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Psychological Determinants of Health Behavior

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Keywords

psychological construct, attitudes and beliefs, social cognition theories, self-regulation, nonconscious processes, behavior change mechanisms of action

Abstract

This review provides a critical overview of current evidence on psychological health behavior determinants and its value in informing intervention and future determinants research. The review begins with work labeling and classifying the myriad of determinants available in the extant research to arrive at core groups of determinants. Next, the conceptual bases of these determinant groups are identified, and the weight of the evidence for their purported effects on health behavior, including belief-based determinants (e.g., outcome expectancies, capacity beliefs), determinants representing self-regulatory capacity (e.g., planning, action control) and nonconscious processes (e.g., habit, implicit cognition), and dispositional determinants (e.g., personality, regulatory control), is critically evaluated. The review also focuses on the theory-based mechanisms underpinning determinant effects and moderating conditions that magnify or diminish them. Finally, the review recommends a shift away from research on determinants as correlates, outlines how determinants can inform intervention development and mechanisms of action tests, suggests alternatives to predominant individualist approaches, and proposes future research directions.

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Health protection

behaviors: actions that offer protection from illness or adverse health conditions or promote good health (e.g., physical activity participation, healthy eating)

Health risk

behaviors: actions that present an increased risk to health (e.g., smoking, excess alcohol consumption)

Effect: relationship between a psychological determinant and an outcome (e.g., health behavior), often expressed as directional and causal or deterministic

Psychological determinant:

psychological entity or construct representing a mental process implicated in, or deterministic of, a psychological or behavioral outcome

1. INTRODUCTION

Population rates of many communicable and noncommunicable diseases and conditions identified as major threats to public health have been associated, directly or indirectly, with human behavior (Ford et al. 2012). Beyond the human costs, treatment and ongoing management of these illnesses and conditions present a substantive financial burden to health care systems. By contrast, syntheses of social epidemiological research have noted small yet robust associations between regular participation in health protection behaviors (e.g., physical activity, healthy eating, medication adherence) as well as avoidance of health risk behaviors (e.g., smoking, excess alcohol consumption, unprotected sex) and lower disease incidence and better health outcomes in populations (Loef & Walach 2012, Saint Onge & Krueger 2017). Predicated on this evidence, public health departments and health care providers have prioritized the development and promulgation of preventive interventions purposed to promote population-level participation in behaviors most reliably linked with the mitigation of ill-health and adaptive health outcomes (e.g., Glanz & Bishop 2010, Hagger et al. 2020a).

Based on the premise that the development of optimally efficacious behavior change interventions necessitates a fundamental understanding of human behavior, behavioral scientists, particularly psychologists, have been engaged to provide the requisite formative evidence base to inform intervention development (e.g., Glanz & Bishop 2010, Michie 2008). Central to this endeavor has been the identification of psychological factors that are related to, or, preferably, deterministic of, uptake and maintenance of health-promoting behaviors and reduced participation in health risk behaviors. Such determinants are assumed to represent the mental processes implicated in the initiation and maintenance of health behavior, and research evidence identifying these determinants and their effects contributes to informing and developing explanatory models of health behavior. However, the essential contribution of health behavior determinants research lies in its potential to guide intervention development. To the extent that determinants are modifiable through the methods or techniques adopted in behavioral interventions, they are assumed to be of value to inform the content of health behavior change interventions (Hagger et al. 2020a, Sheeran et al. 2017b).

This review aims to provide a broad, critical overview of the extant research on the psychological determinants of health behavior. The first part of the review provides an appraisal

of procedures adopted to identify, conceptualize, and classify determinants of health behavior and their theoretical basis. Next, the review provides definitions of core groups of health behavior determinants derived from these classification efforts, including belief-based determinants representative of reasoned action processes (e.g., outcome evaluations, capacity beliefs, normative beliefs, risk perceptions), determinants that represent self-regulatory capacity (e.g., planning, self-regulatory skills) and nonconscious processes (e.g., habit, implicit cognition, affective perceptions and responses), and dispositional determinants (e.g., personality, individual difference constructs, regulatory control). In parallel, this article presents a summary of the proposed theory-based patterns of associations between each determinant group and health behavior along with an evaluation of the strength of the evidence supporting unique determinant–behavior links and the theory-based mechanisms involved across the extant literature. To accompany the review, **Figure 1**

Implicit cognition: a psychological construct representing nonconscious, automatic processes implicated in behavioral performance and surmised to affect behavior beyond individuals' awareness

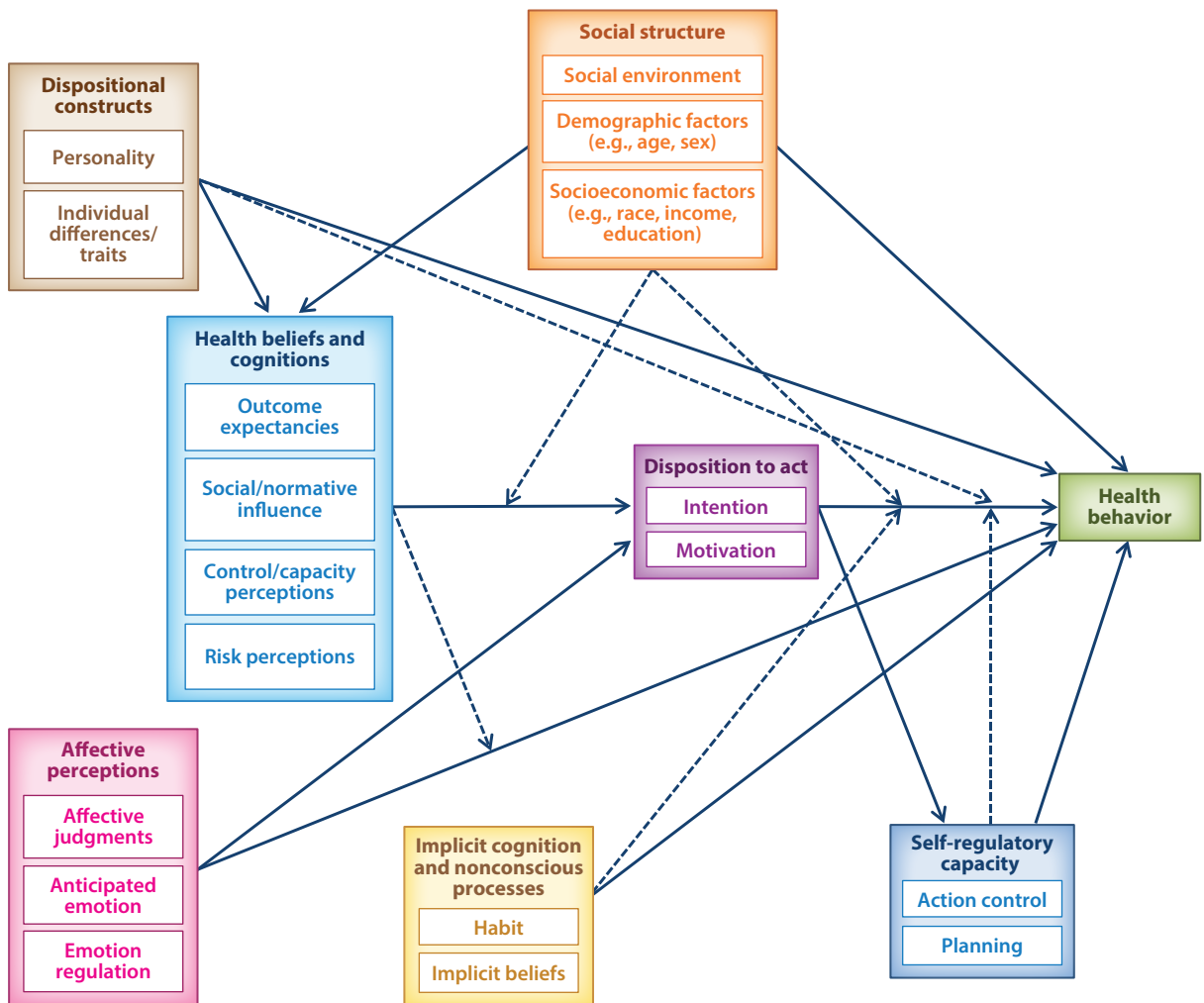


Figure 1

Diagram illustrating theory-stipulated relations among core groups of psychological and social structural determinants and health behavior based on a review of classification research. The moderating effect of control/capacity perceptions on the intention–behavior relationship has been omitted for clarity. The solid arrows indicate direct effects; the dashed arrows indicate moderator effects.

Psychological theory:

a set of propositional statements based on prior evidence summarizing current knowledge on associations between variables (e.g., psychological determinants) and outcomes (e.g., health behavior)

Nomological network:

specified pattern of theory-stipulated associations or effects among psychological determinants and outcomes

Psychological

mechanism: mental process implied or represented by effects among determinants and outcomes (e.g., health behavior)

offers a diagram summarizing the consensus-based, theory-defined determinant–health behavior links and associated processes. Concurrently, the review provides a critical analysis of the value and limitations of the extant evidence on the effects of these core determinants, outlines some recent developments, and proposes directions for future research.

