The identity-value model of self-regulation:

Integration, extension, and open questions

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We are grateful for the careful consideration, thoughtful comments, and insightful critiques that were provided in response to the target article (Berkman, Livingston, & Kahn, this issue). We are broadly in agreement with all the commentaries and were heartened to read about the many ways that the commentators easily identified routes by which our identity-value model of self-regulation (IVM) might be extended and connected with other theories in the field. Perspectives on the model were particularly positive with respect to the integrative nature of the model, the clarity of the mechanism by which identity contributes to self-regulation, and the value of using a neuroscientific perspective to underscore the relationship between identity and self-regulation.

Given the overall positive reception of this model, we will use this response as opportunity to review and expand upon the goals of the IVM, to explore areas of overlap with existing models, to summarize valuable extensions provided by commentators, and to outline open questions that remain for the IVM.

Review of the IVM

The IVM holds that identity, as a strong and enduring source of value, can play a particularly important role in determining self-regulation and self-control outcomes. The model adopts a valuation-based mechanism which posits that decisions relevant to self-regulation are the output of a subjective value integration process (Berkman, Hutcherson, Livingston, Kahn, & Inzlicht, in press). Given this value-integration model of self-regulatory choice, the IVM points to evidence from social psychology and cognitive neuroscience indicating that identity-relevant behaviors are more valued than identity-irrelevant ones to support the prediction that identity can promote self-regulation in identity-relevant domains by increasing the value of goal-relevant behaviors.

The goals of the IVM are multi-fold and expand on the current self-regulation literature in a number of ways. First, the IVM provides a broad, integrative framework that allows multiple processes, not just hot and cold ones, to influence self-regulation. For example, value inputs such as monetary incentives, identity, social influences, and perceived effort can contribute simultaneously to a self-control decision, each potentially adding or subtracting from the cumulative value of any of the choice options. In this way, the model does not deny a distinction between hot and cold processes, but instead suggests that the processes that lead to self-regulation success and failure are far more nuanced than merely the dominance of cold or hot processes, respectively. Because the model allows each value input to weight multiple response options, it removes the one-to-one mapping between processes and outcomes that is characteristic of dual-process models. We believe the inclusion of multiple processes and multiply determined outcomes allows for a more realistic account of the various routes to self-control success or failure and provides clear and novel pathways for self-control intervention.

The IVM focuses on identity-related processes as a key factor in determining self-regulation outcomes. In the context of goal-related choice, we conceive of identity as a relatively stable mental representation of personal and intrapersonal values, priorities, roles, and so forth, sometimes called the self-concept. The rationale for our emphasis on identity is evidence that identity activation can improve self-control in identity-relevant domains, as well as neuroscientific evidence suggesting that identity and value-based processing share substantial overlap in brain regions such as the ventromedial prefrontal cortex (vmPFC), a region that also predicts self-control success when self-relevant information is involved.

In allowing for multiple processes to influence self-regulation and focusing specifically on identity-related processes, the IVM builds a framework that, above and beyond providing a

mechanistic model of self-regulation, suggests new ways of *intervening* on self-regulation. Broadly speaking, the value-based model of self-control suggests that interventions that enhance the value of a desired outcome will be effective in improving self-regulation, and the IVM more specifically predicts that identity-bolstering interventions (e.g., that affirm or increase the salience of aspects of identity during choice) will be particularly effective. For example, high-level construal, social identity priming, cognitive dissonance, and self-affirmation are proposed as possible identity-based manipulations for motivating successful self-control. A strength of the model is that it makes the specific, testable predictions that these strategies will influence self-regulation via changes in the subjective value of the choice options.

Lastly, we note that our goal in formulating the IVM was not to build a comprehensive model that explains all instances of self-regulation, but rather to suggest a common, integrative framework by which a variety of choice attributes and features, as well as cognitive and motivational processes (separately or in interaction), influence self-regulation. Thus, we are pleased to see that many of the commentators articulated how specific processes and theoretical models can connect to the IVM. For example, as noted by O'Leary, Uusberg, and Gross (this issue), there is converging evidence that value-integration is a general process that occurs simultaneously in multiple regions of the brain and across a variety of cognitive processes; even while identity contributes to the value integration for a particular behavioral option in a self-control choice, it might simultaneously influence additional integration processes at different levels of the action hierarchy (see also Shehav; Sklar & Fujita, this issue). How exactly multiple value integrations themselves become integrated remains an open question, one that we do not attempt to solve here but that we will return to in the final section of this paper.

