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## Finding the “self” in self-regulation: The identity-value model

Elliot T. Berkman, Jordan L. Livingston, and Lauren E. Kahn

Department of Psychology and Center for Translational Neuroscience, University of Oregon

### Abstract

Many psychological theories suggest a link between self-regulation and identity, but until now a mechanistic account that suggests ways to improve self-regulation has not been put forth. The identity-value model (IVM) connects the idea from social psychology, that aspects of identity such as core values and group affiliations hold positive subjective value, to the process-focused account from decision-making and behavioral economics, that self-regulation is driven by a dynamic value integration across a range of choice attributes. Together, these ideas imply that goal-directed behaviors that are identity-relevant are more likely to be enacted because they have greater subjective value than identity-irrelevant behaviors. A central hypothesis, therefore, is that interventions that increase the degree to which a target behavior is perceived as self-relevant will improve self-regulation. Additionally, identity-based changes in self-regulation are expected to be mediated by changes in subjective value and its underlying neural systems. In this paper, we define the key constructs relevant to the IVM, explicate the model and delineate its boundary conditions, and describe how it fits with related theories. We also review disparate results in the research literature that might share identity-related value as a common underlying mechanism of action. We close by discussing questions about the model whose answers could advance the study of self-regulation.

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Guiding one’s actions toward goals and away from behaviors that detract from those goals, referred to as self-regulation, is a perennial challenge for human beings. To study goals and how they are more or less successfully pursued is to study a constellation of issues that revolve around the tension between different types of rewards, such as those that are delivered immediately versus later in time (Loewenstein & Prelec, 1992), those motivated primarily by hot versus cold processes (Metcalf & Mischel, 1999), and rewards that are more concrete and proximal versus abstract and distal (Trope & Liberman, 2003). We use the term self-regulation to refer to the set of processes that aligning behavior with long-term goals (Carver & Scheier, 1998), and self-control to refer to the process of resolving conflicts between lower-order and higher-order goals (Duckworth & Gross, 2014).

In this article, we present a process-oriented model of self-control that posits a central role for identity in goal directed behavior. This model shares the assumption of many decision-making models that behavior is driven by a value integration process in which the values of heterogeneous choice attributes (e.g., primary reward value, self-relevance, effort) are dynamically accumulated until a threshold is met, triggering behavior. Focusing on this

value-based choice process as a mechanism of self-regulation is highly advantageous for three reasons. First, it opens channels of knowledge into the self-regulation literature from otherwise unrelated areas of social psychology (e.g., self, identity, and reward) and from neighboring fields (e.g., social neuroscience, neuroeconomics, and philosophy). Second, a value integration model of self-regulation can explain results from social psychology and other fields that are not fully accommodated by current models of self-regulation. And third, it provides avenues for interventions to improve self-regulation that target its underlying valuation process.

## Overview

The Identity-Value Model (IVM) focuses on a specific kind of value—that derived from identity—as a particularly potent motivating factor in self-control. In a self-control conflict, many kinds of inputs can contribute to the total subjective value of each choice option. From this perspective, a successful act of self-control reflects the tipping point at which the cumulative subjective value of a self-controlled behavior (i.e., one of the choice options that is in line with the long-term goal) exceeds that of the alternatives. The subjective value of each response option can be derived from many different sources (e.g., hedonic value, social influence, effort cost), but the IVM emphasizes the role of identity because it is superordinate to many self-regulatory goals (Carver & Scheier, 1998) and relatively enduring, and may even be inherently intertwined in the computation of subjective value (Northoff & Hayes, 2011).

The overarching prediction of the IVM is that identity can promote self-control in identity-relevant domains by increasing the value of goal-relevant behaviors (i.e., actions, decisions, and choices) that, were they not seen as self-relevant, would be undervalued relative to alternative behaviors. This hypothesis assumes that a relevant aspect of identity is salient and perceived as related to the self-controlled behavior. For example, consider someone who is trying to quit smoking. The IVM predicts that, all else being equal, a person will be more likely to succeed in resisting a temptation to smoke—both at a given moment and cumulatively across the quit attempt—to the extent that she identifies as a “quitter” and that her quitter identity tends to be salient at the times that she decides whether to smoke.

Though the cumulative value of a behavior derives from many sources, the IVM places particular emphasis on the role of identity as a source of value for self-regulatory behaviors. The rationale for focusing on identity is that it is, by definition, relatively stable across time and contexts compared to other potential sources of value (e.g., social influence or monetary incentives). Identity exists on a comparable plane with long-term goals in the sense that it is relatively abstract and enduring. Additionally, aspects of identity are generally positively valued and chronically accessible. Together, these features of identity (stability, positivity, and accessibility) make it a promising target for interventions that aim to increase self-regulation by increasing the value of goal-relevant behaviors. If being a quitter (or a dieter or an exerciser) is part of a person’s identity and integral to who she aspires to be, then maintaining and reinforcing that identity will be valuable across time and in a variety of situations.

The model pulls together several distinct yet related threads of inquiry from social psychology, cognitive neuroscience, and neuroeconomics that have evolved in parallel but have yet to be woven together into a unifying framework (Figure 1). The IVM builds in particular on two core ideas: that identity-relevant behaviors are more valued than identity-irrelevant ones, and that a subjective value integration is a mechanism by which self-control decisions are made. In addition to the data behind these two ideas, the theory is supported by evidence that identity can improve self-control in domains that part of one's self-concept (here referred to as *identified* domains); that the neural systems related to identity and value are substantially overlapping in dopaminergic regions such as the ventromedial prefrontal cortex (vmPFC); and that activation in the vmPFC and related regions mediate self-control success when relevant aspects of identity are made salient. In articulating this model, we lay out its assumptions and describe how it accounts for a number of results across a range of self-regulation behaviors. We close by discussing several questions the model poses that are currently unanswered.

## Theory and evidence

The main prediction of the IVM is that behaviors that are connected to identity are more likely to be enacted because they hold greater subjective value. To the extent that self-control reflects the output of a value comparison among response options, then self-regulatory goals (e.g., smoking cessation, dieting, exercise) that are more central to identity will have more value and consequently be more likely to succeed. The subjective value of a given behavior is determined by a number of input sources including, but not limited to, identity (Figure 1).

### What do we mean by self-regulation and self-control?

Self-regulation is defined here as the process of directing one's actions, thoughts, and feelings toward a goal (Carver & Scheier, 2011). A goal is a cognitive construct that specifies an intended outcome, typically one that is relatively long in duration and wide in scope compared to immediate or hedonic goals. Goals are embedded in an action hierarchy with long-term, abstract, "be" goals at the top and short-term, concrete, "do" goals at the bottom (Carver & Scheier, 1998). For example, "eat healthfully" is a high-level goal that might require self-control in cases when it conflicts with the low-level goal to "eat this donut". Our working definition, then, is that self-control is the set of processes that promote the enactment of psychologically distant goals when they conflict with psychologically proximal ones. It is noteworthy that in this definition self-control includes not only overriding or inhibiting prepotent responses (typically referred to as inhibitory control) but also biasing behavior toward desired responses, usually in the face of prepotent alternative responses or mere inertia (sometimes referred to as goal striving). Self-control is a critical component of self-regulation because goal conflicts are common.

Self-control is usually considered to operate through a competition between two opposing processes: one control process that promotes successful self-regulation by impelling behavior toward a goal and a second impulsive process that promotes failed self-regulation by impelling behavior toward an alternative behavior that is counter to the goal (Hofmann, Friese, & Strack, 2009). For example, in the classic dieter's dilemma, the impulsive process

is a craving for a tasty but high-calorie snack and the control process is the ability to resist the craving (e.g., through attentional deployment, cognitive control, or some other top-down process). These “dual process” models explain the outcome of a given self-control effort as the product of a competition between the two processes, whereby the stronger “wins out” to enact the behavior.

The dominant process is nearly always inferred by observation. For example, if a hungry participant does not eat a tempting food then his behavior is attributed to effective self-control, but if he eats it this is attributed to poor self-control and/or excessive impulsiveness. Using this logic to infer a mental process from observed behavior is a key limitation of studies on dual process models because it is somewhat circular; if there are only two outcomes, then only two processes can be inferred. Thus, no pattern of observations can falsify the model in studies following this template. Also problematic is the lack of a specific mechanism by which the conflict between the two processes is resolved.

A valuation-based model of self-control addresses both of these issues. If both processes serve as inputs to a common valuation process instead of interacting directly with one another, then additional (third, fourth, etc.) processes can contribute to self-control conflict resolution simply by also contributing to the value calculation. Researchers in behavioral economics and decision science have built computational models of a value-integration process that capture many of the properties of self-control choices, and these models are beginning to be articulated in a coherent way across psychological, computational, and neural levels (Berkman, Hutcherson, Livingston, Kahn, & Inzlicht, in press). Valuation, then, represents a parsimonious framework to understand how multiple processes come together and give rise to specific patterns of behavior during self-control, where the relevant neural systems are and how they interact, and at what points in the process interventions are mostly likely to be effective and enduring.

### **What do we mean by “identity”?**

Following the long history of the study of self and identity in psychology, we define identity as a relatively stable mental representation of the self that includes, but is not limited to, cherished core values and beliefs, social identities, long-term goals, and important past experiences (McAdams, 2013; Swann & Bosson, 2010). This definition fits with the narrative, edited aspect of the self that William James classically referred to as the “Me,” which is to be distinguished from the phenomenological “stream of consciousness” aspect of self or “I” (James, 1890). Neuroimaging has shown that thinking about one’s own beliefs and values (e.g., Mitchell, Macrae, & Banaji, 2006), identities (e.g., Pfeifer, Kahn, Merchant, Peake, Veroude, Masten, et al., 2013), and past experiences (e.g., Bonnici, Chadwick, Lutti, Hassabis, Weiskopf, & Maguire, 2012) all recruit activity in the vmPFC, suggesting that these aspects of identity are related to each other at a computational level.

Though our definition casts identity as a representation that is relatively stable across time, the IVM also draws upon the notion of a “working self-concept”—that different aspects of the whole of identity can be more or less salient in a given moment (Markus & Kunda, 1986). We use the term identity to reflect both the active (i.e., salient and accessible in the moment) and inactive (i.e., relatively less salient and accessible) parts of the self-concept,

which includes core values, social identities, long-term goals, past experiences, and so forth, but assume that the effects of identity are primarily driven by its active parts. Because the IVM holds that the active identity directs both motivation (e.g., subjective value) and cognition (e.g., information processing) in the moment, aligning goals and identity—and particularly the working self-concept—is a critically important step toward goal achievement. (This also implies that individuals with larger working memory capacities would self-regulate more effectively if some aspects of their identities were goal-relevant. There is some evidence for this, e.g., Schmeichel & Demaree, 2010; Schmeichel, Volkhov, & Demaree, 2008.) In short, we predict that behaviors related to active aspects of identity will have greater subjective value than behaviors that are related to inactive aspects or unrelated to identity entirely.

Another definitional issue related to identity is the distinction between the “actual self”, or the self-concept an individual believes to be currently accurate, and the “ideal self”, or the self-concept toward which an individual strives (Higgins, 1987). We define identity to include aspects of both. For example, someone can identify as a smoker (actual self) but also strongly desire to be a quitter (ideal self). In these cases, one factor that drives which of the two will “win out” is the degree to which one versus the other is more central (vs. peripheral) to identity (Greenwald et al., 2002), which would presumably make it more likely to occupy the working self-concept, or to be active, at any given moment. A central challenge in self-regulation, then, is to maintain within one’s working self-concept the goal-relevant aspects of one’s ideal, as opposed to actual, self. We return to the matter of actual and ideal selves in the final section, but for now it will suffice to note what we consider to be parts of identity that can, in turn, endow related behaviors with subjective value.