The second part of the review identifies some limitations of the current evidence on health behavior determinants and outlines some recent developments aimed at advancing research and knowledge on determinants. Specifically, although researchers studying determinants often frame their findings in causal terms, much of the research conducted in the field and referred to in this review is focused on correlates, which precludes directional and causal inference and is inconsistent with the determinants moniker. The review discusses the value of research adopting alternative designs and advocates their use to better enable such inferences with illustrative examples. Furthermore, the article highlights the value of determinants research to the specification and testing of how behavior change interventions operate through their mechanisms of action. Finally, the review outlines the limitations of an exclusive focus on individual approaches to determinants research and how examination of sociostructural determinants in conjunction with psychological determinants can elucidate important, often neglected, processes. Overall, this discussion summarizes the latest research developments on each issue and recommends avenues for future inquiry.

2. THEORETICAL BASIS AND IDENTIFICATION OF CORE DETERMINANTS

Researchers examining health behavior determinants have long extolled the virtue of a basis in psychological theory (Michie et al. 2008). Theories provide sets of predictions of how psychological constructs, as representations of mental processes, relate to outcomes of interest (e.g., health protection or health risk behaviors). Good theories should clearly define their component constructs, the mental processes they represent, and how they are measured. In addition, they should clearly specify predicted patterns of relations or effects among the constructs and outcomes expressed in causal terms, known as nomological networks, hence the characterization of constructs as determinants. Nomological networks should also specify the psychological mechanisms by which theory constructs are proposed to relate to each other and to outcomes. Two prominent mechanisms are mediation, in which the effect of a construct on an outcome is transmitted through, or explained by, one or more other constructs or mediators, and moderation, in which the effects of a construct on an outcome are magnified or diminished due to the effect of one or more other constructs or moderators. Theories are expected to have utility in guiding empirical tests of their predictions and to provide grounds for them to be confirmed or falsified. In the case of health behavior determinants, therefore, theory enables the specification of determinants, represented by psychological constructs and their content, and their effects on outcomes such as behavior, and it guides research aimed at verifying the proposed effects (for a summary, see Davis et al. 2015).

While a basis in theory affords numerous advantages in guiding identification and testing of health behavior determinants, the vast array of psychological theories and associated constructs presents challenges to efforts to draw definitive conclusions on the determinants with the most reliable effects on health behaviors and the mechanisms involved. Numerous theorists have highlighted this vexing construct proliferation problem, particularly the existence of multiple constructs with similar definition, content, and operationalization that are referred to by different labels—often termed a jangle fallacy or déjà variable phenomenon—and noted the dearth of attempts at resolution (e.g., Hagger 2014, Shaffer et al. 2016). In addition, this problem should be

contrasted with its converse, known as a jingle fallacy, erroneously assuming that measures with the same label tap the same construct. Although both issues hinder research progress, the jangle fallacy is the most salient threat to health behavior determinants research because it serves to inhibit identification of commonality and redundancy in determinants and, by extension, evaluation of the cumulative evidence on their behavioral effects.

The construct proliferation problem has inspired researchers to develop methods to identify, collate, define, and classify constructs along conceptual bases with the goal of reducing redundancy across constructs and arriving at a core set of constructs that serve as determinants. Scholars have proposed numerous approaches, including classifications based on informal theory and evidence reviews (e.g., Abraham & Sheeran 2000, Albarracín et al. 2024, Conner & Norman 2015, Sheeran et al. 2017b), formal expert review or evidence synthesis (e.g., Cane et al. 2012, Fishbein et al. 2001), or application of systematic procedures (e.g., Larsen & Bong 2016, Peters & Crutzen 2024). Applications of these approaches have converged on broad groups of health behavior determinants into which most constructs reported in research in this field can be classified (e.g., Michie et al. 2008). These approaches serve as useful means to guide the identification of core sets of the psychological health-behavior determinants that have featured prominently in extant theory and research and to inform reviews of the extant evidence on health behavior determinants.

The next section focuses on providing an overarching summary of core sets of psychological health behavior determinants. The determinant sets were identified through a review of the aforementioned efforts purposed to identify, label, and group psychological constructs based on their conceptual underpinnings. The sets represent a general convergence in expert opinion on the psychological constructs expected to be deterministic of health behavior derived from published research and commentaries in the field. Accordingly, the review defines the conceptual basis for each determinant set, identifies prototypical representative constructs and the theories from which they are derived, and outlines the mechanisms by which they are proposed to relate to health behavior. Furthermore, the following discussion provides an evaluation of the weight of current evidence on the effects of representative constructs from each group on health behavior and identifies potential moderators and boundary conditions on which the determinant effects depend. The overview provides a basis for a subsequent discussion of the limitations of health behavior determinants research and a review of some innovations aimed at resolving them with suggestions for future research. To complement the narrative here, **Table 1** provides an accessible overview of the core determinant groups, including definitions and exemplars.

3. CORE SETS OF HEALTH BEHAVIOR DETERMINANTS

3.1. Health Beliefs and Cognitions

A key group of psychological health behavior determinants is derived from theories adopting a social cognition approach, often characterized as reasoned action or rational decision theories (Bandura 2001, Conner & Norman 2015). Consistent with the cognitivist tradition, these theories assume an information-processing metaphor of decision making (Schneider 1991). Individuals' propensity to perform a target behavior is guided by their evaluative judgments with respect to its future performance represented in their stated beliefs (Ajzen 2001). Beliefs are proposed to summarize the information available to the individual on performance of the behavior derived from past experience with the behavior, particularly its utility to attain desired outcomes or goals, observations of others' behavior, perceived information from the environment, and anticipated future conditions under which the behavior is expected to be performed. This approach underpins many of the well-established theories that have been frequently applied to predict health behavior,

Table 1 Summary of psychological determinants of health behavior

Theoretical domain(s)	Determinant group	Determinant subgroup membership and characteristics		
		Determinant subgroup	Determinant subgroup definition	Exemplar determinants
Social cognition theories Rational decision theories Reasoned action theories Motivational theories	Health beliefs and cognitions	Disposition to act	Individuals' stated motivation or readiness to approach or perform a future behavior	Intention Protection motivation Readiness to change Goal pursuit Willingness/desire Autonomous/controlled motivation
		Outcome expectancies	Beliefs that performing a future behavior will lead to attainment of salient outcomes or goals	Outcome expectancies Attitude Perceived benefits/disadvantages Response efficacy Coping appraisals
		Capacity beliefs Control perceptions	Beliefs in personal capacity to perform a behavior in the future and expectations that barriers or facilitating factors will affect behavioral performance	Self-efficacy Perceived behavioral control Locus of control Perceived capability Task/maintenance/relapse self-efficacy
		Normative beliefs	Beliefs in social agents' influence over performance of a future behavior through support, pressure, or modeling	Subjective norm Descriptive norms Social support Group norms
		Risk perceptions	Evaluation of perceived risks of performing a future behavior	Perceived susceptibility Perceived vulnerability Threat appraisals Risk perceptions
Dual-phase theories	Self-regulatory capacity	Self-regulatory skills	Reported extent or availability of cognitive or behavioral skills that can be employed to promote behavioral performance or to deal with obstacles or setbacks once a course of action has commenced	Action control Action planning Coping planning Implementation intentions
Dual-process theories	Affective perceptions	Affective judgments	Emotion or feeling state co-occurring with performing a current behavior or an emotional response expected to coincide with future performance of the behavior	Affective responses Anticipated affect Affective attitudes Desires or willingness

(Continued)

Table 1 (Continued)

Theoretical domain(s)	Determinant group	Determinant subgroup membership and characteristics		
		Determinant subgroup	Determinant subgroup definition	Exemplar determinants
	Implicit cognition and nonconscious processes	Habit Implicit beliefs	Beliefs representing learned associations between behavioral performance and situational conditions or cues, or evaluative responses that determine behavior with limited conscious awareness or cognition	Habit Implicit attitudes Implicit motives
Personality theory	Dispositional constructs	Personality	Stable, enduring, and generalized self-perceptions expected to be associated with multiple behaviors and outcomes	Conscientiousness Extroversion
		Individual differences Traits	Stable, enduring, and generalized dispositions that confer better capacity to regulate behavior	Trait self-control Behavioral prepotency Executive function Inhibitory control

including social cognitive theory (Bandura 2001), the theories of reasoned action and planned behavior (Ajzen 1991), the health belief model (Rosenstock 1974), and protection motivation theory (Rogers 1975), as well as less prominent yet highly influential theories such as the theory of interpersonal behavior (Triandis 1977) and the theory of self-regulation and self-control (Kanfer 1970). The social cognition approach common to these theories is reflected not only in their shared assumptions but also in the psychological constructs they specify as behavioral determinants.

