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Review

Trait self-control as a determinant of health behavior: Recent advances on mechanisms and future directions for research

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We summarize theory and research testing a mechanistic explanation for the trait self-control-health behavior relationship. Specifically, social cognition constructs summarizing individuals' utility, normative, risk, and capacity beliefs with respect to future health behavior performance are proposed to mediate the self-control-health behavior relationship. The effect represents the informational function of self-control in decision making. We also specify a mechanism wherein trait self-control moderates the intention-behavior relationship such that 'good' self-control affords effective intention-to-action translation. Both effects have pervasive support in the extent literature. We propose ongoing meta-analyses expected to provide further robust support for these mechanistic effects and the need for research employing designs enabling better directional and causal inferences in the effects, including experimental or types of cross-lagged panel design.

Addresses¹ Department of Psychological Sciences, University of California, Merced, USA² Health Sciences Research Institute, University of California, Merced, USA³ Faculty of Sport and Health Sciences, University of Jyväskylä, Finland⁴ School of Applied Psychology, Griffith University, AustraliaCorresponding author: Hagger, Martin S. (mhagger@ucmerced.edu)^a Correspondence concerning this article should be addressed to Martin S. Hagger, Social and Health Psychology Behavioral Research for Prevention and Promotion (SHARPP) Lab, Department of Psychological Sciences, University of California, Merced, 5200 N. Lake Rd., Merced, CA 95343, USA.**Keywords**

Self-discipline, Self-regulation, Social cognition theory, Health action, Response inhibition, Integrated model.

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<https://doi.org/10.1016/j.copsyc.2024.101887>2352-250X/© 2024 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).**Introduction**

The consistent links observed between chronic disease risk and health-related behavior provide impetus for the development of efficacious interventions to promote health behavior participation [1–3]. Central to this endeavor is the identification of potentially malleable health behavior determinants that may inform behavioral intervention content [4,5]. Determinants research has tended to focus on the belief-based constructs from social cognition theories that inform individuals' decisions to engage in a given target health behavior [1,6]. There has also been focus on the traits that afford generalized adaptive capacities to engage in health behaviors, such as self-control and impulsivity [7–9]. Research indicates that constructs from both perspectives are consistently associated with health behavior participation [8,10,11]. Recent work has focused on the mechanisms by which individual difference constructs such as trait self-control relate to participation in health-related behavior [12–15]. In the current review, we outline the conceptual bases and hypothesized effects of a model based on received theory representing these potential mechanisms and summarize prior research testing these hypotheses. We also propose two meta-analyses expected to contribute to, and extend, this evidence. Finally, we outline future research directions including the need for study designs that permit better inference of direction and cause in model effects.

**The model and proposed mechanisms
Basis for integration: trait self-control and social cognition theories**

Trait self-control (see [Box 1](#) for definition and conceptualization) has been identified a key individual difference determinant of health behavior [8]. This is because health-related behaviors generally require persistent engagement in goal-directed actions that are often effortful and require sustained, focused attention [9,16–18]. Such behaviors are considered costly in that they are generally inconsistent with immediately rewarding alternative activities. The capacities afforded by high trait-self-control, therefore, afford individuals distinct advantages in the pursuit of such behaviors. In keeping with these predictions, a synthesis of research examining associations between trait self-control and health behavior participation reports consistent,

Box 1. Trait self-control: Definition, theory, and conceptualization

Trait self-control is typically conceptualized as a dispositional, individual difference construct reflecting generalized, enduring capacities that enable persistent engagement in goal directed behavior to obtain distal desired outcomes or end states [18,33,34]. Individuals with 'good' self-control are afforded generalized adaptive capacities for sustained attention, planning and structured thought, suppression of competing activities, and detection and management of potentially derailing impulse-driven alternatives [17]. Good self-control is described or indicated by a density of states or instances of self-control such that individuals with good self-control exhibit a high propensity to perform or apply trait-consistent behaviors or strategies (e.g., resisting impulses, managing temptations, engaging in sustained effortful goal-directed actions) [40,41]. Research has suggested that the generalized capacities represented by trait self-control are attributable to superior ability to mobilize 'cool' executive functioning capacities [35,36] such as working memory and cognitive control to regulate goal-directed behavior [for more details on theoretical perspectives see 18, 34]. These capacities are linked to superior inhibition of responses that derail goals [37] and recognition of, and attention to, cues to good self-regulation as opposed to immediately rewarding ones [9]. Trait self-control is typically captured using self-report psychometric survey methods [25].

positive associations with small-to-medium effect sizes [16].

