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The Energetics of Motivated Cognition: A Force-Field Analysis

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A force-field theory of motivated cognition is presented and applied to a broad variety of phenomena in social judgment and self-regulation. Purposeful cognitive activity is assumed to be propelled by a *driving force* and opposed by a *restraining force*. *Potential* driving force represents the maximal amount of energy an individual is prepared to invest in a cognitive activity. *Effective* driving force corresponds to the amount of energy he or she actually invests in attempt to match the restraining force. Magnitude of the potential driving force derives from a combination of goal importance and the pool of available mental resources, whereas magnitude of the restraining force derives from an individual's inclination to conserve resources, current task demands, and competing goals. The present analysis has implications for choice of means to achieve one's cognitive goals as well as for successful goal attainment under specific force-field constellations. Empirical evidence for these effects is considered, and the underlying theory's integrative potential is highlighted.

Keywords: motivated cognition, driving force, restraining force, cognitive energetics theory

Much of human cognition is motivated. As Fiske (1992) aptly observed, "Thinking is for doing" (p. 877). Its purpose is to guide intelligent action. To be sure, thinking, in and of itself, *is* doing of sorts. It is carried out in the service of (cognitive) goals. It can be laborious, just like "doing." It amounts to "work." This view has been implied often by social cognition theorists. Zanna and Aziza (1976), for instance, referred to the "cognitive work" (p. 577) that a reduction of dissonance can entail, whereas Fiske and Taylor (1991) invoked the metaphors of persons as "cognitive misers" and "motivated tacticians," respectively, depicting actors reluctant to put out the required cognitive effort and those prepared to conscientiously process information in an effort to reach their cognitive objectives.[1] Issues of energy and effort have been often skirted in the social cognition literature and have remained unarticulated in major theoretical treatments of motivated reasoning. Our aim is to address this gap and put energetic requirements at the forefront of theorizing about motivated cognition. As will be seen, the energy focus integrates broad swathes of seemingly unrelated findings in social cognition and self-regulation and affords novel insights into well-tilled topics in these domains of research.

In a Gist

Our cognitive energetics theory (CET) assumes that motivated cognition represents a dynamic process wherein a driving force matches a restraining force to effect goal pursuit. The force-field formulation highlights the work aspect of motivated cognition. Work involves struggle against obstacles, conceptualized as the interaction of different forces.

In our theory, *potential* driving force represents the maximal amount of energy the individual is prepared to invest in a given goal pursuit. *Effective* driving force represents the actual amount of energy he or she invests (for a related distinction, see Brehm and Self, 1989). For a goal-directed activity to be carried out, the magnitude of the effective driving force needs to match the magnitude of the restraining force, that is, supply the energy to do "what it takes" to effect goal pursuit. Having the energy is a *necessary* but not a *sufficient* condition for goal attainment. It is also necessary to possess sufficient skill or aptitude in a domain. Combined with the energy supply, such aptitude serves to promote goal attainment. For instance, no matter how high the energy, one's likelihood of solving a complex mathematical problem is nil given the absence of appropriate aptitude or training in mathematics.

The potential driving force represents a combination of two elements: goal importance and resource availability. The restraining force represents resistance to a given pursuit; such resistance arises cumulatively from task demands, the pull of competing goals, and one's inclination toward resource conservation (or cog-

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[1] The notion that cognitive activity can be effortful and laborious has been widely accepted in psychology and has been supported by manifold physiological evidence. Thus, it has been found that mental effort is accompanied by physical arousal (Berlyne, 1960), increased levels of cortisol (Fibiger & Singer, 1989), cardiovascular response (Lacey, 1967; Obrist, 1981; Van Roon, Mulder, Veldman, & Mulder, 1995), contraction of the corrugator muscles (Cacioppo, Petty, and Morris, 1985), a drop of blood glucose level, muscular tension (Wilkinson, 1962), and pupil dilation (Beatty, 1982), and the P300 component (Ullsperger, Metz, & Gille, 1988) as well as metabolic an cardiorespiratory effects indicative of effort (Backs & Selijos, 1994).

nitive "miserliness"). The CET assumes that elements of the driving force (goal importance and amount of resources) combine to determine its overall magnitude. As explained later, increasing or decreasing one of the elements (say, goal importance) by a given amount has the same effect on magnitude of the potential (driving) force as decreasing or increasing the extent of its counterpart (say, available resources) by the same amount. Similarly, elements of the restraining force (task demands, competing goals, or resource conservation) are functionally interchangeable: increasing or decreasing the magnitudes of those elements is tantamount, as far as the overall restraint magnitude is concerned, to proportionately increasing or decreasing the magnitude(s) of the remaining elements.

The CET also maintains that elements of the *effective driving* versus those of the *restraining* force are compensatory: Specifically, to keep the activity going, increase in the magnitude of a restraining element, say task demands, must be offset by an equivalent increase in driving element(s), that is, goal importance or resource availability. Finally, as implied earlier, the CET assumes the energy potential to combine with domain-relevant *skill* to determine goal attainment. Where the relevant skill is present, appropriately increasing the individual's energetic capability (by increasing the magnitude of the potential driving force) enhances the likelihood of goal attainment.

The relation between the driving and the restraining forces is managed in part by an individual's executive that effects choices and adjustments aimed at affording maximally efficient pursuit. The larger the magnitude of one's potential driving force, the broader the range of restraining forces that could be overcome. As an important implication, given a high potential driving force, one could choose highly demanding tasks as means of goal attainment; these could not be implemented if one's potential driving force was low. Why would one ever prefer more over less demanding tasks? One reason is that some demanding tasks might seem to be more effective means to goal attainment. A major empirical focus of the present theory is on individuals' greater tendency to elect low-demand informational means to their cognitive goals when their potential driving force is low and to elect means seen as highly effective (even if demanding) when their potential driving force is high.

Whereas choice of tasks according to their level of demand represents an adjustment of one's restraining force to affordances of one's driving force, the opposite dynamic is at play as well: One typically adjusts one's actual energy expenditures, that is, one's effective driving force, to the restraining force at hand. For instance, more of one's energy supply is typically invested if the (chosen or assigned) task is more demanding.

Finally, because the range of performable tasks is broader under higher (vs. lower) potential driving force and because highly instrumental means can be (though need not invariably be) highly demanding, the likelihood of goal attainment is assumed to vary positively with one's potential driving force. These theoretical implications are examined later in the light of relevant empirical research.

The Purchasing Metaphor

The motivated cognition process depicted in CET may be likened to a purchasing activity. The driving force behind a purchase reflects a combination of two elements: (a) the (subjective) importance to the individual of the targeted object (corresponding to CET's construct of goal importance) and (b) the monetary resources at one's disposal (corresponding to CET's resource supply). Similarly, the restraining force counterindicating the purchase may consists of (a) one's personal stinginess (corresponding to the tendency toward resource conservation), (b) the price of one's object of desire (corresponding to task demands), and (c) other desirable objects one also wishes to acquire (corresponding to competing goals).

Concerning the interchangeability of elements, one can see how increasing the object's importance is tantamount to increasing one's supply of funds. Both increase the individual's readiness to buy. Too, a price increase can be offset by increasing the object's importance or one's supply of funds. One would be ready to expend a considerable amount on an item deemed of high importance or if one's supply of cash was considerable and money was "no object."

Relations between one's purchasing potential and obstacles to the purchase are dynamic and driven by the individual's choices. Just as in the absence of cognitive resources, one would choose a less effortful (albeit a less effective) cognitive means to one's goal—one would be likely to settle for a cheaper (albeit a less effective item, say a beat-up clunker rather than a brand new automobile) if one lacked the money. But if one had the money and deemed a given item of sufficient importance, one would likely be prepared to meet the seller's price; that is, pay more if need be. This echoes the idea that one would expend the necessary mental energies (out of the existing supply) if the cognitive task (means to one's cognitive goal) so required.

Finally, in parallel to CET's notion that relevant skill is necessary and that energy alone may not guarantee goal attainment, a consumer's purchase readiness carries no guarantee that the purchase will take place. Some objects, after all, are not readily available on the market and may require from the buyer considerable acumen to locate them or to convince the seller to part with her or his valued possessions. For a different example, a politician may need considerable funds to run an effective campaign, but in addition she may need the appropriate personality, ideas, and attitudes to be elected.

The purchasing metaphor is suggestive, and hence it will be invoked at various junctures as our analysis unfolds. Yet, a metaphor can only go so far, and it cannot substitute for a detailed theoretical treatment of the substantive issues at hand. The latter are elaborated subsequently, followed by a review of the empirical evidence for our theory. But a prior question is how does the present framework relate to relevant past conceptualizations of motivated cognition? To address this issue, our upcoming sections situate the CET in its conceptual landscape and delineate its intended scope.

Background and Scope

Background

Scientific theories are rarely detached from their past. Typically, they emerge in response to previous findings and formulations. The present theory is no exception. In important ways, it is continuous with its predecessors and builds on their insights and

discoveries. Its overarching aim, in fact, is to articulate what was often implicit in prior paradigms and to "connect the dots" they placed on the "map" of motivated cognition phenomena. In what follows, we offer a brief review of CET's major precursors, and we indicate how the present theory extends and synthesizes those earlier conceptions.

Dual process models. The field of motivated cognition has been dominated in recent decades by models that partitioned the processes of human inference into two qualitatively distinct categories (albeit characterized differently in the different frameworks). These models have been extensively reviewed and analyzed elsewhere (e.g., see Evans, 2008; Keren & Schul, 2009; Kruglanski & Gigerenzer, 2011; Kruglanski & Orehek, 2007). Our purpose here is to indicate their relevance to the present formulation. Essentially, it derives from the juxtaposition of quick and effortless process of judging (referred to variously as *intuitive*, *peripheral*, *heuristic*, or *reflexive*) to a slow and arduous process (e.g., variously referred to as *deliberative*, *central*, *systematic*, or *reflective*). Though the distinction between these two types of process hints at a possibility of differential energy requirements, the dualistic models typically stopped short of explicitly saying so.

Consider Petty & Cacioppo's (1986) well known elaboration likelihood model (ELM). In that influential formulation, *issue involvement* and *cognitive capacity* (resembling the present variables of *goal importance*, and *resource availability*) act as critical selectors between the *peripheral* versus the *central* "routes" to persuasion, where the former relies on cues (e.g., communicator expertise or likeability) unrelated to the message and the latter concerns message arguments as such. Whereas the ELM predicts that processing of message arguments would occur under high issue involvement or high capacity and processing of cues under low involvement or capacity, unlike the present theory it does not tie it to differential task demands associated with processing cues versus arguments. Rather, the distinction between cues and arguments was seen to lie in their *differential relevance* to the substance of the message (Wegener & Claypool, 1999); this implies a link between motivation or capacity and relevance of information used, rather than a link between motivation or capacity and information's *ease of processing* (for discussions, see, e.g., Kruglanski, Pierro, Mannetti, Erb, & Chun, 2007; Kruglanski & Thompson, 1999a, 1999b).