Integration of the IVM with other models of self-regulation

In bringing together knowledge across a variety of fields, the IVM shares foundations and assumptions with other theoretical models, and many commentators elaborate on the points of convergence with these other models. Here, we review the ways the IVM interfaces with other models of self-regulation and how considering these areas of overlap can yield new insights above and beyond the insights that either model proposes on its own.

Process Model of Self-Control

The process model of self-control (O'Leary et al., this issue) draws from the extended process model of emotion regulation (Gross, 2015) to identify a broad range of steps at which self-control decisions can be made (world, perception, valuation, action). This model explicitly suggests that a dynamic value integration occurs at each of these steps, and not only in the choice phase between options in a self-control situation as in the IVM. As noted earlier, we agree with the notion that multiple valuation systems operate in parallel, and appreciate that they can account for a wider array of self-control scenarios. For example, the extended process model clearly distinguishes between engaging self-control by suppressing a behavioral response and by avoiding the temptation to begin with, while articulating how both can be conceived within a unified model. The process model also describes four stages in the process of self-control initiation (identification, selection, implementation, and monitoring), and in so doing, identifies different ways in which identity could be targeted for intervention. As O'Leary and colleagues point out, a subtle but important implication of integrating the process model with the IVM is that the outcome of the identity-value relationship might behave a bit differently at each stage of self-control initiation. For example, whereas identity might change the value of a particular response option during the implementation stage (as described in the IVM), identity might also influence the relevance of the set of response options available during the selection stage,

thereby directly altering the set of response options available for the self-control decision. Sklar and Fujita make a similar point, noting that identity might influence whether or not self-control is engaged in the first place by altering which goals are salient at a given moment and the extent to which choice options are perceived as goal-promoting or goal-preventing. Integrating the IVM with the process model of self-control to understand these identity-value relationships will become particularly important when designing identity-relevant self-control interventions.

Construal Level Theory

Construal level theory describes the relation between psychological distance and conceptual abstraction. As psychological distance increases along a variety of dimensions (space, time, social distance, etc.), so does abstraction. Abstraction can be defined as the process of successively obscuring low-level details until only essential features and attributes remain. Because details are removed, abstraction is a powerful way to bridge psychological distance and see the connections between people, situations, and targets that appear on the surface to be unrelated. A dog and a cat look different, but they are connected by the abstract category of pets; eating a salad today and purchasing exercise equipment next week are different acts, yet they are connected through abstraction to the category of health behaviors. In this way, by enabling connections between behaviors across time and place, abstraction is one process by which high level construal can facilitate self-control. Sklar & Fujita (this issue) propose that construal level theory provides an explanatory mechanism by which identity imparts value to self-control decisions. We agree that abstraction – as the mental process that allows people to fluidly move up the conceptual construal hierarchy – may be the psychological process by which we connect identity to self-control choice. Sklar and Fujita go on to provide compelling evidence for the role of abstraction beyond identity value. In a similar vein, we add that identity might contribute to

subjective value beyond the process of abstraction. For example, a specific social identity may be less abstract than, say, core values, but nonetheless could hold substantial subjective value and thereby influence self-regulatory choices. The question of whether abstraction could account for the entire psychological process underlying the identity-value relationship, or if there are other pathways, remains open.

Dual-Process Theories

Shenhav (this issue) argues that our critique of dual-process theories does not apply to all dual-process models, but only to a small subset of them. He notes that even these dual process models, which frame self-control decisions as the output of a battle between automatic and controlled processes, are not incompatible with the value-based choice aspect of the IVM. Also, Shenhav cites evidence that additional neural circuits beyond vmPFC are involved in different types of evaluative processes. Finally, he describes how apparent self-control failures do not necessarily reflect a failure of a control process. Though these critiques are not particular to the value imparted by identity, they are relevant to the IVM because the model assumes that identity influences self-regulation choices via its effects on a common valuation process.