### What do we mean by “subjective value”?

Value has been given a variety of definitions in the research literature, but here we use it to refer to a subjective sense of net reward or utility (positive value) or punishment or disutility (negative value) associated with a given behavior (Camerer & Loewenstein, 2004; Kahneman, 2003). Value is important to self-regulation because choices about behaviors relevant to goals play out through a value accumulation process: attributes, including the identity-relevance, of each response option are assigned a weighted value and dynamically integrated to guide choice (Berkman et al., in press). Value is a continuous, stochastic, and fluctuating process that depends on which choices are presented and which of their attributes are salient. For the purposes of the IVM, value is a “common currency” that enables a comparison among qualitatively different outcomes (Georgescu-Roegen, 1968; Glimcher & Rustichini, 2004). For example, in deciding whether or not to go for a run, an exerciser might compare the anticipated negative value derived from the effort and discomfort of running against the anticipated positive value associated with living up to social expectations and his or her long-term goals and identity. The term “value” is sometimes used synonymously with “reward”; however, reward generally refers to the outcome of a decision, whereas value refers to the expected outcome (Montague, King-Casas, & Cohen, 2006). As such, subjective value is computed in the pre-choice period, after options have been considered but before a decision has been made. In the behavioral economics and

neuroeconomics literatures, this kind of value is called “decision value” because it represents a key input to the decision-making process (Chib, Rangel, Shimojo, & O’Doherty, 2009).

One way that researchers in neuroeconomics have sought to understand the processes behind the unified value calculation is by identifying its neuroanatomical substrates. With remarkable consistency, these researchers have found that activity in the vmPFC and related mesolimbic dopamine structures such as the orbitofrontal cortex, OFC, and the ventral striatum, VS (Wallis, 2007) tracks closely with the subjective value of a variety of stimuli including food, goods, money, and charitable donations (Chib et al., 2009; Gallagher, McMahan, & Schoenbaum, 1999; Hare, Camerer, Knopfle, O’Doherty, & Rangel, 2010; Izuma, Saito, Sadato, 2008; Levy & Glimcher, 2011; O’Doherty, 2007). Thus, there is substantial overlap in the neuroanatomical regions involved in subjective value and identity.

### **Prediction 1: Identity in a domain increases the value of domain-relevant behaviors**

The first hypothesis of the IVM is that there is a positive relationship between identity and value. Identified constructs (e.g., goals, relationships, beliefs) will have higher subjective value than non-identified constructs. Enacting identified behaviors has value because it verifies one’s identity to one’s self (Swann, Pelham, & Krull, 1989). An important conceptual distinction here is between *core values*, which are part of one’s identity (e.g., loyalty), and *subjective value*, which is a momentary evaluation of the subjective worth of a particular action, object, belief, choice, etc. This first prediction is meant to describe the relationship between identity (including core values) and subjective value. For example, if the principle that “education is important” were a core value in a person’s identity, then that person would be hypothesized to value, say, a college degree and be more disposed to work hard at academics compared to someone who does not identify with the importance of education.

The relationship between identity and value is a core tenant of many theories from social psychology. One of the fundamental conclusions of the rich history of research on self-esteem is that people are motivated to maintain a positive self-image (Rosenberg, 1979), and that maintaining valued identities is one of the main ways that we do so (Crocker & Wolfe, 2001; Pelham, 1995; Pelham & Swann, 1989). One theorist even compared the self to a totalitarian regime in its apparent motive to see itself as fundamentally good, stable, and consistent (Greenwald, 1980). A central prediction of Self-Affirmation Theory (Steele, 1988) is that affirming personal values buffers the self from threats. Recent perspectives from neuroscience, which we will review further below, also point to a close interconnection between identity and reward/value (Kim & Johnson, 2014a; Northoff & Hayes, 2011). Together, this work suggests that (a) maintaining a global, positive, and unified sense of self (“self-integrity”) is a fundamental motive for humans, and (b) one of the main ways people do this is by integrating specific positive core values (e.g., family), broad goals (e.g., be kind), and social group memberships (e.g., social psychologists) into their identities.

The strategy of coupling identity to value has both risks and benefits. On one hand, research on Social Identity Theory (Tajfel & Turner, 1979) has shown how threats to social identity can motivate group-based discrimination such as in-group favoritism and out-group bias (Brewer, 1979), or cause disidentification from certain identities that are seen as unfavorable

or unwelcoming to other identities (e.g., women distance themselves from STEM fields following exposure to gender stereotypic TV ads; Davies, Spencer, Quinn, & Gerhardtstein, 2002). On the other hand, because different aspects of the self are linked and value is somewhat fluid between them, bolstering one part of one's identity can protect other parts from threats or the whole from integrity threat (Cohen & Sherman, 2014; Sherman & Cohen, 2002). Deriving a sense of self-worth from core values and group memberships has both positive and negative consequences that follow from the fact that those core values and groups are closely linked with the self. An important consideration for the IVM, then, is that the failure of goals that are closely linked to the self will be threatening and could cause goal disengagement. We will return to this issue below in our discussion of potential interventions based on the model.

A parsimonious way of integrating the findings reviewed above is by positing that, among its cognitive functions such as attentional biasing, identity also plays the motivational role of maintaining and protecting the positive value of the self and its linked construct. Social identities, long-term goals, and core values contribute to positive self-esteem by increasing the subjective value of objects related to the self, which then become part of the *extended self* (Belk, 1989; Wicklund & Gollwitzer, 1982; Kim & Johnson, 2014b). Notably, the boost in subjective value associated with ownership of objects, i.e., the endowment effect (Kahneman, Knetsch, & Thaler, 1991), extends as well to beliefs and attitudes (De Dreu & van Knippenberg, 2005). Self-enhancement (e.g., through in-group favoritism or positive illusions) feels good in part because it increases value of the identity, and self-threat (e.g., discrimination or negative health effects of identified behaviors) feel bad in part because it decreases the value of the identity. Different aspects of identity have varying levels of value, each contributing to a global sense of self-worth, with more central and active aspects contributing with a greater weight than more peripheral and inactive aspects (Greenwald & Pratkanis, 1984). This idea is related to the notion from Self-Affirmation Theory that affirming activities such as thinking or writing about core values protects the self from threats—even ones unrelated to the self-affirmation—by making the value of the self more salient relative to the threats against it (Sherman, 2013). In both cases, self-enhancement and self-threat contribute toward a global, fluctuating sense of self-worth and integrity. Engaging in behaviors that promote and reinforce the value and integrity of the self, therefore, becomes an effective way to maintain self-worth.

An interesting theoretical nuance is the question of directionality: Does identity lead to value, or do behaviors that are valued for another reason (e.g., extrinsic rewards) become incorporated into one's identity? These are not mutually exclusive, so a bidirectional relationship is one possibility. For the present purposes, we note that the IVM accommodates either a unidirectional relationship from identity to value or a bidirectional relationship (an advantage of the model), so this issue does not need to be resolved at this point. However, it remains an important question for identity research that deserves empirical attention, and one that will re-emerge in the discussion below about the potential of identity-bolstering interventions to increase self-regulation.

**Neuroimaging data relevant to Prediction 1: Overlapping neural systems for identity and subjective value**—Our model claims that aspects of identity hold

subjective value because of the strong motive to maintain self-worth. Evidence for this comes from social psychology, but it remains mostly indirect because the construct of value is inferred based on behavior and not easily directly measured. Corroborating, though still indirect, evidence for the link between identity and value comes from the related field of social neuroscience, where researchers have investigated the brain regions and networks that underlie many of the social psychological concepts relevant to the conceptual model in Figure 1, especially identity (and self-concept) and subjective value.

One of the marquee claims of social neuroscience is that self-reflection and social cognition are distinct from other kinds of information processing, reflected in a special role of the medial prefrontal cortex (mPFC), and particularly its ventral aspect (i.e., the vmPFC), in those processes (Amodio & Frith, 2006; Mitchell, 2009). Though the veracity of that claim is still debated, the evidence marshaled in its favor is relevant here because the evidence has consistently found the vmPFC to be a locus of self-related information processing. The vmPFC, among other regions, is active when people reflect on their traits (Kelley, Macrae, Wyland, Caglar, Inati, & Heatherton, 2002; Pfeifer, Lieberman, & Dapretto, 2007), attitudes and preferences (Ames, Jenkins, Banaji, & Mitchell, 2008; Mitchell, Macrae, & Banaji, 2006), and ongoing emotional experience (Ochsner, Knierim, Ludlow, Hanelin, Ramachandran, Glover, et al., 2004; Phan, Wager, Taylor, & Liberzon, 2002). A recent meta-analysis of over 200 neuroimaging studies further supports the role of mPFC in self-related processes, particularly implicating the vmPFC in self-processing (Van Overwalle, 2009).

A separate line of work has evolved in the neuroeconomics literature implicating the vmPFC in the computation of subjective value (referred to in economics as decision utility). This work conceptualizes decision-making as value-based choice process (Rangel, Camerer, & Montague, 2008), and consistently finds the vmPFC to be involved in value computations of both appetitive and aversive stimuli (Tom, Fox, Trepel, & Poldrack, 2007). The vmPFC appears to integrate information across a range of properties about a stimulus to produce a final value signal that includes stimulus properties, active goals, costs, and other types of choice-relevant information (Rangel & Hare, 2010). Activity in the vmPFC tracks the subjective value of a range of stimulus types (Lebreton, Jorge, Michel, Thirion, & Pessiglione, 2009; Padoa-Schioppa & Assad, 2006; Philiastides, Biele, & Heekeren, 2010). For example, vmPFC activity predicts choice regardless of whether the stimuli in question are food or money (Levy & Glimcher, 2011). A related study found that activity in vmPFC scales with the subjective value of a monetary gain for oneself and another person (Zaki, Lopez, & Mitchell, 2014). These findings converge in identifying the vmPFC as playing a central role in the integration of subjective value.

The presumptive purpose of this “unified valuation” system that integrates across disparate outcomes is to facilitate choice among them (Levy & Glimcher, 2011). For example, the vmPFC value signal predicts decisions regardless of whether they appear to be driven by impulsive or self-controlled processes (e.g., keeping money vs. giving it to charity, or eating unhealthy vs. healthy foods; Hare, Camerer, Knoeplfle, O’Doherty, & Rangel, 2010; Hare, Malmaud, & Rangel, 2011a). In another study, participants separately rated the tastiness and healthiness of a series of food stimuli, and then made choices about whether or not to eat each food (with one choice randomly selected at the conclusion of the study and given to the



participant to eat). Activity in vmPFC predicted stimulus value (i.e., choice) regardless of whether the choice was driven by health or taste concerns (Hare, Camerer, & Rangel, 2009). The vmPFC thus appears to be a point of convergence for value-related information during choice.

Consistent with this idea, vmPFC receives inputs from other brain regions depending on the contextual cues and response options available. For example, the dorsolateral prefrontal cortex (dlPFC) is functionally connected with the vmPFC when higher-order goals such as health concerns or social factors are made salient (Hare et al., 2010; 2011a; Hutcherson, Plassman, Gross, & Rangel, 2012). There is also evidence that the value of potential response options are reflected in the vmPFC before specific action plans are selected (Wunderlich, Rangel, & O'Doherty, 2010), but that value signals provide input to downstream brain regions that are responsible for selecting and implementing motor plans (Hare, Schultz, Camerer, O'Doherty, & Rangel, 2011b). Taken together, then, the emerging view from the neuroeconomics literature is that the vmPFC represents a point of convergence for a variety of input signals that are relevant to the decision at hand, and its activation reflects a dynamic value integration process that subsequently biases behavior toward high-valued actions.