Extensive analysis of the remaining dual-process models is beyond the present scope (see Kruglanski & Orehek, 2007, for a relevant discussion). Suffice it to say that much like the ELM, these frameworks did not explicitly address issues of *energetic potential* and *task demands* inherent in judgmental tasks, nor did they typically address the possible relevance of one to the other, and its potential to account for a plethora of dual process effects.

The unimodel. The latter relevance was a mainstay for the *unimodel*[2] that interpreted in its terms multiple findings in domains of persuasion, attribution, and biases and heuristics among others (for reviews, see Erb et al., 2003; Kruglanski & Gigerenzer, 2011; Kruglanski et al., 2007; Kruglanski & Thompson, 1999a, 1999b). In this sense, the unimodel is a precursor of the CET. As will be seen, however, the CET goes well beyond the unimodel. It does so by refocusing the analysis on a *field of forces* acting on a motivated cognizer but also by refining, generalizing, and formalizing the unimodel's insights. Most important, perhaps, the CET expands the scope of the unimodel by addressing domains of phenomena beyond the pale of the dual-process models (e.g., biases of motivated reasoning) and integrating under its aegis several heretofore unconnected domains of motivated cognition research.

Resource-oriented models. The pioneering work of Brehm, Wright, and their colleagues (Brehm and Self, 1989; Wright, 2008; Wright, Brehm, & Bushman, 1989) focused on the relation between effort expenditure and task demands. As will be seen, the CET builds on this research and extends the basic principle of resource conservation that underlies it to considerations of resource availability and depletion as they impact broad domains of additional phenomena (i.e., the choice of cognitive means to one's goal and the likelihood of cognitive goal attainment).

Research by Baumeister, Vohs, Tice, and their colleagues (Baumeister, Vohs, & Tice, 2007; Schmeichel, Vohs, & Baumeister, 2003; Vohs et al., 2008) yielded important discoveries concerning the depletion and replenishment of resources and implied how these affect successful self-regulation. Building on their insights, the present work ties these processes with alternative phenomena (e.g., heretofore addressed by the dual-process frameworks and the unimodel) and incorporates them within a broader force-field analysis of motivated cognition.

Motivated reasoning. A major topic to which the present theory is applied concerns the phenomenon of motivated reasoning. Prior work in this domain by Dunning (1999); Kunda (1990, Kunda & Sinclair, 1999) and Hsee (1996) hinted at the difficulty (if not impossibility) of motivated biases in cognition under conditions of *reality constraints*, *stimulus clarity*, and *inelasticity*. As will be seen, the present analysis suggests that those can be overcome by sufficient magnitude of the potential driving force (i.e., sufficient goal importance and sufficiently ample resources) resulting in motivationally biased judgments under what might to some persons represent considerable reality constraints. In this way, the CET relativizes the occurrence of motivational biases in cognition to a field of forces acting upon the reasoning individual at a given moment. Such analysis affords a new understanding of motivational biases, grounded in a general conception of dynamic processes that govern social cognition.

To summarize, the present theory grows out of several heretofore unrelated strands of research on motivated cognition and integrates them under a common conceptual umbrella. Such integration suggests new possibilities, relevancies, and extensions as well as new insights into classic domains of prior work.

Theoretical Scope

The intended application scope of the CET is broad. Basically, it is meant to pertain to all instances of goal-directed thinking, in particular reference to energy expenditures, cognitive strategy selection, and goal attainment. By goal-directed thinking, we mean a motivated cognitive activity occurring within a temporally bounded context. Examples of such activity would be forming an impression, judging the likelihood of an event, or addressing a

[2] Unlike the CET, the main focus of the unimodel has been on the rule-following inferential mechanism assumed common across diverse judgmental phenomena (Kruglanski & Gigerenzer, 2011).

mathematical problem.[3] The goals to which our theory is assumed to apply also are multifarious. They have been usefully ordered within Fiske's (2004) BUCET motivational model, standing for Belonging, Understanding, Controlling, Enhancing (self), and Trusting goal categories. In a broader classification, Higgins (in press) categorized human motives into three fundamental classes, namely, those of truth, value, and control. Though subsequently reviewed research may not necessarily touch on goals in all those rubrics (most such evidence addresses Fiske's understanding, and enhancing and Higgins' truth and value categories), the present theoretical statements are assumed to apply to the remaining motivational categories as well.

Our concept of goal attainment is meant here in its subjective sense. In other words, the CET addresses a personal sense of goal attainment that may or may not coincide with objective attainment. For instance, a motivational bias in reasoning may gratify a goal in the enhancing-self category, but the reasoning conclusion in this case may mismatch the objective reality (cf. Kruglanski, 1989b). The enhancing-self goals may typically operate beneath conscious awareness in constituting an "illegitimate" influence on judgments (cf. Hsee, 1996) falsely assumed by the perceiver to reflect solely accuracy concerns (in Fiske's understanding category). In this sense, the present theory is assumed to apply to a variety of implicit goals of recent interest (for a review, see Fishbach & Ferguson, 2007).

Indeed, recent findings suggest that although nonconscious mental processes are not represented in awareness, they do require cognitive resources to keep the goal active and monitor the environment for new opportunities, hence increasing the likelihood of goal attainment (Fishbach, Friedman, & Kruglanski, 2003, Study 2; Hassin, Aarts, Eitam, & Custers, 2005; Papies & Aarts, 2010). These results are in line with the recent models of working memory (Baddeley, 2000, 2003, 2007) as a process that allows the episodic representations of the environment to interact with long-term memory and to facilitate flexible problem solving by "creating new cognitive representations" (Baddeley, 2000, p. 421).

This concludes our brief sketch of the background and scope of the present theoretical framework. In what follows, CET is elaborated in detail and is followed by a review of empirical evidence pertinent to its various implications.

Cognitive Energetics Theory

Our cognitive energetics theory adopts Kurt Lewin's (1936, 1951) field theoretic approach. We assume that the dynamics of motivated cognition are driven by a force field acting upon an individual at a given moment. In Lewin's terminology, there is a *driving force* set to bring about a given cognitive activity and a *restraining force* set to prevent it.[4] If the activity is to occur or to be brought to a successful completion, the driving force must match in magnitude the restraining force.

Just like a physical force, a psychological force too (of the driving or restraining type) has a *direction* and a *magnitude* (Deutsch, 1968). Such force can be mathematically depicted as a vector (Lewin, 1951, p. 27). The *direction* of a driving force is determined by the specific goal it is geared to accomplish, for example, to reach a nonspecific cognitive closure or to formulate specific desirable conclusions (Dunning, 1999; Fiske, 2004; Kruglanski, 1989a, 2004; Kunda, 1990; Kunda & Sinclair, 1999).

The restraining force is directionally opposed to the driving force. In the realm of motivated thought, the restraining force is aimed to forestall the occurrence or completion of a given cognitive activity, that is, to prevent thinking. As outlined earlier, the restraining force can derive from specific concerns the activity is threatening to undermine (e.g., competing goals in the situation), perceived task demands, or a general tendency toward inertia and quiescence. We elaborate on these factors later.

Potential and Effective Driving Forces

Potential driving force. A fundamental distinction in CET is between potential and effective driving forces.[5] A potential driving force (DP) represents the maximal amount of energy the individual is capable of investing in a given goal pursuit. In other words, the magnitude of a potential driving force corresponds to its *energy supply*. It determines the potency a force is capable of exerting toward goal pursuit, hence the amount (upper bound) of work it is capable of performing. In popular parlance, the concept of *force* is tantamount to that of energy: it denotes the "strength or *energy* exerted or brought to bear" (italics added; Merriam-Webster's Online Dictionary, 2011). Magnitude of an activity's potential driving force has two principal determinants related to the (a) *goal importance*, that is, significance that the individual accords to the goal she or he is pursuing, and her or his (b) reservoir of *available mental resources*. In turn, goal importance is assumed to depend on a product of its value and its attainment expectancy by the individual (Atkinson & Birch, 1970).

Effective driving force. Effective driving force (DE) represents the actual amount of energy ultimately invested in goal pursuit. Just as individuals are unlikely to pay more for an item than the asking price, they are unlikely to invest more energy than required to meet the demands of the restraining force. Thus, we assume that the effective driving force matches the restraining force and hence blocks it and removes it effect. In other words, given that they possessed the necessary energetic wherewithal, individuals would do "what it takes" to attain their cognitive goal, no more, no less.

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[3] This conception allows that a larger cognitive enterprise (e.g., constructing a model of artificial intelligence or writing a novel) be concatenated from smaller, time-restricted segments each driven by its specific limited subgoals of the overarching objective.

[4] Though passing references to Lewin's force-field approach and the notions of driving or restraining forces are found often in the psychological literature (e.g., see Latané, 1981), particularly in domains of conflict resolution and social change research (Coleman, Hacking, Stover, Fisher-Yoshida, & Nowak, 2008), few (if any) analyses go as far as to specify the ingredients of those forces or trace their implications.

[5] A related distinction, namely, between *potential motivation* and *motivational arousal* was proposed by Brehm and Self (1989). Potential motivation, much like the potential driving force, referred to the individual's willingness to expend the effort on a given activity, whereas motivational arousal, like our effective driving force, had to do with the degree of effort actually expended. However, Brehm and Self's (1989) conceptualization of potential motivation did not include the resource pool factor that is crucial to the potential driving force, and their construct of motivational arousal was assumed to be determined solely by task demands rather than by a broader force of restraint including also competing goals and individual miserliness.

Magnitude of the potential driving force determines the maximal magnitude of the restraining force that can be tolerated if goal pursuit is to occur. This means that magnitude of the potential driving force (i.e., the amount of energy at the individual's disposal) should affect the individual's choice of cognitive strategies (serving as means to the cognitive goals) in accordance with his or her energetic demands. Furthermore, the relation between magnitudes of the potential driving and restraining forces should ultimately affect goal attainment. No attainment can be expected if the restraining force exceeded in magnitude the potential driving force. Furthermore, as explained later, within the proviso that the effective driving force matched in magnitude the restraining force, likelihood of goal attainment would be proportionate to magnitude of the potential driving force. In what follows we formally elaborate on the different elements of our theory. And at a later juncture, we integrate under its aegis a diverse body of prior empirical findings and describe new studies pertinent to its derivations.

Restraining force. Magnitude of the restraining force is determined by (a) an individual's tendency toward cognitive inertia, hence toward cognitive miserliness or inclination to conserve mental resources, (b) energy demands of the activity, stemming from its perceived difficulty,[6] and (c) possible competing goals vying for the individual's resources. All these are likely to differ from one person to the next and from one situation to the next. In this vein, Deutsch (1968, p. 441) commented on individual variability in the experience of restraint, noting, for instance, that "[t]he same social or physical obstacle corresponds . . . to different restraining forces for different individuals."

