescents: Evaluation of a school-based education program. *Preventive Medicine, 23,* 409–417.

*Martinez, R., Levine, D. W., Martin, R., & Altman, D. G. (1996). Effect of integration of injury control information into a high school physics course. *Annals of Emergency Medicine, 27,* 216–224.

*Martinez, T. B. (1999). Message framing and college students HIV preventative behavior. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 60,* 4303.

Mauro, R. (1990). Understanding L. O. V. E (left out variables error): A method for estimating the effects of omitted variables. *Psychological Bulletin, 108,* 314–329.

*Melendez, R. M., Hoffman, S., Exner, T., Leu, C-S., & Ehrhardt, A. A. (2003). Intimate partner violence and safer sex negotiation: Effects of a gender-specific intervention. *Archives of Sexual Behavior, 32,* 499–511.

Mento, A. J., Steel, R. P., & Karren, R. J. (1987). A meta-analytic study of the effects of goal-setting on task-performance, 1966 to 1984. *Organizational Behavior and Human Decision Processes, 39,* 52–83.

Mermelstein, R., Lichtenstein, E., & McIntyre, K. (1983). Partner support and relapse in smoking cessation programs. *Journal of Consulting and Clinical Psychology, 51,* 465–466.

Meyerowitz, B. E., & Chaiken, S. (1987). The effect of message framing on breast self-examination attitudes, intentions and behavior. *Journal of Personality and Social Psychology, 52,* 500–510.

Michie, A. J., & Abraham, C. (2004). Interventions to change health behaviours: Evidence-based or evidence-inspired? *Psychology and Health, 19,* 29–49.

*Milne, S. E., Orbell, S., & Sheeran, P. (2002). Combining motivational and volitional interventions to promote exercise participation: Protection motivation theory and implementation intentions. *British Journal of Social Psychology, 7,* 163–184.

Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and intervention in health related behavior: A meta-analytic review of protection motivation theory. *Journal of Applied Social Psychology, 30,* 143–166.

Mowen, J. C., Middlemist, R. C., & Luther, D. (1981). Joint effects of assigned goal level and incentive structure on task performance: A laboratory study. *Journal of Applied Psychology, 66,* 598–603.

*Murphy, W. G., & Brubaker, R. G. (1990). Effects of a brief theory based intervention on the practice of testicular self-examination by high school males. *Journal of School Health, 60,* 459–462.

Oettingen, G., & Gollwitzer, P. M. (2001). Goal setting and goal striving. In A. Tesser., & N. Schwarz (Eds.), *Blackwell book of social psychology: Intraindividual processes* (pp. 329–348). Oxford, England: Blackwell.

Orbell, S., & Sheeran, P. (1998). Inclined abstainers: A problem for predicting health-related behaviour. *British Journal of Social Psychology, 37,* 151–165.

Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin, 124,* 57–74.

Palmer, C. L., Burwitz, L., Smith, N. C., & Barrie, A. (2000). Enhancing fitness-training adherence of elite netball players: An evaluation of Maddux's revised theory of planned behavior. *Journal of Sport Sciences, 18,* 627–641.

Pierce, J. P., Dwyer, T., Frape, G., Chapman, S., Chamberlain, A., & Burke, N. (1986). Evaluation of the Sydney "quit for life" anti-smoking campaign. *Medical Journal of Australia, 144,* 341–346.

Plotnikoff, R. C., & Higginbottom, N. (1995). Predicting low fat diet intentions and behaviours for the prevention of coronary heart disease: An application of protection motivation theory among an Australian population. *Psychology and Health, 10,* 397–408.

Pornpitakpan, C. (2004). The persuasiveness of source credibility: A critical review of five decades' evidence. *Journal of Applied Social Psychology, 34,* 243–281.

Povey, R., Conner, M., Sparks, P., James, R., & Shepherd, R. (2000). The theory of planned behaviour and health eating: Examining additive and moderating effects of social influence variables. *Psychology and Health, 14,* 991–1006.

Prochaska, J. O., & DiClemente, C. C. (1984). *The transtheoretical approach: Crossing the traditional boundaries of change.* Homewood, IL: Irwin.

*Quine, L., Rutter, D. R., & Arnold, L. (2001). Persuading school age cyclists to use safety helmets: Effectiveness of an intervention based on the theory of planned behaviour. *British Journal of Health Psychology, 6,* 327–346.

Raats, M. M., Sparks, P., Geekie, M. A., & Shepherd, R. (1999). The effects of providing personalized dietary feedback. A semicomputerized approach. *Patient Education and Counseling, 37,* 177–189.

