The Impact of Changing Attitudes, Norms, and Self-Efficacy on Health-Related Intentions and Behavior: A Meta-Analysis

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Abstract

Objective: Several health behavior theories converge on the hypothesis that attitudes, norms, and self-efficacy are important determinants of intentions and behavior. Yet inferences regarding the relation between these cognitions and intention or behavior rest largely on correlational data that preclude causal inferences. To determine whether changing attitudes, norms, or self-efficacy leads to changes in intentions and behavior, investigators need to randomly assign participants to a treatment that significantly increases the respective cognition relative to a control condition, and test for differences in subsequent intentions or behavior. The present review analyzed findings from 204 experimental tests that met these criteria. *Methods:* Studies were located using computerized searches and informal sources and meta-analyzed using STATA Version 11. *Results:* Experimentally induced changes in attitudes, norms, and self-efficacy all led to medium-sized changes in intention (d_+ = .48, .49, and .51, respectively), and engendered small to medium-sized changes in behavior (attitudes-d_+ = .38; norms-d_+ = .36; self-efficacy-d_+ = .47). These effect sizes generally were not qualified by the moderator variables examined (e.g., study quality, theoretical basis of the intervention, methodological characteristics, features of the targeted behavior), although effects were larger for interventions designed to increase (vs. decrease) behavioral performance. *Conclusion:* The present review lends novel, *experimental* support for key predictions from health behavior theories, and demonstrates that interventions that modify attitudes, norms, and self-efficacy are effective in promoting health behavior change.

Keywords: health behavior, interventions, attitude, norm, self-efficacy

The Impact of Changing Attitudes, Norms, and Self-Efficacy on Health-Related Intentions and Behavior: A Meta-Analysis

Meta-analyses of correlational studies indicate that beliefs concerning (a) the appeal and consequences of behavior (attitudes), (b) other people's approval and performance of the behavior (social norms), and (c) one's ability to execute the relevant responses (self-efficacy) are reliable predictors of health behaviors (e.g., Conner & Sparks, 2005; Godin & Kok, 1996; McEachan et al., 2011). However, evidence from correlational studies that a variable *predicts* behavior does not necessarily indicate that interventions that *change* the same variable will cause changes in behavior (Sheeran, Harris, & Epton, 2014). Experimental tests are needed to assess whether changes in beliefs lead to changes in behavior. The present review analyzes the *experimental evidence* to quantify the effect that changing attitudes, norms, and self-efficacy has on subsequent intentions and behavior. The results will clarify whether these three cognitions specified by many health behavior theories have a causal effect on behavior, and whether interventions designed to promote health behavior change should target these cognitions.

The Role of Attitudes, Norms, and Self-Efficacy in Health Behavior Theories

Health behavior theories (HBTs) refer to a family of theories that were developed in health psychology or were adopted from research on attitude-behavior relations and goal pursuit to predict and understand health actions. Based on previous reviews (e.g., Conner & Norman, 2005; Glanz, Rimer, & Viswanath, 2008), we identified ten major HBTs that specify roles for behavior-specific cognitions in determining the performance of health behaviors.[1] Table 1 indicates how these ten theories converge on attitudes, norms, and self-efficacy as major determinants of behavior. Table 1 also contains an entry for *intention* as most HBTs include intention as a mediator of the influence of attitudes, social norms, and self-efficacy on health

behavior, and evidence indicates that intention has a causal impact on behavior (Webb & Sheeran, 2006). Intention is, therefore, considered alongside behavior as an outcome variable in the present review.

Correlational Versus Experimental Tests

Table 2 reports findings from 18 meta-analyses of the correlations between the beliefs (attitudes, social norms, and self-efficacy) and outcomes (health-related intentions and behavior) examined here. The findings indicate that attitudes, norms, and self-efficacy have large or very large effects on intention, and that their effect on behavior ranges from small-to-medium to medium-to-large (c.f. Cohen, 1992). Taken together, these findings suggest that manipulating these cognitions will lead to substantial changes in intentions and behavior.

However, this impression is mistaken for several reasons. First, the cross-sectional analyses reported in many studies do not necessarily indicate whether attitudes, norms, or self-efficacy cause behavior or whether behavior causes attitudes, norms, or self-efficacy. Second, past behavior is rarely controlled for in these analyses and so these findings cannot speak to the factors that predict *changes* in behavior. Third, even prospective studies that measure the relevant cognitions and past behavior at one time-point and measure behavior at a subsequent time-point cannot rule out the possibility that a third variable is responsible for the observed cognition-outcome association. For instance, conscientious people holding positive attitudes toward health behaviors are more likely to have performed those behaviors in the past and are more likely to do so again in the future (e.g., Booth-Kewley & Vickers, 1994). Thus, all or some of the observed consistency between attitude and behavior change could be spurious.