3.1.1. Dispositions to act. Central to many of these theories are representations of generalized dispositions to act, often captured by the intention construct, which is motivational in nature and captures the extent to which an individual is prepared to invest effort in performing a given behavior in the future (for a contrasting perspective, see the sidebar titled Self-Determined Motivation and Intentions). The intention construct is often considered the most proximal determinant of behavior with origins in the conative component of attitudes (e.g., Ajzen 2001) and volitional theories that assume individuals are agentic, self-regulating organisms (e.g., Bandura 2001). Gollwitzer (1990) also qualifies intentions as goal intentions, insofar as intention constructs are often conceptualized as implying, or explicitly referencing, effort or motivation to attain a stated goal or outcome. As such, intentions have also been classified alongside goal-striving constructs such as goal pursuit and persistence (Brandstätter & Bernecker 2022). Accordingly, many social cognition theories identify intention (e.g., Ajzen 1991, Triandis 1977), or a similar construct (e.g., readiness to change, see Prochaska & DiClemente 1982; protection motivation, see Rogers 1975), as a proximal, focal behavioral determinant. This determinant effect is illustrated in the direct effect of dispositions to act on health behavior, as shown in **Figure 1**. Other than serving as a proximal determinant, intention is also integral to a key mechanism by which other determinants relate to health behavior, that is, as a mediator of effects of belief-based determinants on behavior. The indirect effect indicates that individuals' beliefs are integral to formation of an intention to perform a future health behavior.

Social cognition theories: theories that assume behavior is the consequence of reasoned processing of social information regarding future behavioral performance

SELF-DETERMINED MOTIVATION AND INTENTIONS

Constructs reflecting dispositions to act like intention are often considered solely in terms of their intensity, that is, the degree to which individuals are motivated to pursue a given target behavior to attain a given outcome. Other perspectives (e.g., humanistic or needs-based theories) conceptualize dispositions to act in terms of the quality of motivation experienced. Preeminent among these is self-determination theory, which makes the fundamental distinction between autonomous motivation, reflecting self-determined reasons for acting that emanate from an individual's genuine self, and controlled motivation, reflecting reasons determined by events occurring outside the individual (e.g., pressures from others, rewards, punishment; Deci & Ryan 2000). While both motivational forms are implicated in behavioral enactment, autonomous forms are considered most adaptive and are consistently linked with behavioral persistence because they are independent of external contingencies and coincide with greater behavioral involvement and adaptive outcomes (e.g., interest, enjoyment). Studies integrating these forms of motivation alongside traditional dispositions to act have demonstrated that intentions can take on autonomous and controlled forms, with implications for links with health behavior. For example, determinants research has demonstrated that autonomous intentions are more likely to predict health behavior than are controlled intentions (e.g., Chatzisarantis & Biddle 1998).

3.1.2. Belief-based determinants. Research has identified a number of key psychological determinants of dispositions to act and health behavior. These determinants are common to many social cognition theories, including consensus-based models that bring together constructs and predictions from multiple theories of this class (e.g., Fishbein et al. 2001, Montaña & Kasprzyk 2015), and they feature prominently in many efforts to classify health behavior determinants (e.g., Abraham & Sheeran 2000, Albarracín et al. 2024, Conner & Norman 2015, Sheeran et al. 2017b). Most prominent are constructs that reflect beliefs in the utility of a target behavior to attain outcomes, beliefs in individual capacity to perform the behavior, and beliefs that reflect the social influences or expected norms with respect to behavioral performance. Beliefs in behavioral utility, often referred to as outcome expectancies, reflect individuals' judgments on whether performing the behavior in the future will lead to certain outcomes and whether those outcomes are consistent or inconsistent with desired goals. Prototypical examples are the outcome expectancy construct from social cognitive theory, attitudes and their underlying behavioral beliefs from the theories of reasoned action and planned behavior, and response efficacy from protection motivation theory. Beliefs reflecting perceived capacity to perform a behavior feature prominently as a behavioral determinant in multiple theories, with origins in Bandura's (2001) highly influential social cognitive theory and, more broadly, in the control-related constructs pervasive in multiple psychological theories (for a review, see Skinner 1996). A prime example is self-efficacy, a construct central to many social cognition theories, which reflects individuals' judgments on whether they have sufficient confidence and personal resources to perform a behavior in the future, particularly in the face of obstacles or impediments. Finally, multiple theories specify normative beliefs as a key behavioral determinant. These represent perceived social influences with respect to future behavioral performance, particularly social support and pressure, but also the role others serve to model or signal social norms. Prominent among these are the subjective norm and social support constructs, which represent the perceived pressure from, and desires of, significant others with respect to future behavioral performance (Ajzen 2001).

Some theoretical perspectives also specify belief-based determinants focused on outcomes other than health behavior performance. A prominent example is the risk perception construct, which summarizes individuals' beliefs regarding the consequences of health threats such as

illnesses and health conditions. Specific exemplars of the risk perception construct are threat appraisals, which are central to illness-specific social cognition theories such as the health belief model and protection motivation theory, and also more recent integrated approaches (e.g., Schwarzer 2008). These typically comprise perceptions relating to the extent to which an illness or condition is considered personally threatening, known as perceived vulnerability, and the extent to which the illness or condition is expected to have serious health consequences, known as perceived severity.

Researchers have amassed a vast literature comprising thousands of studies reporting tests of the relative effects of these core determinant constructs on health behavior. Most of these studies have adopted multivariate correlational research designs in which unique associations between measures of the constructs and health behavior are estimated in patterns consistent with the underlying theory. Meta-analyses of this research provide robust data on the generalized effects of these determinants on outcomes, chiefly intentions and behavior (e.g., Carpenter 2010, McEachan et al. 2011, Milne et al. 2000). These syntheses have lent broad support for the independent effects of outcome expectancies, capacity beliefs, normative beliefs, and risk perceptions on health behavior across multiple behaviors, contexts, and populations. Effect sizes for each determinant are usually in the small-to-medium range. However, there is general consensus that observed averaged effects of normative beliefs and risk perceptions on intentions tend to be smaller than those for outcome expectancies and capacity beliefs, although formal differences have not always been confirmed (McEachan et al. 2011, Milne et al. 2000, Zhang et al. 2019). The syntheses have also provided support for key theory-stipulated patterns of effects, such as the role of intention as a mediator of the determinant effects on health behavior, as illustrated by the direct effect relationship between health beliefs and cognitions and health behavior, with dispositions to act as the intermediary construct in **Figure 1**.

3.1.3. Moderators of belief-based determinants. While the generalized support from meta-analyses provides useful evidence of the salient determinants of health behavior and the associated mechanisms, the size and direction of the effects vary considerably across studies. This variability suggests the likely presence of moderator variables, which represent salient conditions that may account for the observed variability. Prominent moderators include behavior type (e.g., health protection versus health risk behaviors), population characteristics (e.g., sex, age, socioeconomic status), research methods (e.g., type of behavioral measure), and properties of the determinants themselves (e.g., intention stability). Accordingly, research syntheses have examined the cumulative evidence for the effects of these methodologically and conceptually salient moderators on determinant–behavior relations.

Unsurprisingly, a key moderator is behavior type: Evidence syntheses have demonstrated that effects of normative beliefs on behavior tend to be larger for health risk behaviors (e.g., unprotected sex, smoking, alcohol consumption) relative to health protection behaviors (e.g., McEachan et al. 2011), while effects of capacity beliefs on behavior tend to be larger for behaviors such as physical activity and dietary behaviors than for safe sex and medication adherence behaviors (McEachan et al. 2011, Rich et al. 2015). These differences likely reflect the relative salience of different sources of information in informing individuals' decisions to act. For example, health risk behaviors (e.g., risky patterns of alcohol consumption, smoking) are more likely to be performed in social contexts (e.g., drinking in bars or pubs, smoking on cigarette breaks) relative to other behaviors for which social influences are less pervasive. Behaviors such as physical activity participation may be more likely to be performed alone (e.g., working out in the gym, going for a walk with the dog), in which case capacity beliefs may feature more prominently in individuals' decision making.

Researchers have also explored measurement type as a moderator of determinant effects. Prominent among measurement type moderators is the type of behavior measure adopted, either by self-report or by a non-self-report measure (e.g., devices such as accelerometers to measure physical activity, attendance records to measure screening behavior, or expired carbon monoxide monitors to measure smoking behavior). While self-report measures often exhibit good concurrent validity against ostensibly objective criteria, they may still be subject to reporting bias or associated with common method error variance. Meta-analyses examining behavior measure type as a moderator of psychological determinant effects report larger effects of measures of intention, outcome expectancies, and capacity beliefs on health behavior in studies using self-report behavior measures relative to those using non-self-report measures (McEachan et al. 2011). These findings have important ramifications with respect to measure selection in health behavior determinants research and the interpretation of the resultant effect sizes.