Noting the similarity in the brain regions involved between studies of self and value, scholars have now begun directly investigating the overlap between these two. For example, when directly choosing between monetary reward and self-disclosure (e.g., choosing between keeping information private for \$0.02 vs. sharing information for \$0.01), individuals in many cases were willing to forego the former in favor of the latter, and this disclosure was associated with increased activation in the vmPFC in addition to other mesolimbic dopamine structures (Tamir & Mitchell, 2012). Another study dissociated value from self-relevance by crossing an endowment manipulation with an ingroup/outgroup manipulation; participants were scanned before and after they imagined owning an item that was highly valued by either an ingroup or an outgroup member (Kim & Johnson, 2014a). The vmPFC was more active when participants imagined ingroup items that increased in value post-ownership, and also when participants imagined outgroup items that later *decreased* in value. Furthermore, this effect was moderated by ingroup-outgroup implicit associations such that more ingroup bias was associated with greater vmPFC increases for ingroup items and greater decreases for outgroup items. This pattern of results supports the role of vmPFC in a unified subjective value calculation that reflects not only monetary value (e.g., ownership) but also social value (e.g., ingroup preference) vis-a-vis the self. In line with an account of vmPFC reflecting a hybrid of momentary self-relevance and value, the researchers characterized its function as “assign[ing] significance to self-relevant experiences based on individuals’ motivations (needs, goals) that are salient at a given moment” (Kim & Johnson, 2014a).

To provide further evidence of the coupling between identity and value at the level of neural function, we used the Neurosynth database (Yarkoni, Poldrack, Nichols, Van Essen, & Wager, 2011) to conduct a meta-analysis and conjunction of studies on identity (“self” and “self-referential” terms in the database) and value (“value” term in the database). At the time of the meta-analysis (March 2017) there were 903 studies related to identity/self and 344

related to value. For both of these, we computed a forward-inference map of activations that are likely to appear (with 1% family-wise error rate) in studies that use the term. We then created a conjunction map of regions that appeared in both identity and value maps (Figure 2). This image contained several regions along the medial cortical wall, notably the vmPFC, the posterior cingulate, and the rostral dorsomedial prefrontal cortex. As expected, the vmPFC was the single largest cluster to be consistently associated with both identity and value. We interpret this and the other neuroscience evidence presented here as broadly consistent with the ideas that (a) identity and value are functionally related and (b) relative to other potential sources of value that do not necessarily invoke the self (e.g., health considerations for a smoker), identity might have special status because it overlaps to a great degree with value in terms of its neural systems and conceptual representation. (Other sources of value may be generated or represented in other areas such as the dlPFC in the case of health concerns; Hare et al., 2011a.) It may even be that identity and value are inseparable, in the sense that things that are valued are by definition part of the self, and all aspects of the self are valued (Northoff & Hayes, 2011), in which case our case for focusing particularly on the role of identity in self-regulation is even stronger.

### **Prediction 2: Subjective value contributes to self-regulation toward relevant goals**

The second link in our model is a positive relationship between value, derived from identity among other sources, and self-regulation. The most direct evidence for this path comes from research in behavioral economics and neuroeconomics, which conceptualize self-regulation as a class of value-based decision-making in which each response option is assigned a subjective value, the values are compared, and the option with the highest value is chosen (Kable & Glimcher, 2007; Rangel et al., 2008; Rieskamp, Busemeyer, & Mellers, 2006). Computational modeling shows that even simple models of this sort (sometimes called drift-diffusion models) capture many of the properties of self-regulation decisions such as how they differ when made quickly versus slowly and how they change with the presentation of new information (e.g., taste versus health information about food choices; Sullivan, Hutcherson, Harris, & Rangel, 2015). Critical to the model presented here, the value for each option is computed by integrating inputs from a number of qualitatively different sources such as hedonic values, ongoing goals, or social influence (Rangel & Hare, 2010). For example, a person may assign a value of +7 to a donut and a value of +2 to a piece of celery based on tastiness alone, but when dieting might modify those scores by -9 and +5, respectively, resulting in a decision to eat the celery instead, thereby promoting self-regulation.

From this perspective, self-regulation is less the result of a battle between “hot” impulses and “cold” control (Metcalf & Mischel, 1999) than it is an integration of value inputs from an arbitrary number of sources including self-relevance, primary rewards, social value and effort costs (Berkman et al., in press; see Figure 1). Computational modeling has demonstrated that choices that appear to be driven by two competing systems can arise from a unified value-integration process (Hutcherson, Bushong, & Rangel, 2015). Under a value-integration model, self-regulation success can be increased by amplifying the value of the goal-related behavior, attenuating the value of the alternative choices, or some combination of the two. Evidence of the efficacy of the first approach comes from research on

contingency management treatment for substance use disorders (Bigelow & Silverman, 1999), in which the value of drug abstinence is increased with monetary incentives. A meta-analysis found this approach to have an effect size  $d = 0.42$  on treatment for alcohol, tobacco, and illicit drugs, which was larger than therapy ( $d = 0.25$ ) and outpatient treatment ( $d = 0.37$ ), and comparable to methadone treatment for opiate use (Prendergast, Podus, Finney, Greenwell, & Roll, 2006). Similarly, “precommitting” to buy more healthy foods at the risk of losing financial incentives is more effective than having the incentives alone (Schwartz, Mochon, Wyper, Maroba, Patel, & Ariely, 2014). Another line of work relating value to self-regulation shows that monetary incentives increase persistence at exercise (Cabanac, 1986), endurance on a cold-pressor task (Baker & Kirsch, 1991), and performance on a difficult cognitive task (Boksem, Meijman, & Lorist, 2006). Manipulating the salience of self-regulation itself increases self-regulation performance, presumably because many people value willpower as an attribute (Magen & Gross, 2007; Study 2). In that study, participants completed a self-regulation task twice, and in between were randomly assigned to reconstrue *the task itself* as a measure of their own “willpower” or not. Performance improved only among participants whose perceptions of the task were changed from non-diagnostic to diagnostic of willpower.

Other examples of the link between value and self-regulation come from research on the ego depletion effect (Baumeister & Heatherton, 1996), which refers to the observation that self-regulation performance decreases with sequential use across different tasks. Ego depletion has been observed in over 100 studies using a range of tasks and operationalizations (Hagger, Wood, Stiff, & Chatzisarantis, 2010; however, the bias-corrected effect size may be quite small, Carter & McCullough, 2014; Inzlicht & Berkman, 2015). Nonetheless, giving participants monetary incentives for performance (Muraven & Slessareva, 2003), or even encouraging participants to *think* about incentives (Boucher & Kofos, 2012), mitigates or eliminates the ego depletion effect, consistent with the idea that increasing the value of self-regulation can improve performance that would otherwise drop off. Value can also be enhanced by adding other inputs or rewards to the intervening period between the two self-regulation tasks in a typical ego depletion paradigm. Smoking cigarettes (Heckman, Ditre, & Brandon, 2012), watching a favorite television program (Derrick, 2013), experiencing a positive change in mood (Tice, Baumeister, Shmueli, & Muraven, 2007), gargling with sugar (Hagger & Chatzisarantis, 2013; Molden, Hui, Scholer, Meier, Noreen, D’Agostino, et al., 2012), meditating (Friese, Messner, & Schaffner, 2012), or even praying (Friese & Wanke, 2014) all prevent the reductions in self-regulation characteristic of ego depletion.

These results are difficult to explain in terms of a dual-process model, whereby an impulsive process takes over when the control process becomes depleted, because it is unclear how the manipulations described provide renewed resources to the control process. However, the results are broadly consistent with the view that self-regulation is a function of an ongoing valuation integration with a variety of inputs. According to the IVM, the ego depletion effect reflects a decrease in the subjective value of self-regulation (relative to other, more hedonic behaviors) over time. The valuation model can account for ego depletion in terms of the diminishing marginal value of effort: the value of completing the initial task is high enough to warrant working hard on it, but then the value of completing subsequent tasks is reduced because further effort does not produce sufficient additional gains (Berkman, Kahn, &

Livingston, 2016). From this perspective, it follows that manipulations that add value to persistence, either by rewarding it directly or drawing the participant's attention to valued aspects of the self, would restore the subjective value of self-regulation, which, in ego depletion studies, is generally more consistent with participants' identities (e.g., persistence, achievement, or pleasing the experimenter) than the alternative (e.g., quitting, failing, or disappointing the experimenter).

An interesting question is whether value needs to be directly relevant to self-regulation to have an impact. For example, in some cases participants were paid (e.g., Boksem et al., 2006) or otherwise incentivized (e.g., Magen & Gross, 2007) for better performance, whereas in other cases participants were simply rewarded in a way that was unrelated to task performance (e.g., Heckman et al., 2012). How could it be that simply rewarding people can improve their self-regulation? In a way, this parallels the idea of fluidity of value across self domains (Greenwald, 1980), which explains why bolstering one aspect of self can protect otherwise unrelated aspects of self from threat (Steele, 1988). The "fluidity of value" idea is also consistent with the *process model* (or shifting-priorities model) of ego depletion (Inzlicht & Schmeichel, 2012; Inzlicht, Schmeichel, & Macrae, 2014), which states that "depleting" tasks cause a motivational shift from "have-to" to "want-to" goals as people try to maintain a balance between them. Rewards delivered between two self-regulation tasks improve performance on the second task by fulfilling a hedonic "want-to" motive, thereby facilitating a shift back to effortful, "have-to" tasks.

**Neuroscience evidence consistent with Prediction 2: A central role for value-related brain regions in self-regulation**—Computations in the vmPFC and related regions appear to represent both (a) self-related processes, particularly those relating to self-concept attributes, preferences, and traits, and (b) subjective value of options during choice. A function of these regions during choice could be described as *matching preferences with possibilities*. This function is on display when the situation might require self-regulation, when the behavioral possibilities each have some amount of value but one is more in line with long-term goals than the other. For example, in a classic dieter's dilemma where someone is faced with a tasty but unhealthy treat and a bland but healthy food, the IVM predicts that these regions would play a decisive role in tracking which kind of value trumps: taste or health. Evidence reveals that the vmPFC plays exactly that role during choice, tracking decisions in these kinds of self-regulatory situations (Hare et al., 2009, 2011b; Hutcherson et al., 2012; Plassmann, O'Doherty, & Rangel, 2010). In one study (Hare et al., 2011), participants were presented with health-versus-taste decisions with or without the presence of health cues. As expected, health cues increased the likelihood of healthy choices. Tellingly, the healthiness rating of the foods (assessed earlier) was strongly correlated with vmPFC activity at the moment of decision, which in turn predicted the food choice. When unhealthy foods were selected, their earlier *tastiness* ratings were correlated with vmPFC activity during choice. Further, activity in vmPFC before healthy choices was coupled with activity in another brain region, the dorsolateral prefrontal cortex (DLPFC), which is frequently associated with executive control, suggesting that this region modulated the value signal in the vmPFC to produce healthy choices. We take this evidence to support

the claim that vmPFC contributes to self-regulation by reflecting the subjective value of a choice, and that this value can be modulated by ongoing goals.