The driving and restraining forces differ in the way they are constituted: The (potential) driving force reflects the *interdependent* operation of goal importance and resources, whereas the restraining force reflects the accumulation of *independent* sources of resistance to a cognitive activity. Consider the potential driving force: It represents a process wherein the goal of the cognitive activity mobilizes the available resources in proportion to this goal's importance to the individual. Both goal importance and resources are essential. An activity would not happen if the goal was below a threshold of importance, nor would it happen in a complete absence of resources. Harking back to the purchasing metaphor, no purchase would take place if the object held no significance to the person or if he or she possessed no funds whatsoever.

The restraining force is constituted differently. Here, the various sources of resistance combine additively to determine the total extent of resistance to the activity. Thus, *none* of the resistance sources as such is absolutely necessary for *some* amount of resistance to exist. For instance, extensive task demands could set up a restraining force of appreciable magnitude, even if no competing goals were active at the moment. Similarly, competing goals could engender a considerable restraining force, even for an eager cognitive "spendthrift," disinclined to conserve her or his mental resources. In terms of our purchasing metaphor—the determinants of an object's price (defining a restraint on the purchase) are independent of one another. For instance, even if there was no competition among potential buyers of a property (competition typically drives up the price of a property), the price could be still forbidding (reducing the readiness of a buyer to buy) owing to the property's desirable location or its size.

Determinants of Force Magnitudes

Potential driving force. As stated earlier, magnitude of the potential driving force is a function of (a) importance of the activity's goal, and (b) available supply of resources. Consistent with major motivational theorists (e.g., Atkinson & Birch, 1970), goal importance is assumed to depend on the desirability or value attached to the end state that the goal represents and its attainability or expectancy of completion (cf. Kruglanski, 1996). Specifically, we assume goal importance (*GI*) to be a product of value *V* and expectancy *E* ($GI \sim V \times E$).[7]

By mental resources, we refer to an individual's capacity to perform cognitive tasks of various kinds. As Shah, Hall, and Leander (2009) described it, such capacity depends upon potentially exhaustible self-regulatory resources that are generally applicable to goal pursuits (cf. Broadbent, 1971: Kahneman, 1973; Kanfer, Ackerman, Murtha, Dugdale, & Nelson, 1994; Moray, 1967). They include (but are not limited to) physical and mental energy (Hockey, 1996; Wright & Brehm, 1989; Zijlstra, 1996), affect various forms of executive functioning (e.g., impulse control, and affect regulation; see Schmeichel & Baumeister, 2004), and are generally understood to be limited and depletable.

The constructs of goal importance and the availability of resources are conceptually separate. They have different antecedents and different temporal boundaries. The antecedents of goal importance are expectancy and value as already noted; in contrast, the available resources are determined by one's reservoir of physical and mental energy and its state of depletion. Furthermore, the variable of goal importance transcends the specific situation. In contrast, available resources are defined in reference to a particular moment. Despite their qualitative differences, the factors of goal importance and available resources interact quantitatively as indicated later.

We assume that the total, momentarily available supply of mental resources is constant and cannot be enlarged or diminished in accordance with goal importance. We also assume, however, that goal importance does determine the proportion of available resources that the individual recruits for an activity. Specifically, as function of the goal's importance, the individual is assumed to draw a fraction *k* (i.e., a quantity between zero and one) of the available resource supplies. Thus, the (finite) total size of the resource pool defines the upper bound of resources the individual may mobilize for a cognitive activity. Just as one cannot spend more money than one has, one cannot use more cognitive resources than are available. These notions are expressed formally as follows:

> *Postulate 1:* The magnitude of the potential driving force (M_{DP}) is a product of the fraction *k* proportionate to goal importance (*GI*) and the momentarily available pool of mental resources (*RP*).

[6] Similar to our analysis, Kahneman (1973) suggested that the amount of effort needed to carry out a task successfully is determined mainly by the "intrinsic demands of the task" (p. 15).

[7] According to Atkinson & Birch (1970), in the achievement domain, goal attractiveness depends on task difficulty. However, this relation appears to be specific to achievement rather than general in the realm of motivated cognition as a whole.

$$M_{DP} \sim k \times RP, \text{ where } k \sim GI \text{ and } 0 < k < 1 \quad (1)$$

The multiplicative relation between *GI* (representing goal importance) and *RP* (representing the available resource pool) represents the plausible assumption that if either was at zero (i.e., the goal was of no subjective significance, or the individual's mental resources were completely depleted), no energy investment would take place. Furthermore, it is implied that goal importance (and the proportionate fraction *k*) and the resource pool will have reciprocally compensatory relations as far as magnitude of the driving force is concerned:

Derivation 1 (from Postulate 1): As far as magnitude of the potential driving force (M_{DP}) is concerned, its two constituents, *GI* and *RP*, are functionally interchangeable. That is, keeping the goal importance constant and increasing the resource pool would have the same effect on potential driving force as keeping the resource pool constant and increasing goal importance.[8]

Restraining force. As noted earlier, magnitude of the restraining force is assumed to be determined by three general factors: an individual's inclination to conserve mental resources,[9] demands of the cognitive activity serving as means to the individual's cognitive goal, and competing alternative goals active at the moment and exerting a potential pull of the individual's mental resources (Shah & Kruglanski, 2002). To reiterate, these factors are assumed to constitute independent sources of resistance to an activity that exert a cumulative effect on the overall magnitude of the restraining force. Stated formally, we have:

Postulate 2: The magnitude of the restraining force (M_R) is an additive function of an individual's inclination toward resource conservation (*RC*), task demands (*TD*), and the saliency and importance of alternative goals active at the moment (*AG*).

$$M_R \sim RC + TD + AG \quad (2)$$

Derivation 2 (from Postulate 2): As far as magnitude of the restraining force M_R is concerned (though not in other ways), its constituents (*RC*, *TD*, or *AG*) are functionally interchangeable such as decrease or increase in any of the constituents can be offset by a proportionate increase or decrease in the remaining constituents.

Effective driving force. As implied earlier, magnitude of the effective driving force has two general determinants: the potential driving force and the restraining force. Specifically, the effective driving force cannot exceed in magnitude the potential driving force (the latter constitutes its upper bound) and its magnitude is proportionate and approximately equal to magnitude of the restraining force. Speaking metaphorically, just as one would not typically spend more for an item than the asking price, one would not invest more resources in an activity than the activity requires. For instance, if one's knowledge of the multiplication table was held with full assurance, one would not invest much effort in computing the product of some simple numbers (e.g., 2×3), even if one's energy supplies were ample. Expressed formally, we have:

Postulate 3: The magnitude of the effective driving force M_{DE} will be equal to magnitude M_R of the restraining force and lower or (at most) equal to magnitude M_{DP} of the potential driving force:

$$M_R = M_{DE} \leq M_{DP} \quad (3)$$

Derivation 3 (from Postulate 3): The greater the demands of a task to be employed as means to goal attainment, the greater the individual's energy expenditures within limits of his or her potential driving force.

Goal Attainment

According to Postulate 3, given that goal attainment (*GA*) had occurred, the conditional probability that the effective driving force equaled in magnitude the restraining force is one (Equation 4); furthermore, the conditional probability of goal attainment, where the effective driving force is lower in magnitude than the restraining force, that is, where the individual does not possess the energetic resources required for goal attainment, is zero (Equation 5). In other words, a necessary condition for goal attainment is that the effective driving force be equal to the restraining force.

$$p(M_{DE} = M_R)/(GA) = 1.00 \quad (4)$$

$$p(GA)/(M_{DE} < M_R) = 0.00 \quad (5)$$

Pursuant to Postulate 3 and Equations 4 and 5, individuals will attempt to adjust the restraining force to energetic limitations of the potential driving force, affording the following derivation:

Derivation 4 (from Postulate 3): The lower the magnitude of the potential driving force (i.e., the lesser the goal importance or the size of the resource pool), the greater the individual's readiness to select relatively undemanding (or effortless) means to his or her goal.

Furthermore, to ensure that the restraining force does not exceed in magnitude the effective driving force, that is, to ensure that the activity would take place, increase in one element of the restraining force may be compensated for by decrease in the other elements if those are under the individual's control.

Derivation 5 (from Postulate 3): The higher the individual's tendency to conserve resources (*RC*), the greater the individ-

[8] Obviously, goal importance and resource pool size are not interchangeable in other ways, and they fulfill distinct functions in energizing the cognitive activity. Thus, goal importance determines the fraction of the resource pool that the individual would be willing to devote to an activity, whereas the resource pool is not expected to impact goal importance. As in other multiplicative formulations then, for example, Clark Hull's Drive $\times$ Habit or Atkinson's Expectancy $\times$ Value formulations, the constituent elements of the formulae are functionally interchangeable in their respective contributions to their produce but are distinct in other ways.

[9] Though the tendency to conserve mental resources is general, its strength (*RC* for resource conservation) may vary across individuals and across situations (Brehm & Self, 1989; DeWall, Baumeister, Mead, & Vohs, 2011; Job et al., 2010; Muraven & Slessareva, 2003).

ual's' readiness to select low demands means to his or her goal.

Derivation 4 and 5 reflects the dynamic relation between elements of the driving and the restraining forces, suggesting a way in which individuals may adjust the magnitude of their restraining force (by choice of a high or a low demanding means) to possibilities afforded by their potential driving force (Derivation 4) or to alternative elements of their restraining force (Derivation 5) in the interest of goal pursuit. Reciprocally, in the interest of goal attainment, individuals may adjust their application of the potential driving force to task demands. Simply put, they would do "what it takes" or expend as much of their available energy as the task requires.

Skill or Aptitude

In addition to energy requirements of a cognitive activity, a necessary condition of its successful completion is possession by the individual of the requisite skill or ability in a relevant domain. For instance, no matter how high is one's energy—without some level of know-how or expertise, one may not attain (the sense of having reached) a correct judgment on a problem (say in economics or mathematics), both representing a subjective sense of goal attainment. We assume further that skill and energy combine multiplicatively to effect attainment. Some level of skill and energy is indispensable to that end; furthermore, skill and energy are to some extent compensatory. An individual with high level of skill needs less effort (i.e., energy) to attain a goal that requires greater effort on part of someone with a lower skill or expertise.

Finally, under the constraint (set in Equation 4) that the effective driving force be no lower in magnitude than the restraining force, probability of goal attainment is assumed to increase with magnitude of the potential driving force. As implied in Postulate 3, the greater the magnitude of the driving force, the larger the effective force it can produce and, hence, the greater the restraining force with which it can contend. Because at least some highly effective means to goal attainment may be high in demand (i.e., contain a high *TD* component), the higher the magnitude of the potential driving force—the greater the individual's ability to deploy those means beyond other, less demanding means. In other words, the greater the magnitude of the driving force, the broader the range of means one can implement, contributing to the likelihood of goal attainment. These notions yield Postulate 4 and Equation 5:

> *Postulate 4:* Where magnitude of the effective driving force is equal to that of the restraining force, the probability of goal attainment $p(GA)$ is proportionate to a product of the individual's skill (S) and magnitude of the potential driving force.

$$M_{DE} = M_R;\ p(GA) \sim f(S \times M_{DP}) \tag{6}$$

> *Derivation 6 (from Postulates 3 and 4):* The greater the magnitude of the potential driving force, the greater the tendency to select means deemed maximally instrumental to goal attainment, even if they posed considerable demands.