In general, we agree with the clarifications noted in the Shenhav commentary more than we disagree with them. As he nicely describes, dual-process models have proliferated in psychology to the point that it is difficult if not impossible to address, let alone critique, all of them. Indeed, we are narrowly focused on the variety of dual-process model often adopted in social psychological studies of self-control that pit fast, hot, impulsive processes against slow, cold, controlled ones. Ironically, our criticism of *those* studies is that they typically conflate process and outcome, inferring the former from the latter. For example, a participant's normatively unhealthy choice is presumed to reflect the fact that a hot process "won out" in a

contest with a cold one. But, as Shenhav rightly notes, this inference is not always valid. Perhaps the chooser deployed a slow, controlled strategy to arrive at the unhealthy choice, or perhaps the chooser doesn't hold the goal to eat healthfully in the first place. We posited value-based choice as the central mechanism of self-regulatory choice *precisely because* it is free from assumptions such as a one-to-one correspondence between process and outcome and a limit on the number of relevant processes to two. And, indeed, a tradeoff inherent in the flexibility of value-accumulator models, which integrate value from any number of sources and attributes, is that models become agnostic about the specific blend of processes that drove any particular decision. A "good" choice can result from deliberate down-regulation of the value of the alternatives, but also from activation of relevant identity, increased social influence, high effort costs of alternatives, or any number of other processes, individually or in combination. To extend Shenhav's analogy, we agree that a conflict between the Axis powers and the Allies is a good characterization of the Second World War. But we also believe that war in general is better described as an armed conflict between any number of combatants with complex and potentially shifting alliances and interactions rather than as a fight between good and evil.

Similarly, we agree with Shenhav that value-based choice doesn't constrain representation. Inputs to the IVM are not all presumed to originate in the same place, such as the case with effort costs calculated in the dACC (Shenhav et al., 2016). However, we hold that these inputs may occur by means of a parallel valuation process, as suggested by O'Leary et al. (this issue), with the value of different attributes of the choice and at different levels of the action hierarchy simultaneously accumulated throughout the brain. Finally, we note that, though value-based choice does focus on accumulation of value, this process is not mutually exclusive with inhibition. For example, perhaps the dorsolateral prefrontal cortex represents abstract health

value in connectivity with vmPFC *and also* inhibits hedonic processing of competing choice options. However, we would be remiss not to point out that, upon careful inspection, even studies that are interpreted as supportive of dual-process models often find a positive or zero within-subjects relationship between activity in hot and cold regions instead of a negative one as would be expected by dual-process models of self-control in social psychology (e.g., Lopez et al., 2017; Wagner & Heatherton, 2013).

Our aim in introducing the IVM and critiquing dual process models is to broaden conceptualizations of self-control beyond battles of fast and slow, automatic and controlled. The distinction between these two systems is real but often serves as a red herring for self-regulation research, particularly because inputs of both types can serve to both facilitate and debilitate self-control. For example, as noted by many commentators, social norms can increase or decrease the value of actions, and thus influence self-regulation for better or worse. For example, a teenager's peer group can make smoking look cool or disgusting, a value that gets integrated with the teenager's own values to determine whether or not they choose to smoke (Buckholtz, 2015). In this context, the degree to which the influence of peers' perceptions of smoking are fast / hot / System 1 or whether they are slow / cool / System 2 is irrelevant. Shenhav notes, and we agree, that what matters more is the direction and weight of the value input to a choice, regardless of its type.

Strength Model

The strength model of self-control holds that self-control is a limited, domain-general resource that can improve with use (Baumeister, Vohs, & Tice, 2007). Specifically, the model is motivated by evidence suggesting that self-control performance seems to "deplete" or decline with use, but that rebounds under certain motivational circumstances. Maranges & Baumeister

(this issue) describe a number of ways that identity, as described in the IVM, also fits within the strength model, insofar as identity allocates resources to goals that are valued. This account allows for some interesting extensions of the model, including how identity can account for planning failures and uncertainty, which we think are valuable directions to consider.