Studies of “intertemporal choice” between smaller-sooner and larger-later options provide further evidence of a central role of vmPFC in self-regulation. The challenge in effective self-regulation in intertemporal choice, which is usually defined as choosing the larger-later over the smaller-sooner reward, is in finding a way to boost the immediate subjective value of the former despite the fact that it has no immediate monetary value. In economic terms, each individual has an idiosyncratic “discount function” that relates the duration of the delay and the payout to the immediate subjective value (Laibson, 1997; Loewenstein & Prelec, 1992); a person with a flat discount function values immediate and delayed rewards equally, whereas a person with a steep discount function is biased toward immediate rewards.

According to the IVM, the degree of this temporal discounting can be mitigated by amplifying the value of the larger-later option or by attenuating the value of the smaller-sooner option. In a classic study, Kable and Glimcher (2007) showed that activity in vmPFC (and two other regions) tracked the subjective values of larger-later options when the smaller-sooner options were held constant, and did so across subjects with a range of discount parameters, consistent with the idea that activity in this region indexes the value of both immediate and delayed decision options in self-regulation contexts, and both within and across individuals. Another study leveraged the fact that reframing intertemporal choice to include an “explicit zero” (e.g., offering participants a choice of “either \$5 now *and* \$0 later or \$0 now and \$10 later”) increases larger-later choices (Magen, Dweck, & Gross, 2008) to characterize the neural dynamics of shifting valuation; in that study (Magen, Kim, Dweck, Gross, & McClure, 2014), reframing to include an explicit zero increased activation in the ventral striatum (a region functionally and anatomically interconnected with the vmPFC) during larger-later choices. Other studies have shown that activity and connectivity of the vmPFC during exposure to health messaging (e.g., the benefits of physical activity) predicts successful self-regulation in response to the messages (Cooper, Bassett, & Falk, 2017; Falk et al., 2015). In one case, so-called “top-down control” regions impaired self-regulation by boosting the value of the smaller-sooner reward (Hayashi, Ko, Strafella, & Dagher, 2013). In that study, information about whether or not a cigarette would be available to smokers was represented in the DLPFC, which in turn was coupled with the vmPFC and related strongly with cravings; deactivation of the DLPFC by transcranial magnetic stimulation eliminated its coupling with vmPFC and reduced cravings. These studies are all consistent with the ideas that the vmPFC provides an online index of the subjective value of choice options during self-regulation, and that its modulation by DLPFC, ventral striatum, and other regions can contribute to, or even detract from, self-regulation behavior depending on the balance of the value inputs.

Put together, Predictions 1 and 2 suggest a third, indirect, relationship between identity and self-regulation. We review some of the evidence for this relationship from a wide range of sources below. Before we do so, however, we first describe the scope of the model in terms of the situations in which the model is expected to apply and the conditions that are assumed to be met. As we summarize below, it is under these conditions that the relationship between identity and self-regulation emerges most strongly.

## Theoretical scope and assumptions

The IVM applies any time an individual is faced with a self-regulation dilemma, defined as a situation with two or more response options that vary in terms of their fit with ongoing goals. Examples of self-regulation dilemmas include classic dieting situations where a healthy option is pitted against a tasty one, intertemporal choice scenarios where greater utility can be achieved at the cost of a temporal delay, and labor/leisure trade-offs where immediate relaxation comes at the cost of reduced or delayed productivity. The IVM is thus relevant to a broad range of situations that involve some degree of choice among goal-relevant behaviors. Though it is probable that the effect of identity on value computations influences other variables too (e.g., moral decisions; Hutcherson et al., 2015), for now we specifically focus on self-regulation given its importance to well-being and physical and mental health (e.g., Tangney, Baumeister, & Boone, 2004).

### Identity is salient and perceived as relevant to the behavior at hand

Within this broad range of self-regulation situations, a central prediction of the IVM is that the extent to which an aspect of identity is *salient* and *perceived as relevant to the action at hand* will increase the subjective value of that action, in turn increasing the likelihood of its enactment. In other words, salience and perceived relevance are preconditions for identity to influence self-regulation. Salience refers to the level of cognitive accessibility of some aspect or aspects of one's identity, referred to elsewhere as the "working self-concept" (Markus & Kunda, 1986). Salience is important given the complexity and dynamic nature of self-concepts, which do not exist as a unitary construct in working memory with all parts being equally accessible at all times. Instead, various aspects of one's identity can be brought to the fore of consciousness for any number of reasons including motivational (Dodgson & Wood, 1998) and situational (Ellemers, Spears, & Doosje, 2002; Oyserman, 2007; Turner, Oakes, Haslam, & McGarty, 1994) ones. Relevance refers to the extent to which an aspect of identity is perceived as applicable to the behavior at hand. We characterize relevance as a matter of degree rather than absolute presence or absence, and as such variation in perceived relevance can amplify or attenuate the effect of a given identity on subjective value. Identity, and even central aspects of identity, will only impart values to behaviors that are seen as identity-relevant. For example, even if I see being a good cook as central to who I am, slogging through a difficult cooking class will have high identity-value only if I make the connection that finishing that class is relevant to my "good cook" identity. The IVM requires that the self-regulated behavior be appraised (though not necessarily consciously) as relevant to some aspect of identity. This flexibility of construal is thus a potential point of intervention for increasing self-regulation, and one to which we will return in the concluding section about questions for the future of self-regulation research.

A clear example of the importance of salience and perceptions in self-regulation comes from the ego depletion literature. Studies there have now shown that perceptions and beliefs about the task and/or one's own self-regulation capacity can reduce or eliminate the ego depletion effect. For example, people who hold lay theories that willpower is an unlimited resource do not evince the ego depletion effect (Job, Dweck, & Walton, 2010), and ego depletion tracks with people's perceptions of their degree of depletion, even when the participants were not

actually depleted (Clarkson, Hirt, Jia, & Alexander, 2010). Though there are a number of possible explanations for these effects including strategic resource allocation (Clarkson et al., 2010) and self-verification (Swann et al., 1989), they also fit within the IVM. Specifically, the way a task is presented to participants (e.g., in terms of difficulty or relevance to willpower) might make certain aspects of identity more or less salient (e.g., “I think of myself as a person with strong willpower”) and can thus change the overall value calculation.

### **The relevant aspect of identity is positive**

After relevance and salience, a third key assumption is that identity is positive. Though social psychological research and theory on self and identity strongly support the notion that identity is positively valenced for most people most of the time (Diener & Diener, 1996; Epstein, 1973; Greenwald, 1980; Steele, 1988), this is not always the case. For example, a minority of people have low enough self-esteem that their identities might be considered negatively valenced (Baumeister, 1993). This may also be the case for people who are clinically depressed (Roberts, Gotlib, & Kassel, 1996; Swann, Wenzlaff, & Tafari, 1992). Even among people who have positive overall self-esteem, it seems that most have at least some negatively valenced identity aspects (Swann, 1992; Swann et al., 1989), or vary in their ability to compartmentalize the positive and negative aspects of their identities (Showers & Zeigler-Hill, 2007). Given that all or part of an individual’s identity has no or even negative value in these cases, the theory predicts no facilitation of self-regulation by identity. If anything, it is possible that verification of a negatively-valued aspect of identity could work against self-regulation (Swann et al., 1989). For example, an individual who believes himself to be impulsive might lapse in a cigarette cessation attempt in part to affirm that belief.

**What happens when a positive identity is threatened?**—We alluded above to some of the compensatory processes that can be launched to protect identities from threat. It is important to consider these kinds of processes here because the possibility of self-regulation failure may become threatening when the goal being pursued is seen as highly self- or identity-relevant. Faced with this situation, people have two options. One is to *disidentify* from the domain so that failure is less self-relevant and therefore less harmful to self-esteem (Aronson, Blanton, & Cooper, 1995). This could potentially undermine motivation toward the goal entirely, though some evidence suggests that appraisal of failure as reflective of goal commitment (as opposed to goal progress) can actually *increase* identification with the goal (Fishbach, Eyal, & Finkelstein, 2010). Understanding how interpretations of feedback contribute to or detract from goal identification is therefore critical in future work. A second option is to *self-handicap* performance to supply oneself an alternative explanation for self-regulation failure besides a lack of skill or motivation (Berglas & Jones, 1978; Snyder, Kleck, Strenta, & Mentzer, 1979). Self-handicapping by definition undermines goal pursuit, but can also be mitigated in a number of ways (Niiya, Brook, & Crocker, 2010; Urdan & Midgley, 2001). In any case, disidentification and self-handicapping are ways that efforts to leverage identity to increase self-regulation might backfire, and as such should be considered carefully when crafting an intervention to increase self-regulation based on this or other theories that draw upon identity as a source of value.

## The content of identity varies across demographics and cultures

There are also boundary conditions of the model in terms of demographic factors. We claim that the key advantages of identity above other sources of value are that it is relatively stable and superordinate to many other ongoing priorities. This is generally the case in adulthood, but identity is still forming in childhood (Cole, Maxwell, Martin, Peeke, Seroczynski, Tram, et al., 2001) and is particularly labile during adolescence (Kroger, Martinussen, & Marcia, 2010), so the IVM may not hold during these periods. However, adolescence bears some consideration here because it is widely recognized as a period when increased self-regulation would be beneficial. Though adolescent identity may be in flux, it does seem that social identity emerges at this time—particularly one's identity relative to the peer group (Pfeifer, Masten, Borofsky, Dapretto, Fuligni, & Lieberman, 2009; Smetana, Campione-Barr, & Metzger, 2006). Drawing values from peer-related social identity might thus be a particularly powerful way to boost self-regulation among adolescents, though of course this depends on those peers valuing behaviors that are related in some way to self-regulation. (On the flip side, deviant peer influence is a major risk factor for a range of antisocial behaviors, e.g., Gardner, Dishion, & Connell, 2008.)

Cultural factors are also relevant. It has been argued that a universally positive self is a distinctly western phenomenon, and that other cultures (e.g., East Asian) place value on different features of self and social relationships such as a self-critique (Heine, Lehman, Markus, & Kitayama, 1999). For example, the most highly valued, "ideal affect" states in East Asian cultures are different from those in western cultures (Tsai, 2007). In terms of the IVM, the content of identity is arbitrary as long as it holds value for the individual. The content and structure of identity will clearly vary from country to country and culture to culture (Markus & Kitayama, 2010). Furthermore, culture can powerfully determine what aspects of identity are more or less likely to find their way into the working self-concept at a given time (Oyserman & Lee, 2008). For example, bicultural individuals can be primed with one cultural identity or the other, which is likely to make different aspects of identity salient and valued (Shih, Pittinsky, Ambady, 1999). In all of these cases, identity is expected to impart value toward self-regulation in identified domains that are salient, whatever those domains may be.

## Related and foundational models

The IVM specifies a mechanistic account of self-regulation that cuts across the psychological, computational, and neural levels of analysis, and thereby suggests new routes to improving self-regulation by targeting identity and other enduring sources of positive value. These innovations were gained by synthesizing theoretical ideas from social psychology and neighboring fields, so the IVM naturally connects with many theories in terms of shared constructs and the relationships among them. The IVM is intended to be an extension, not a replacement, of these ideas. In describing the model, it is helpful to clarify the distinct space it occupies and the overlapping space it shares with its predecessors and relatives. Also, by describing a neurocomputational model of how value contributes to self-regulation, the IVM feeds back to these theories by suggesting a common mechanism of action that might capture how some of these disparate theories are related to one another.