However, observed associations between trait self-control and health behavior provides limited information on possible mechanisms. Integrating trait self-control into prototypical social cognition theories typically employed to predict health behavior may elucidate a candidate mechanism for this association (for a description of social cognition theories applied to health behavior see Box 2). A key assumption of these theories is that effects of distal environmental (e.g., resource availability) and intrapersonal (e.g., personality) factors on future health behavior performance will be subsumed by sets of beliefs that serve as immediate determinants of health behavior [19]. Such factors are expected to provide individuals with information that is explicitly or implicitly accounted for in decisions to perform behaviors and expected to be reflected in the beliefs on which their decisions are based [19,20]. That is, individuals will, implicitly or explicitly, tend to take these individual difference factors into consideration when estimating their beliefs with respect future behavioral performance. Based on this hypothesis, effects of trait self-control on behavior would be expected to be mediated by the belief-based constructs from these theories and intention, affording a possible mechanistic explanation for the observed association. Next, we outline the predictions of a proposed integrated model and its value in offering potential explanations for the role of trait self-control in health behavior performance.

A proposed integrated model

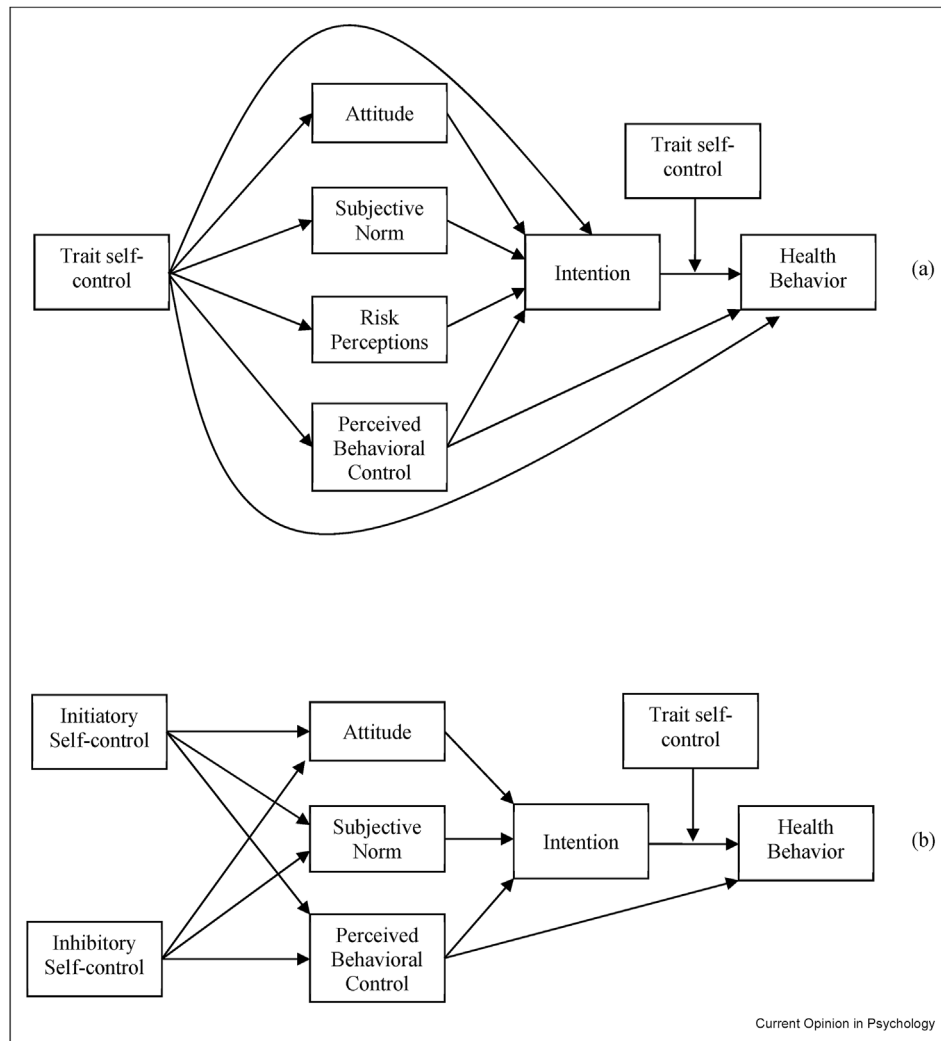
Consistent with assumptions of social cognition theories, we present an integrated model in which effects of trait self-control on health behavior are hypothesized to be mediated by the belief-based constructs from social cognition theories (see Figure 1a). In the model, effects of trait self-control on health behavior are predicted to be mediated by the belief-based social constructs (i.e., attitude, subjective norms, risk perceptions, self-efficacy) and intention [7,14]. As trait self-control captures capacities considered adaptive in pursuit of health behavior (e.g., recognizing and managing derailing cues, focusing attention on cues for control, see Box 1), it is expected to serve an informational function signaling requisite personal capacities and resources available for health behavior performance [9,13]. Individuals with 'good' self-control are, therefore, more likely to report beliefs that favor behavioral performance (e.g., positive attitudes, higher self-efficacy, see Box 2). This is predicted to be reflected in indirect effects of trait self-control on health behavior mediated by the social cognition constructs and intention in the proposed model.