Randall, D. M., & Wolff, J. A. (1994). The time interval in the intention-behaviour relationship. Meta-analysis. *British Journal of Social Psychology, 33,* 405–418.

Rippetoe, P. A., & Rogers, R. W. (1987). Effects of components of a protection motivation theory on adaptive and maladaptive coping with a health threat. *Journal of Personality and Social Psychology, 52,* 596–604.

Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In J. T. Cacioppo & R. E. Petty (Eds.), *Social psychophysiology: A sourcebook.* London: Guilford Press.

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs, 2,* 1–8.

Rosenthal, R. (1979). The "file drawer problem" and tolerance for null results. *Psychological Bulletin, 86,* 638–641.

Rutter, D. R., Quine, L., & Chesham, D. J. (1993). *Social psychological approaches to health.* Hemel Hempstead: Harvester Wheatsheaf.

*Sanderson, C. A., & Jemmott, J. B. (1996). Moderation and mediation of HIV-prevention interventions: Relationship status, intentions and condom use among college students. *Journal of Applied Social Psychology, 26,* 2076–2099.

Schwarzer, R. (1988). *Meta: Programs for secondary data analysis.* Berlin: Free University of Berlin.

Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and a new model. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 217–242). Washington, DC: Hemisphere.

Schwarzer, R. (1999). Self-regulatory processes in the adoption and maintenance of health behaviors: The role of optimism, goals, and threats. *Journal of Health Psychology, 4,* 115–127.

Sears, D. O. (1986). College sophomores in the laboratory: Influences of a narrow database on social psychology's view of human nature. *Journal of Personality and Social Psychology, 51,* 515–530.

Sheeran, P. (2002). Intention-behaviour relations: A conceptual and empirical review. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology,* (Vol. 12, pp. 1–36). London: Wiley.

Sheeran, P., & Abraham, C. (2003). Mediator of moderators: Temporal stability of intention and the intention–behavior relation. *Personality and Social Psychology Bulletin, 29,* 205–215.

Sheeran, P., Abraham, C., & Orbell, S. (1999). Psychosocial correlates of heterosexual condom use: A meta-analysis. *Psychological Bulletin, 125,* 90–132.

Sheeran, P., & Orbell, S. (1998). Do intentions predict condom use? Meta-analysis and examination of six moderator variables. *British Journal of Social Psychology, 37,* 231–250.

Sheeran, P., & Orbell, S. (2000). Using implementation intentions to increase attendance for cervical cancer screening. *Health Psychology, 19,* 283–289.

Sheeran, P., Orbell, S., & Trafimow, D. (1999). Does the temporal stability of behavioral intentions moderate intention–behavior and past behavior–future behavior relations? *Personality and Social Psychology Bulletin, 25,* 721–730.

Sheeran, P., Trafimow, D., & Armitage, C. J. (2003). Predicting behaviour from perceived behavioural control: Tests of the accuracy assumption of the theory of planned behaviour. *British Journal of Social Psychology, 42,* 393–410.

*Sheeran, P., Webb, T. L., & Gollwitzer, P. M. (2003). *Implementation intention effects are goal-dependent.* Unpublished manuscript.

Sheeran, P., Webb, T. L., & Gollwitzer, P. M. (2005). The interplay between goal intentions and implementation intentions. *Personality and Social Psychology Bulletin, 31,* 87–98.

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research, 15,* 325–343.

Silagy, C., Mant, D., Fowler, G., & Lodge, M. (1994). Meta-analysis on efficacy of nicotine replacement therapies in smoking cessation. *Lancet, 343,* 139–142.

*Slonim-Nevo, V., Auslander, W. F., Ozawa, M. N., & Jung, K. G. (1996). The long-term impact of AIDS preventive interventions for delinquent and abused adolescents. *Adolescence, 31,* 409–421.

Smith, B. N., & Stasson, M. F. (2000). A comparison of health behavior constructs: Social psychological predictors of AIDs-preventive behavioral intentions. *Journal of Applied Social Psychology, 30,* 443–462.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural models. In S. Leinhardt (Ed.), *Sociological Methodology* (pp. 290–312). San Francisco: Jossey-Bass.

Srull, T. K., & Wyer, R. S. (1979). The role of category accessibility in the interpretation of information about persons: Some determinants and implications. *Journal of Personality and Social Psychology, 37,* 1660–1672.

*Stanton, B. F., Li, X., Ricardo, I., Galbraith, J., Feigelman, S., & Kaljee, L. (1996). A randomized, controlled effectiveness trial of an AIDS prevention program for low-income African-American youths. *Archives of Pediatric and Adolescent Medicine, 150,* 363–372.