### Self-Determination Theory

Perhaps the nearest neighbor to the IVM in goals research is self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000). Whereas the IVM focuses on identity, self-determination theory instead emphasizes the role of intrinsic value in making a goal more or less likely to be acted upon, sustained, and ultimately successful. A foundational idea in self-determination theory is that humans are intrinsically motivated by primary needs for competence, relatedness, and autonomy, and will preferentially seek goals that fulfill those needs. In turn, goals that are evaluated as consistent with one or more of the intrinsic needs foster well-being and are broadly more likely to endure and succeed than goals motivated by external rewards. Like self-determination theory, the IVM is concerned with properties of goals that facilitate or hinder their progress, and also focuses on motivation as the ultimate force that impels their pursuit. In contrast, the IVM identifies subjective value as the underlying source of motivation when it comes to self-regulation, and suggests that value can be derived from any number of external or internal rewards including and especially identity. Further, in the IVM, identity can influence self-regulation in any domain that is seen as relevant to a valued aspect of one's self-concept, even beyond competence, relatedness, and autonomy. In that sense, the variety of ways in which the self can increase motivation is somewhat broader in IVM than in self-determination theory, though the resulting motivation is applied more narrowly in IVM to self-regulation. Another key difference is that self-determination theory is primarily concerned with the consequences of how a goal is motivated (e.g., intrinsically vs. extrinsically), whereas the IVM is also concerned with the antecedents of motivation, particularly identity, and whether they can serve as a point of intervention to increase motivation.

### Self-Concordance Theory

The central claim of Self-Concordance Theory (SCT) is that striving toward a particular goal is a function of the degree to which the goal aligns with a person's "authentic interests and values" (pp. 483), or, in other words, is integrated with the self (Sheldon & Houser-Marko, 2001). Self-concordant goals tend to elicit sustained effort (because the self is stable), which in turn promotes attainment (Sheldon & Elliot, 1999). Furthermore, because self-concordant goals by definition fulfill the primary needs for autonomy, relatedness, and competence described by self-determination theory, attaining self-concordant goals increases overall well-being. SCT and IVM share the ideas that goals vary in the extent to which they are related to one's self and identity, and those that are more central are more likely to succeed by virtue of their connection to the self. However, the IVM is more specific about the mechanism responsible for the relation between self-concordance and sustained effort, namely subjective value. The IVM can be thought of as a refinement of SCT in this sense. Another difference is that the IVM adopts a broader perspective on the possible ways that identity can increase self-regulation. This is based on recent evidence, reviewed below, that associative processes such as priming or construal can be used to increase the subjective value of a goal by linking it to core values or other aspects of identity, even if that goal is not central to one's identity (self-concordant) per se. The assertion of the IVM that people can flexibly (re)construe the relationship between a behavior and their identity is important because it allows the model both to explain cases when self-regulation fluctuates over time (e.g., ego depletion) and to offer ways to intervene to improve self-regulation.

## Identity-Based Motivation Model

The identity-based motivation model states that actions and choices are shaped by their relevance to identity (Oyserman, 2007; 2009). Specifically, the model holds that identity-congruent actions and beliefs have a motivational pull because they reaffirm one's membership within the identified social group. For example, to the extent that individuals from ethnic minorities view certain unhealthy behaviors as defining of their in-group, priming those individuals with ethnicity reduces the cognitive accessibility of health knowledge and the perceived efficacy of health behaviors (Oyserman, Fryber, & Yoder, 2007). The idea that identity-congruent behaviors are more likely to be enacted than identity-incongruent or identity-irrelevant ones is entirely consistent with the IVM. However, the IVM is more focused on self-regulation as an outcome than the identity-based model, which suggests that all behaviors are potentially influenced by their degree of identity-relevance, including thoughts, beliefs, and even cognitive processes. Also, the identity-motivation model emphasizes the "socially situated" nature of identity (Oyserman, 2009), meaning that identity shifts depending on the social environment and salient situational cues. Therefore, what is considered identity-congruent may fluctuate to some extent from one moment to the next. The IVM accommodates the view that identity is malleable (or at least that the aspects of it that are active in the moment are malleable), though the IVM assumes that at least some aspects of identity are chronically accessible or otherwise temporally stable such that they can impart value to goal-consistent actions repeatedly across time and place.

## Other theories from the self and identity literature

**Self-Esteem**—The IVM shares the assumption from the self-esteem literature that humans are motivated to seek and maintain positive evaluations of the self (Crocker & Major, 1989). In the self-esteem literature, these positive evaluations include both cognitions (e.g., positive illusions; Taylor & Brown, 1988) and emotions (e.g., self-worth; Rosenberg, 1979) about the self. Some self-evaluations are more strongly connected to global self-esteem than others, and which domains of the self are most central to global self-esteem varies across individuals (Crocker & Wolfe, 2001). The IVM adopts a similar perspective in characterizing self-evaluations as generally positive, stable, and idiosyncratic, and extends the self-positivity assumption to other aspects of identity (e.g., social categories). The IVM also shares the view that positivity (and negativity) about one aspect of the self can spread to other aspects in the sense of spreading activation (Greenwald, Banaji, Rudman, Farnham, Nosek, & Mellott, 2002; Rumelhart & McClelland, 1986). The IVM is fully consistent with the notion that there are mutually reinforcing relationships among self-esteem, successful striving toward self-concordant goals, and overall well-being that can lead to an "upward spiral" of positive outcomes (Ryff & Singer, 1998; Sheldon & Houser-Marko, 2001).

**Self-Affirmation Theory**—The IVM draws upon the prediction from the self-affirmation literature that people are motivated to maintain a sense of self-integrity and protect the integrity and positivity of the self from threats (Steele, 1988). This motivation turns out to be a double-edged sword. On one side, the motivation to protect the integrity and internal consistency of self with respect to certain beliefs or actions can lead to biases and/or false beliefs generated by a rationalization process (as described extensively by Festinger, 1957).

On the other side, a key mechanism by which people maintain a coherent and unitary sense of the self is by introducing a degree of fluidity across aspects of the self (Greenwald, 1980), which allows a threat to one aspect of the self to be mitigated by bolstering the positive evaluation of another aspect. For example, heavy alcohol drinkers tend to minimize messages about the dangers of drinking because they are threatening, but this discounting can be eliminated by affirmation of core values unrelated to alcohol or health (Klein & Harris, 2009).

Like self-affirmation theory, the IVM also suggests that identity can alternately promote or prevent successful self-regulation, respectively, when the regulated behavior in question is seen as contributing to or detracting from a sense of a positive, consistent, and rational self. All else being equal, for example, the IVM predicts that a person who sees exercising as consistent with his core values, long-term goals, social group, culture, etc., will have an easier time at it than someone who sees exercising as inconsistent with or orthogonal to those other aspects of his identity. The dark side of this is that, if quitting is viewed as central to identity, then threats to the success of that goal may be met with a variety of rationalization tactics (e.g., discounting, denial, distancing) that may in fact run counter to successful quitting. A key contribution of self-affirmation research and theory to the model proposed here is a nuanced understanding of the ways that threats to valued aspects of identity can some times strengthen and other times weaken the centrality of those aspects to the self (Steele, 1997). We return to this idea when we discuss the risks and benefits of increasing self-regulation with identity-based manipulations.

**Self-Schema Theory**—The idea that the content and organization of one’s identity and self-concept can influence cognition is not new. Self-schema theory (Markus, 1977) has suggested that self-schemas, or interconnected cognitive networks of beliefs, memories, and representations of the self, bias information processing preferentially toward self-relevant information. Social cognition research has established that self-relevant information is processed faster, allocated greater attention, and remembered better compared to non-self-relevant information (Greenwald & Pratkanis, 1984; Kihlstrom & Cantor, 1984; Markus, 1983). The IVM draws upon these ideas in claiming that goals will also receive preferential attention, processing, memory, etc., to the extent that those goals are incorporated within one’s self-schema or otherwise strongly connected to the self-schema. The other main tenant of self-schema theory pertinent to the IVM is the idea that people hold multiple self-schemas that are more or less active in a given moment, and that these multiple schemas can differentially influence cognitive processing and behavioral outcomes based on contextual factors (e.g., priming, the social environment, or recent tasks). The key difference between the theories is that self-schema theory focuses on the “cold” information processing functions of the self, whereas the IVM highlights how identity also can generate “hot” valuation computations that serve as an important source of input to self-regulation behaviors.

### **Emergent lessons from foundational theories applied to the IVM**

We extract two overarching theoretical lessons from the theories reviewed above. First is the assumption that the self is, on balance, positively valenced, and that people are generally

motivated to maintain a positive self-view. In the IVM, the positive affect associated with the self is considered to be a form of value, such that concepts within the self and actions consistent with the self are not just liked, but are also imbued with positive value such that they are more likely to be enacted relative to actions that are not linked to the self. In this sense, the IVM expands the definition of the self as a cognitive/motivational construct (as it is typically studied within social psychology) to also include the notion from decision-making and behavioral economic frameworks that decisions related to the self can be understood in terms of expected value or utility. Behaviors that are connected in some way to the self come to have increased value (e.g., Newman, Bloom, & Knobe, 2014).

A second broad lesson is that identity is somewhat malleable in response to past behavior and other situational factors. In other words, there is a bidirectional relationship between what is valued and enacted, on one hand, and what is part of identity, on the other. This becomes important to the IVM because, if identity does influence self-regulation, then one way to increase self-regulation is to alter identity. Both cognitive dissonance theory (Festinger, 1957) and self-perception theory (Bem, 1972) predict a bidirectional relationship between identity and subjective value such that actions/decisions/beliefs that are valued highly enough would eventually come to be part of one's identity, and that aspects of one's identity would come to be positively valued. The two theories famously provide different explanations of why that would be the case—with dissonance advocating a self-consistency process and self-perception offering a cognitive and informational one—but the relevant fact here is that the content of our identities and the set of things we value are mutually informative. Regardless of the cause and direction of the relationship between identity and value, all of these accounts are consistent with one of the main proposals of the IVM: that there is a strong and positive association between identity and the valuation of the actions, beliefs, decisions, etc., that comprise it. We merely note here for clarity that the IVM is agnostic about how the identity-value relationship develops, and focuses instead on the implications of that relationship, whatever its source, for self-regulation and interventions aimed at improving it.

## **The IVM as a unifying framework for disparate results**

Putting together the first two predictions of the IVM yields a third: that identity-based manipulations should improve self-regulation toward goals that are viewed as self-relevant. At least five separate lines of research are broadly consistent with this prediction. Notably, the studies reviewed below are grounded in a variety of theoretical models; though the models share some constructs they are mostly non-overlapping, and none provides a mechanistic account of their effects. In this section, we survey evidence of the relation between identity and self-regulation, and argue that a value integration process is a plausible candidate mechanism of the observed effects.

### **Why does self-affirmation mitigate ego depletion?**

Manipulations of identity and related constructs (e.g., self-affirmation) can attenuate the ego depletion effect or eliminate it altogether. Schmeichel and Vohs (2009) tested this by adding a values-affirmation task between the first and second self-control tasks in an ego depletion

study; they found that participants who wrote about core values showed equal if not better performance on a cold-pressor task following a difficult (vs. easy) writing task. The IVM suggests the hypothesis that self-affirmation increases the salience of valued aspects of the self (which are linked to each other and positively valued; Greenwald et al., 2002), in turn increasing the value of related behaviors (e.g., agency or stamina in the context of a cold-pressor). Relatedly, increasing participants' sense of autonomy during a task also reduces ego depletion relative autonomy-undermining or forced-choice conditions (Moller, Deci, & Ryan, 2006; Muraven, Gagne, & Rosman, 2008; Sheldon & Elliot, 1998). Self-affirmation also amplifies neurophysiological activity during self-regulation, even outside of an ego depletion paradigm (Legault, Al-Khindi, & Inzlicht, 2012; Legault & Inzlicht, 2013). These results are consistent with the IVM's prediction that highlighting how a task is linked to valued aspects of identity, such as autonomy, can increase the value of performance.