As implied earlier, however (see Derivation 3), if highly instrumental means required little energy expenditure (i.e., its *TD* was low), the effective energy expenditure would be low regardless of the energy potential. Metaphorically speaking, one would not spend more money on an item than the asking price, even if one's finances were plentiful.

> *Derivation* 7 *(from Postulate 4):* Assuming the requisite skill and a potential driving force that matched or exceeded the restraining force, goal attainment likelihood will vary proportionately with magnitude of the potential driving force (i.e., with *GI* or *RP*).

This completes the formal articulation of our theory. Its overall representation is given in Figure 1. The restraining force is represented by a downward arrow, and it is constituted of the three "tributaries" comprising task demands (*TD*), tendency toward resource conservation (*RC*), and the alternative goals in the situation (*AG*). It is met by an equal magnitude effective driving force represented by an upward arrow. The effective force is shown to constitute a portion of the potential driving force and to be affected by the restraining force that it is to match. The effect of the restraining on the effective driving force is represented by a right side arrow connecting the two forces. The potential driving force is constituted from elements of goal importance (*GI*) and resource pool (*RP*) in which the former draws, or mobilizes, resources from the latter. The thick arrow on the left represents the notion that the possibility of selecting instrumental means and the likelihood of goal attainment are proportionate to magnitude of the (potential and hence effective) driving force as explained earlier. In what follows, we consider empirical evidence pertinent to the various theoretic derivations outlined previously.

The Empirical Evidence

The scope of the present theory covers all domains of motivated cognition irrespective of content, topic, or conventional classification. Accordingly, the review of our theory's empirical basis is organized in terms of its theoretic derivations rather than by traditional distinctions among domains of phenomena, thus treating in common effects that typically are considered under different conceptual rubrics. Furthermore, the forthcoming discussion of evidence for CET's derivations follows their order of appearance in the preceding discussion.

1. Interchangeability of Resource Supplies and Goal Importance

Derivation 1 of the CET states that the way the ingredients of the potential driving force multiplicatively combine, (i.e., goal importance and resource pool size) contribute similarly to the force's magnitude and in this sense are interchangeable and mutually compensatory. This possibility is supported by the work of Muraven and Slessareva (2003). They showed that initially depleted individuals persevered longer at a later self-control task if they were led to believe that their persistence would be of high importance and beneficial to others (by answering their questions about Alzheimer's disease) or to themselves (improving their performance or earning money). However, when the task was not perceived as especially important, participants showed the typical ego-depletion effect, whereby previously depleted participants persisted on the task for shorter time than nondepleted participants. In

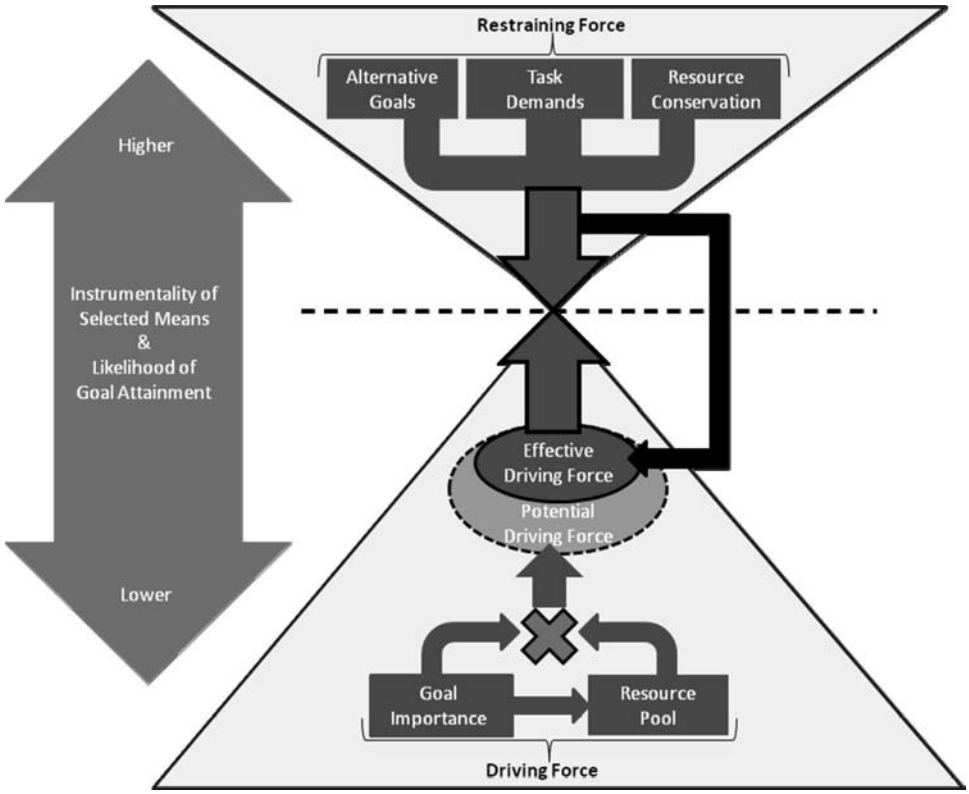

Figure 1. Cognitive energetics theory: A driving force is pitted against a restraining force and determines the instrumentality of selected means and likelihood of goal attainment. *Potential* driving force represents the maximal amount of energy an individual is prepared to invest in a cognitive activity. *Effective* driving force corresponds to the amount of energy the individual actually invests in attempt to match the restraining force. Magnitude of the potential driving force derives from the interaction between goal importance and the pool of available mental resources, whereas magnitude of the restraining force derives from the individual's inclination to conserve resources, current task demands, and competing goals.

the same vein, DeWall, Baumeister, Schurtz, and Gailliot (2010) showed that holding a position of power can overcome depletion if a task is considered worthy of a leading role, that is, where goal importance is high. In their experiments, participants' resources were either depleted in various ways (e.g., by watching a video clip while ignoring words on the screen) or not depleted. Power was orthogonally manipulated by assigning participants the role of the manager (high power) or the role of the subordinate (low power). DeWall et al. (2010) measured participants' performance on different tasks including dichotic listening and problem solving. Invariably, participants in the low-power condition showed the typical depletion pattern and performed more poorly if their resources had been previously depleted. No such effect emerged in the high-power condition, presumably because power or leadership role increases the importance of the task goal by making the person feel responsible to the group. Interestingly, these effects were only obtained for tasks that were perceived as worthy of a leading position. On tasks perceived as unworthy, participants in the leading or power position performed worse than participants in a subordinate position, suggesting a withdrawal of resources from the task.

The notion that resource depletion may be compensated for by goal importance is also supported by a recent series of studies by Job, Dweck, and Walton (2010). These investigators used the ego-depletion paradigm while measuring (Study 1) or manipulating (Study 2) the extent to which people believed or did not believe that willpower is a limited resource. The belief that resources cannot be depleted (vs. can be depleted) increased the expectancy of goal attainment under depletion. In turn, as noted earlier, increased expectancy of goal attainment increases goal importance (*GI*) and motivates individuals to perform their task. Job and colleagues' (2010) results showed that participants for whom willpower did not appear to constitute a limited quantity, hence, those for whom goal importance was higher due to a higher expectancy of success, did not show a decrease in cognitive performance (on a Stroop task) after being depleted. In contrast, those who believed in the possibility of resource depletion did show the expected decline. In present terms then, increase in goal importance (via the expectancy component of *GI*) may compensate for resource depletion effects as implied by our theory (Equation 1).

2. Magnitude of the Restraining Force and Means Selection

Effects of low need for cognition. Our Derivations 2 and 5 affirm a functional interchangeability between elements of the

restraining force and, more specifically, a positive, compensatory relation between the tendency to conserve one's mental resources, or cognitive miserliness, and choice of relatively undemanding means to one's cognitive ends. Cognitive miserliness as such has not been directly assessed in research thus far. However, its mirror image, the propensity for acting like a cognitive spendthrift, has been tapped by an important line of work on the need for cognition. This need constitutes a stable individual difference variable defined as a "tendency to engage in and enjoy thinking" (Cacioppo & Petty, 1982, p. 130). Individuals may occupy varying locations on the need for cognition continuum that spans the entire gamut of tendencies from cognitive miserliness to a disposition toward intensive cognitive engagement (Cacioppo, Petty, Feinstein, & Jarvis, 1996).

The need for cognition is associated with a variety of processes and outcomes pertaining to judgment. Relevant to present concerns, there is evidence that the lower an individual's need for cognition, the stronger his or her tendency to employ resource-conserving ways of judgment formation. For instance, in the realm of persuasion, the lower the individual's need for cognition, the stronger the tendency to base his or her attitudes on easy-to-process peripheral or heuristic cues and the weaker the tendency to base attitudes on the more laborious processing of message arguments (Cacioppo, Petty, & Morris, 1983).

Moreover, individuals low in the need for cognition appear to be more susceptible to judgmental biases originating from insufficient information processing. Specifically, they are more susceptible to the correspondence bias (i.e., the tendency to overemphasize the role of internal factors when explaining an individual's behavior to the neglect of external factors; D'Agostino & Fincher-Kiefer, 1992), the attractiveness bias (i.e., the tendency to believe that attractive persons possess other desirable traits; Perlini & Hansen, 2001), primacy (Ahlering & Parker, 1989), and framing effects (Smith & Levin, 1996), presumably because their propensity to conserve cognitive resources leads them to employ ready-made inferential shortcuts afforded by heuristic cues. Finally, in the realm of impression formation, individuals low in the need for cognition appear to be more prone to expectancy-consistent impressions than their individuals who are high in the need for cognition (Dudley & Harris, 2003). In short, there is evidence that high magnitude of the tendency to conserve cognitive resources, represented by a low need for cognition, restrains cognitive activity and directs the judgmental process toward the use of undemanding heuristics as a means of forming opinion.

Effects of a high need for cognitive closure. The reluctance to expend one's mental resources or the tendency to conserve resources (*RC*) may be augmented by one's need for cognitive closure.[10] According to Derivation 2, this should increase individuals' tendency to choose undemanding strategies as means to their cognitive goals. Pierro, Mannetti, Erb, Spiegel, and Kruglanski (2005) obtained evidence for this proposition in a study where participants' experimentally induced goal was to form a judgment on an issue. In one condition of this study, cue information (high vs. low expertise of the communication source) preceded the message information (of high vs. low argumentation quality), rendering reliance on the cue an easier (or less demanding) means to judgment than the message information (the "cue–message" condition). In another condition, that order was reversed (the "message–cue" condition). In accordance with Derivation 2, we predicted that irrespective of the order of presentation (cue–message or message–cue sequence), participants high in the need for closure would base their judgment to a greater extent on the early appearing, and hence easier to process, information. This prediction was borne out. Specifically, in the cue–message condition, participants with a high (vs. low) need for closure differentiated more between the positive versus negative heuristic cues (regarding source expertise) but not between high-quality (vs. low-quality) arguments, whereas in the message–cue condition, they differentiated more between high-quality (vs. low-quality) arguments but not between positive and negative cues.