Steffen, V. J. (1990). Men's motivation to perform the testicle self-exam: Effects of prior knowledge and an educational brochure. *Journal of Applied Social Psychology, 20,* 681–702.

*Steffen, V. J., Sternberg, L., Teegarden, L. A., & Shepherd, K. (1994). Practice and persuasive frame: Effects on beliefs, intentions, and performance of a cancer self-examination. *Journal of Applied Social Psychology, 24,* 897–925.

Sutton, S. (1998). Predicting and explaining intentions and behavior: How well are we doing? *Journal of Applied Social Psychology, 28,* 1317–1338.

Sutton, S. (2000). Interpreting cross-sectional data on stages of change. *Psychology and Health, 15,* 163–171.

*Sutton, S., & Hallett, R. (1988). Smoking intervention in the workplace using videotapes and nicotine chewing gum. *Preventive Medicine, 17,* 48–59.

Tedesco, L. A., Keffer, M. A., Davis, E. L., & Christersson, L. A. (1993). Self-efficacy and reasoned action: Predicting oral health status and behaviour at 1, 3, and 6 month intervals. *Psychology and Health, 8,* 105–121.

* Tesar, C. M. (1996). Peer education intervention and change in HIV related knowledge, attitudes, intentions, and behaviors in college students. *Dissertation Abstracts International: Section A: Humanities and Social Sciences, 57,* 2376.

*Thompson, S. C., Kyle, D., Swan, J., Thomas, C., & Vrungos, S. (2002). Increasing condom use by undermining perceived invulnerability to HIV. *AIDS Education and Prevention, 14,* 505–514.

Thornton, B., Gibbons, F. X., & Gerrard, M. (2002). Risk perception and prototype perception: Independent processes predicting risk behavior. *Personality and Social Psychology Bulletin, 28,* 986–999.

Trafimow, D., Sheeran, P., Conner, K., & Finlay, K. A. (2002). Evidence that perceived behavioural control is a multidimensional construct: Perceived control and perceived difficulty. *British Journal of Social Psychology, 41,* 101–122.

Triandis, H. C. (1977). *Interpersonal behaviour.* Monterey, CA: Brooks/Cole.

Triandis, H. C. (1980). Values, attitudes, and interpersonal behavior. In H. E. Howe, Jr. & M. Page (Eds.), *Nebraska symposium of motivation* (Vol. 27, pp. 195–259). Lincoln: University of Nebraska Press.

Van den Putte, B. (1991). *20 years of the theory of reasoned action of Fishbein and Ajzen: A meta-analysis.* Unpublished manuscript. University of Amsterdam.

Verplanken, B., Aarts, H., van Knippenberg, A., & Moonen, A. (1998). Habit versus planned behaviour: A field experiment. *British Journal of Social Psychology, 37,* 111–128.

Webb, T. L., & Sheeran, P. (2005). Integrating concepts from goal theories to understand the achievement of personal goals. *European Journal of Social Psychology, 35,* 69–96.

Weinstein, N. D. (1988). The precaution adoption process. *Health Psychology, 7,* 355–386.

Weinstein, N. D., & Sandman, P. M. (1992). A model of the precaution adoption process. Evidence from home radon testing. *Health Psychology, 11,* 170–180.

Wicker, A. W. (1969). Attitudes versus actions: The relationship of verbal and overt behavioral responses to attitude objects. *Journal of Social Issues, 25,* 41–78.

Wills, T. A., Gibbons, F. X., Gerrard, M., & Brody, G. H. (2000). Protection and vulnerability processes for early onset of substance abuse: A test among African American children. *Health Psychology, 19,* 253–263.

Wood, W., & Quinn, J. M. (2005). Habits and the structure of motivation in everyday life. In J. P. Forgas, K. D. Williams, & W. Hippel (Eds.),

Social motivation: Conscious and unconscious processes (pp. 55–70). New York: Cambridge University Press.

Wood, W., Quinn, J. M., & Kashy, D. (2002). Habits in everyday life: The thought and feel of action. *Journal of Personality and Social Psychology, 83,* 1281–1297.

*Wurtele, S. K. (1988). Increasing women's calcium intake: The role of health beliefs, intentions and health value. *Journal of Applied Social Psychology, 18,* 627–639.

*Wurtele, S. K., & Maddux, J. E. (1987). Relative contributions of protection motivation theory components in predicting exercise intentions and behavior. *Health Psychology, 6,* 453–466.

Received October 19, 2004
Revision received July 18, 2005
Accepted August 16, 2005 ■