The properties of determinant constructs themselves are another prominent moderator of determinant effects on health behavior. Of these, the most frequently studied is intention stability. Consistent with theory, research has indicated that intentions that are more stable—and, by implication, more coherent and resistant to change—are those that are more likely to be enacted, as represented by larger intention–behavior relations (e.g., Cooke & Sheeran 2004). Along similar lines, researchers have reported the potential for other determinants to moderate determinant–behavior effects. For example, while behavioral effects of risk perceptions have generally been modest across studies, research demonstrates that risk perception effects, as represented by exposure to threatening messages designed to elevate perceived risk, are much larger when individuals report high self-efficacy to perform a health protection behavior (Peters et al. 2013). Studies also indicate that individuals reporting high control over their behavior are more likely to act on their intentions, again represented by larger intention–behavior relations (Hagger et al. 2022). Similarly, those whose actions generally tend to be guided by affective attitudes (Conner et al. 2016), perceptions of control (Sheeran et al. 2002), or normative beliefs (Trafimow & Finlay 1996) are more likely to behave accordingly.

Recent health behavior determinants research has examined innovative, more complex moderators, such as those based on cumulative tendencies derived from multiple determinants, or nonlinear trends in moderator effects. For example, Sheeran & Conner (2019) indicated that individuals with “well reasoned” intentions, where within-individual effects of key belief-based determinants (i.e., outcome expectancies, capacity beliefs, normative beliefs) on intentions were consistently strong, tended to exhibit larger intention–health behavior relations. In another study, Sheeran et al. (2017a) revealed that intention–health behavior relations traced an inverted-U pattern with prior behavioral experience, such that intention–behavior relations increased with greater experience, but only to a point, and thereafter decreased. Interpreting this pattern, the authors proposed that as individuals gain experience after initiating a behavior their intentions become more stable and crystallized and therefore more reliable in predicting behavior; however, as they acquire the behavior as a habit, intention salience wanes. These studies highlight the value of further research examining effects of salient moderator variables on intention–health behavior relations such as behavior complexity and of research examining nonlinear effects of health behavior determinants on intentions and behavior.

3.2. Determinants in Extended and Integrated Theories

Although the belief-based determinants consistently account for nontrivial variance in health behavior, effect sizes are typically in the small-to-medium range, with substantive variance in health behavior remaining unexplained (e.g., McEachan et al. 2011, Rich et al. 2015). This finding has

been attributed in part to a focus on a narrow set of determinants derived exclusively from rational decision-making theories, without consideration of the effects of determinants that represent other highly salient processes implicated in health behavior performance. Scholars have, therefore, proposed and tested extended, integrated theories that include determinants derived from other theoretical paradigms with a goal of developing more comprehensive accounts of health behavior and the associated mechanisms (e.g., Hagger 2009, Montaño & Kasprzyk 2015, Rhodes & de Bruijn 2013, Sheeran et al. 2013). This section outlines additional determinants that have featured prominently in these extended theories, describes the conceptual basis for their inclusion and their predicted effects, and evaluates the extant health behavior determinants research testing their effects.

3.2.1. Self-regulatory capacity. Prominent among the additional psychological determinants that have been included in extended health behavior theories are those that broadly represent self-regulatory capacity, defined as individuals' propensity to proactively manage or control their own behavior. Self-regulatory capacity has generally been captured by constructs that represent the extent to which individuals possess skills or techniques that they can actively apply to alter or regulate their health behavior. This section reviews the effects of two constructs representative of self-regulatory capacity on health behavior: planning and self-regulatory skills or action control strategies.

3.2.1.1. Dual-phase theories of behavior and planning determinants. While determinants research has reported consistent links between dispositions to act and health behavior performance, typically manifested in intention–behavior relations, the modest size of this association has been noted. Extending this observation, research syntheses have indicated that a substantive proportion of individuals report holding health behavior intentions but do not subsequently act on them; this group is referred to as “inclined abstainers” or “unsuccessful intenders” (e.g., Feil et al. 2023, Orbell & Sheeran 1998). Theorists and researchers have turned to dual-phase theories of behavior, such as the model of action phases, to assist in explaining and resolving this intention–behavior “gap” (Gollwitzer 1990). According to the model, individuals who intuitively, or are prompted to, furnish their behavioral intentions with concrete plans to enact them are those likely to shift from a motivational to a volitional phase of behavior and follow through on their intended actions thereafter. Existing social cognition theories have therefore been modified to include forms of planning, and studies have examined effects of these planning constructs on the intention–behavior relationship.

A preeminent form of planning is implementation intention, also known as an “if-then” plan (Gollwitzer 1990). An implementation intention represents the extent to which an individual has paired performance of the target behavior with a salient condition or cue. In implementation intention research, individuals report the extent to which they have paired the behavior with a cue or are explicitly prompted to do so by a message or manipulation. These plans promote better intention enactment by strengthening the efficiency of the cue–behavior link and by promoting effective recall of the intention (Orbell et al. 1997). Other similar planning constructs have been identified, such as action plans, which have conceptual similarity to implementation intentions but also encompass how the behavior might be performed, and coping plans, in which individuals preempt potential obstacles that might impede or derail the behavior and develop plans to mitigate or circumvent them (Schwarzer 2008).

A relatively large number of studies have supported the inclusion of planning as an additional health behavior determinant in extended theories and identified the mechanisms involved. For example, research reviews and meta-analyses have demonstrated that planning constructs or manipulations moderate the intention–behavior relationship (Bélanger-Gravel et al. 2013, Gollwitzer

Dual-phase theories: theories specifying separate phases of action: a motivational phase involving intention formation and an action or volitional phase involving intention enactment

Dual-process

theories: theories specifying separate but interacting action processes: a reasoned, deliberative process governing intentional action and an implicit, nonconscious process involved in impulsive action

& Sheeran 2025, Hagger & Luszczynska 2014, Sheeran et al. 2024). The moderation effect corroborates predictions of the model of action phases, such that individuals who form plans or are prompted to do so are more likely to enact their intentions. This notion is illustrated in **Figure 1** by the direct effect of self-regulatory capacity on the direct effect relationship between dispositions to act and health behavior. Research has also demonstrated that planning constructs, including action and coping planning, mediate the intention–behavior relationship (Zhang et al. 2019), as illustrated by the direct effects between intention and behavior with self-regulatory capacity constructs as a mediator in **Figure 1**. The mediated effect implicates planning in decision making, indicating the extent to which the effect of intention on behavior can be attributed to planning (Schwarzer 2008). These studies provide relatively consistent evidence supporting planning as a health behavior determinant and elucidate a key mechanism by which individuals enact their intentions.

3.2.1.2. Self-regulatory skills and action control. Planning constructs and manipulations represent specific forms of broader sets of strategies that individuals may employ to enact health behaviors, commonly referred to as self-regulatory or action control strategies. These strategies reflect the extent of individuals’ skills involved in carrying out intended behaviors, such as goal setting, self-monitoring, self-incentivizing, emotion regulation, and situation modification, and are directed to attain desired outcomes and goals (for a review, see Duckworth et al. 2018). Individuals who have developed these skills and can recognize their utility, have had prior success in using them, and are inclined to employ them are more effective in enacting health behaviors. Growing evidence has linked adoption of these strategies to greater effectiveness in health behavior enactment (for a review, see Rhodes & de Bruijn 2013). Beyond the independent effects of strategy use on behavior, these strategies are also implicated as a mediator of the intention–behavior relationship, such that individuals enacting their intentions do so because they apply these skills (de Bruin et al. 2012). In addition, skill use should also render individuals more effective in enacting their intentions such that skill use should moderate the intention–behavior relationship, although strong evidence for this mechanism is limited (Rhodes et al. 2022). There have also been advances in measures designed to capture skill use (e.g., Rhodes & Lithopoulos 2023). While research supports effects of constructs capturing self-regulatory skill use on health behavior and their role in the mechanisms proposed to underpin their effects, the research is neither as developed nor as extensive as other determinants, such as planning, in this group.

3.2.2. Nonconscious processes. The performance of many everyday behaviors, including health behaviors, may arise from processes that do not involve elaborated, reasoned deliberation and are, instead, governed by automatic or nonconscious processes (Hagger 2016, Sheeran et al. 2013). Such processes are not modeled explicitly by effects of determinants from rational decision theories. Researchers have sought to identify determinants derived from dual-process theories of action that reflect these nonconscious processes and test their behavioral effects. The value of this research lies not only in evaluating the relative contribution that determinants representing reasoned and nonconscious processes make to the prediction of behavior, but also in elucidating the conditions that determine which type of process predominates. The next section focuses on research on habit and implicit cognition as health behavior determinants representative of these nonconscious processes.