3. Proportionality of Effort Investment

Theory of motivation intensity. Derivation 3 of the present theory suggests that individuals' investment of mental resources in an activity is proportionate to the estimated amount of resources the activity requires. Extensive evidence for this proposition has been furnished by the pioneering work of Brehm and his colleagues (e.g., Brehm & Self, 1989; Wright, 2008; Wright et al., 1989; for a recent review, see Gendolla, Wright, & Richter, in press).

According to the theory of motivation intensity (Brehm & Self, 1989) the amount of effort invested in a cognitive activity is proportionate to relevant task demands. The theory posits that mobilization of energy toward goal pursuit varies as a function of "what can, will, and must be done to satisfy the motive" (Wright, 2008, p. 684). In essence, it is suggested that given an individual's willingness to invest the effort required to succeed, that is, given sufficient goal importance, engagement should be proportional to task difficulty. Based on our notion that the effective driving force will be proportionate (in fact, equal) to the restraining force (see Equation 3), resource mobilization should be low where the means to the individual's goal is undemanding or where a task is perceived as an ineffective means to goal attainment (Brehm & Self, 1989). On the contrary, "outcomes that are perceived as difficult, possible, and worthwhile" have been predicted to increase expenditure of energy (Wright et al., 1989, p. 162).

Relevant research has amply supported these predictions using physiological indices to investigate the extent to which individuals are task-engaged. Largely, these studies were based on the psychophysiological work of Obrist (1976; Obrist et al., 1978) on the relationship between effort and sympathetic cardiovascular activity. In an early study in this paradigm, Contrada, Wright, and Glass (1984) had participants solve either easy or difficult arithmetic problems. Participants' systolic blood pressure (SBP) was measured before the onset of the task. Results indicated greater blood pressure increases in the difficult versus the easy condition, suggesting anticipatory energy mobilization in response to perceived task demands. In another study, Wright, Contrada, and Patane (1986) gave participants 2 min to memorize nonsense trigrams (nonwords composed of three letters). Task difficulty was manipulated by asking participants to memorize either two, six, or twenty trigrams, thus creating an easy, difficult, and impossible conditions, respectively. Measures of SBP taken before the memorization task revealed the expected pattern of results, with greater

[10] In situations where one possessed closure to begin with (Kruglanski, Webster, & Klem, 1993).

pretask SBP responses in the difficult condition (six trigrams) than in the easy and impossible conditions.

Physiological measures of effort: Pupil size. Pupil size is known to increase with sympathetic activity and decrease with parasympathetic activity (Steinhauer, Siegle, Condray, & Pless, 2004). For that reason, it has been often used as a valid indication of mental effort. Indeed, it was found across different areas of mental activity that pupil dilation increases when tasks require more resources (Hess, 1965; Hess & Polt, 1964; Wright & Kahneman, 1971). In a recent study, Bijleveld, Custers, and Aaarts (2009) used pupillary dilation to demonstrate strategic recruitment of resources as a function of task demands. Specifically, they showed increased pupil dilation on tasks performed under high (vs. low) cognitive load, that is, in a condition that makes the task more difficult to perform. Of interest, such increase occurred to a greater extent when participants were primed with high (vs. low) rewards. Consistent with the present theory, this last finding suggests that increasing goal importance (*GI*) increases the magnitude of the driving force mobilized to cope with task demands (*TD*).

Blood glucose. Fairclough and Houston (2004) used a high-demand Stroop task (100% *incongruent* color–text stimuli) or a low-demand Stroop task (i.e., 100% *congruent* color–text stimuli) and measured participants' blood glucose levels at the beginning and then every 15 min throughout the task. It was found that blood glucose levels dropped with time for both high- and low-demand conditions, but it dropped faster when the task was difficult rather than easy. Assuming that blood glucose provides the fuel for the brain to carry out cognitive tasks, a drop in blood glucose levels can serve as an indicator of resource investment in meeting the demands of the current task. Therefore, faster drop in blood glucose levels suggests that more resources are being exerted to meet the demands of a difficult versus an easy task.

Disfluency. Beyond the use of physiological measures, the hypothesis that difficult, or "disfluent" versus "fluent" tasks invite greater effort investment was explored in a series of studies by Alter, Oppenheimer, Epley, and Eyre (2007). Using different ways of manipulating disfluency (difficulty of font or furrowed brow), these investigators found consistent evidence that disfluency elicits greater effort on part of participants.

In summary then, varied evidence supports our Derivation 3 whereby individuals' expenditure of mental resources is proportionate to perceived demands of the (cognitive) task in which they are engaged.

4. Magnitude of the Potential Driving Force and Means Selection: Effects of Goal Importance and Size of the Resource Pool

Persuasion. Derivation 4 of our theory asserts that the *lower* the magnitude of the potential driving force (due either to low goal importance or to limited pool of mental resources), the *stronger* the tendency to choose a less demanding means to the activity's goal. Earlier, we have seen that high magnitude of the restraining force stemming from the tendency to conserve mental resources (approximated by a low need for cognition or high need for closure) disposes individuals to pursue judgmental objectives via relatively undemanding means. Derivation 4 suggests in addition that selection of such means should depend also on magnitude of the driving force. In other words, high magnitude of the restraining force should have the same effect on means selection as low magnitude of the driving force demonstrating inverse interchangeability[11] between elements of the driving and the restraining forces. Evidence for Derivation 4 comes from several domains of social cognition wherein use of simple cues, such as stereotypes and heuristics, were typically preferred over more detailed and complex information processing strategies under a low resource or low motivation (goal importance) condition. In what follows, we briefly review several lines of evidence for this proposition.

In much persuasion research (for a recent review, see Briñol & Petty, in press), informational cues referred to as *peripheral* to the substance of the message (Petty & Cacioppo, 1986) or as *heuristic* (Chaiken, 1980; e.g., cues concerning the expertise or likeability of the communicator or the number of arguments in a message) were typically relied upon where individuals' mental resources were limited in some fashion or their issue involvement was low (reflecting a low importance of the goal of accurate judgment). In contrast, the persuasive message itself was typically impactful under conditions of high involvement or plentiful resources.

Two alternative explanations of this ubiquitous finding come to mind. One is that the obviously different content of the peripheral or heuristic cues versus the message arguments is responsible for their differential use under low (vs. high/ample) motivation or resource conditions. Alternatively, their differential use could stem from their degree of demand or processing difficulty. Derivation 3 highlights the latter, demand-based explanation. Indeed, in studies where content of the information (that was either peripheral or central to the message) was experimentally controlled, it was consistently found that it was processing ease/difficulty of the information rather than its content that determined its use under low (vs. high) motivation and limited (vs. ample) resource condition.

For instance, in one experiment (Kruglanski & Thompson, 1999a, Study 4), brief expertise information conveyed by the communicator's status (professor at a high prestige vs. low prestige institution) was followed (in an orthogonal design) by lengthy expertise information presented via the communicator's lengthy curriculum vitae. Under cognitive load that reduced recipients' available mental resources, participants' judgments were affected by the brief expertise information but not by the lengthy expertise information. In contrast, in the absence of load, the lengthy but not the brief information had judgmental impact. In another study (Pierro et al., 2005), brief message arguments were found to affect judgments under participants' low motivational involvement in the issue (hence, under low driving force magnitude), whereas lengthy subsequent arguments affected judgments under high motivational involvement (hence, high driving force magnitude). Additional persuasion studies obtained similar results (for a review, see Kruglanski, Erb, Pierro, Mannetti & Chun, 2006; Kruglanski et al., 2007). This research suggests that, consistent with Derivation 3, information that is easy (vs. difficult) to process that serves as means to judgment formation is likely to be utilized where magnitude of the driving force prompting the judgmental activity is low.

[11] That is, *higher* magnitude of the restraining force having the same effect as *lower* magnitude of the potential driving force.

Base rate neglect. Derivation 4, concerning the relation between magnitude of the potential driving force and selection of strategic means to one's judgmental goal, affords a novel insight into the phenomenon of *base rate neglect* made famous by the seminal works of Tversky and Kahneman (1974; Kahneman & Tversky, 1973). In the original demonstrations of this effect, the base rate information was typically presented briefly, via a single line of text, and upfront. By contrast, the individuating (representativeness) information (about an individual who resembled a lawyer or an engineer) was presented subsequently and via a relatively lengthy vignette. If participants in such studies had a goal of sufficient importance and an adequate pool of mental resources to wade through the entire informational package, they might have managed to fully process the later, lengthier, and more demanding vignette information and to base their judgment upon it, especially it if it was seen to provide more relevant evidence for their judgmental task then the base rate information (Schwarz, Strack, Hilton, & Naderer, 1991; Zukier & Pepitone, 1984). This is akin to the finding in persuasion studies, reviewed earlier, that the lengthier, later-appearing, message-argument information but not the brief, initially appearing, peripheral-cue information typically had greater impact under ample processing resources (e.g., high goal importance or ample pool of mental resources). If this analysis is correct, it should be possible to influence the occurrence and extent of base-rate neglect by appropriately manipulating the relative processing demands of base rate and representativeness information.

This possibility was explored in a series of experiments by Chun and Kruglanski (2006). In one study, the lawyer–engineer problem used by Kahneman and Tversky (1973) was presented in the typical manner by first presenting brief base rate information followed by lengthier vignette with representativeness information. In another condition, these relations were reversed by presenting brief stereotypic information first, followed by lengthier and more complex base rate information. The latter presentation format was enabled by decomposing the sample percentages of lawyers and engineers into the base rates of different subcategories of lawyers (e.g., civil lawyers, criminal lawyers, corporate lawyers) as well as engineers (e.g., electrical engineers, mechanical engineers, aeronautic engineers). As predicted, the customary but not the novel presentation mode replicated the base rate neglect phenomenon. Specifically, where gleaning the base rates of engineers and lawyers was laborious, participants evinced considerable base rate utilization, suggesting that the driving force of the participants' information processing in this instance had sufficient magnitude (i.e., sufficient mental resources or goal of sufficient importance) for them to analyze the (difficult-to-compute) base rate information and use it in judgment.

Chun and Kruglanski's (2006) subsequent studies depleted participants' resources by putting them under cognitive load. This led to greater reliance on the brief information presented early in the sequence, regardless of whether it pertained to base rates or to representativeness information. Thus, when the base rates or the representativeness information was given in an easy-to-process format (i.e., briefly and up front), it was utilized more when participants were put under load. In contrast, where no cognitive load was imposed, greater reliance was manifest on the lengthier, later information, again irrespective of whether it pertained to the base rate or the representativeness information (see Table 1).