Interestingly, one study found that self-awareness induced between the first and second self-control tasks in an ego depletion paradigm also eliminated the depletion effect (Alberts, Martijn, & de Vries, 2010). The authors interpreted this result in terms of self-awareness theory (Duval & Wicklund, 1972), such that self-awareness increased the salience of internalized standards for behavior (e.g., the expectations of the generalized other; Mead, 1925), which in turn motivated people to live up to those standards. We additionally suggest the possibility that increasing identity salience (through self-awareness) also increased the salience of self-relevant values (e.g., competency), which improved self-regulation performance on a value-relevant task. These studies provide converging evidence that making valued aspects of identity salient (via self-affirmation, increasing self-awareness, or priming autonomy goals) can bolster self-regulatory performance in cases that it otherwise would diminish. Our model suggests that the underlying mechanism in all these studies is an increase in the subjective value of behaviors that are in line with the participant's identity.

### **Why does self-affirmation and personalized tailoring facilitate health behavior?**

A common problem in health behavior change is that personally-relevant health messaging can be threatening (Lieberman & Chaiken, 1992), which triggers people to engage in motivated, self-protective reasoning in order to discount the information (Kunda, 1990). For example, smokers generally underestimate the dangers of smoking compared to non-smokers, and this effect is most pronounced in heavy smokers (Schoenbaum, 1997). However, self-affirmation reduces or eliminates this effect. People who affirm core values are more willing to be screened for diabetes (van Koningsbruggen & Das, 2009), more likely to adhere to a medication regimen (Ogedegbe, Boutin-Foster, Wells, Allegrante, Isen, Jobe, et al., 2012), and, among smokers, more likely to be receptive to messages about the risks of smoking (Dillard, McCaul, & Magnan, 2005). Non-affirmed heavy drinkers tended to bias their attention away from words drawn from an article about the health risks of drinking, but those who completed a values affirmation showed an attention bias toward those threatening words (Klein & Harris, 2009). This last study is especially illuminating because it establishes a plausible pathway through which self-affirmation can influence self-regulation: core-values priming enables people to direct their attentional resources toward health-relevant information that would otherwise threaten the self (Harris & Epton, 2009; McQueen & Klein, 2006; Sherman, Nelson, & Steele, 2000). Considering the link between subjective

value and attention (Krajbich, Armel, & Rangel, 2010; Louie & Glimcher, 2010; Maunsell, 2004), it is plausible that the proximal mechanism by which self-affirmation helps people engage with health messages is attentional biasing toward information that is threatening though relevant to important long-term goals. In these cases, self-affirmation might enhance the warm glow of positivity that identification casts upon self-regulatory goals, briefly banishing their shadow of threat.

A meta-analysis of 52 studies testing the effect of self-affirmation on health behavior change found that self-affirmation significantly increased acceptance of health messages, intentions to change, and actual health behavior (Epton, Harris, Kane, van Koningsbruggen, & Sheeran, 2015). The effect of self-affirmation was about twice as strong on behavior ( $d = 0.32$ ) than on acceptance ( $d = 0.17$ ) and intentions ( $d = 0.14$ ). This discrepancy is intriguing because most models indicate that effects of affirmation on behavior are mediated through (cognitive) changes in acceptance of the risks of certain behaviors and intentions to change them, suggesting that the magnitude of its effect should be *smaller* on behavior—a more distal outcome—compared to acceptance and intentions. The alternative explanation offered by the IVM is a motivational one. Self-affirmation broadly increases the salience of valued aspects of the self, in turn raising the value of and attention to health goals that are related to identity, ultimately increasing the likelihood that behaviors related to those goals will be enacted. In other words, the IVM posits that self-affirmation facilitates identity-relevant health behavior by increasing its value - a motivational route - instead of by increasing intentions to change and acceptance, a cognitive route. This may be why self-affirmation has a stronger effect on behavior than on more cognitive constructs.

The effect of identity on health behavior change is also apparent in studies on tailored messaging. Tailoring, in this context, refers to creating messages about a given health behavior or outcome that are customized to each person based on one or more individualizing characteristic such as age, gender, race, personality, personal or family history (Rimer & Kreuter, 2006). By definition, then, tailored messages are more self-relevant than non-tailored messages, leading to the prediction that tailored content would hold more value than non-tailored content. As expected, tailored messages are generally more effective than generic ones at promoting health behavior change (Krebs, Prochaska, & Rossi, 2010; Lustria, Noar, Cortese, Van Stee, Glueckauf, & Lee, 2013). Not all tailored messages are equally self-relevant, and a meta-analysis suggests that efficacy increases as the number of tailored features goes up (Noar, Benac, & Harris, 2007), presumably because each additional tailored feature makes the messages that much more self-relevant. This is an exciting area of growth where identity-based manipulations could have a major impact on health behavior change. A recent innovation, for example, is to use highly realistic virtual doppelgangers to help people literally visualize their own behavior change (Fox & Bailenson, 2009), using “the self to persuade the self” (Ahn & Bailenson, 2014).

### **Why does high-level, abstract construal promote self-control?**

A fascinating line of research grounded in construal level theory (Trope & Liberman, 2003) shows that construing behavior at a high, more abstract level promotes self-regulation compared to lower-level, more concrete construal (Fujita, 2011; Fujita & Carnevale, 2012).

For example, priming high-level construal by having participants think about “why” they performed certain actions (instead of “how” they did them) increases self-regulation on a subsequent handgrip and intertemporal choice tasks (Fujita, Trope, Liberman, & Levin-Sagi, 2006). This work draws upon the idea from construal level theory that cognitively reframing, or construing, an action can increase its psychological distance. Thinking about an action from a psychological distance increases its level of abstractness by obscuring the fine-grained details (e.g., how to do it) and bringing the bigger picture into focus (e.g., why it’s done). In a simple intertemporal choice scenario of \$5 now or \$10 in a month, low-level construal encourages focus on experience in the present moment, favoring the smaller-sooner choice; whereas high-level construal helps broaden the perspective beyond one’s immediate experience and frames the problem as an abstract choice between impulsiveness and thriftiness, tipping the scale toward the larger-later choice.

High-level construal also does something else: it increases the salience of the self. In a conceptualization of goals as action hierarchies with abstract ends at the higher levels and concrete means at the lower levels—which is entirely compatible with construal level theory—the highest possible level is “be” goals, or self-concepts (Figure 3; Carver & Scheier, 1998). In this view, the ideal self is the ultimate high-level goal. As such, high-level goals constitute a critical part of identity. Any manipulation that promotes higher-level construal will be expected to increase the salience of one very important aspect of identity, the ideal self-concept<sup>1</sup>. This is related to the idea from action identification theory (Vallacher & Wegner, 1987) that high-level construal reflects the motives, agency, and personal meanings of an action—its “why”—whereas low-level construal reflects the details, steps, and means of an action—its “how”. Together, these ideas can account for the finding that self-determined or self-concordant beliefs or primes, which connect tasks to their underlying motives (“why am I doing this?”), increase self-regulation, persistence, and ultimately goal achievement (Koestner, Otis, Powers, Pelletier, & Gagnon, 2008; Ntoumanis, Healy, Sedikides, Duda, Stewart, Smith, et al., 2014; Sheldon & Elliot, 1998). The IVM adds to this the idea that higher (vs. lower) level construal promotes self-regulation because it brings identity to the fore, thus increasing the immediate subjective value of behaviors associated with long-term goals, core values, and ideal selves.

The connection between high-level construal and identity suggests a new interpretation of the result that “explicit zero” effect on intertemporal choice. The presence of the explicit zero in the later outcome broadens the scope of temporal attention (Radu, Yi, Bickel, Gross, & McClure, 2011), and a broader temporal horizon increases the construal of the problem to a more abstract level, bringing the future self into the working self-concept. This interpretation is supported by evidence that substance abusers—who typically show dramatic temporal discounting during intertemporal choice—also have a severely restricted

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<sup>1</sup>The relationship between high-level construal and identity is likely bidirectional: it may also be the case that thinking about one’s ideal self-concept can serve as a high-level construal induction. A reader might wonder, then, whether the effects of identity on self-regulation operate through increased construal level instead of the reverse. We cannot rule out this possibility given the data available now. However, we provide two reasons why it is unlikely. First, identity-relevant behaviors can be valuable without being construed at a high level. Doing lots of push-ups or playing hours and hours of video games, for example, are closer to “do” goals than “be” goals yet are still highly valued by many people who identify with those activities. Second, as noted above, the actual self can also be part of identity, and need not be abstract. Identifying as a marine, father, or recovering alcoholic can powerfully influence value and attentional salience even though those kinds of social identities do not necessarily invoke high-level construal.

temporal horizon, essentially living in the immediate present with little consideration of the future self (Bickel, Kowal, & Gatchalian, 2006). Interventions that focus on increasing thoughts of the future either explicitly (Kober, Kross, Mischel, Hart, & Ochsner, 2010) or implicitly (Bickel, Yi, Landes, & Baxter, 2011) are effective in reducing drug craving and use. Put together, these results converge on the notion that higher-level construal, which is abstract, broad, and long-ranging, also invokes important aspects of identity to a greater degree than lower-level construal. And, for that reason, higher-level construal also facilitates behavior that is in line with self-relevant goals.

### **Why do identity-based manipulations influence economic choice?**

One of the more disheartening recent discoveries in psychology is the extent to which poverty apparently diminishes cognitive functioning. Compared to those with plentiful resources, participants given scarce resources on a letter-guessing game perform more poorly, use their resources less wisely, and even perform worse on an unrelated subsequent game (Shah, Mullainathan, & Shafir, 2012). In a natural experiment, sugarcane farmers in India were found to have reduced cognitive control before they sold their crop, when they are poor, compared to after, when they receive an annual windfall, even controlling for stress, nutrition, and time pressure (Mani, Mullainathan, Shafir, & Zhao, 2013). It is increasingly clear that poverty is characterized by not just restricted monetary resources but also cognitive ones, which forces poor individuals to limit their temporal and attentional scope. In effect, poverty is a chronic low-level construal induction, restricting space in the working self-concept for the ideal self and other high-level aspects of identity.

If it is true that one way that poverty reduces self-regulation (e.g., cognitive control performance) is by inducing people to focus on immediate in favor of long-term concerns, then broadening their attentional scope or reorienting them toward their long-term goals and values might mitigate its effects. In line with this prediction, a self-affirmation induction increased cognitive control performance in very low SES individuals relative to a positive mood induction (Hall, Zhao, & Shafir, 2014). Remarkably, participants in the self-affirmation condition were also three times as likely (46% vs. 15%) to take a flier advertising benefits programs available to but generally underutilized by the working poor. A potential mechanism of this effect is the increased salience of valued aspects of identity brought about by self-affirmation. Insofar as broad goals to achieve competence and autonomy are seen as integral to the self, then affirming the self also increases the value of behaviors related to those goals.