If meta-analyses of correlational studies cannot determine whether changing attitudes, norms, or self-efficacy lead to changes in intentions and behavior, can an answer be found in the

hundreds of interventions that have attempted to change these predictors (see, e.g., Bridle et al., 2005; Hardeman et al., 2002; Milne, Sheeran, & Orbell, 2000; Tyson, Covey, & Rosenthal, 2014; Webb, Joseph, Yardley, & Michie, 2010, for reviews)? For understandable reasons, intervention research has relied upon health behavior change as its primary outcome. Many studies do not include intervening measures of attitudes, norms, or self-efficacy, which precludes an analysis of the causal influence. Interventions also may not be successful in increasing attitudes, norms, or self-efficacy regarding the focal behavior; such studies underline the difficulty in changing cognitions but cannot speak to the issue of whether changing cognitions has a causal impact on behavior. Even studies that measure cognitions before and after the intervention and observe significantly enhanced cognitions in the wake of the intervention are problematic – because causal inferences are based on the *correlation* between changes in cognitions and changes in behavior (see Spencer, Zanna, & Fong, 2005, for discussion of the superiority of experiments over mediation analysis in tests of causality).

In the present review, we synthesize intervention studies in a manner that overcomes these limitations. Drawing upon Spencer et al.'s (2005) framework, we focus on the basic scientific question: does eliciting changes in attitudes, norms, or self-efficacy lead to changes in health-related intentions and behavior? Experiments permit the strongest inferences about causality on the basis of three defining characteristics: random assignment of participants to condition, manipulation of the treatment condition, and measurement of the dependent variable (West, Biesanz, & Pitts, 2000; see also Campbell, 1957; Sigall & Mills, 1998). Our meta-analysis leverages these defining characteristics of experiments to generate inferences about the causal role of attitudes, norms, and self-efficacy (see also Sheeran et al., 2014; Webb & Sheeran, 2006). A quantitative review of studies that satisfy the following criteria was conducted: (a)

participants are randomly assigned to treatment versus control conditions: Random assignment rules out third variable explanations of the findings as scores on third variables should be evenly distributed between the conditions and thus cannot account for treatment effects; (b) *the treatment produces a statistically significant difference in attitudes, norms, or self-efficacy between participants who receive the treatment and control participants*: Manipulation of the treatment condition must be successful; change in the putative mediator must occur in order to assess the causal impact of the treatment on the dependent variable. If the treatment does not change attitude, norm, or self-efficacy, then inferences concerning the causal effect of changes in these cognitions cannot be made; (c) *a statistical test of the difference in subsequent intention/behavior between treatment and control participants can be undertaken*. The temporal precedence of the treatment over the outcome permits inferences about the causal direction of the effect (i.e., that the treatment caused the change in the outcome, rather than the reverse). In sum, random assignment of participants, successful manipulation of the causal factor, and measurement of outcomes in the wake of treatment are necessary and sufficient criteria to afford the strongest test of whether attitudes, norms, or self-efficacy alter intentions or behavior.

The Present Study

The present review uses meta-analysis to test the extent to which changing attitudes, norms, or self-efficacy leads to changes in health-related intentions and behavior. We also examine the impact of simultaneously changing more than one of these predictors, and examine several factors (study quality, theoretical basis of the intervention, sample characteristics, measurement factors, and features of the targeted behavior) that could moderate the effects of attitude, norm, and self-efficacy change on health-related intentions and behavior.

Method

Selection of Studies

Studies were obtained via three methods: (a) a computerized search of social scientific and health databases (Web of Knowledge, PsychINFO, PubMed, ProQuest, and Dissertation Abstracts International) for articles published up to March 2, 2015 using the search terms behavior* OR belief* OR outcome* OR expect* OR costs OR benefits OR pros OR cons OR norms OR norm OR normative OR peer pressure OR social pressure OR parent* pressure OR social influence* OR parent* influence* OR self-efficacy OR perceived control OR perceived behavi* control OR control belief* OR PBC AND intention* OR behavi* OR action OR performance AND health OR illness OR disease AND increase* OR change* AND intervention* OR experiment* OR behavioral* OR randomi*ed trial (search terms could appear in article titles, keywords, or abstracts), (b) reference lists in each article were evaluated for inclusion, and (c) relevant social science and health listservs were sent messages requesting relevant unpublished papers and theses (APA Division 38; Cancer Prevention Research Center Email List; Social, Personality, and Health Network; Society of Behavioral Medicine; Society of Personality and Social Psychology).

There were three inclusion criteria for the meta-analysis. First, studies had to use an experimental design with random assignment of participants to a treatment versus a control condition. Second, the intervention had to generate a significant difference in attitudes, norms, or self-efficacy between a treatment and a control condition. Third, studies had to measure health-related intentions or behavior in the wake of the intervention. Health-related behaviors were defined in line with Gochman's (1997, p. 3) specification as " ... overt behavioral patterns, actions or habits that relate to health maintenance, to health restoration and to health

improvement." There was one exclusion criterion; studies involving participants with psychiatric problems were excluded, as findings may not generalize to other samples.

Figure S1 in the supplementary materials details the flow of information through the phases of the present review (Moher, Liberati, Tetzlaff, Altman, & the PRISMA Group, 2009). The literature search identified 17,963 articles and theses. Following de-duplication, 14,649 articles were excluded. Primary reasons for exclusion at this stage were a lack of focus on health behavior, a non-experimental design, and failure to measure attitudes, norms, or self-efficacy. Assessment of the eligibility of 883 full-text reports led to the exclusion of 728 reports. At this stage, the reasons for exclusion were (a) no significant treatment effect on attitudes, norms, or self-efficacy (n = 358), (b) effect sizes could not be computed, even after contacting authors (n = 202), (c) failure to measure attitudes, norms, or self-efficacy, or health-related intentions or behavior (n = 79), (d) assignment to conditions was not random (n = 78), and (e) duplication of data (n = 11). One hundred and fifty-one papers (155 independent studies) met the inclusion criteria for the review. Table S1 in the supplementary materials presents the characteristics and effect sizes for each study. There were k = 87 tests that significantly increased attitudes, k = 21 tests that significantly increased norms, and k = 109 tests that significantly increased self-efficacy.