Multiple empirical studies have provided converging evidence to support social cognition constructs and intention as mediators of trait self-control effects on health behaviors across in a range of behaviors, samples, and contexts [12–15]. For example, Hagger and colleagues [13] were among the first to test this prediction

Box 2. Social cognition theories: Definition, conceptualization, and predictions

Social cognition theories adopt an information processing metaphor for human decision making and, therefore, outline how social information available through perception or encoded prior experiences is utilized to make future decisions [1]. Applied in the context of health behavior, these theories typically assume that individuals' decisions to perform a given future target behavior is a function of their intentions, a motivational construct representing readiness or motivation to perform a behavior. Intentions are proposed to be a function of sets of beliefs reflecting future behavioral performance. Typically, these beliefs reflect individuals' perceived expectations regarding the utility, social influences, perceived risk, and perceived capacity with respect to performing the behavior, summarized in measures of attitude, norms, risk perceptions, and self-efficacy constructs, respectively [1,38]. Specifically, attitude represents beliefs that performing the target behavior in future will lead to useful, salient outcomes, subjective norms represents beliefs that salient social agents support performance of the behavior, risk perceptions represent beliefs that performing the behavior will mitigate risk of a relevant illness or health condition, and self-efficacy represents beliefs in personal capacities, that is, skills or abilities to perform the behavior [38]. Typical social cognition theories such as the theories of reasoned action and planned behavior [19] and protection motivation theory [39] propose that intentions or motivation mediates effects of the belief-based constructs on behavior. The predictions of these theories have been supported in research across multiple populations, contexts, and behaviors [10,11].

Figure 1



Diagrammatic representation of the multiple proposed effects by which trait self-control is expected to relate to health behavior in generalized form (panel a) and differentiating between initiatory and inhibitory forms of trait self-control within the theory of planned behavior (panel b).

in a diverse set of samples and health behaviors (e.g., eating fruit and vegetables, avoiding fast food, dietary restrictions, binge drinking, physical activity, walking, out-of-school physical activity, pre-drinking). In a subsequent study, Conner et al. [12] further supported these effects in an online sample of adults and for a similar set of health behaviors (e.g., dietary- and activity-related behaviors, regular dental flossing, avoiding excess alcohol consumption). Finally, in an analogous test, Bogg et al. [21] demonstrated that drinking motives mediated the effect of trait-self control on alcohol consumption in college students. Such studies adopt prospective correlational designs with measures of trait self-control and social cognition constructs and intentions taken on an initial occasion with follow-up behavioral measures taken on a subsequent

occasion. Overall, these findings consistently support the indirect effects of trait self-control on health behavior, with attitude or outcome expectancies, self-efficacy, and intention as the prominent mediators.