A similar mechanism might account for the effect of time perspective on personal savings. This work targets the problem of under-saving in the US, and shows that vividly imagining one's future self makes people more willing to save for the future instead of spend now (Hershfield, 2011). In one study, for example, participants who spend several minutes navigating a virtual environment as a digital rendering of their aged selves put more than twice as much money in a retirement account than participants who interacted as a rendering of their actual selves (Hershfield, Goldstein, Sharpe, Fox, Yeykelis, Carstensen, et al., 2011). These studies represent a rather direct identity manipulation: by literally interacting with the world *as their future selves*, participants are made to feel the connection between the future



and present self. The future self comes to have increased value via its incorporation into current identity, and, thereby, behaviors linked to the future self become more likely to be enacted.

### Why do groups (sometimes) promote self-regulation?

Social groups can facilitate self-regulation across a range of behavioral domains, perhaps by increasing the value of actions that would otherwise be less valued and by increasing the salience of a goal-consistent identities. The effect of groups on behavior may not be surprising given the high value that humans place on sociality (Baumeister & Leary, 1995) and group identification in particular (Hogg, Terry, & White, 1995). For example, success at smoking cessation is related to social factors such as partner support, perceived general social support, and even the mere presence or absence of smokers in an individual's social network (Mermelstein, Cohen, Lichtenstein, Baer, & Kamarck, 1986). These effects are independent of other predictors of cessation (e.g., age, disease status, SES), indicating that social factors can add independent value to self-regulation. The value of social groups may also help explain the positive effects of group or even individual therapy on behavior change. A rough summary of the literature is that, independent of everything else, merely identifying with a group that values a particular behavior (e.g., smoking cessation, healthy eating) seems to increase the chances of its enactment.

There are many reasons why social groups can influence self-regulation, some related to identity and some not, and we do not presume that the IVM can explain them all. However, the IVM is pertinent to two. First, the value that peers place on specific behaviors can change our value calculation through simple social influence (Turner, 1991), separate from identity. For example, information about how peers rated the attractiveness of a series of face images altered both the self-reported ratings and the vmPFC activity while viewing the faces from pre- to post-peer information (Zaki, Schirmer, & Mitchell, 2011). Second, social identity may impart value to behaviors that are valued by the social group, separate from direct social influence. For example, even if I am alone, I know what kinds of behaviors would and would not be valued by my identified groups. In this way, social groups are doubly powerful factors in self-regulation because they have two plausible routes to influence value, direct social influence and social identity.

These two forces might work in concert: when we interact with people who are members of our identified groups, we might feel *both* social influence (e.g., conformity) *and* motivation to live up to our social identity within the group. Because social influence is, on its own, a source of value distinct from identity, if a person both identifies with a group *and separately* feels social pressure to conform to the group, then the two sources each contribute value to the self-regulated behavior. When aligned, the two sources might even interact to increase the value of self-regulation beyond an additive effect of the two separately. Consistency theories predict the two sources of value to be mutually reinforcing: if I conform with my peers' behavior, I'm more likely to identify with those peers, which in turn makes me more likely to conform to them. Social constructionist models of virtue (including self-regulation) further support this idea (e.g., Alfano, 2016). In these accounts, social groups reinforce, and perhaps even constitute, virtuous behavior by setting expectations publically and

acknowledging mutual awareness of those expectations: you expect me to act a certain way, I know that you have that expectation, you know that I know about the expectation, and so forth. People who are high in the individual difference characteristic of “social value orientation” (van Lange, 1999) might evince the effect particularly strongly (Bogaert, Boone, & Declerck, 2008). Interactions between value sources such as social influence and social identity are be a promising avenue for self-regulation intervention, and might be able to account for diverging trajectories of self-regulatory behavior among some peer groups.

## Questions for the future of the identity-value model

In this final section, we consider in further depth three questions that emerged in various forms throughout the presentation of the model above. Seeking answers to these questions constitutes a research agenda for the future of research on self-regulation based on the IVM.

### How can identity be used to increase self-regulation?

The central question that motivates the IVM is whether it is possible to build interventions to improve self-regulation by altering identity and/or value. Above, we touched upon one potential strategy based in consistency (Festinger, 1957) and balance (Greenwald et al., 2002; Heider, 1958) models of self. Engaging in a behavior that is otherwise not consistent with identity demands justification, which, in some cases, can be provided by a shift in identity to align with the behavior. Changing behavior can lead to shifts in identity if the change is a relatively easy way to restore balance to the self-concept and does not introduce new intrapersonal conflicts (Greenwald et al., 2002). Cognitive dissonance has convincingly shown that behavior change can lead to attitude change.

But at what point does attitude change become internalized to the point that it is incorporated into one’s identity? Theories of change within psychology have long recognized the importance of identity change as a force for behavior change (e.g., Prochaska, DiClemente, & Norcross, 1992), though these theories generally view identity change as reflecting a relatively autonomous intrapersonal process (e.g., self-reevaluation) that can be facilitated, but not necessarily directly caused, by external processes. However, philosophy, and particularly moral philosophy, has considered this possibility. For example, Aristotle wrote in *Rhetoric* that “to praise a man is in one respect akin to urging a course of action” (Aristotle, 2000); Nietzsche noted how ascriptions of identity can be directive as well as descriptive (Alfano, 2015). To tell someone that she is kind both describes that person’s kindness and also invokes kindness behavior. Contemporary philosophers have used that insight as a starting point to develop a theory of “factitious virtue”, or summoning virtuous behavior by prompting an identity shift (Alfano, 2013). To some degree, identity can molded by a self-fulfilling prophecy. Calling someone conscientious might make them disposed to act in a conscientious way, which might eventually turn in to full-blown consciousness. Labeling children as “tidy” prompts them to conform to this label to a greater degree than merely asking them to be tidier (Miller, Brickman, & Bolen, 1975); calling adults helpful led them to see themselves as altruistic, which in turn increased their willingness to volunteer (Burger & Caldwell, 2003). To our knowledge, nobody has yet tried

this with self-regulation (“you are good at self-control”) or related aspects of identity. This could be a promising avenue for future research.

Another way to approach the identity change problem is to leverage the fact that identity is somewhat susceptible to cognitive shifts such as framing, construal, or priming effects. Of course, there are reality constraints. A heavy smoker, for example, might never come to identify as a non-smoker, but he might be able to think of himself as someone who can smoke less. Using this phenomenon as a starting point, psychologists have shown that a simple “noun-verb” manipulation can increase self-regulatory behavior, presumably through a subtle shift in the extent to which the behavior is construed as identity-relevant. In one study, phrasing questions about voting intentions in terms of identity (noun: “being a voter”) instead of an action (verb: “voting”) increased voting intentions and actual turnout in statewide elections (Bryan, Walton, Rogers, & Dweck, 2011). In another, participants were less likely to cheat by claiming money they were not entitled to if that behavior was described as a (negative) identity (noun: “being a cheater”) instead of an action (verb: “cheating”; Bryan, Adams, & Monin, 2013). Both of these results are consistent with the idea that identity influences self-regulation, presumably by underscoring the subjective value of desired (“voter”) or undesired (“cheater”) identities. Following this path is a promising direction for the future of self-regulation interventions because it is low-cost, modest in scope, and easily scalable to a broad range of populations and types of desired identities.

### How does value seemingly flow between aspects of identity?

Previous work examining the structure of self and identity suggests that the self is a unitary construct that nonetheless has transitive properties, such that affirming the self in one domain can reduce threat in others (Tesser, 2001). For example, core-values affirmations reduce the tendency to resolve cognitive dissonance (Steele & Liu, 1983) and react defensively to unfavorable social comparisons (Tesser & Cornell, 1991), even if the affirmation is unrelated to the dissonant cognitions or social comparisons. The positivity or value derived from self-affirmation apparently spreads to other domains of the self. To what extent does this transitive self apply to the IVM?

It is important to note that the transitive nature of the self is not a precondition or assumption of the IVM, which narrowly focuses on identity *in a specific domain* imparting value to actions *in that domain*, in turn making domain-relevant actions more readily executed. However, we recognize that some of the evidence we presented here in support of the model relied on general affirmations as a source of value to specific actions—consistent with a transitive model. Hence the importance of the construct of identity in the model: identity itself is what binds its constituent parts (Greenwald, 1980). In varying degrees, each aspect of identity both receives and supplies value to all the others; this is what allows self-affirmation to protect against a range of threats. Also, identities are not random collections of nouns; they are constructed and maintained in part under a guiding force for consistency (Steele, 1998). Identities may thus come to (or be defined to) overlap; the smoking “quitter” aspect and the “healthy eater” aspect of a person’s identity likely have overlapping representations at the cognitive and neural levels insofar as both support a superordinate identity of a “healthy person”. Likewise, being a “good friend” and a “therapist” might

reinforce each other and bolster a “good listener” identity. The idea of superordinate identities may in part explain the transitivity among domains; after all, at the highest level, all aspects of identity are subordinate to some larger aspect of identity within the hierarchy (Carver & Scheier, 1998). The transitive and mutually reinforcing aspects of identity could also account for “upward spirals” in self-regulation where success at a goal serves, in part, to reinforce the values and other aspects of identity that propelled the goal in the first place (Sheldon & Houser-Marko, 2001).

### **What are the relative contributions of the actual and ideal selves to value?**

The degree to which identity represents the actual versus ideal self has arisen in several places in this article. Identity contains aspects of both. Long-term goals that have not yet been attained are part of the ideal self and certainly part of identity; social identities are part of the actual self (e.g., “I am a father”) and just as certainly constitute one part of identity. Generally speaking, these are compatible, but the role of identity as a source of value brings up an interesting potential conflict. When an ideal self is in direct conflict with an actual self (e.g., “I am a smoker, but I strive to be a quitter”), which will be more valued?

This issue relates to discussion about the relationship between implicit and explicit attitudes (Fazio & Olson, 2003; Nosek & Smyth, 2007) such that actual self can be validly measured by implicit measures (e.g., response times on a me/not me implicit association task, or IAT; Greenwald, McGhee, & Schwartz, 1998) whereas ideal self is typically indexed with explicit measures (e.g., direct report). For example, it is possible that a smoker’s responses on a questionnaire would indicate that she identifies strongly as a quitter (ideal), whereas her IAT responses suggest that she more easily links her identity to smoking than quitting (actual). A behavioral economic answer to this question would rely upon “revealed preferences” (Kahneman & Tversky, 1979): decisions reveal what we actually value. However, revealed preferences might more strongly reflect the subjective value of an action rather imply that it is integral to identity, because there are a number of other ways for a behavior to have increased value besides identification (e.g., social pressure). A contemporary interpretation of Nietzsche’s thinking is that he believed the two selves would ultimately converge (Alfano, 2015); in *Human, All Too Human*, he writes that “if someone obstinately and for a long time wants to *appear* something it is in the end hard for him to *be* anything else” (Nietzsche, 1878/1996; pp. 51). In any case, this is an important question for the model that can be clarified by future work in both psychology and philosophy.

### **Conclusion**

We presented an identity-value model that describes a self-regulation process that integrates and compares choice options in terms of their subjective value, which is partly driven by the choice’s relevance to identity. Situational factors can alter the salience of goal-relevant aspects of identity, and these factors can be strategically modulated in the service of long-term goals. Novel pathways for improving self-regulation follow from the mechanistic account of how various attributes of a choice are integrated. We hope this model will inform psychological theory on self-regulation by casting self-regulation as value-based choice and articulating the role of identity in contributing to value, and also inspire a new generation of

research on self-regulation interventions based on identity. If the central challenge in the war of self-regulation is to sustain motivation throughout the course of a prolonged series of battles, then, by its enduring nature, identity may prove to be a powerful weapon.