Moderator Variables

A number of factors could moderate the effect of changing attitudes, norms or self-efficacy on intention and behavior. Variables from each of the following categories of moderators were analyzed: (a) study design and quality, (b) theoretical basis of the intervention, (c) construct measurement, (d) sample characteristics, and (e) features of the targeted behavior.

Study design and quality involved coding nine features of the research: (a) whether the report was a published journal article or an unpublished paper or thesis, (b) use of a pretest-posttest design, (c) whether the statistical analyses involved controlling for covariates, (d) quality of the blinding of participants and experimenters (Chalmers et al.'s, 1990, rating scale), (e) quality of participant randomization (Chalmers et al.'s, 1990, rating scale), (f) use of a control or comparison group that was matched for intervention duration and content, (g) use of a waitlist control group, (h) use of a treatment as usual control group, and (i) quality of reporting and treatment of attrition (Chalmers et al.'s, 1990, rating scale).

The theoretical basis of the intervention was coded in terms of the following five characteristics: explicit mention that theory was used to design the intervention, and the reliance on any of four formal theories: the theory of planned behavior, social cognitive theory, the health belief model, or the transtheoretical model. Six features of the measurement of constructs were coded, including the reliability of the measures of (a) attitude, (b) norms, (c) self-efficacy, (d) intention, and (e) behavior, and (f) use of an objective measure of behavior. Seven sample characteristics were also coded: (a) college student sample, (b) general population sample, (c) workplace sample, (d) school pupil sample, (e) percentage of female participants, (f), percentage of white participants, and (g) mean age.

Several features of the targeted behavior were examined. First, we coded whether the study aimed to (a) increase the targeted behavior, (b) decrease the targeted behavior, and (c) change multiple behaviors. Second, we estimated effect sizes for specific health behaviors (e.g., physical activity, smoking, alcohol consumption). Third, we categorized health behaviors more broadly using the distinction made by Janz and Becker (1984) between preventive health behaviors and disease management (or "sick role") behaviors, and the distinction made by

Ouellette and Wood (1998) between frequently versus infrequently performed behaviors. This resulted in three categories of health behaviors: *frequent prevention behaviors* (i.e., diet, alcohol, sun protection, smoking, driving safely, breastfeeding, parental monitoring behaviors, sexual behaviors, and exercise), *infrequent prevention behaviors* (i.e., vaccinations, cancer screening, other screening, and self-examinations), and *disease management behaviors* (i.e., diabetes care, blood pressure self-monitoring, asthma management, HIV/AIDS self-management, and apnea management).

Reliability of Coding

The second and third authors and a research assistant independently coded the moderator variables and effect sizes, and reliability of coding was checked for 80% of studies. Agreement was high for both categorical and continuous variables; kappa coefficients and intraclass correlations ranged between 0.70 to 1.00 (M = 0.92) and 0.70 to 1.00 (M = 0.94), respectively. Disagreements were resolved through discussion.

Meta-Analysis Strategy

The effect size metric used here was Cohen's *d*. Positive *d*-values indicate effects in the predicted direction (i.e., more positive attitudes, norms, and self-efficacy lead to stronger intentions and greater behavioral performance); *d*-values were reverse coded where necessary to meet this criterion (e.g., if intentions to avoid snacking were associated with reduced snack consumption). In cases where the constructs were measured multiple times following the intervention, effect sizes for attitude, norm, and self-efficacy were always computed using data from the first time point after the completion of the intervention. For intentions and behavior, effect sizes were computed using data from the longest follow-up in the wake of the intervention.

Whenever possible, we used the treatment and control conditions designated by the authors of the original reports to compute effect sizes. If studies had multiple treatment or control conditions, we selected the conditions that exhibited the largest difference in attitudes, norms, or self-efficacy; this is consistent with the aim of the research to determine whether changing attitude, norm, or self-efficacy leads to changes in intention or behavior (cf. Webb & Sheeran, 2006). If there was no control condition, then the comparison between the two treatment conditions that had the largest impact on attitude, norm, or self-efficacy was used. One hundred and thirteen studies compared a treatment condition to a control condition, and 44 studies compared a treatment condition to another intervention condition.

The meta-analysis was conducted using STATA Version 11 (StataCorp, 2009). Weighted average effect sizes (d_+) were computed based on a random effects model (STATA command *metan*) 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). Effect sizes were interpreted using Cohen's (1992) guidelines where $d = .20$ is a "small" effect, $d = .50$ a "medium" effect, and $d = .80$ a "large" effect.

The homogeneity Q statistic (Cochran, 1954) was used to evaluate variability in effect sizes from the primary studies. A statistically significant Q indicates that effect sizes are heterogeneous, and examination of moderators is justified. Heterogeneity was also assessed via the I^2 statistic, which indicates the proportion of inconsistency in the individual studies that cannot be explained by chance. When Q and I^2 statistics were significant, we tested moderation of effect sizes for intentions and behavior. For categorical moderators, effect sizes were computed for the different levels of the moderator, and compared using the Q statistic. For continuous moderators, meta-regressions were used (STATA command *metareg*), where β is the

beta weight or coefficient assigned to the predictor and *t* (and the associated *p* value) tests whether the beta weight is significantly different from zero.