Table 1
Likelihood Estimation (Chances Out of 100) That the Target Is an Engineer as a Function of the Condition, Cognitive Load, and Base Bate (in Experiment 2)

	Replication		Reversal	
Engineer base rate	High load	Low load	High load	Low load
70%	63.64	75.00	50.00	63.85
30%	43.00	63.33	45.38	35.38
Difference	20.64*	11.67	4.62	28.47***

* $p < .01$. *** $p < .001$.

Levav, Heitmann, Herrmann, and Iyengar (2010) conducted a field study in which students seeking a master's degree in business administration were asked to select among options for designing a suit that varied on seven attributes. The number of options ranged from a mere five to 100. In one condition, attributes with greater numbers of options preceded those with fewer options, defining a descending order. In another condition, the order was reversed, and the options were presented in an ascending order. For every attribute, there was a default choice referred to as the "tailor's standard recommendation," representing the *expert heuristic*. It was found that in the descending order condition (where attributes with more options preceded those with fewer options), there was a significantly greater tendency to make the default choice, constituting an easier (heuristic) means to the goal of a correct choice compared with the ascending order condition, presumably because participants in the descending condition were depleted early on in the process.

In a subsequent study, Levav et al. (2010) had car purchasers configure a vehicle to their own specifications. Replicating their former result, Levav and colleagues found that participants who made the more difficult choices early on (hence, depleting their mental resources) tended more to accept the manufacturer's default option than participants who made the less complex (hence, less depleting) choices first. In the same vein, Danziger, Levav, and Avnaim-Pesso (2011) found that in the course of making repeated parole judgments, highly experienced judges increased their preference for the status quo—in this case, denial of parole—as a function of the number of (resource-depleting) decisions they had previously made.

In summary, a substantial amount of evidence from a wide variety of tasks and ways of manipulating mental resources supports Derivation 4, whereby the lower the magnitude M_{DP} of the driving force (due to low goal importance or a limited pool of mental resources), the greater the tendency to choose a less resource-intensive means to the activity's goal.

5. Means Effectiveness as Principle of Choice Under High Potential Force Magnitude

Our Derivation 6 asserts that as magnitude of the potential driving force increases, so does the tendency to choose one's means on the basis of its perceived effectiveness (rather than on the basis of its ease of execution), simply because one's ample resources allow one to engage in an extensive search for a superior means and pick and choose among available strategy options.

Findings reviewed previously suggest that where the magnitude of the driving force is low, an easy or undemanding means to the cognitive goal is likely to be selected over a more demanding means. Furthermore, in much social judgment and persuasion research, the more demanding means to judgment, often represented by relatively lengthy and late-presented message arguments, was preferred over the undemanding cues and heuristics where goal importance (represented by issue involvement) was high or available resources were ample, both contributing to magnitude of the potential driving force behind the cognitive activity (see Equation 1). In that research, the relative relevance to judgment formation (hence, effectiveness as means to an adequate judgment) of the demanding (message arguments) versus undemanding (cues, heuristics) informational means was not systematically controlled. It is possible, therefore, that when the driving force magnitude is high, reliance on demanding informational means to judgment was prompted by its perceived greater relevance (compared with the heuristic cues) rather than by its high level of processing demand as such.

Research by Pierro, De Grada, Mannettti, Livi, and Kruglanski (2004) yielded results consistent with the former, perceived relevance interpretation. Pierro et al. (2004) first ascertained that the later-presented, more complex message information is typically perceived as more judgmentally relevant, hence, as a more effective means to the goal of valid judgment than the easier to process and earlier appearing peripheral or heuristic information. Pierro et al. (2004) then proceeded to separate experimentally the demand or difficulty aspect of the information presented from its perceived relevance (hence, effectiveness as a means to valid judgment). The findings indicated that it was the *more relevant* information rather than the *more difficult-to-process* information that was relied upon where magnitude of the driving force was high (vs. low).

Specifically, in this research, participants were provided with two sets of information presented in a sequence. Based on a pretest, it had been determined that one of the sets afforded the use of a more (subjectively) valid rule than the other. Three studies were carried out in this format. Each included two informational sequences: in one of those, the less (subjectively) valid information came first, and it was followed by the more valid information. In the remaining sequence, the order was reversed, and the more (subjectively valid) information came first. Based on prior research (for a review, see Kruglanski & Webster, 1996), we assumed that the first set would be easier to process than the second set. Orthogonally, we manipulated accountability instructions designed to increase the goal importance of reaching a valid judgment.

The three experiments that employed this general procedure differed in informational contents. In one study, both information sets consisted of information generally regarded as heuristic, namely, concerning the degree of consensus regarding a given judgment (representing the "consensus heuristic"). In the second study, both sets of information consisted of message arguments (typically juxtaposed to heuristic information), and in the third study, the first set consisted of message arguments and the second consisted of the (heuristic) consensus information, reversing the typical order in which these two informational kinds appear typically in persuasion studies.

All three studies yielded similar findings: When the second set pertained to a more subjectively valid rule than the first set, participants relied on the information it contained only under the high accountability motivation (high accuracy goal importance) but not under the low accountability motivation. In contrast, participants relied more on this early, less valid set, under low accountability motivation but not under high such motivation. However, when the first set pertained to a more subjectively valid rule, participants relied on it more *both* under low and high accountability conditions. These findings are represented in Figure 2 (Panels a–d). The impact of the information is represented in the figure via the differential impact on attitudes of information with positive versus negative attitudinal implications. Figures 2a and 2b pertain to the sequence wherein the first information set is less subjectively valid (pertains to a less valid rule) than the second set. Figure 2a shows that the second, more subjectively valid set has greater impact on attitudes under high (vs. low) accountability motivation. Figure 2b shows that the first, less subjectively valid set has greater impact under low (vs. high) accountability motivation. Figures 2c and 2d pertain to the sequence wherein the early information is more valid than the later information. Figure 2c shows that the early information has substantial impact on attitudes under both low and high accountability conditions. Figure 2d shows that the later, less valid information has relatively low impact under both low and high accountability conditions.

These findings suggest that when individuals' goal importance is limited as in the low accountability condition, early, easier to process cues are used even if they are less subjectively valid or less relevant than the later cues. In other words, individuals with limited energy potential would tend to expend only the energy they could afford and engage in "satisficing" as far as strategic effectiveness is concerned. However, when the importance of the processing goal is high, and hence the individuals' potential driving force, they would tend to optimize by using the more effective cognitive strategy even if that meant greater energy expenditure.

These findings also suggest, however, that (consistent with Derivation 3) where use of the (subjectively) superior strategy appeared undemanding and easy to execute (rendering the restraining force low in magnitude), individuals would use it even if they had the energy to seek alternative strategies. In the studies by Pierro et al. (2004) where the more relevant information was presented upfront (making it easy to process), it was utilized in judgment regardless of whether individuals' goal importance (and hence their energetic potential) was high or low. Thus, even where individuals' potential driving force was high, they expended little energy on the judgmental task if that is what the effective strategy required. In another study relevant to this idea, Bar (1999, as reported in Kruglanski et al., 2005) found that individuals tended to "buy information" from their most trusted source ("epistemic authority") immediately, that is, without investing much effort in the search for alternative strategies; similarly, they based confident judgments on that information regardless of whether their accuracy goal was of relatively high or low importance, hence regardless of the magnitude of their potential driving force.

6. Magnitude of the Driving Force and Goal Attainment

According to Derivation 7 above, increasing the magnitude of the potential driving force (by increasing the resource pool *RP* or

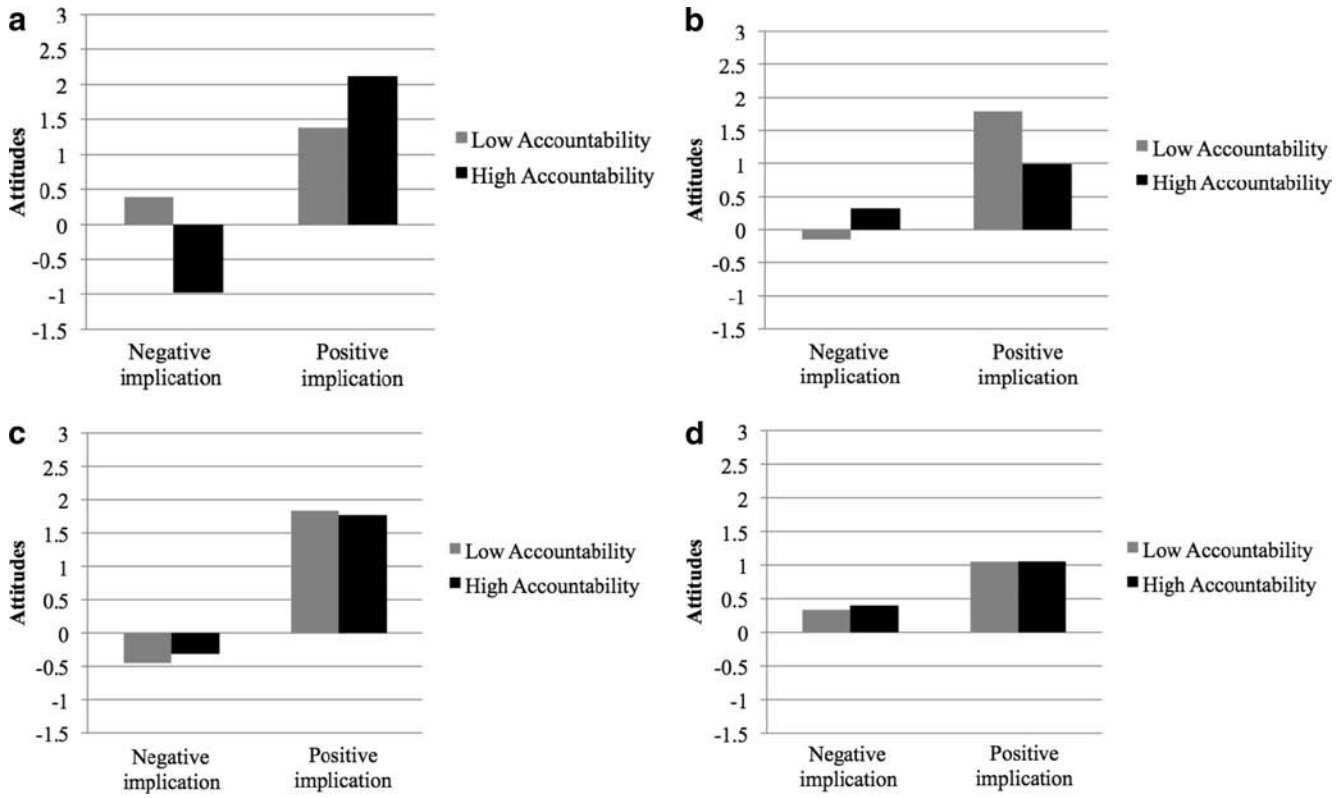

Figure 2. Attitudes were measured on a Likert scale ranging from −4, representing a highly negative attitude toward the attitude object, to 4, representing a highly positive attitude toward the attitude object. a. When the second information is more subjectively valid than the first information, attitude difference between positive and negative implication of the *second information* is greater under high accountability versus low accountability. b. When the second information is more subjectively valid than the first information, attitude difference between positive and negative implication of the *first information* is greater under low accountability versus high accountability. c. When the first information is more subjectively valid than the second information, attitude difference between positive and negative implication of the *first information* is equally significant under low and high accountability. d. When the first information is more subjectively valid than the second information, attitude difference between positive and negative implication of the *second information* is nonsignificant under both low and high accountability.

by increasing goal importance *GI*) should increase individuals' likelihood of goal attainment.