However, we want to make a subtle but important distinction about the ways in which the strength model and the IVM differ in their treatment of limited resources. Although both models assume that prioritization of certain values (e.g., identity-relevant ones) over others occurs because of limited resource, the IVM assumes that prioritization must occur because *only one option can be enacted at a given time*, reflecting a limitation on parallel processing. We assume this limitation stems from bandwidth limitations on some types of cognitive resources, such as working memory (Shenhav et al., 2017), as well as similar practical constraints on many behaviors (e.g., people usually choose only one entrée for lunch). Thus, the nature of the resource in the IVM is essentially about parallel capacity for cognition and behavior, rather than some limited physiological or motivational constraint. This is true of value-based models of choice more broadly, which typically apply to forced-choice situations where only one choice can be enacted at a given time.

Still, there is a second kind of resource limit in addition to the parallel processing bottlenecks. This limit manifests as fluctuations of self-control performance after sequential self-control attempts across time – the classic ego depletion phenomenon that has been hotly debated (Inzlicht & Schmeichel, 2012; Kurzban et al., 2013; Baumeister & Vohs, 2016). Why would self-control decisions change merely as a function of having performed earlier ones? Following valuation models from behavioral economics, we are tempted to attribute these shifts to diminishing marginal utility, but, as Maranges and Baumeister rightly note, this too requires an

explanation – *why* does utility diminish? Beyond the importance of characterizing anomalies in valuation (including how it fluctuates over time), the IVM itself is agnostic about this effect. However, arguments about the adaptive value of labor/leisure tradeoffs (e.g., Kool & Botvinick, 2014) as well as neurophysiological evidence that such tradeoffs are governed by fluctuations in dopaminergic tone (Cools, 2015) fit particularly well with the IVM and other valuation-based accounts. Ultimately, the value of any given choice diminishes over time because trying something new is adaptive after exploiting the current resource beyond some point. The interesting questions regarding this temporal limit on self-control, therefore, are about the features of a choice or a person that govern the tipping point between sticking with the current choice and trying out a new one.

Areas of Elaboration and Expansion for the IVM

The commentators helpfully provided several extensions of the IVM based on areas where it overlaps and converges with other models. These extensions include ways that related models from psychology and neuroscience could clarify the nature of identity, elucidate the important role of social context, and uncover the specific neural systems and computations by which identity influences self-regulation. We fully endorse these extensions and are grateful to the commentators for articulating how the IVM can serve as a mechanistic framework that enables connections among so many theoretical models. Below, we review the extensions and highlight promising directions for further inquiry.

The nature of identity

Definitions of self and identity within psychology are "extremely wide-ranging and [lack] uniformity," posing a crucial challenge for models such as the IVM to clarifying how they conceive of the nature of the self (VandenBos, 2007, p. 827). A number of commentaries focus

on the paradox of identity *stability*: how can identity be at once stable, as we claim, and simultaneously susceptible to myriad situational influences, amenable to fast cognitive restructuring, and malleable to change through intervention? The commentaries helpfully articulate how stability can be achieved through a number of constituent processes, particularly abstraction.

Northoff solves this seeming paradox by stating that the "diachronic" nature of the self forces identity to be abstract in nature, rather than being constituted by fleeting self-relevant cognitions or mental states. Because the essential abstractness of the self seems to be more salient at some times over others, Sklar and Fujita suggest that construal level theory can account for "the when" of the IVM by suggesting the hypothesis that identity will be particularly influential in self-regulation when construal level is high. Interestingly, Northoff hypothesizes that the more stable, abstract aspects of self connect to and bridge across lower-level elements, an idea that meshes well with the hierarchical value integration model proposed by O'Leary and Gross. In this view, even some low-level events might be seen as identity-relevant to the extent that they are strongly linked with higher level aspects of the self.