Results

How Effective Were Interventions at Changing Attitudes, Norms, and Self-Efficacy?

Eighty-seven interventions elicited an increase in attitudes, with an overall effect size of d_+ = .47 (*CI* = .42 to .53, *k* = 87, *N* = 34,993). The 21 studies that elicited an increase in norms produced an overall effect size of d_+ = .62 (*CI* = .40 to .84, *k* = 21, *N* = 10,087), whereas the 109 interventions that elicited an increase in self-efficacy produced an overall effect size of d_+ = .65 (*CI* = .57 to .72, *k* = 109, *N* = 36,593). Thus, interventions were moderately successful in changing attitudes, norms, and self-efficacy; in each case, effect sizes were of approximately medium magnitude.

How Much of an Effect Does Changing Attitudes, Norms, or Self-Efficacy Have on Intentions and Behavior?

Table 3 shows the findings for the impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior. Each of the three cognitions had a reliable effect on both intentions and behavior (the confidence intervals did not contain zero). All three effects on intention were medium-sized (d_+ = .48, .49, and .51, for attitudes, norms, and self-efficacy, respectively). Changing attitudes and norms had small-to-medium sized effects on behavior (d_+ = .38 and d_+ = .36, respectively), and changing self-efficacy had a medium effect on behavior (d_+ = .47).

We undertook two checks to ensure that these findings were robust. First, we removed outliers ($M \pm 3SD$) from each set of cognition-outcome effect sizes; findings did not change in this analysis (mean change in d_+ = -.02). Second, we used Coyne, Thombs, and Hagedorn's

(2010) criterion to investigate whether tests had adequate power (i.e., 55% power to detect a medium-sized effect). The proportion of tests with adequate power ranged from 78% to 90% (*M* = 86%). Findings were unchanged when the meta-analysis was restricted to adequately powered tests (mean change in d_+ = -.02).

The values in Table 3 suggest that eliciting changes in attitudes, norms, and self-efficacy has a stronger effect on intention than on behavior. We tested this premise among the subset of studies that changed the respective cognition and measured both intentions and behavior (*k* = 39, 12, and 31, *N* = 10,514, 5,321, and 10,321, for attitude, norm, and self-efficacy change, respectively). Findings indicated that changing attitudes, norms and self-efficacy each had a larger effect on intentions (d_+ = .47, .52, and .46, respectively) than on behavior (d_+ = .35, .44, and .35), *Q* = 19.48, 4.14, and 15.29, respectively, *p*s < .05. The consideration that cognition changes had larger effects on intentions compared to behavior is consistent with the premise that intention mediates the impact of attitudes, norms, and self-efficacy on behavior (e.g., Ajzen, 1991). To formally evaluate this possibility, we used the d_+ = .36 observed in Webb and Sheeran's (2006) meta-analysis to represent the strength of the intention-behavior relationship. (The correlation between intention and behavior was reported in only five studies reviewed for the current analysis; using the average correlation from these studies made no substantive difference to the findings reported below). The d_+ values representing the effects of cognition changes on intentions and behavior were converted to *r's*; the resulting correlations between cognition change, intention, and behavior were then used as the input matrix for a series of linear regression analyses (see Figure S2 in the supplementary materials). Findings showed that attitude, norm, and self-efficacy change each predicted intentions (β = .23, .24, and .25, respectively, *p*s < .001). In simultaneous regressions predicting behavior, intentions were

significant predictors (β = .14, .15, and .13, respectively, *p*s < .001), and Sobel tests indicated that the associations between attitude, norm, and self-efficacy change and behavior were attenuated (Z = 5.57, 5.67, and 5.26, respectively, *p*s < .001). Thus, intentions partially mediated the impact of cognition change on behavior.

Does Changing More Than One Cognition Produce Larger Effects on Intentions and Behavior?

Next, we explored whether changing more than one cognition led to a larger change in intentions and behavior, as compared to changing only one cognition. To this end, studies were divided into two categories: Studies that changed *both* cognitions (e.g., there was a significant difference between the treatment and control conditions for both attitudes and norms) and studies that assessed change on both cognitions but succeeded in changing only one of them. Similarly, studies that successfully changed all three cognitions were compared to studies that attempted to, but did not, change all three cognitions. Next we regressed the effect sizes for intentions and behavior on the respective dummy-coded variables (see Table S2 in the supplementary materials). There was no evidence that changing more than one of the cognitions elicited larger effects on intentions and behavior. Two meta-regression analyses were significant; interventions that changed both attitude and norms actually had a *smaller* effect on behavior (B = -.30, p < .05) as did interventions that changed attitudes, norms, *and* self-efficacy (B = -.34, p < .05).

Do Study Design/Quality, Theoretical Basis, and Measurement and Sample Characteristics Moderate Effects on Intentions and Behavior?

Meta-regression was used to determine whether features of the study design and quality, the theoretical basis of the intervention, the measurement of constructs, and sample characteristics moderated the observed effect of changing cognitions on intentions or behavior.