It is important to note that the proposed indirect effect represents one candidate mechanism for the trait self-control-health behavior association. Other mechanisms may account for the effect of trait self-control on health behavior [12]. We therefore specify a direct effect of trait self-control on health behavior in the model. Other factors likely mediate this residual effect – possible candidates are constructs representing implicit, non-conscious processes that affect behavior independent of the beliefs and intentions that inform reasoned decision making such as implicit cognition, habit, and

affective processing [12]. Such constructs are developed through individuals' repeated experience of a target health behavior co-varying with positive or negative judgments and motivational responses [22]. The mediated self-control effects, therefore, reflect instances where the capacities afforded to individuals with good self-control lead to consistent behavioral performance creating conditions that develop habits and implicit beliefs.

A further mechanism: the moderating effect of trait self-control

The processes implicated in decisions to perform health related behaviors specified in social cognition theories may also be conditional on intrapersonal factors such as trait self-control. Specifically, the superior capacities afforded to individuals with 'good' self-control means they will be better equipped to follow through on their stated behavioral intentions. Trait self-control is, therefore, proposed to moderate the intention-behavior relationship as illustrated in Figure 1a. 'Good' self-control is likely to strengthen the intention-behavior relationship, an 'upward' moderation, while self-control deficits are likely to undermine the relationship, a 'downward' moderation. There is emerging empirical support for this proposed mechanism in health behavior contexts. For example, Hagger et al. [13] observed self-control moderating effects for four of the ten behaviors tested, with upward moderation observed for dietary restriction and downward moderation for binge drinking, alcohol consumption, and pre-drinking. This is indicative of an adaptive pattern – self-control yields superior capacity to act in accordance with intentions for health promoting behaviors and inhibit intention enactment for health risk behaviors. Subsequently, Conner et al. [12] lent further support for the upward moderation effect in multiple health behaviors.

Future studies and avenues for future research

The potential for research syntheses

Proliferation of research on self-control in the context of social cognition theories increases the viability of research syntheses that offer robust evidence in support of the mechanistic effects proposed in the integrated model and further extend them through evaluation of potential moderating conditions. To this end, we summarize two research syntheses currently under development. The first, a pre-registered meta-analysis of research examining associations between trait self-control and social cognition theory constructs,¹ is designed to capitalize on the large sample and statistical power afforded by the synthesized data to provide robust estimates of the mediation effects proposed in

the integrated model [23,24]. The analysis will provide important information on the tenability of the mediation effect and its variability across the extant research. It is also expected to extend knowledge through tests of the effects of key moderators on which the proposed mediation effects may be conditional such as behavior type (e.g., health protection vs. health risk behaviors) and study design (e.g., prospective correlational vs. experimental).

The second is a meta-analysis of studies from two programs of research measuring trait self-control and social cognition theory constructs. The analysis aims to incorporate recent developments in trait self-control measurement suggestive of a multidimensional conceptualization [see 25], specifically studies that have differentiated between two separate but related factors: the first focused on goal-directed action ('initiatory' self-control) and the second focused on reactive responding ('inhibitory' self-control) [26–28]. We will capitalize on the availability of multiple data sets to meta-analytically test the mediation and moderation effects of our proposed model and extend them to the separate trait self-control factors (see Figure 1b). The analysis is expected to augment existing knowledge by illustrating the extent to which each factor is implicated in these proposed mechanisms.

Alternative designs to broaden inferences

The mediation effect proposed in the integrated model, consistent with many tests of effects framed conceptually in terms of direction and cause, has generally been tested in studies adopting designs that preclude strong inferences for either [29,30]. Correlation infers neither direction nor cause, and many tests of this effect, therefore, should be framed with the caveat that inferences drawn are based on theory not the data. Researchers should be compelled to adopt alternative designs in order to offer a stronger basis for such inferences. Foremost among these should be experimental or quasi-experimental designs in which key constructs comprising the proposed effects are varied across experimental and control or comparison groups and the effects on targeted outcomes evaluated. In the context of the mediation of self-control effects on health behavior, current received approaches would advocate for varying trait self-control and, importantly, simultaneous change in the mediator, such as attitudes or risk perceptions, and examining the effect of change in each on health behavior [30]. Varying self-control could be achieved through manipulation, such as through training, or by identifying those high and low in self-control, and examining their effects on health behavior through change in the mediator. Such designs are also most optimal for testing the proposed moderation effect, for example, by estimating the size of the intention-behavior relationship across groups with high or low levels of self-control, either through screening or manipulation.