The conceptual link between between higher- and lower-level concepts introduces a potential explanation for Lempert and Kable's point that low-level construal can sometimes facilitate self-control decisions. The IVM does not suggest that low-level construal can never facilitate self-regulation. Our prediction is that the degree of identity-relevance can influence self-regulatory outcomes. And, as noted, identity tends to be high-level and abstract. However, not all abstract concepts are part of identity, and it is an interesting open question whether and how low-level concepts can be part of identity. From this perspective, evidence that high-level construal does not promote self-regulation, or that low-level does, is not necessarily contrary to

the predictions of the IVM. The critical issue is whether those manipulations – high- or low-level – successfully invoke aspects of identity that are perceived as relevant to the goal at hand. For example, it is possible that low-level, concrete planning could invoke identity as well or better than high-level, abstract or future-oriented thinking; in those cases, we would predict that the identity-relevant low-level manipulation would lead to greater changes in self-regulation than the identity-irrelevant, high-level one.

The role of social context

Another important aspect of identity that commentators considered to be highly relevant to the IVM is the social self. We fully agree: identities are, to a large extent, socially and/or culturally constructed (Maranges & Baumeister, this issue), so in considering the role that identity plays in shaping self-regulation, it becomes very important to consider the role that social contexts and roles, as antecedents to and possibly authors of identity, play in doing the same. Moreover, as the research literatures on empathy and close relationships have made clear, the values of the self are often represented to some degree in others, just as the values of others are represented in the self (Fitzsimons, Finkel, & vanDellen, 2015; Nicolle, Klein-Flugge, Hunt, Vlaev, Dolan, & Behrens, 2012), so the IVM must address how not only social norms but also close others can influence identity and self-concept.

However, as some commentators note, the strong influences of social context on identity complicate our argument that identity is a promising candidate process to consistently influence self-regulation across time and context precisely because of its stability. As Hackel and Zaki (this issue) highlight, the assumption that identity has a consistent impact on choice across situations may hold for aspects of identity related to social identification, such as self-construal (e.g., independent vs interdependent) and self-categorization (e.g., political or regional

identities), both of which are largely subject to contextual social influences. A similar notion was raised by Oyserman et al. (this issue) stating that situational cues (and perhaps social cues) about the contents of identity can shape behavior, an idea that builds off the working self-concept as presented in the IVM.

We agree with the commentators that substantial changes in goal-relevant identity could potentially undermine the role of identity as a consistent contributor to self-regulation. However, this concern is mitigated for several reasons. First, as suggested by other commentators, it may be the case that the hierarchical nature of identity allows abstract, stable aspects of self to influence which lower level (e.g., contextually-determined) aspects of the self become salient and how strongly they influence behavior. Second, even as social identities and contextual influences change over time and situations, we hold that core values and goals are stable across time because of their inherent abstract and diachronic nature (Northoff, this issue; Sklar & Fujita, this issue). Contextual cues are important, but they do not trigger the same behavior in all people; the meaning of situations and social identities are different across individuals, in part because they interact with stable, within-person attributes such as personality, core values, and long-term goals. Third, as Oyserman et al. (this issue) note, situations themselves can be a source of stability: people are not randomly assigned to situation, but instead end up in similar ones repeatedly and often by their own choosing. To the extent that any aspects of identity, such as core values, are stable, they might also promote temporal stability in situations. In this way, we agree that stable contextual cues can facilitate successful self-regulation.

We also add that the flexibility of social identities may provide a particular advantage when designing identity-based self-control interventions. Although the stability of the self seems to provide the greatest source of value for motivating goal-oriented behavior change, it's less

clear how susceptible the stable nature of the self is to manipulation. Given that identity is stable and well-rooted in established values, it would be difficult to change (although could be primed). Rather, flexible elements of identity, such as social identification, that tap into core underlying values may be more effective for targeted interventions. Additionally, just because some or many elements of identity are stable across time and place doesn't imply that they always influence behavior in the same way. Another explanation for apparent changes in identity over time – and potential avenue for intervention – is variability in the accessibility or salience of different aspects of identity. Ultimately, the IVM predicts that the contents of the "working self-concept" (Markus & Wurf, 1987) at the time of choice will influence the subjective value of the options, regardless of whether those contents are chronically accessible (stable) or were made temporarily salient by situational influences such as the social context or an intervention.