Few significant moderator effects were observed (see Table S3 in the supplementary materials). None of the associations pertaining to the theoretical basis of the intervention or sample characteristics were significant. Only one feature of study design/quality moderated effect sizes for intentions – not including covariates in the analysis was associated with larger effects on intentions (B = -.30 p < .05). Two features of study design/quality moderated effect sizes for behavior – the use of better quality randomization procedures and better quality blinding procedures were both associated with larger effects on behavior (B = .20 and .14 respectively, ps < .01).

Do Features of the Targeted Behavior Moderate Effects on Intentions and Behavior?

Table S3 in the supplementary materials shows that interventions designed to *increase* performance of a targeted behavior were associated with larger effect sizes for intentions (B = .19, p < .05) and behavior (B = .18, p < .05), whereas studies that aimed to *decrease* performance were associated with smaller effects for behavior (B = -.23, p < .01). Interventions targeting multiple behaviors did not lead to larger or smaller effect sizes. We also examined whether effect sizes varied by the target health behavior (see Table S4 in the supplementary materials). The only reliable difference in effect sizes for intentions was observed for cancer screening intentions (d_+ = .90), which was larger than the effects on intentions regarding sexual behavior, diet, physical activity, and sun protection. The only reliable difference for behavior was observed for alcohol use, such that this effect was substantially smaller (d_+ = .11) than the effects observed for other behaviors.

Finally, we explored the impact of changing attitudes, norms, and self-efficacy on intentions and behavior in relation to three categories of health behaviors (see Table S5 in the supplementary materials). Non-independent effects precluded formal comparison of cognition

changes *within* each category of health behavior (as the same study could contribute effects for attitudes, norms, or self-efficacy), and there were too few effects for social norms in the different health behavior categories to permit meaningful inferences. Attitude change had similar effects on intentions regarding frequent prevention, infrequent prevention, and disease management behaviors. Norm change had a larger effect on intentions regarding infrequent prevention behaviors than frequent prevention behaviors, but there was only one study of norm change in relation to infrequent prevention behaviors. Self-efficacy change had similar effects on intentions in relation to frequent prevention behaviors and infrequent prevention behaviors (there was only one study of self-efficacy change in relation to disease management behaviors). The effect sizes for behavior showed that attitude change had a larger effect on both disease management (d_+ = .60) and infrequent prevention behaviors (d_+ = .48) compared to frequent prevention behaviors (d_+ = .36, *p*s < .01); effect sizes for disease management and infrequent prevention behaviors did not significantly differ. The effect sizes for behavior showed that norm change had a larger effect on infrequent prevention behaviors (d_+ = .82) compared to frequent prevention behaviors (d_+ = .27, $p < .001$). Findings for self-efficacy change revealed a larger effect on both disease management (d_+ = .70) and infrequent prevention behaviors (d_+ = .68) compared to frequent prevention behaviors (d_+ = .41, *p*s < .001); effect sizes for disease management and infrequent prevention behaviors did not significantly differ.

Discussion

The present review supports the premise that attitudes, norms, and self-efficacy have a causal effect on intention and behavior, and indicates that interventions that successfully change these cognitions promote health behavior change. Eliciting changes in each of the three cognitions had a reliable effect on both intentions and behavior. Intervention effects on attitudes,

norms, and self-efficacy had effects of medium magnitude on intentions. Changing attitudes or norms had small-to-medium effects on behavior, and changing self-efficacy had a medium-sized effect. These findings provide *experimental* evidence that three key cognitions specified by leading health behavior theories elicit change in health-related intentions and behavior.

The present findings are consistent with correlational evidence that attitudes, norms, and self-efficacy are reliable predictors of intentions and behavior (e.g., Conner & Sparks, 2005; McEachan et al., 2011). However, the findings obtained here also indicate that correlational tests generally *overestimate* the influence of these cognitions. The d_+ values in correlational tests of attitude-intention, norm-intention, self-efficacy-intention, and attitude-behavior relations (Table 2) were twice as big as the d_+ values observed in our experimental tests (Table 3). Correlational and experimental tests converged on the conclusion that norms had a small-to-medium effect on behavior and that self-efficacy change had a medium-sized effect on behavior. The relative importance of changing attitudes versus changing norms or self-efficacy differed in correlational and experimental tests. Whereas correlational studies indicate that changing norms is much less effective in promoting intention and behavior change compared to changing attitudes (e.g., Hagger & Chatzisarantis, 2005), interventions that changed attitude and interventions that changed norms proved similarly effective in promoting these outcomes. Experimental findings also offered support for social cognitive theory's (e.g., Bandura, 1998) analysis of the importance of self-efficacy (relative to attitudes) in determining health-related intentions and actions.

Changing attitudes, norms, and self-efficacy had a larger effect on intentions than on behavior. This finding is consistent with Gollwitzer's (1990, 2012) mindset theory of action phases (MTAP), which distinguishes between the *deliberative* versus *implemental* phases of goal

pursuit. The deliberative phase involves consideration of the desirability and feasibility of the focal goal, and culminates in the decision or intention to act. The implemental phase concerns the translation of respective intentions into action and involves a different set of processes that have to do with action preparation (e.g., planning when, where, and how to act; Gollwitzer, 1999; Gollwitzer & Sheeran, 2006). Thus, according to the MTAP, favorable attitudes, norms, and self-efficacy mainly influence the formation of intentions (see also de Bruin et al., 2012).