¹ The analysis is pre-registered on the PROSPERO database of meta-analyses and systematic reviews: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42018095964.

An alternative approach to test the proposed mediation effects would be to employ recent implementations of cross-lagged panel designs (e.g., ‘random intercept’ designs), that permit better inferences of directional effects while controlling for stability [31]. Specifically, this would entail collecting data on all constructs involved in the associations (i.e., trait self-control, relevant social cognition constructs, health behavior) across multiple occasions, and then testing a model specifying cross-lagged effects while simultaneously accounting for temporal and intraindividual stability in the constructs [29]. In the case of the mediation effect, the received design would be to ensure each construct involved in the indirect effect was temporally lagged, enabling tests of cross-lagged mediation effects [32]. To the extent that the cross-lagged mediated effects in the proposed direction is confirmed relative to the effect in the theoretically contraindicated direction the researcher can claim support for the effect.

Conclusion

Given pervasive research identifying trait self-control as a consistent correlate of health behavior participation [8], establishing the psychological mechanisms involved may advance knowledge on the individuals most adapted to persist with health behavior and those likely to lapse, and inform intervention efforts to promote health behavior uptake and maintenance. In this review, we proposed a model outlining how social cognition approaches to intentional behavior may offer mechanistic explanations for the effect of trait self-control on health behavior in a model integrating both perspectives [7]. Specifically, we summarize research specifying and testing the model in which social cognition beliefs and intention mediate effects of the trait self-control on health behavior [12,13,15,21]. The mediation effect summarizes the informational function of trait self-control in shaping individuals’ expectations with respect to future behavioral performance [7]. Accumulating research supports this mechanism, and we propose future research syntheses expected to yield further support for this effect, and extend it through differentiation of initiatory and inhibitory forms of trait self-control [26–28]. We also proposed an additional mechanism in our model in which enactment of intentions is conditional on trait individuals’ trait self-control [7]. This effect reflects how the capacities afforded to those with good self-control (e.g., inhibiting potentially derailing impulses, focused attention on goal-directed actions) facilitates intention enactment. Despite some evidence supporting this effect [12,13], corroboration in tests using large sample meta-analytically synthesized data, as proposed in our future studies, is warranted. Current research, however, would also benefit from corroboration using designs permitting directional and causal inferences, such as experimental designs employing screening or manipulations to vary

trait self-control and recent implementations of panel designs. Similar designs may also offer more robust support for the moderation effect.

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Author contributions

Martin S. Hagger: Conceptualization, Writing – Original Draft, Writing – Review and Editing; *Kyra Hamilton*: Conceptualization, Writing – Original Draft, Writing – Review and Editing.

Declaration of competing interest

Martin S. Hagger and *Kyra Hamilton* declare no competing interests.

Data availability

No data was used for the research described in the article.

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- * of special interest
 - ** of outstanding interest
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Further Information on References of Particular Interest

6. Broad integrated review of health behavior determinants derived from psychological theory providing an overview of key assumptions on which the integrated mechanistic model of trait self-control proposed in the current review is based.
7. Brief conceptual proposal of the key mechanistic effects of trait self-control on health behavior outlined in the current integrated model,

including the indirect effects of trait self-control mediated by social cognition constructs and intentions, and the moderation effect of trait self-control on the intention-health behavior relationship.

8. A modern classic meta-analysis synthesizing associations between multiple measures of trait self-control and health behavior in the extant literature observing consistent, small-to-medium averaged correlations across the extant research.
12. Analysis lending support for the mediation and moderating mechanisms by which trait self-control relates to behavior in multiple behaviors.
13. Key analysis providing support for the two mechanistic effects proposed in the current integrated model: the mediation of the trait self-control-health behavior relation by constructs from social cognition theories and the moderating effect of trait self-control on the intention-health behavior relationship in multiple samples and behaviors.
20. Recent application of a mediational model that adopts a similar basic approach, known as a dispositional-belief-motivational model, to the integrated mechanistic model proposed in the current review.