Resource depletion/replenishment and cognitive task performance. Evidence for the previous proposition comes from studies in which depletion of resources (i.e., reducing *RP*) resulted in a deterioration of cognitive performance or in quitting the task before completion (reflecting a failure of attainment) and the replenishment of resources resulted in performance improvements.

Relevant to these concerns, Martin and Benton (1999) conducted a study testing the influence of a glucose drink on performance of a demanding memory task. Participants were instructed to either to fast or to have breakfast prior to coming to the experiment. Upon arrival at the laboratory, participants were given either a glucose drink or a placebo drink. It was found that fasting, assumed to reduce the level of individuals' resources needed for mental activity was associated with poorer performance on a demanding memory task—the Brown–Peterson task. Participants who had breakfast before coming to the lab had higher glucose level in their blood and had better memories, and taking a glucose drink did not make a difference for their memory performance. Those who fasted but had a glucose drink upon arriving at the lab had improved memory, comparable to performance of those who had a placebo drink.

In another series of studies by Schmeichel et al. (2003), resource-depletion-impaired performance on demanding cognitive tasks including logic and reasoning, cognitive extrapolation, and reading comprehension. Finally, Vohs et al. (2008) found in a series of studies that individuals who made many resource-depleting choices persisted less on solvable and unsolvable problems (Experiment 4A and 4B), and customers at a mall who reported having made many (vs. fewer) shopping choices persisted less on math problems given them by the experimenter.

Overcoming the "reality constraints": Effects of goal importance and size of the resource pool. Whereas studies previously reviewed looked at the relation between resource depletion/replenishment and objective attainment of performance goals on cognitive tasks, Derivation 7 also implies that subjective attainment of judgmental goals may depend on magnitude of the driving

force behind the cognitive activity. An intriguing implication of this proposition concerns overcoming the reality constraints that may forestall motivational biases in reasoning and judgment. Evidence for this possibility is considered in what follows.

Motivated biases and stimulus ambiguity. Despite the manifest occurrence of motivated biases across a broad range of tasks, motivations, and circumstances (for reviews, see Dunning, 1999; Kruglanski, 1996; Kunda, 1999; Kunda & Sinclair, 1999), understanding the moderating factors that facilitate or inhibit such biases has been limited so far. One variable, however, that received a preponderant amount of attention in this regard is *stimulus ambiguity*. Specifically, it has been theorized and found that motivated biases are likely to appear when the informational stimulus confronting the perceiver is ambiguous and open to multiple interpretations and are unlikely to appear when the situation is relatively clear-cut and straightforward.

For instance, Dunning, Meyerowitz, and Holzberg (1989) found that people are more likely to rate themselves as above average on ambiguous traits such as being "friendly" and "creative," which are open to multiple construals, but not on unambiguous traits such as being "intelligent" and "punctual." Additional studies revealed that people's susceptibility to motivational biases is constrained by their prior knowledge. In a study by Kunda and Sanitioso (1989), participants led to believe that either introversion or extraversion is conducive to academic success, judged themselves accordingly to be more introverted or extraverted. Nonetheless, the extraverts still viewed themselves as significantly more extraverted than did the introverts. "In other words, the effects of the manipulation on self-concepts were constrained by prior self-knowledge" (Kunda, 1990, p. 485). In the same vein, Kunda (1990) interpreted the relatively small motivational effect reported by Dunning, Story, and Tan (1989) as possibly reflecting the fact "that changes in self ratings were constrained by prior self-knowledge" (p. 485).

The notion of stimulus ambiguity and its role in motivated biases are central to Hsee's (1996) concept of elasticity. According to Hsee, "elasticity in justifiable factors" refers to "the possibility of interpreting those factors in multiple ways . . . where different justifiable factors have different values and the relative weights among those factors are ambiguous" (Hsee, 1996, p. 124). In this vein, Hsee (1996) found that when the information provided is "elastic" (e.g., one option was better than another on some features and worse on other features), individuals *distort* their evaluation of the elastic "justifiable" factors (e.g., competitors' relative standings, job candidates' relative competence, houses' relative advantages and disadvantages) in the direction of the motivationally desirable, yet "unjustifiable" factor (e.g., the nationality of the pianist, the looks of the job candidates, hypothetical fiancé's involvement in the choice alternatives) and then make biased judgments that, although explained only by referencing the justifiable factors, in effect are influenced by the unjustifiable factors as well.

In summary, the idea that the information given or prior knowledge constrain motivational biases is based on converging empirical evidence from several independent lines of research. Researchers agree that the stronger such constraints—that is, the less ambiguous or elastic the knowledge—the less is individuals' ability to bias their judgments in motivationally desirable directions.

Overcoming "reality constraints" via increased goal importance. Kunda's (1990) important concept of reality constraints is presently seen as representing demands of the cognitive task involved in reaching the goal of forming a motivationally desirable conclusion. In other words, where the reality facing the individual is clear-cut and unambiguous, it may be difficult to cognitively bend or "spin" it in a desired direction. But difficult does not mean impossible. Indeed, anecdotal evidence suggests that people who are highly motivated to reach given conclusions can distort what to others may appear as undeniable realities. In this vein, Stroebe, Hansson, Stroebe, and Schut (2001) recount anecdotes of widows who stubbornly denied the reality of their husbands' deaths. Similarly, Kübler-Ross (1969) recalled terminally ill patients who, to the very end, negated the incontrovertible (to others) evidence of their approaching demise. These and other similar observations suggest that formidable reality constraints imposed by the information given may be overcome if sufficient effort was invested in the biasing enterprise.

Thus, reality constraints represent a restraining force that needs to be overcome if the goal of biased judgment (i.e., reaching a desirable conclusion) is to be attained. Increasing the magnitude of the driving force by augmenting the importance or salience of the biasing goal or augmenting individuals' pool of available resources should increase the likelihood of overcoming the reality constraints and attaining the goal, hence reaching motivationally biased conclusions. Several recent studies investigated these possibilities.

In one study (Bélanger, Orehek, Chen, and Kruglanski, 2011), participants were choosing between two brands of tea and deciding which is tastier. One tea was labeled "everyday smooth tea" and the other, carrying the implication of healthfulness, a "nutrition essential tea." In one experimental condition, the two teas were essentially identical in taste. This made for a highly ambiguous informational stimulus that readily lent itself to a motivational distortion, representing a case of low reality constraints (Kunda, 1990). In another condition, the nutrition essential tea was substantially diluted (20% water was added), making it appreciably less tasty than the undiluted everyday smooth tea. This manipulation rendered the informational stimulus relatively unambiguous, defining a case of high reality constraints and making it relatively difficult to bias one's tastiness judgments in favor of the nutrition essential tea should one so desire.

Cross-cutting the stimulus ambiguity manipulation, we implemented a goal activation manipulation in which half the participants were primed with a *health goal* (via a scrambled sentence technique), and the other half, in the *neutral prime* condition, were not. In the neutral goal condition, the nutrition essential tea was chosen to a significantly lesser degree in the unambiguous (vs. ambiguous) stimulus condition (where it was selected, appropriately, about 50% of the time); this attests to the efficacy of our manipulation and the operation of appreciable reality constraints. Of greater interest, where the health goal was primed, the nutrition essential tea was chosen preponderantly not only in the ambiguous, low constraint, condition, but also in the unambiguous high reality constraint condition. This suggests that consistent with our Derivation 7, where goal importance is sufficiently high (namely, the goal of viewing the healthful tea as tastier, and hence more likely

to be selected for use), reality constraints can be overcome and the biasing goal may be achieved.

Overcoming reality constraints via expanded resource pool. Derivation 7 suggests that in addition to increased goal importance, overcoming reality constraints may be enabled by an increased pool of mental resources; these may augment the driving force that the individual brings to bear on pursuit of one's biasing goal, hence increasing the likelihood of the goal's attainment. The following two studies put this proposition to empirical test.

In one experiment (Bélanger et al., 2011), participants were presented with a picture of the Mona Lisa and were asked to judge the extent to which she appears "agreeable," "friendly," "smiling," and "welcoming." Half the participants were subliminally primed with a rejection prime (via words implying rejection such as "rejected," "isolated," and "castaway"). This manipulation was assumed to induce an acceptance/inclusion goal, served by perceiving others (i.e., the Mona Lisa picture in this case) as smiling and friendly. The remaining participants were exposed to an accuracy prime (by words such as "accurate," "correct," and "true"). Cross-cutting the manipulation of the acceptance goal, the presence of resources was manipulated via cognitive load: Resources of half the participants were depleted by a requirement to rehearse a nine-digit number and to reproduce it at the end of the study. No such requirement was imposed on the remaining participants. The tendency to perceive the Mona Lisa as smiling and friendly did not vary as a function of cognitive load under the accuracy prime. However, under the rejection prime, that tendency was significantly greater in the absence versus presence of cognitive load, that is, where participants' mental resources were intact versus depleted.

In an additional study by Bélanger et al. (2011), participants' resources were depleted by a difficult (vs. easy) Stroop task. Then, for half the participants, a guilt induction manipulation was implemented: They were made to feel that they destroyed the experimenter's study by pushing the wrong key on the computer. The other half of the participants were made to feel that this action had no adverse consequences. The major dependent variable was participants' guilt feelings. We assumed that the guilt induction manipulation would activate the goal of guilt avoidance and that attaining that goal would be rendered more difficult if participants' resources were depleted. That is, in fact, what happened. In the high blame condition, participants' guilt feelings were significantly higher where their resources were depleted by the difficult (vs. easy) Stroop task. Thus, it seems that biasing one's perceptions (and attendant feelings) in direction of one's cognitive goals—whether these represent positive strivings (e.g., of perceiving a person's expression as friendly and accepting), or the avoidance of negative states (of guilt)—is more likely where one's resources are intact versus depleted.