3.2.2.1. Habit. Although habit has been a focal research topic in psychology for many years, only relatively recently have habits been conceptualized and studied as a psychological construct (Wood & Runger 2016). Habits are typically defined as mental representations of cue–action response associations developed through regular behavioral performance under stable conditions (e.g., contexts, cues). Habits are considered a specific type of nonconscious response enacted

with little deliberation and in response to the presentation of well-learned associated conditions (Fleetwood 2019, Wood et al. 2014). Researchers have developed habit measures that leverage multiple methods (e.g., self-report, response frequency, device data) to capture the essential characteristics of the construct (for a review, see Hagger et al. 2023). Studies employing these measures report consistent relations with health behavior, independent of other determinants and intentions (for a review, see Gardner 2015). These relations are illustrated by the direct effect of the implicit cognition and nonconscious processes determinant group that includes habit, representing one form of nonconscious process, on health behavior, as shown in **Figure 1**. Research has also indicated consistent relations between habit measures, intention, and health beliefs, which are likely artifacts reflecting that habits arose out of actions that were formerly goal directed (Wood & R unger 2016).

Most revealing, however, is research identifying the conditions that dictate when habit is the predominant determinant of health behavior relative to intentions. Consistent with habit theory, research syntheses have indicated that habit effects on health behavior are larger when behaviors are conducive to habit formation (e.g., behaviors that tend to be performed regularly under stable conditions) or are less complex (e.g., behaviors comprising relatively few sub-behaviors or steps to perform; Hagger et al. 2023). In addition, increasing research is outlining the strategies that can be adopted in interventions to foster health-promoting behaviors as habits or to break habits for health risk behaviors (Gardner et al. 2023, Wood & R unger 2016). These findings indicate that habit is a pervasive health behavior determinant and represents a key nonconscious process linked to health behavior enactment. Consistent with theory, research has revealed salient conditions that determine the relative effects of habit and intention on health behavior and possible avenues for intervention.

3.2.2.2. Implicit beliefs. Effects of nonconscious processes on health behavior have also been represented by implicit cognition, such as implicit attitudes and beliefs. Because behavioral processes represented by these determinants are assumed to occur beyond conscious awareness, the measurement of nonconscious processes has necessitated the adoption of innovative reaction-time tasks (e.g., the implicit association test; Greenwald & Lai 2020) in which behavior-specific stimuli (e.g., words, pictures) are matched with evaluative attributes (e.g., positive–negative words or approach–avoidance responses). Evidence reviews have supported effects of implicit cognition measures on health behavior, although effect sizes tend to be small and highly variable (Rebar et al. 2016). Consistent with the predictions of dual-process theories, effects of implicit cognition on health behavior tend to be direct, while effects of explicitly measured determinants tend to be intention mediated (e.g., Hagger et al. 2017), as illustrated by the direct effects of the implicit cognition and nonconscious processes determinant group that encompasses implicit beliefs on health behavior, as shown in **Figure 1**. Analogous to the research on habit, conditions that determine when health behaviors are more likely to be governed by implicit cognition relative to constructs representing reasoned processes have also been identified. For example, studies have found that constructs that reflect individual differences in capacity to inhibit impulses, represented by self-control, impulsivity, or executive function measures, moderate the effects of implicit beliefs on behavior (Burton et al. 2012, Friese et al. 2016). Individuals lacking the capacity to regulate their urges or impulses to perform tempting behaviors (e.g., alcohol use, smoking) were more likely to act in accordance with their implicitly held positive beliefs about the behavior. These findings support the prediction that implicit beliefs are likely developed through positive evaluations arising from consistently rewarding experiences with the behavior. Finally, dual-process models of action also raise the prospect of interactive effects of determinants representing conscious and nonconscious processes on behavior (Strack & Deutsch 2004). For instance, congruency in implicit and

explicit attitudes is expected to facilitate behavioral engagement; although the two forms of attitude arise from different processes, they share a common route to behavior. Consistent with this model, implicit attitudes have been shown to moderate the effects of explicit attitudes on behavior (Perugini 2005), suggesting interdependence in the types of processes that govern health behavior enactment.

3.2.2.3. Affective perceptions. Compelling evidence supports affective perceptions as health behavior determinants. These perceptions encompass anticipated affective responses (e.g., Conner et al. 2015, Lawton et al. 2009), desires and willingness (Gibbons et al. 1998, Perugini & Bagozzi 2001), and momentary affect (Kim et al. 2019). Anticipated affective responses reflect judgments that future behavior performance will evoke an emotional response, captured by constructs such as affective attitudes. Conceptually, individuals have shown the capacity to distinguish between affective and cognitive beliefs (Trafimow & Sheeran 1998). In keeping with dual-process theories, studies report differential effects of these belief types on health behavior. Affective attitudes are more likely to predict behavior directly, particularly in behaviors more likely to be impulsive or rewarding (e.g., alcohol consumption, unhealthy snacking), while the effects of cognitive beliefs on behavior are generally intention mediated and tend to predominate in behaviors that are more complex or require greater deliberation (e.g., physical activity; Conner et al. 2015, Lawton et al. 2009). This expected pattern of effects does not rule out intention-mediated effects for affective attitudes representing the informational value of prior affect on individuals' intention formation (Lawton et al. 2009). Furthermore, consistent with proposals for interactive effects of constructs representing conscious and nonconscious processes in dual-process theories (Perugini 2005, Strack & Deutsch 2004), evidence indicates that effects of affective attitudes on health behavior are moderated by applying regulatory skills that promote deliberative control over action, such as breaking a habit or engaging in a behavior to attain a health goal (e.g., Phipps et al. 2022). These direct, indirect, and interactive effects are illustrated in **Figure 1**. Distinctions have also been made between intention, as individuals' motivation to perform goal-directed behaviors, and desires and willingness, which reflect appetitive or reactive motives based on needs and wants. Desires and willingness have demonstrated conceptual independence with intentions and tend to have larger effects on impulsive or rewarding, but potentially risky, behaviors, particularly under conditions of temptation (Gibbons et al. 1998, Perugini & Bagozzi 2001).

The affective-cognitive distinction has led researchers to propose revised theories to formally encompass differentiated subcomponents of constructs such as affective and cognitive beliefs (Fishbein & Ajzen 2010). However, it should also be stressed that the subcomponents are frequently strongly correlated and have been shown to be subsumed by the higher-order construct (Hagger & Chatzisarantis 2005). Furthermore, while evidence shows that these components can be independently manipulated (e.g., Trafimow & Sheeran 1998), there is scant research differentially targeting change in subcomponents (e.g., changing affective and cognitive attitudes independently) and examining their unique effects on behavior. Future research is, therefore, needed to evaluate whether making such a distinction has practical value in health behavior change interventions.

As reflective judgments, constructs such as anticipated affective responses and desires and willingness do not encompass the immediate, in-the-moment affective responses experienced when performing a health behavior, typically referred to as integral affective responses. These affective responses are typically captured on intensity scales, and, because of the relative instability of these responses, researchers tend to use high-frequency sampling methods to capture flux in responses over time. Studies have indicated that integral affective responses can evoke visceral motivation to continue or desist with the behavior, depending on the valence and intensity of the response

and future goals or motives, and are often linked to endogenous dopaminergic reward systems (for a review, see Williams & Evans 2014). For example, eating a palatable snack (e.g., chocolate or candy) may evoke an intense positive affective response (e.g., pleasure) and motivate continuation, while vigorous exercise may evoke similarly intense but negative affective response (e.g., distress) and a desistence motive. However, postaction affective responses may differ, particularly if they coincide with reflection on more elaborated goals. For example, among individuals holding a weight loss goal, snacking may lead to feelings of regret or guilt, while vigorous exercise may evoke positive affective responses such as satisfaction or contentment. Theory suggests that integral affective responses arising from health behavior performance are a key informational source on which individuals base their affective judgments with respect to future behavior, such as affective attitudes. Similarly, integral affect may be central to the formation of underlying implicit cognition, such as implicit affective attitudes, learned through consistent associations of the affective response with health behavior performance (Williams & Evans 2014). However, there is a need for definitive empirical corroboration of these hypotheses, perhaps through evaluating the effects of moment-by-moment affective responses to health behavior performance on affective belief change.

3.2.3. Dispositional constructs as determinants. Health behavior determinants vary in the extent to which they are fixed or stable. Determinants can, therefore, be placed on a continuum representing the extent of their stability—those low in stability and highly liable to change over time are referred to as states or state-like, and those high in stability and with less propensity to change are referred to as traits or trait-like. Belief-based health behavior determinants (e.g., outcome expectancies, capacity beliefs) can be generally considered state-like because they tend to vary over time and are liable to change when new information leads individuals to modify their beliefs. This variability affords opportunity for behavior change because determinants that are both reliably linked with behavior and subject to change (i.e., those that are highly “pliable”; Conner & Sparks 2002) are viable targets to guide behavior change interventions. By contrast, dispositional psychological constructs (e.g., personality, optimism) are generally considered trait-like insofar as they are highly stable and enduring and unlikely to exhibit change. These dispositional constructs have also been identified as salient health behavior determinants. This section reviews theory and evidence on key sets of dispositional constructs that function as determinants of health behavior.