The neural computations involved in identity and valuation

Northoff grapples with the tricky question of how the brain might represent a stable, diachronic identity. His points that identity is essentially (and necessarily) abstract, and likely represented in cortical midline structures such as the medial prefrontal cortex, fit well with the IVM and its assumptions about how the content and neural underpinnings of identity. His commentary substantially advanced our broad starting points on these topics by adding mechanistic specificity of the neural processes, such as infraslow frequency oscillations in the medial prefrontal cortex, that give rise to identity diachronicity. We are encouraged that the very notion of stable identity seems plausible at the level of the brain, and eager for further research to uncover exactly how these oscillations interact with the more rapid value accumulation process that occurs at the time of self-control choice.

As described earlier, Shenhav notes that there is now strong evidence that value

accumulation does not only occur in the vmPFC, but also in regions such as the dorsal anterior cingulate cortex (dACC). Critically, evidence to date suggests that different accumulators might operate simultaneously at separate locations for various choice attributes, and possibly in interaction (Polania, Krajbich, Grueschow, & Ruff, 2014). For example, the value of mental effort appears to be accumulated in dACC (Shenhav, Cohen, & Botvinick, 2016), whereas the value of choice options is accumulated in vmPFC (Rangel & Hare, 2010). The idea that multiple value accumulation processes correspond to different points in the action control hierarchy and operate in parallel is fundamental to the process model of self-regulation (Duckworth, Gendler, & Gross, 2016; Gross, 2015; O'Leary et al., this issue) and consistent with the IVM. The pressing questions for the latter is whether and how the vmPFC decision value accumulator interacts with other valuation systems during self-control choice, and how these interactions might be influenced by identity and leveraged by interventions that target self-regulation.

A Research Agenda for the Future of the IVM

A number of important open questions remain despite the insightful expansions of the IVM described in the commentaries. When considered alongside the target article, the commentaries suggest a fascinating research agenda for future investigations into the role that identity might play in self-regulation. We briefly describe three areas of further study that were inspired by the commentaries and that we find particularly promising.

Is identity stable across time and situations?

Given the centrality of identity to the IVM, and particularly its stability, one of the more important questions to consider moving forward is the nature of identity and the degree to which identity is stable across both time and situations. Although identity's stability is implicit in many of the personality and autobiographical memory-based tasks used to investigate self-referential

processing (Northoff et al., 2011; Legrand & Ruby, 2009), methods by which to directly test identity's stability are less developed and a topic that philosophers have debated for centuries. Recent work in experimental philosophy has contributed new insight on the topic by revealing that hypothetical shifts in moral identity lead to larger perceptions of identity change relative to other types of identity (e.g., social), suggesting that moral character may lie at the foundation of who we are (Strohminger & Nichols, 2014), or at least who we are perceived to be. Future investigations on this topic may benefit from considering the extent to which the moral self maps onto stable goals and values in real world settings. Additionally, developmental psychologists study identity's stability using longitudinal approaches to measure change in self-concept over time (e.g., Pfeifer et al., 2013). An extension of the IVM for adolescent populations has been proposed that places even greater emphasis on social identity given the heightened importance of peer-oriented social interaction during that developmental stage (Pfeifer & Berkman, under review).

As suggested throughout this article, high level construal may be the common psychological process underlying the stability of some aspects of the self. Future research will need to further investigate this hypothesis by examining the extent to which high-level construal of the self (e.g., self-distancing, self-compassion, self-transcendence) overlaps with other types of high-level construal processing, as well as how the effectiveness of high- (versus low-) level construal specifically of identity-related processes (e.g., situational identities) in influencing self-regulation. For example, the threat-mitigating effects of self-distancing manipulations (e.g., Ayduk & Kross, 2010) might be even further amplified if, in addition to promoting distancing from certain aspects of the self, they also motivated individuals to construe relevant aspects of the self at a higher level. A notable advantage of the proposed research is that it expands away

from traditional trait-centered approaches to utilize more holistic, narrative accounts of the self that, to date, have been under-represented in investigations of self-relevant processing (McAdams, 2013).

How can social context and social identification help and hinder self-regulation?