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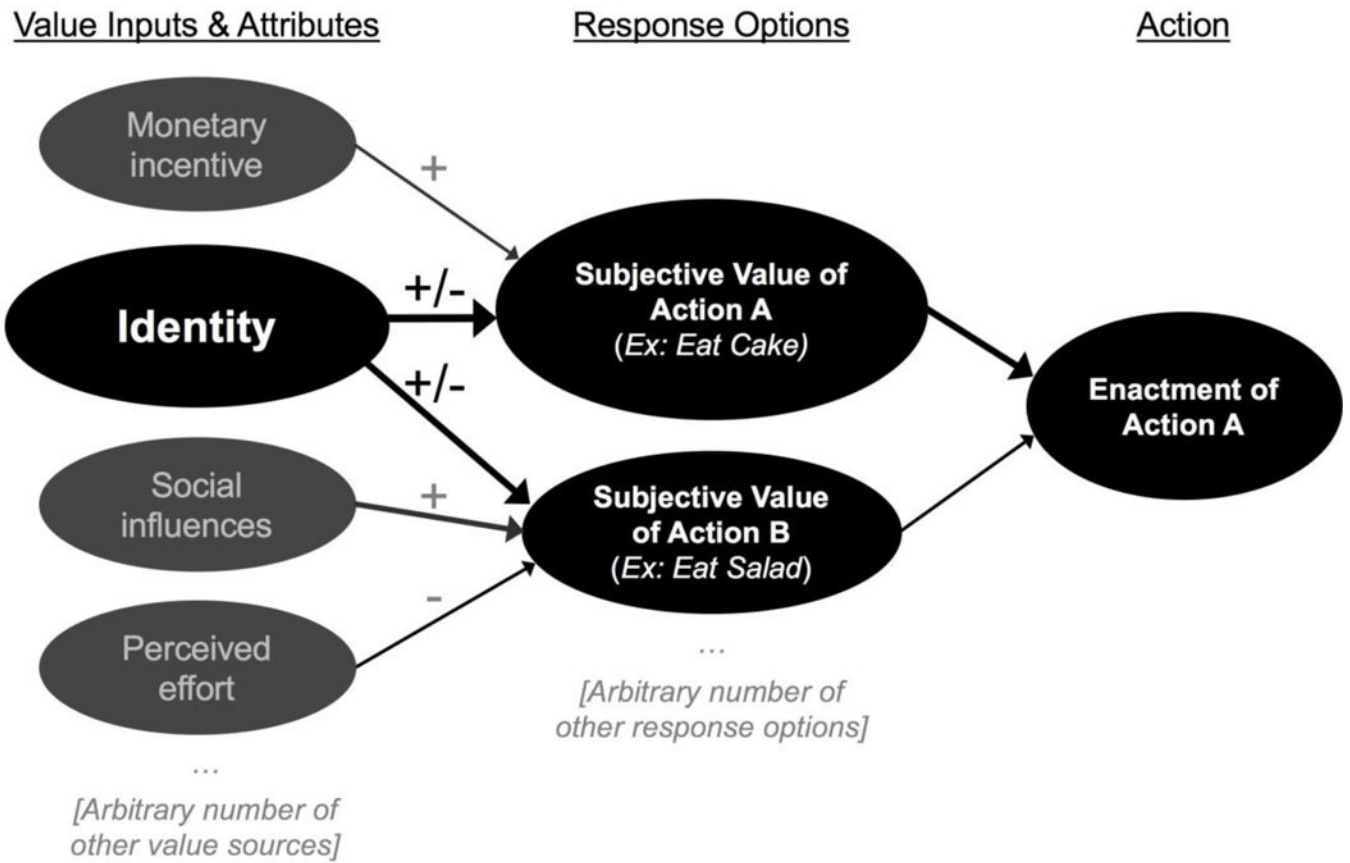
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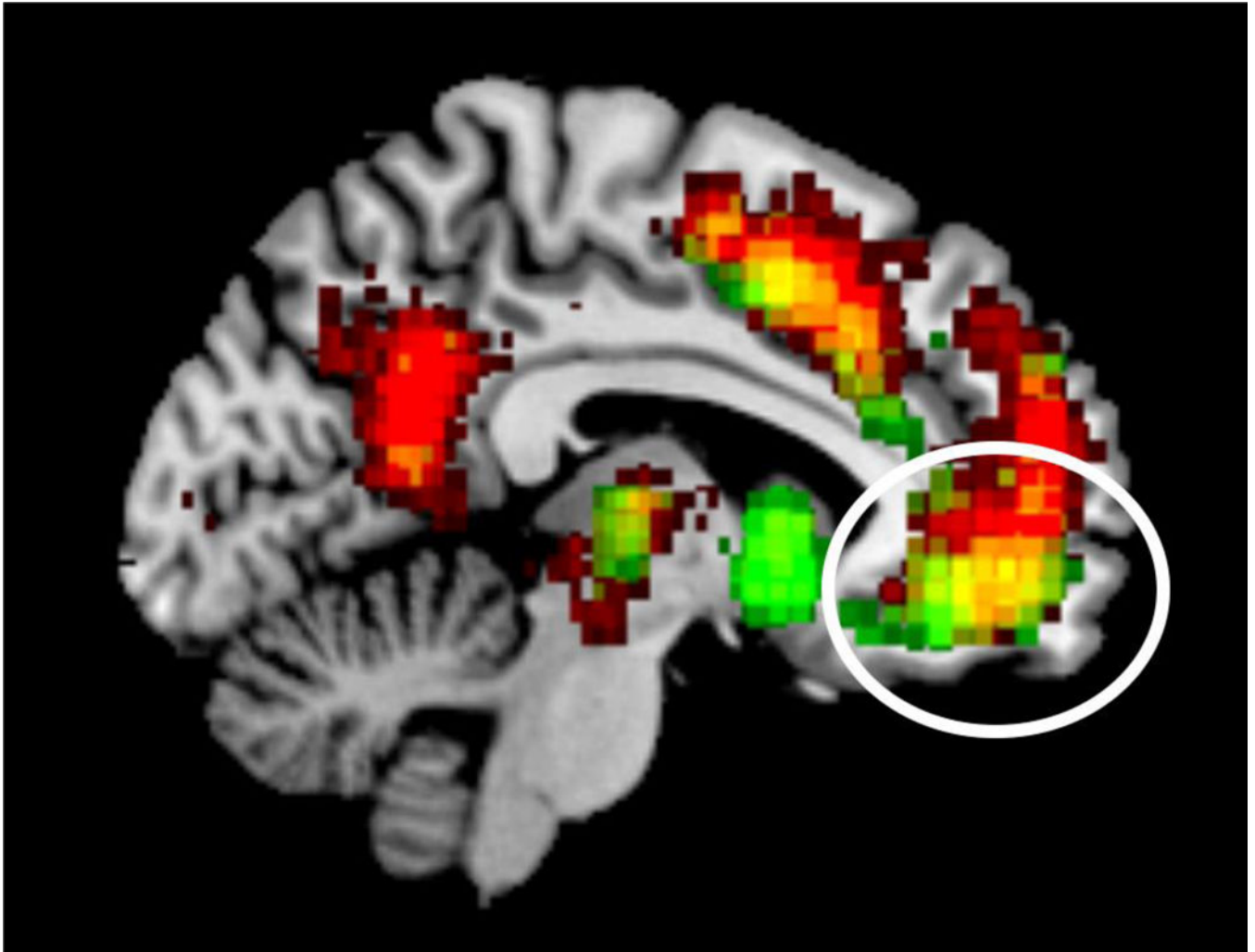
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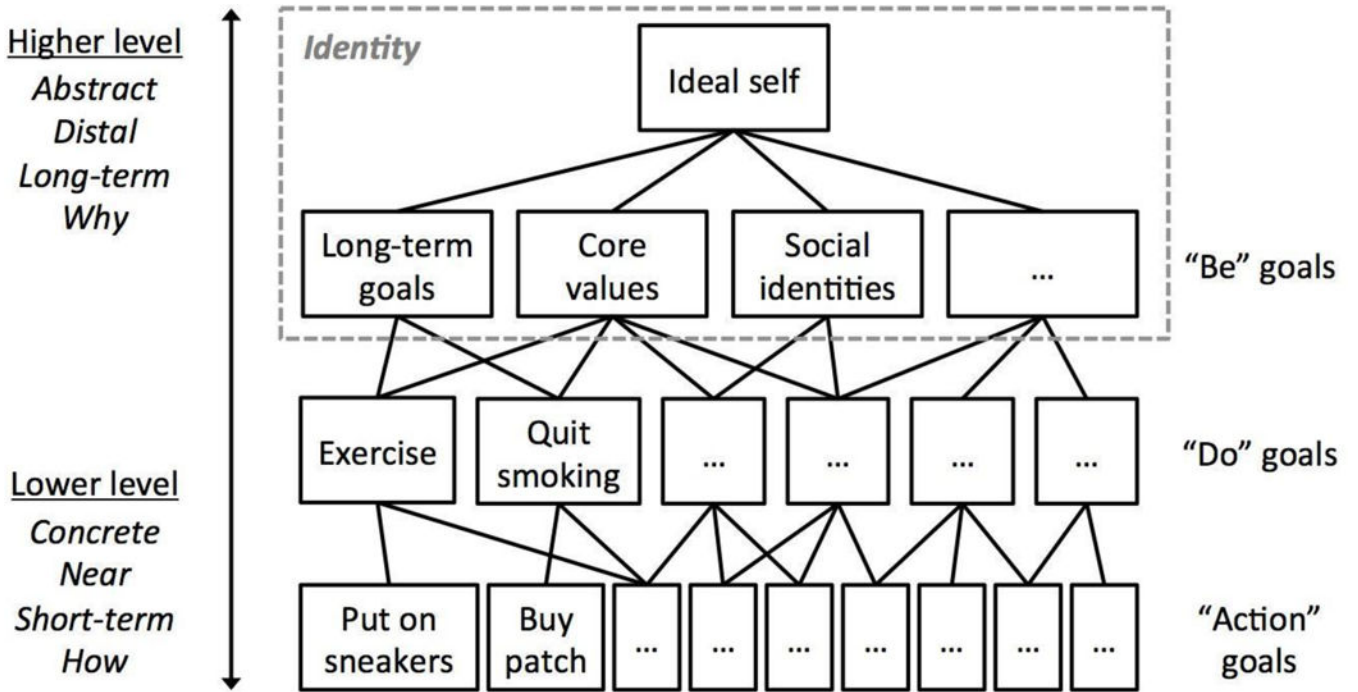


**Figure 1.** The identity-value model of self-regulation. Identity, among other factors, contributes to the subjective value of goal-consistent behaviors to the extent that the goal is identity-relevant. The cumulative subjective value of the behavior is compared to the value of other response options (only one shown, but more are possible), and the behavior with the highest subjective value is enacted. All else being equal, therefore, increasing the identity relevance of a goal will facilitate behaviors that foster goal progress.





**Figure 2.** Overlap between identity and subjective value in the ventromedial prefrontal cortex (vmPFC) shown in yellow. Identity-related neural activity is defined as regions active during self-processing and self-related thought (903 studies; red); value is defined as regions active during subjective value computation (344 studies; green). Image generated using the NeuroSynth tool for automated meta-analysis of neuroimaging data (Yarkoni et al., 2011).



**Figure 3.** Identity resides at the highest levels of the goal hierarchy. Higher-level, more abstract, longer-term (“why”) construals connect actions to identity. Lower-level, more concrete, shorter-term (“how”) construals distance actions from identity. Only some aspects of identity are shown; others (e.g., actual self, important past events) are not necessarily higher-level. [Adapted from Carver & Scheier, 1998.]