This is not to say that attitudes, norms, and self-efficacy do not directly elicit behavior change. It was notable that in mediation analyses, attenuation of attitude-behavior, norm-behavior, and self-efficacy-behavior relations by intention was modest (mean reduction in standardized beta = .03), and that the direct effects of cognitions on behavior remained highly significant even after intention had been taken into account. Research by Lawton, Conner, and McEachan (2009) showed that when attitude measures were divided into affective (feelings about performing the behavior) and cognitive (thoughts about performing the behavior) components, affective attitudes predicted behavior over and above the influence of intentions. Possibly, therefore, attitude change interventions were successful in modifying feelings about performing the behavior, which engendered direct effects of attitudes on behavior. There is also evidence that norms can affect behavior directly, in a manner that bypasses people's conscious intentions (e.g., Aarts & Dijksterhuis, 2003) and that self-efficacy affects behavior directly when efficacy appraisals accurately reflect actual control over the performance (Ajzen & Madden, 1986; Sheeran, Trafimow & Armitage, 2003). Primary research studies are needed that manipulate *both* intention *and* the respective cognition to confirm the direct effects of attitude, norm, and self-efficacy change on behavior, and to unravel the mechanisms responsible for these effects (see Peters, de Bruin, & Crutzen, 2015, for discussion).

A surprising finding was that interventions that changed more than one cognition did not generate larger effects on intentions or behavior compared to interventions that changed only attitude, norms, or self-efficacy. Most health behavior theories assume that these cognitions have additive effects, and some analyses suggest that there may be synergistic interactions among attitudes, norms, and self-efficacy (e.g., Acock & deFleur's, 1972, consistent contingency hypothesis). One possible explanation is that the amount of change elicited in two or more respective cognitions was not sufficiently large to observe additive or synergistic effects (see Fife-Schaw, Sheeran, & Norman, 2007, for relevant statistical simulations).

An alternative hypothesis is that it suffices to change attitude or norm or self-efficacy to change behavior because only one of these cognitions is the crucial determinant of the focal behavior. For instance, in a study of 30 behaviors, equivalent beta weights for attitudes, norms, or self-efficacy were observed for only three behaviors; for 15 behaviors attitude had the largest beta, and norms and self-efficacy had the largest betas for 6 behaviors apiece (the mean difference in betas between the key predictor and the two alternative predictors was .19; Sheeran, Trafimow, Finlay, & Norman, 2002). These findings could arise because, for instance, most people already have at least moderately favorable perceived norms and strong self-efficacy regarding the focal behavior but do not believe that positive consequences will follow from its performance. In this case, attitude change will generate behavior change but simultaneously changing norms and self-efficacy will confer no additional benefit. Similar reasoning applies to interventions that change norms (when people already possess favorable attitudes and self-efficacy regarding the behavior) and to interventions that change self-efficacy (when attitudes and norms are both supportive). If accurate, this analysis suggests that formative research will be important to determine whether resources should be devoted to identifying and then targeting the

key cognition that determines the focal behavior among the relevant sample, rather than spreading resources more thinly in efforts to change attitudes, norms, *and* self-efficacy (see Bartholomew, Parcel, Kok, Gottlieb, & Fernández, 2011, for discussion of intervention mapping).

A novel feature of the present review was that health behaviors were categorized using a taxonomy that drew upon both the long-standing distinction between prevention behaviors and disease management behaviors (Janz & Becker, 1984) and Ouellette and Wood's (1998) analysis of the impact of frequent versus infrequent performance on behavioral prediction. The key finding obtained in the current analysis was that changing attitudes and self-efficacy had a smaller effect on frequent prevention behaviors compared to both infrequent prevention behaviors and disease management behaviors. This finding is consistent with Wood's analysis of habit formation (Ouellette & Wood, 1998; Wood & Neal, 2007), which proposes that behaviors that are performed frequently (daily/weekly) in stable contexts are liable to become habitual. More particularly, action control is delegated from conscious, reflective factors (such as attitudes, self-efficacy, and intentions) to contextual cues that come to elicit the behavior automatically (i.e., immediately, efficiently, and without the need for conscious guidance at the moment of acting; e.g., Neal, Wood, Labrecque, & Lally, 2012; Orbell & Verplanken, 2010).

If habit attenuates the impact of changing attitudes and self-efficacy on frequent prevention behaviors, how should practitioners intervene in relation to such key health behaviors such as smoking, diet, and alcohol consumption? Rothman, Sheeran, and Wood (2009) reviewed two possibilities. The first concerns the use of deliberate self-control strategies. Quinn, Pascoe, Wood, and Neal (2010) showed that *vigilant monitoring* – paying close attention to, and actively inhibiting, the unwanted response – was effective in overcoming habit repetition, and Adriaanse

and colleagues observed that forming if-then plans or *implementation intentions* could reduce habitual snacking (Adriaanse et al., 2010, 2011). The second possibility involves altering the cues in people's environments that trigger unwanted habits. Such interventions could involve public policy initiatives to curb advertising or remove vending machines from schools, or self-initiated changes to purchase, storage, and consumption behaviors (see Rothman et al., in press). In sum, modifying frequent prevention behaviors may require the deployment of additional strategies alongside attitude, norm, and self-efficacy interventions.