3.2.3.1. Personality and other traits. Facets of personality from leading approaches to personality such as the five factor model (Costa & McCrae 1992), as well as dispositional constructs such as trait self-control and optimism, feature prominently in research on dispositional determinants of health behavior. Consistent with personality theory, these constructs share similar properties: They are relatively fixed and highly stable over time, domain general, and common to population and cultural groups. They are expected to have broad associations with multiple behavioral responses, as indicated by a density of states or instances of trait-consistent responses. These associations have been observed in health behavior research examining the effects of these dispositional determinants on health behavior. For example, research syntheses and meta-analyses have identified key personality facets such as consciousness (Bogg & Roberts 2004), and other traits such as trait self-control (de Ridder et al. 2012) and optimism (Boehm et al. 2018), as correlates of multiple health behaviors. Consistent with broader research on personality and dispositions, effect sizes for these determinants typically tend to be substantively smaller than those for belief-based determinants.

Beyond dispositions as correlates, researchers have considered the relative contribution that these constructs make to explaining variance in health behavior relative to belief-based

determinants from rational decision theories and have tested the mechanisms involved. These approaches generally conceptualize traits as a source of information in decision making and should be represented in individuals' beliefs with respect to future behavioral performance (Ajzen 1991). Dispositions are thus expected to serve as distal health behavior determinants mediated by the belief-based determinants more immediately involved in intention formation, referred to in recent conceptual work as a disposition-belief-motivation framework (e.g., Bogg et al. 2023). Studies have lent support to this mechanism, demonstrating that the effects of dispositions such as conscientiousness (Conner & Abraham 2001), extroversion (Rhodes et al. 2002b), and trait self-control (Conner et al. 2023, Hagger et al. 2019) on health behavior are mediated by the belief-based constructs (e.g., outcome expectancies, capacity beliefs) and intentions. In many cases, however, substantive unmediated or residual effects of these dispositions on behavior remain. These direct effects have been proposed to reflect other nonconscious processes, and researchers are encouraged to identify candidate mediators of these direct effects, such as implicit cognition, to corroborate this hypothesis. Both patterns of effect are depicted in **Figure 1**, with direct effects between dispositional constructs and health behavior as well as indirect effects between health beliefs and cognitions and dispositions to act as sequential mediators.

A practical concern arising from work on dispositional determinants of health behavior relates to their utility in informing interventions. The high stability and lack of pliability of these constructs may suggest that they lack value as targets for change in health behavior interventions. However, such a perspective may be misplaced for two reasons. First, research has challenged the notion that dispositional constructs are not manipulable; rather, they have been shown to be sensitive to change (e.g., Malouff & Schutte 2017, Roberts et al. 2017). There are, however, numerous caveats to these findings: Disposition change depends on relatively long-term, intensive interventions; effect sizes are small; and whether the changes are enduring is unclear. Second, dispositional constructs may serve as key intrapersonal conditions that moderate the effects of other determinants on health behavior. Evidence of dispositional moderators may be instrumental to identifying groups of individuals (e.g., those low in conscientiousness or self-control) for whom specific determinants may be more salient and, therefore, the most viable targets for change in behavioral interventions. For example, dispositional constructs have been shown to moderate the effects of belief-based determinants, such as outcome expectancies and normative beliefs, on intentions and intentions on behavior, including personality traits (Rhodes et al. 2002a) and trait self-control (Conner et al. 2023, Hagger et al. 2019, Hagger & Hamilton 2024a), albeit with relatively small effect sizes. Such patterns also tend to be behavior specific. For example, trait-self-control moderator effects on the intention-behavior relationship tend to be confined to behaviors where impulse control is highly salient, such as alcohol consumption (Hagger et al. 2019). These caveats suggest that it would be imprudent to dismiss dispositional determinants as lacking conceptual and practical value. However, there is a need for research that systematically tests the efficacy of interventions targeting change in determinants known to be moderated by a specific dispositional construct in groups of individuals defined by the construct.

3.2.3.2. Regulatory control determinants. Researchers have identified determinants that represent dispositional capacity to exert regulatory control over behavioral responses, such as controlling impulses or cues to rewarding contingencies or managing distracting stimuli that may derail goal-directed behaviors. Such capacities have been implicated in the performance of goal-directed behaviors (e.g., engaging in health protection behaviors or refraining from risky behaviors). Regulatory control constructs include working memory and executive function (Hall et al. 2008, Hofmann et al. 2008), behavioral prepotency (Hall & Fong 2007), and inhibitory control or response inhibition (McGreen et al. 2023). These constructs have often been linked with

other dispositional constructs representing generalized capacity such as trait self-control (Allom et al. 2016b). They are typically measured on tasks that require high-level processing such as memory capacity and response inhibition.

Research in this domain has supported associations between these constructs and health behaviors, particularly those that are highly rewarding and impulse driven such as eating unhealthy foods and consuming alcohol (e.g., Dassen et al. 2018, Houben et al. 2011), illustrated by the direct effect of dispositional constructs on health behavior shown in **Figure 1**. Research also indicates that training on these capacities improves health behavior performance, a pathway for intervention (e.g., Allom et al. 2016a). These determinants have also been incorporated in integrated theories as parallel and direct determinants of behavior and implicated in the mechanisms of the effects of other determinants on behavior. For example, temporal self-regulation theory (Hall & Fong 2007) and theories of self-regulation (Hofmann et al. 2012) suggest that executive functions manifested as capacity to suppress prepotent responses not only predict health behavior, but also serve to moderate the effects of determinants that reflect nonconscious processes that lead to action, such as implicit cognition or habits (e.g., Friese et al. 2008). Regulatory control constructs reflect key capacities that afford individuals better means to manage rewarding yet maladaptive health behaviors and are also implicated in the processes by which determinants representing nonconscious processes relate to health behavior.

4. EXTENDING HEALTH BEHAVIOR DETERMINANTS RESEARCH: LIMITATIONS AND SOLUTIONS

4.1. Moving Beyond Determinants as Correlates

Evidence on health behavior determinants is dominated by research adopting correlational study designs. Although researchers frequently imply both directional and causal effects of determinants on outcomes in studies adopting such designs, such inferences are based on theory alone, not on the data (for in-depth treatment of these issues, see Hagger & Hamilton 2024b, Rohrer et al. 2022). Drawing such inferences from correlational data is contraindicated due to the possibility that the observed effects could be caused by other, unmeasured variables. Correlational tests of the proposed theoretical mechanisms by which determinants relate to behavior, such as mediation and moderation effects, are also subject to the same limitation (see Bullock et al. 2010, Rohrer et al. 2022). Furthermore, observed effects in correlational studies can be either unidirectional or bidirectional: Both patterns are equally plausible and cannot be ruled out. Such designs also fail to account for change in the determinants and outcomes within and between individuals and over time. Alternative study designs that enable researchers to better infer directional and causal effects include longitudinal and time series designs as well as randomized controlled designs such as laboratory and field experiments and interventions. The next section reviews the value of adopting these designs in health behavior determinants research, particularly with respect to extending the inferences that can be drawn on determinant effects, and provides examples of how innovative research adopting these designs has advanced knowledge on determinants.

4.1.1. Longitudinal study designs in determinants research. Types of longitudinal study design, such as cross-lagged panel designs, enable researchers to examine effects among determinants and outcomes while accounting for temporal stability in the constructs and, in some implementations, within-individual variability, known as intraindividual change (Orth et al. 2021). Such designs also allow for the estimation of directional and reciprocal effects among determinants and outcomes, that is, whether effects occur in a specific direction or serve as mutual causes of each other, respectively. These may also permit more appropriate tests of determinant mechanisms, such as examination of sequential mediation effects among determinants, outcomes, and

mediators over time (Maxwell & Cole 2007). Research applying such designs has provided evidence to support directionality in determinant effects while controlling for stability. For example, a meta-analysis of longitudinal research on belief-based health behavior determinants supported proposed directional effects, such as the effects of outcome expectancy, capacity beliefs, and normative beliefs on intention, and intention on behavior, but provided little evidence to support reciprocal effects (Hagger & Hamilton 2024b). However, this research did not adopt recent implementations of panel designs that account for intraindividual change (e.g., “random intercept” designs; Orth et al. 2021), and research adopting these designs is needed to fully elucidate directional effects under multiple stability conditions.

Panel designs also may not adequately capture effects among determinants and outcomes when determinants are more variable over time. Time series designs in which determinants and outcomes are measured with high frequency may offer a solution. Research adopting these designs utilizes techniques (e.g., ecological momentary assessment, experience sampling methods) that permit regular sampling of measures of psychological determinants and behavior over extended periods (e.g., Burke et al. 2017; N. Bolger & J.-P. Laurenceau, unpublished manuscript). These methods enable researchers to capture rapidly moving or dynamic change in psychological determinants over time and how they relate to behavioral outcomes. For example, studies using devices (e.g., mobile phones, smartwatches) to collect multiple determinant and behavior measurements over extended periods demonstrate that variation in determinants such as intention, control beliefs, regulation capacity, and norms led to better behavioral adherence (e.g., Conroy et al. 2011, Jones et al. 2024, Maher & Dunton 2020). These studies also indicated that conditions within the individual, such as higher-than-average levels of self-efficacy and intention, were related to increased health behavior performance and stronger intention–behavior relations. This research supports the notion that studies focused solely on between-individual determinant effects “tell only half of the story” (Conroy et al. 2011, p. 822) and highlight the advantage of a simultaneous consideration of within- and between-participant determinant effects.