As noted in several of the commentaries, social identity is complex and fluid. That being the case, an important question to consider is how social identity might contribute to successful self-regulation, if at all. In addressing this question, we think the following three observations are particularly relevant. First, behaviors that are positively valued because of their link to an important social identity are not necessarily goal-consistent. For example, even Dodger fans who are attempting to diet are likely to have fond appraisals of Farmer John Dodger Dogs in no small part because of their relevance to a Dodger fan identity. So, merely activating a valued social identity does not inherently promote self-regulation with respect to a particular goal, and at times it can impede it. Second, many social identities include a cluster of group goals that may or may not be related to personal goals. Activating a social identity might not only change the value of goal-relevant behaviors, but also change which goals are active in the first place (see also O'Leary et al. and Sklar & Fujita, this issue). Perhaps the Dodger fan's dieting goal becomes subsumed entirely by the goal of enjoying the day game. Third, it becomes unclear exactly how to define self-regulation "success" in cases of multiple goal pursuit, including the pursuit of personal and group goals. This definitional problem is related to the point Hackel and Zaki (this issue) raise about symbolic gestures toward goal completion, as well as to questions about how to consider satisficing and self-deception in goal pursuit: Is it self-regulatory success if someone changes the goal on the fly? Of course, theorists have considered these issues in the past (Carver & Scheier, 1998; Kruglanski et al., 2002; Miller, Galanter, & Pribrum, 1960), but adding the

layers of self-motives (e.g., to maintain a consistent, internally coherent, and positive self-concept) and the many ways those motives can influence goal-related cognition is new. Together, the three considerations above suggest that the relation between self-regulatory outcomes and social identities will be quite complex. We consider this a fruitful and yet underexplored area that is ripe for additional empirical attention.

Can the IVM be falsified?

An important question moving forward will not only be how we can test this model, including ways to expand upon it, but also ways that it can be falsified. As Lempert and Kable (this issue) note, because the IVM argues that value mediates the relationship between identity and self-regulation, the model may be falsified by examining the degree to which the mediation relationship holds true. However, this examination proves challenging given that identity and value demonstrate strong overlapping activity in the vmPFC. We agree that disentangling identity and value-based processing in this region will be important for directly testing the IVM, and we are optimistic that it will be possible to distinguish the processes. Though research using machine-learning techniques have demonstrated an impressive ability to significantly predict the overlap between identity and value in the vmPFC, the predictive ability is still just (significantly) above chance (Chavez, Heatherton, & Wagner, in press). Moreover, as Lempert and Kable note, recent approaches have been able to use connectivity-based approaches to disentangle self-relevant and value-based processing, for example, to separately identify the role of each in predicting health-relevant behaviors (e.g., Cooper, Bassett, & Falk, 2017). As a result, despite the strong overlap between self and value-based processing in the vmPFC that suggests the two processes are intimately related, we are also optimistic that future research will be able to use a combination of different neuroimaging techniques to disentangle subjective value from self-

based processing in the brain. These tools could be used to test not only whether value mediates the relationship between identity and self-regulation but also related hypotheses that arise from this model, such as whether an intervention can influence one but not the other of value and identity.

Conclusion

The Identity-Value Model proposes that identity influences self-regulation by contributing to a value integration process that drives choice. One impetus behind the development IVM was the lack of a broad, integrative, and flexible theoretical framework that can account for the diversity of processes, including and especially identity, that influence self-regulation. In the IVM, considerations such as the implications of a behavior for a cherished core value, its perceived meaning to a social group, and even its dollar cost, anticipated tastiness, or perceived effort, can all simultaneously contribute to its likelihood of being enacted. By positing a dynamic subjective value accumulation process as the mechanism by which these many and diverse considerations are integrated during self-regulation, the IVM hooks in to computational and neural models of choice, amplifying its conceptual reach and explanatory power. We are deeply grateful to the commentators for identifying and articulating additional ways that the IVM can connect across theoretical models and disciplinary boundaries. Ultimately, the IVM is a model of self-regulation change because of its focus on stable sources of choice value, such as identity, that may be malleable to change through targeted intervention. In the words of Kurt Lewin, "if you want truly to understand something, try to change it." Our hope for the future of this model is that it helps to refine scientific knowledge of self-regulation by accelerating the development of new interventions to improve goal pursuit.

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