Relatively few of the many moderator variables examined here qualified effect sizes for intentions or behavior. There were no significant associations for the theoretical bases of interventions or for sample characteristics, indicating that cognition change efforts were effective irrespective of researchers' conceptual approach or the nature of the targeted participants (see also Prestwich et al., 2014). Although this may indicate that the effect of these cognitions on intention and behavior is quite robust, one must keep in mind that these comparisons are non-experimental. The observation that the theoretical grounding of the intervention did not matter may reflect the fact that the most prominent health behavior theories rely on a similar set of constructs (see Table 1). To the extent that investigators identify explicit distinctions among theories in how these constructs influence behavior, more focused experimental comparisons may be informative (see Montanaro & Bryan, 2014). Similarly, investigators may also want to consider theoretically grounded tests of differential effects of these constructs across populations.

One strength of this literature is that the vast majority of studies were adequately powered and that effect sizes were unaffected by publication status or features of the study design. Two aspects of study quality were associated with effect sizes; better quality randomization and blinding procedures each led to larger effects for behavior. It was also the case that effect sizes

for behavior were not inflated by the use of self-report measures. Features of the targeted behavior had some influence on effect sizes. Interventions had smaller effects on sexual behavior intentions and on consumption of alcohol compared to other health behaviors. These findings may speak to the importance of additional factors such as context (e.g., involvement of alcohol use; Cooper, 2006) and partner communication (e.g., Sheeran, Abraham, & Orbell, 1999) in determining sexual decisions, and the role of self-control resources in drinking behavior (Muraven, Collins, & Neinhaus, 2002; Muraven, Collins, Shiffman, & Paty, 2005). We also found that when interventions were designed to decrease performance of the behavior (e.g., reduce consumption of high-fat foods or alcoholic beverages), smaller effects on intentions and behavior were observed. Again, self-control resources could have a role here as people set less ambitious goals and are less capable of meeting their set goals when such resources are diminished (Hare, Camerer & Rangel, 2009; Muraven & Baumeister, 2000).

Limitations and Directions for Future Research

A potential challenge to the criteria used in the present meta-analysis to infer a causal role for attitude, norm, and self-efficacy change is that a third variable that is correlated with these cognitions is, in fact, responsible for the observed effects on intentions and behavior. Although we recognize this challenge, we believe there are two related issues that mitigate this concern. First, the objection relies on the assumption that the manipulations and measures of attitudes, norms, and self-efficacy used in the studies reviewed here lack construct validity and, thus, are operating as a proxy for some unspecified construct. There are no strong grounds for this assumption. Second, if the 'third variable' that the manipulations supposedly changed is not specified, then the challenge leads to an infinite regression (the effect of the 'third variable' could, in fact, be due to a 'fourth variable,' and its effect due to a 'fifth variable,' and so on) and

becomes unfalsifiable. In our view, an argument for an alternative explanation predicated on a 'third variable' would need to be grounded in regards to a specific plausible explanation. Although it is possible that such an explanation may emerge over time, we believe the current evidence stands in support of our proposed explanation.

Conclusions drawn from the present meta-analysis must be mindful of the evidence base upon which it stands. After a search that started with almost 18,000 records, 204 tests of the effect of changing attitude, norm, and self-efficacy change on intention and behavior were identified and included in the meta-analysis. These tests provided a robust evidence base for answering our key research questions, but we acknowledge the paucity of data concerning effects in specific behavioral domains (e.g., smoking, alcohol consumption, sun protection, diabetes care, and cancer screening). It is presently unclear whether the smaller number of studies reflects a lack of interest among investigators to pursue these questions in these behavioral domains, or an inability to elicit a significant change in attitudes, norms, or self-efficacy for these behaviors. Future work in this area is well positioned to address these issues.

It is also the case that the present review identifies worthwhile cognitive targets for behavior change interventions but does not indicate *how* researchers and practitioners should intervene to change these cognitive targets. Future basic and applied researchers will need to tackle several important questions that could not be addressed here, such as "what are the most effective techniques to elicit changes in attitudes, norms, and self-efficacy?", "can the techniques that increase self-efficacy in relation to one behavior also enhance self-efficacy in relation to other health behaviors?", and "how do features of the sample or intervention context influence the effectiveness of techniques designed to change cognitions?".

Conclusion

The present review was motivated by both theoretical and practical concerns. At the theoretical level, several models of health behavior propose that attitude, norm, and self-efficacy change will promote health-related intentions and behavior. At the practical level, a great deal of intervention research has been based on the premise that cognition change will lead to health behavior change. However, correlational studies designed to test theories, and intervention studies to promote health-related behavior did not answer questions about whether or how much change in health-related intention and behavior accrues from changing attitudes, norms, and self-efficacy. By selecting studies that (a) used random assignment to intervention condition, (b) observed change in cognitions due to the intervention, and (c) measured subsequent intentions and behavior, we could show that attitude, norm, and self-efficacy change interventions have causal effects of meaningful magnitude on health decisions and actions. The present review supports key postulates of health behavior theories and indicates that conceptual and empirical attention must now be devoted to the question of how best to change attitudes, norms, and self-efficacy in behavior change interventions.

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Footnotes

[1] Theories that do not address the role of behavior-specific beliefs but focus on other factors such as beliefs about a focal disease (e.g., risk perception, perceived severity) or illness (e.g., causes, consequences, control, timeline; e.g., Leventhal, Brissette, & Leventhal, 2003) fall outside the purview of the present review.