4.1.2. Randomized controlled designs in determinants research. Studies adopting randomized controlled designs, such as laboratory or field experimental or intervention designs, are often considered gold standard methods for testing causal effects of psychological determinants on health outcomes. Such designs usually entail development and application of innovative techniques (e.g., persuasive communications aimed at changing beliefs, exercises aimed at training competencies) to change or manipulate one or more psychological determinants and compare their behavioral effects in samples from the population of interest against a reasonable control or comparison group (for reviews, see Shadish & Cook 2009, Sheeran et al. 2017b). While studies adopting randomized controlled designs are far from being the norm in health behavior determinants research, a burgeoning research literature on determinant effects adopting these designs has emerged. Syntheses of this research have provided consistent evidence for causal effects of select manipulations of psychological determinants on behavior. For example, meta-analyses of this research have supported unique effects of experimental manipulations of intentions, outcome expectancies, capacity beliefs, and normative beliefs on health behaviors (e.g., Sheeran et al. 2016, Steinmetz et al. 2016, Webb & Sheeran 2006), with highly variable small-to-medium effect sizes. In addition, studies comprising manipulations targeting change in self-regulatory capacity constructs, such as planning (e.g., Bélanger-Gravel et al. 2013, Sheeran et al. 2024) or self-monitoring (e.g., Harkin et al. 2016), and dispositional constructs representing regulatory control (e.g., Allom et al. 2016a, Aulbach et al. 2019) have demonstrable efficacy in changing health behavior, with similar-sized effects and high variability. By contrast, there is little evidence that changing implicit cognition leads to change in behavior (see Forscher et al. 2019).

Some of the key process-related effects identified in nonexperimental determinants research have also been verified in experimental or intervention research. For example, control perceptions and the likelihood of the behavior to be formed as a habit moderated the effects of intention change on behavior change (Webb & Sheeran 2006). Similarly, the size of experimentally induced change in determinants on intention change tends to be larger than that for behavior change, which seems to align with the nonexperimental research indicating an intention–behavior “gap” (Webb & Sheeran 2006). These studies also indicate that effects of determinant change on behavior change did not vary substantially according to the features of the target health behavior or to whether one or more health behavior determinants were targeted for change (Sheeran et al. 2016).

Taken together, findings from evidence syntheses of determinants research adopting experimental and intervention designs generally corroborate findings from correlational studies, with the advantage of permitting better causal inferences in the theory-implied effects. However, the available experimental evidence is typically not as extensive or robust as research on correlates, and inferences drawn from moderator analyses of research syntheses are especially limited due to small numbers of studies in moderator groups. Researchers have hence advocated for the routine adoption of randomized controlled designs in health determinants research (Hagger et al. 2020b). This work is expected to similarly advance knowledge on intervention design, an issue that is the focus of the next section.

4.2. Health Behavior Determinants, Intervention Design, and Mechanisms of Action

A key rationale for the study of psychological health behavior determinants is the assumption that determinants can inform the development of behavior change interventions. However, the evidential value of behavioral determinants research to intervention development depends on a number of conditions: Determinants reliably related to change in the targeted behavior can be identified; the psychological processes represented by the determinants can be activated or changed through exposure to methods or techniques designed for that purpose; and determinant activation or change resulting from exposure leads to concomitant behavior change (Kok et al. 2016; Sheeran et al. 2017b, 2023). These conditions provide a basis for specifying and testing how behavior change interventions operate or work in changing behavior in accordance with theory predictions, which will provide optimal evidence on which future intervention development can be based.

To this end, researchers have applied numerous methods (e.g., basis in theory, expert consensus, evidence review) to specify the links between the techniques used in behavior change interventions and the psychological determinants that they are purported to activate or change in order to change behavior (Carey et al. 2019, Connell et al. 2019). These patterns of relations have become known as the mechanisms of action of behavior change interventions (Hagger et al. 2020b, Sheeran et al. 2017b, Witkiewitz et al. 2022).¹ These endeavors have been facilitated by efforts to identify, label, and classify available behavior change techniques in organized structures (e.g., Kok et al. 2016, Marques et al. 2023) and by systematic procedures to facilitate technique–determinant links (e.g., Birk et al. 2023, Johnston et al. 2021). These endeavors are critical to developing elaborated

Behavior change techniques: methods or strategies adopted in interventions designed to change behavior through activation of, or change in, one or more theory-based psychological determinants

¹Psychological determinants of health behavior have been referred to directly as mechanisms of action. However, strictly speaking, a mechanism of action comprises the entire proposed causal pathway by which an intervention technique indirectly affects change in a behavioral outcome through the mediation of change in the theory-stipulated determinant. For a full description and visual representation, see Hagger & Hamilton (2022, figure 1).

Mechanism of

action: process by which behavior change techniques affect change in health behaviors through activation of, or change in, psychological determinants

ontologies that comprehensively and systematically chart the key components of mechanisms of action of health behavior change interventions, provide a basis for empirical tests of the mechanisms, and pave the way for building an evidence base of intervention efficacy tests coupled with data on how they work and the conditions on which their efficacy depends (Hagger et al. 2020b, Sheeran et al. 2017b).

Alongside these classification efforts, researchers have also sought to provide optimal empirical tests of mechanisms of action. To do so, studies need to adopt randomized controlled designs to test the effects of intervention techniques on change in measures of behavior and, critically, the determinant constructs implicated in the proposed mechanism of action. Most critical is the conduct of mediation analyses to test whether observed behavior changes attributed to exposure to the technique are directed through change in the putative mediator, that is, the implicated psychological determinant. The resultant indirect effect constitutes the appropriate test of the intervention mechanism of action (Sheeran et al. 2017b, Witkiewitz et al. 2022). Minimization of bias in such tests would ideally require participants to be randomized to both the behavior change technique and mediator (Bullock et al. 2010), which, in practice, is a challenging prospect in health behavior determinants research.

Studies adopting this mediation approach have provided evidence to support the mechanisms of action of interventions purposed to change health behavior through change in determinants such as self-efficacy (e.g., Larsen et al. 2021), outcome expectations (e.g., Paganini et al. 2022), and habits and intrinsic motivation (e.g., Murray et al. 2020). Researchers have also applied meta-analytic methods to synthesize research adopting this approach to test intervention mechanisms of action (e.g., Rhodes et al. 2021, Sheeran et al. 2020). These syntheses have provided qualified support for mechanisms of action in studies focused on techniques and determinants from a specific theoretical approach (e.g., self-determination theory; Sheeran et al. 2020) or for a specific behavior (e.g., physical activity; Rhodes et al. 2021). The research has also permitted examination of potential moderators of mechanisms of action. For example, Rhodes et al. (2021) tested whether the mediated effects representing the mechanisms of action varied according to the underlying theory of the determinant and found no differences. However, the authors acknowledged that the analysis was limited by the lack of information available on the intervention content and the fidelity of the intervention descriptions.

Despite a notable recent uptick in intervention studies adopting the mediation approach, there is general recognition that intervention mechanisms of action are still not routinely tested in intervention and health behavior determinants research. Researchers seldom adopt factorial designs that allow for the isolation of effects of individual behavior change techniques and their mechanisms of action. In addition, they have generally not tested the conditions that moderate constituent components of the mechanism, i.e., effects of the intervention on behavior and of the intervention on the determinant (Hagger et al. 2020b, Rothman & Sheeran 2021). These shortcomings present challenges to meaningful syntheses of research on mechanisms of action and hinder progress on evaluating how interventions work and the associated moderating conditions. Studies that address both limitations represent key directions for future research.

Development of mechanisms of action ontologies and databases of research evidence supporting the mechanisms (e.g., in determinants research adopting the study designs reviewed previously) is a relatively new phenomenon, and the field has a long way to go toward providing comprehensive evidence to support most of the identified mechanisms. There are also outstanding questions on how theorists and researchers should mobilize resources to provide continuity in updating the cumulative evidence on intervention mechanisms of action in databases and ontologies. Numerous strategies have been suggested, such as conducting ongoing living evidence syntheses that are regularly updated by the research community as new evidence comes to light

(for a review, see Sakaluk et al. 2023); assembling global networks of researchers conducting systematic programs of research that address key evidence gaps for subsequent synthesis and archiving their findings in a centralized updatable repository (see Armitage et al. 2021); and leveraging generative artificial intelligence and machine learning to provide rapid, automated updates (see Michie et al. 2017).