Coping With Restraint: Inhibiting Alternative Goals as Function of Focal Goal Importance

The effect on goal importance on goal attainment may be mediated by increased focalizing of resources on overcoming the restraining force that opposes task completion. As noted earlier, an important component of the restraining force stems from the active presence of alternative goals that compete with a given focal goal. Those goals need to be inhibited or suppressed, allowing attention to be focused on the task at hand. Illustrating this process, research by Shah, Friedman, and Kruglanski (2002) demonstrated in a series of studies that pursuit of a focal goal inhibits the competing goals and that the extent of such inhibition depends on focal goal importance. In other words, the more important a given goal is to an individual, the greater the amount of resources he or she is prepared to invest in removing the barrier of competing goals that may interfere with focal goal progress.

One consequence of eliminating the alternative goals is that this affords a larger consideration set of means to the focal goal. This occurs by removing the multifinality constraints that the alternative goals impose on means to the focal objective. In other words, when the alternative goals are active, the individual searches for multifinal means that beside the focal end also advance its alternatives (Chun, Kruglanski, Sleeth-Keppler, & Friedman, in press). This narrows the set of means to the focal goal and reduces it to the subset of those means that are multifinal. In a set of recent studies, Köpetz, Faber, Fishbach, and Kruglanski (2011) found support for the idea that goal importance not only inhibits the alternative objectives (replicating Shah et al., 2002), but as a consequence removes their multifinality constraints and expands the consideration set of means to the focal goal. As our Derivation 7 implies, such expansion in the range of means is likely to increase both the expectancy of goal attainment as well as actual goal attainment (Kruglanski, Pierro, & Sheveland, 2011).

Recapitulation and Conclusion

Thinking typically is purposive; it is carried out with some goal in mind. And the ends of thinking—finding a solution to a problem, forming a judgment to guide action, and so on—can be painfully difficult to accomplish. In those cases, cognitive goal pursuit requires a great deal of dedication and tenacity. As Karl Popper (1972, p. 12) famously commented on scientific thinking "nothing [of value can] ever be achieved without a modicum of passion." In turn, passion, arguably, consists of a mix of purpose and available resources. These are limited, of course; they can be depleted and run short in supply. Typically, therefore, people tend to guard their mental resources jealously and expend them only when this is deemed to serve a worthwhile end.

Our force-field theory of motivated cognition has taken the foregoing, general assumptions as a given. We have postulated that a wide variety of social cognitive phenomena may be elucidated by considering the panoply of forces impinging upon the cognizing subject in a given context. The potential driving force propels the individual toward cognitive activity. It consists of the action's *goal* that lends it direction and recruits from the available pool the resources the activity requires. Like oxygen to the lungs, electric power to the light bulb, or fuel to the combustion engine, a modicum of mental resources is essential for directed cognitive activity that constitutes purposeful thought.

If thought is to reach its desired end, the driving force must face off with the restraining force and match it. The latter force refers to resistance that a cognitive activity may encounter. It has an internal component, the individual's reluctance to expend cognitive effort (or the tendency to conserve resources) and external, situational components: (a) task demands that need to be addressed if goal progress is to occur, and (b) active competing goals that interfere with such progress. The force-field framing of motivated

cognition conveys its dynamic character and the challenging struggle thinking can entail. It also provides a structural outline within which relevant postulates and derivations can be articulated concerning a wide ranging realm of relevant phenomena. These include assumptions about elements of the potential and effective driving forces, the restraining force, the compensatory/interchangeable relations between those elements both within and across these two opponent forces, assumptions about how these affect cognitive means selection, and how they impact goal attainment and cognitive performance. The implications of these propositions apply to widely dispersed domains of social cognition including major areas of interest such as persuasion, self-regulation, biases and heuristics, motivated reasoning and judgment, and decision making. Effectively, the present theory is expected to apply to (and in this sense integrate) all areas of purposive cognition irrespective of their specific topic or content domain.

Considerable body of evidence supports the present theoretical derivations concerning the *process* of motivated cognition and its *outcome*. The process focus pertains to cognitive means that individuals may adopt, whereas the outcome focus pertains to the likelihood of goal attainment under given constellations of driving and restraining forces. As far as process is concerned, across different domains of social cognition we have seen that where magnitude of the driving force is relatively low, easily executed, undemanding means to the cognitive goal are preferred over more demanding means, even if the latter appear more effective with regard to goal attainment. There also is consistent evidence that size of the resource pool similarly determines the choice of cognitive means: The lower the pool size, the greater the tendency to select easy, undemanding means to one's goal. In that regard then, goal magnitude and the resource pool are functionally equivalent, as presently suggested. Moreover, reducing the magnitude of the driving force is functionally equivalent to increasing the restraining force. So, individuals' cognitive miserliness seems to affect the choice of means to cognitive objectives in the same way as does reducing mental resources or perceived goal importance. Finally, we have seen that where magnitude of the driving force is relatively high, individuals engage in a more extensive assessment of the available means and end up selecting the means that appears to be most effective to goal attainment (in relative disregard of its level of difficulty or demand), hence, maximizing likelihood of attainment.

With regard to outcome focus, increased importance of the goal or increased size of the resource pool (e.g., effected via replenishment of depleted resources) may compensate for considerable task demands and allow the goal to be attained despite the difficulties involved. For instance, in the domain of motivated reasoning, the restraining force inherent in a clear-cut stimulus information that is refractory to desirable interpretations may prevent their formation unless the driving force behind such interpretations was sufficiently potent by dint of sufficient goal magnitude or of plentiful mental resources.

Though already supported by a considerable and varied body of empirical evidence, the CET offers further possibilities of research under its aegis. For instance, while we have reviewed research concerning the compensatory relation between people's cognitive conservation tendency and their choice of low effort means to their cognitive goals, the presence of competing goals (another element of the restraining force) should have the same effect on means choice. This implication could be fruitfully pursued in future work as could the hypothesis that increasing any of the elements of the restraining force (competing goals, cognitive miserliness) would need to be compensated by a commensurate increase in elements of the potential driving force for an activity to be carried out. Furthermore, the implied compensatory relation between skill level and potential driving force (assumed to determine the likelihood of goal attainment) could be probed in further research. In short, beyond its ability to integrate previously unrelated concepts and phenomena, the present framework has appreciable generative potential suggesting heretofore unexplored research problems.

Indebtedness of the present theory to prior social cognition work cannot be overstated. The present analysis owes much to insights and discoveries of prior investigators, and it genuinely "stands on the shoulders of giants." In a sense, we merely connected the dots that had been there already, and we explicated what was implicit already in the work of others. For instance, Petty and Cacioppo's (1986) important notion of elaboration likelihood suggests that the magnitude of the driving force is determined by individuals' (recipients of persuasive messages) motivation and cognitive resources, and the present analysis extends this further toward the interaction with restraining forces, like those stemming from cognitive task demands, that differentiate the two routes to persuasion and appropriately interact with the likelihood of elaboration.

Whereas the pioneering work of Brehm, Wright, and their colleagues (Brehm and Self, 1989; Wright, 2008; Wright, Brehm, & Bushman, 1989) focused on the relation between effort expenditure and task demands, we extend their basic principle of resource conservation to considerations of resource availability and depletion as they impact the choice of cognitive means (e.g., in the realm of persuasion) and the likelihood of cognitive goal attainment (e.g., in the realm of motivated reasoning).

Research by Baumeister, Vohs, Tice, and their colleagues (Baumeister et al., 2007; Schmeichel et al., 2003; Vohs et al., 2008) yielded discoveries concerning the depletion and replenishment of resources and implied how these interact with motivation strength (goal importance) to affect means choice and goal attainment (e.g., reflected in successful self-regulation). Building on their insights, the present work connects these processes to the notion of restraining forces that determine the magnitude of the driving force required to surmount them.

Whereas work of Dunning (1999); Kunda (1990; Kunda & Sinclair, 1999) and Hsee (1996) hinted at distortion difficulty in their notions of reality constraints, stimulus clarity, and inelasticity, the present analysis suggests that those can be overcome given a sufficient magnitude of the driving force (i.e., sufficient goal importance and sufficiently ample resources) toward motivationally biased judgments. Finally, whereas the seminal biases and heuristics work of Tversky and Kahneman (1974; Kahneman & Tversky, 1973) implied the ease aspect of heuristics and its relation to people's cognitive miserliness (Kahneman, 2003), the present analysis extends it to motivational considerations and to the resource mobilizing potential of goal importance as a determinant of the driving force behind cognitive activity.

Above all, the present analysis indicates how separate and rarely interlinked research programs in various domains of social cognition and human judgment share fundamental commonalities and

address similar phenomena differing in their surface manifestations (e.g., in their contents) while sharing an underlying dynamic. This portends the potential of fruitful cross-fertilization and the importation of insights from given corners of motivated cognition to all the others.

Though already broad and general, the present theoretical framework could be fruitfully supplemented and extended in additional directions. One of these is the incorporation of multiple goals and means into the model. Specifically, as an initial step, we have focused on the relatively simple case wherein the individual has but a single goal and a limited number of means at her or his disposal. However, it would be useful to expand the theoretical span of our theory to the more representative case where multiple goals, each with its panoply of means, compete for an individual's resources (cf. Kruglanski et al., 2002). Furthermore, it would be of interest to incorporate into the analysis the temporal dynamics of cognitive activity and consider how the force field may fluctuate and shift as a consequence of the cognitive activation of new goals and means by appropriate features of the environment (see Fishbach & Ferguson, 2007, for a review of the literature). Modeling such complex (yet highly realistic) arrays of continually changing force-field constellations may require the development of appropriate computer simulations models and network-based analytic techniques.

Understanding the dynamics of motivated cognition may have important practical implications, for instance in the domains of learning and education (cf. Dweck, 2006). Thus, it may help identify the specific circumstances (defined in terms of the present theoretical parameters) under which learners may be prepared to invest efforts in the acquisition of novel concepts and methods versus opting for the "tried and true" ways of doing things that, though alluring, may forestall significant learning and cognitive development. Similarly, in the realm of addiction (Wiers, Eberl, Rinck, Becker, & Lindenmeyer, in press) or health-related behavior (cf. Stroebe, 2011), our theory may be used to promote the acquisition of salutary attitudes and beliefs (e.g., related to effort investment in the examination of medical evidence relevant to one's condition) and the eradication of maladaptive cognitive habits (e.g., exclusive reliance on others' advice or thoughtless conformity with TV pharmaceutical commercials) with potentially perilous health consequences. In the domain of persuasion, our theory implies that success hinges on a communicator's ability to instill a driving force in her or his targets in direction of the desired conclusions while minimizing the restraining force that would oppose it.

Finally, the general, content-free nature of the present theoretic constructs suggests that they might be associated with functional patterns of brain activation involved in broad domains of cognitive activity. Thus, it may be useful to employ our force-field framework to guide the study of brain areas involved in executive control of cognitive and social behavior (Beer, Shimamura, & Knight, 2004), or the study of neural processes indicating the presence (vs. absence) of a high degree of internal motivation or goal importance (cf. Amodio, Devine, & Harmon-Jones, 2008). Such further investigations and extensions may profitably build on the present portrayal of the elemental field of forces that affects purposeful cognition.

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