Table 1

Role of Attitudes, Norms, Self-Efficacy, and Intentions in Leading Health Behavior Theories

Health behavior theory	Attitude	Norm	Self-efficacy	Intention	Additional Variables
Extended parallel process model	✓		✓	✓	Threat appraisal
Information-motivation-behavioral skills model	✓	✓	✓	✓	Information, behavioral skills
Health action process approach	✓	✓	✓	✓	Risk perception, action planning, coping planning, barriers, resources
Health belief model	✓		✓		Perceived susceptibility, perceived severity, health motivation, cues to action
Protection motivation theory	✓		✓	✓	Perceived vulnerability, perceived severity
Prototype/willingness model	✓	✓		✓	Prototype perceptions, willingness
Social cognitive theory	✓	✓	✓	✓	Impediments
Theory of reasoned action	✓	✓		✓	
Theory of planned behavior	✓	✓	✓	✓	Actual control
Transtheoretical model	✓		✓		Processes of change

Note. Attitude refers to people's evaluation of the consequences of performing health behavior (e.g., "Performing health behavior *X* would be good/bad") and encompasses conceptually similar constructs such as costs and benefits, response efficacy, response costs, outcome expectancies, and pros and cons. Social norms are perceptions of social pressure from other people and beliefs about how other people act (e.g., "Most people who are important to me think that I should perform health behavior *X*"). Self-efficacy refers to how confident people are that they can perform a focal behavior (e.g., "How confident are you that you could undertake health behavior *X* even under adverse circumstance *Y*?") and encompasses beliefs about the ease/difficulty and controllability of the behavioral performance. Intentions are people's decisions or self-instructions to act (e.g., "I intend to perform health behavior *X*").

✓ indicates that the construct is specified by the respective theory as a predictor of health-related intentions or behavior.

Table 2
Meta-Analyses of Attitudes, Norms, and Self-Efficacy as Predictors of Health-Related Intentions and Behavior

Authors	Behavior	Intention						Behavior					
		Attitude		Norm		Self-efficacy		Attitude		Norm		Self-efficacy	
Albarracín, Johnson, Fishbein, & Mullerleile (2001)	Condom use	.58	(65)	.39	(58)	.54	(42)	.38	(42)	.25	(40)	.25	(23)
Bednall, Bove, Cheetham & Murray (2013)	Blood donation	.54	(28)	.36	(27)	.46	(28)	.22	(9)	.17	(10)	.33	(10)
Carpenter (2010)	Various							.27	(15)				
Carron, Hausenblas, & Mack (1996)	Exercise									.18	(53)		
Cooke & French (2008)	Screening	.51	(33)	.41	(31)	.46	(25)					.19	(18)
Gwaltney, Metrik, Kahler, & Shiffman (2009)	Smoking cessation											.10	(87)
Hagger & Chatzisarantis (2005)	Various	.59	(26)	.33	(21)	.51	(24)	.37	(24)	.19	(18)	.30	(22)
Hagger, Chatzisarantis, & Biddle (2002)	Physical activity	.48	(70)	.25	(65)	.45	(60)	.30	(44)	.15	(42)	.33	(44)
Husebø, Dyrstad, Søreide, & Bru (2013)	Physical activity in cancer patients							-.02	(8)	.10	(8)	.11	(3)
McEachan, Conner, Taylor, & Lawton (2011)	Various	.57	(212)	.40	(199)	.54	(217)	.31	(209)	.21	(196)	.31	(219)
Nasuti & Rhodes (2013)	Physical activity							.26	(56)				
Reich, Below, & Goldman (2010)	Alcohol							.41	(16)				

Rhodes, Fiala, & Conner (2009)	Physical activity							.42	(85)				
Schepens, Sen, Painter, & Murphy (2012)	Activity engagement by older adults											.53	(20)
Sheeran, Abraham, & Orbell (1999)	Condom use							.32	(38)	.26	(24)	.25	(25)
Sheeran & Taylor (1999)	Condom use	.45	(32)	.42	(32)	.35	(24)						
Webb et al. (2013)	Smoking	.40	(35)			.52	(35)	.43	(39)			.46	(29)
Yarcheski, Mahon, Yarcheski, & Cannela (2004)	Positive health practices											.31	(3)
Weighted mean r_+		.54	(501)	.37	(433)	.51	(455)	.33	(585)	.20	(391)	.28	(503)
Weighted mean d_+		1.28		.80		1.19		.70		.41		.58	

Note. Values are sample-weighted average correlations. Values in parentheses are the number of tests (*k*).

Weighted mean r_+ and d_+ are weighted by the number of tests.

Table 3

Impact of Changing Attitudes, Norms, and Self-Efficacy on Health-Related Intentions and Behavior

Variable	Intention					Behavior				
	N	*k*	d_+	*95% CI*	*Q*	*N*	*k*	d_+	*95% CI*	*Q*
Attitudes	15,145	59	.48	.39 to .56	317.55***	31,328	67	.38	.32 to .45	443.89***
Norms	6,039	16	.49	.25 to .74	262.59***	9,337	17	.36	.19 to .53	220.34***
Self-efficacy	12, 450	50	.51	.40 to .62	394.49***	29,520	90	.47	.39 to .56	962.42***

Note. *N* = sample size, *k* = number of independent tests, d_+ = effect size, *95% CI* = 95% confidence interval, *Q* = homogeneity statistic.

* $p < .05$, ** $p < .01$, * $p < .001$.