4.3. Alternatives to an Individualist Approach: Socioecological Determinants

The heavy emphasis on individualist theoretical and methodological approaches in health behavior determinants research has been criticized. In these approaches, the effects of the characteristics of individuals' physical and social environments are assumed to be captured by belief-based determinants (e.g., normative beliefs). Alternatives lie in the application of socioecological models to the health behavior prediction informed by ecological systems theory (Bronfenbrenner 1977). These models propose a multilevel hierarchic approach in which individual determinants (e.g., health beliefs and cognitions) are proposed to influence behavior and outcomes at the lowest, most proximal level, with multiple higher-order levels encompassing determinants that represent comparatively more distal features of the physical and social environments. The models posit that determinants within and between these levels affect behavior in both linear and interacting patterns (e.g., Sallis & Owen 2015). Examples of determinants that could be used to represent physical and social environment effects are sociostructural variables such as sociodemographic (e.g., age, gender, ethnicity, race), socioeconomic (e.g., education, income, health care access), and social environmental (e.g., access to facilities such as gyms or clinics, neighborhood safety) factors. These factors have typically been treated as covariates in health behavior research alongside individual-focused determinants (Schüz 2017), a practice that not only negates the potential influence of these determinants, but also neglects evident disparities in health behavior participation. For example, sociostructural factors such as indices of socioeconomic status are reliably and negatively associated with health behavior participation (e.g., Stringhini et al. 2010). Adoption of a socioecological approach may, therefore, identify broader sets of health behavior determinants existing at multiple levels, may assist in explaining observed disparities in health behavior, and may signal potential strategies to address these disparities.

Research adopting a socioecological approach has identified unique effects of psychological and sociostructural determinants on health behavior and, importantly, assisted in elucidating the mechanisms involved. For example, studies have reported that effects of individual-level determinants (e.g., intentions, outcome expectancies) on health protection behaviors are moderated by sociostructural variables (e.g., income, education). More educated individuals and those with greater financial resources were more likely to act on their beliefs and intentions (e.g., Godin et al. 2010, Schüz et al. 2020). One interpretation might be that less educated individuals may have limited awareness of the health–behavior link, while individuals with lower incomes may not have access to facilities or resources to perform the behavior. In addition, the effects of sociostructural determinants, education, and ethnicity on health behavior have been shown to be partially mediated by attitudes, self-efficacy, and intentions (e.g., Godin et al. 2010, Hagger & Hamilton 2021). These findings suggest that lower health behavior engagement among those with lower education and those from marginalized minority groups is attributable, in part, to the lower likelihood that individuals from these groups will endorse beliefs that the behavior will lead to salient outcomes or beliefs that they have control over the behavior. Similarly, effects of variables relating to the social environment, such as perceived neighborhood safety, are also potentially salient determinants of health behaviors mediated by belief-based determinants (e.g., Lee & Shepley 2012). Direct, mediation, and moderation effects involving these sociostructural determinants are illustrated in

Figure 1. While health behavior determinant research adopting socioecological approaches has recently proliferated, the scope of the research remains relatively limited; applications tend to be confined to a few behaviors, focused on a limited range of sociostructural variables, and conducted using correlational designs. Future research should seek to address these evidence gaps.

5. CONCLUSION

This review has aimed to provide a wide-reaching, critical analysis of theory and evidence on psychological health behavior determinants. Given the breadth of determinants identified in the extant research, the review initially focuses on systematic efforts employed by theorists to identify, label, and classify determinants and uses these as a basis to specify a core set of determinants (see **Table 1**). Next, the breadth and weight of evidence supporting the effects of representative determinants from these core groups on behavior are reviewed, with a focus on the theoretical mechanisms involved, referencing evidence syntheses on specific exemplars of each group wherever possible. A substantive research literature comprising thousands of studies has tested the effects of determinants from these groups as health behavior correlates. Evidence syntheses report robust data supporting the effects of belief-based determinants derived from rational decision theories (e.g., outcome expectancies, capacity beliefs, normative beliefs, risk perceptions) on health behavior and the mediating effect of dispositions to act (e.g., intention, protection motivation). Effect sizes are typically in the small-to-medium range, although effects of normative beliefs and risk perceptions tend to be smaller. Determinant effects also tend to be highly variable across studies and subject to moderation by methodological (e.g., measurement of behavior by self-report or non-self-report), behavioral (e.g., behavior type), and conceptual (e.g., properties of constructs such as intention stability or degree of reasoned action) variables. Research syntheses offer support for some of the more frequently studied moderator effects (e.g., behavior type, intention stability), but data on those that are more complex and novel are sparse. There is also growing support for determinants representing additional psychological processes as health behavior correlates, such as self-regulatory capacity (e.g., planning, action control), determinants representing nonconscious processes (e.g., habit, implicit cognition, affective responses), and dispositional constructs (e.g., personality, regulatory control). Syntheses of research provide reasonably robust support for the behavioral effects of these determinants, particularly planning, habit, anticipated affect, and personality, but there are relatively few data on conditions that moderate their effects.

While current correlational evidence tends to support the proposed effects of many of the health behavior determinants identified in this review, such data do not permit the inference of directional and causal effects—a commonly observed shortcoming. These preclusions place limits on the extent to which such evidence can inform theory and guide intervention development. This review has highlighted the value of determinants research adopting alternative designs to afford such inferences, such as forms of longitudinal panel designs and randomized controlled designs. Syntheses of this research largely corroborate correlational evidence on determinants and the associated processes involved but elucidate the directional and causal effects. Extensions of this research implicating determinants in the mechanisms of action of behavioral interventions have provided highly valuable evidence to inform intervention development. Despite their value, mechanism tests are not routinely conducted, and the current evidence base is patchy. However, it paves the way for future determinants research that tests these mechanisms and for the development of procedures to coordinate efforts to conduct, integrate, update, and archive this research. Finally, shortcomings of the heavy emphasis of determinants research on individualist approaches are highlighted, with recommendations for researchers to consider socioecological models as a progressive approach to account for social structure in determinants research.

SUMMARY POINTS

1. Research syntheses have provided reliable evidence of psychological determinants from rational decision theories (e.g., outcome expectancies, capacity beliefs, normative beliefs, risk perceptions) as unique health behavior correlates, with small-to-medium-sized effects and substantive variability. Effects of normative beliefs and risk perceptions tend to be smaller, likely attributable to moderator variables. The syntheses also support dispositions to act (e.g., intention, protection motivation) as mediators of the effects of belief-based determinants on health behavior.
2. Research also broadly supports determinants representing additional processes as unique correlates of health behavior, including constructs representing self-regulatory capacity (e.g., action control, planning) and nonconscious processes (e.g., habit, implicit cognition, affective responses).
3. Evidence also indicates that determinant effects are moderated by behavior type (e.g., highly rewarding behavior type as a moderator of habit and implicit cognition effects, propensity for a behavior to be formed as a habit or behavioral complexity as moderator of habit effects) and properties of constructs (e.g., intention stability). Moderator effect sizes tend to be highly variable, and coverage of research syntheses for moderators is uneven.
4. Studies adopting longitudinal and randomized research designs better enable inferences of direction and cause in determinant effects. Evidence syntheses largely corroborate determinant effects from correlational research and other mechanisms such as the intention–behavior gap. There is an expanding evidence base of experimental studies supporting the effects of determinant groups such as self-regulatory capacity (e.g., planning, self-monitoring) on health behavior, but evidence for the effects of implicit cognition is less clear.
5. Experimental and intervention research has been instrumental in testing the mechanisms of action of health behavior change interventions. While primary studies and research syntheses lend qualified support for some mechanisms for specific behaviors, contexts, and populations, the current evidence is relatively sparse. Behavior change theorists and researchers have called for systematic procedures to identify evidence gaps and coordinate efforts to conduct, catalog, synthesize, and archive studies toward a comprehensive database of behavior change mechanisms of action.
6. Determinants research is dominated by individualist theories, and there is a need for more widespread adoption of socioecological approaches that account for sociostructural and environmental determinant effects on health behavior and that examine how these approaches relate to, and interact with, individual health behavior determinants.

FUTURE ISSUES

1. While effect sizes reported in syntheses of research on psychological determinants as behavioral correlates are largely mirrored in syntheses of research adopting randomized controlled designs, does this observation hold in syntheses that make formal, direct comparisons of determinant effect sizes across these types of research design?

2. How can interventionists reliably tap into determinants that represent nonconscious processes to change behaviors, particularly those that are highly rewarding or risky?
3. Which determinants are consistently implicated in the mechanisms of action of interventions adopting behavior change techniques purposed to activate or change them, and which conditions moderate these effects?
4. How can researchers effectively and sustainably conduct, integrate, update, and archive evidence testing behavior change mechanisms of action based on theoretical determinants across contexts, behaviors, and populations?
5. What are the sociostructural (e.g., age, sex, income) and environmental (e.g., neighborhood environment) determinants that consistently mediate and moderate effects of theory-based determinants on health behavior?

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