Running head: THE I^3 MODEL

The I^3 Model:

Metatheory, Theory, and Evidence

Eli J. Finkel

Northwestern University

July 22, 2013

Citation: Finkel, E. J. (in press). The I^3 Model: Metatheory, theory, and evidence. In J. M. Olson, & M. P. Zanna (Eds.), *Advances in experimental social psychology*, *49*. San Diego: Academic Press.

Author Note: Preparation of this chapter, which was supported by National Science Foundation Grant BCS-719780, benefited immensely from the input of Jeni Burnette, Tom Denson, Paul Eastwick, Kenny Herbst, Grace Larson, and Janet Tomiyama.

Abstract

Psychological research on behavior has waned in recent decades. One underappreciated reason for this trend is that the field lacks a general-purpose framework targeted to the study of behavior. This chapter presents one such framework, a metatheory called the I^3 Model (pronounced "I-cubed model"), which suggests that all behavior emerges from a combination of three orthogonal processes. *Instigation* encompasses the effects of exposure to a particular target object in a particular context that normatively affords a certain behavior. *Impellance* encompasses the effects of situational or stable factors that increase the likelihood that (or the intensity with which) the individual enacts the behavior when encountering that target object in that context. *Inhibition* encompasses the effects of situational or stable factors that increase the likelihood that (or the extent to which) people will override the effects of instigation and impellance on behavior, thereby reducing its enactment. According to "Perfect Storm Theory," which is derived from the I^3 Model, the highest likelihood or intensity of behavior emerges when instigation and impellance are strong and inhibition is weak. The generativity and integrative potential of the I^3 Model and Perfect Storm Theory are illustrated with novel reviews of the aggression and eating behavior literatures.

199 Words

The I^3 Model: Metatheory, Theory, and Evidence

A professional basketball player with a sterling reputation deliberately stomps on the face of an opposing player following a frustrating battle for a rebound. Why? An overweight supermarket shopper encounters a free sample tray and rapidly consumes 400 calories. Why? A passerby witnesses a plane crash and dives into the icy water to rescue survivors. Why?

Psychology has no shortage of explanatory concepts that can help scholars answer such questions. For example, people tend to be aggressive when they experience frustration (Dollard, Doob, Miller, Mowrer, & Sears, 1939), frequently overeat in response to situational eating cues (Wansink, 2006), and are especially prone toward helpful behaviors to the extent that they feel and understand what the potential recipient of the help is experiencing (Batson & Shaw, 1991).

Despite psychology's lengthy and impressive list of explanatory concepts, however, the discipline lacks a unifying framework that scholars can use to address any conceivable question pertaining to the causes of any conceivable behavior. In this chapter, I present such a framework, the *I^3 Model*, which suggests that insight into three processes is both necessary and sufficient for predicting the likelihood or intensity of a given behavior in a given context. *Instigation* encompasses the effects of exposure to a particular target object in a particular context that normatively affords a certain behavior, where "target object" refers to the object (e.g., a cupcake) regarding which the individual might or might not enact the afforded behavior (e.g., eating). *Impellance* encompasses the effects of situational or stable factors that increase the likelihood that (or the intensity with which) the individual enacts the behavior when encountering that target object in that context (e.g., hunger). *Inhibition* encompasses the effects of situational or stable factors that increase the likelihood that (or the extent to which) people will override the effects of instigation and impellance on behavior, thereby reducing its enactment (e.g., trait self-control).

The I^3 Model is a *metatheory* in the sense that its key functions are to serve as a general framework for guiding the development of interesting research questions and novel theorizing about the causes of behavior. It has fostered the development of *perfect storm theory*, which posits, straightforwardly, that an individual is especially likely to enact a given behavior in a given context when instigation and impellance are strong and inhibition is weak. Perfect storm theory, in turn, readily lends itself to the generation of specific, falsifiable hypotheses, some of which can be used to pit variants of the theory against one another. One hypothesis that has received empirical attention in recent years is that instigation, impellance, and inhibition interact to predict behavior, with the situation in which instigation and impellance are high and inhibition is low yielding substantially greater likelihood or intensity of the behavior than any of the other seven situations formed by combining high or low levels of these three processes.

This chapter contains six sections. The first addresses the study of behavior in psychology, discussing issues related to definitions and historical trends. The second addresses the roles of theory and metatheory in scientific inquiry, with a particular emphasis on psychological science. The third provides a detailed overview of the I^3 Model. The fourth addresses issues surrounding the precise operationalization of the model's three processes. The fifth provides a detailed overview of Perfect Storm Theory, along with reviews of the aggression and the eating literatures from that perspective. The sixth discusses implications, complexities, and statistical considerations relevant to the application of the I^3 Model and Perfect Storm Theory to novel empirical questions.

The Study of Behavior in Psychology

Psychology is frequently defined as "the science of behavior." However, this definition does not specify exactly what "behavior" is, and it neglects the reality that vast swaths of research in psychology have very little to do with behavior. In this section, I define behavior and situate psychological research on behavior in historical context.

What is Behavior?

Defining the term behavior has proven to be a surprisingly difficult task. In this chapter, I use the following definition, which was inspired by Fishbein and Ajzen (2010): A *behavior* is an observable, targeted action performed by an organism in a certain context and at a certain time. This definition has four elements: (a) the action performed (e.g., eating), (b) the target at which it is directed (e.g., Häagen-Dazs chocolate ice cream), (c) the context in which it is performed (e.g., on the living room couch), and (d) the time at which it is performed (e.g., between dinner and bedtime last night). As Fishbein and Ajzen (2010, pp. 29-30) note: "Clearly, how we parse the behavior into action, target, context, and time elements is to some extent arbitrary. It is up to investigators to define the behavioral criterion as it best fits their research purposes. Once the elements are specified, however, the behavior is defined." For example, eating Häagen-Dazs chocolate ice cream is not the same behavior as finger-painting with Häagen-Dazs chocolate ice cream (change in action), eating Häagen-Dazs chocolate ice cream is not the same behavior as eating Häagen-Dazs vanilla ice cream (change in target), eating Häagen-Dazs chocolate ice cream on the living room couch is not the same behavior as eating Häagen-Dazs chocolate ice cream at the dining room table (change in context), and eating Häagen-Dazs chocolate ice cream between dinner and bedtime last night is not the same behavior as eating Häagen-Dazs chocolate ice cream between lunch and dinner yesterday afternoon (change in time).

Each of these four elements of behavior can vary in its generality. For example, the dining room table context is relatively specific, but, pending their research interests, scholars might instead generalize the context to be "at home," "in the home city" (i.e., while not on vacation), or "in the United States" (i.e., while not traveling abroad). Indeed, they might even elect to collapse across one or more of the elements. For example, scholars might ask how many grams of Häagen-Dazs chocolate ice cream Sally ate in February. This question is specific in terms of the target at

which she directs this action (Häagen-Dazs chocolate ice cream), intermediate in terms of the action Sally performs (eating) and the time during which she does so (February), and general in terms of the context in which she eats the ice cream (anywhere). The scholars might tolerate or even appreciate such generality because they wish to aggregate her behavior across contexts.

A Problematic Decline

Although the U.S. government's Decade of the Brain (1990s) roared, the American Psychological Association's Decade of Behavior (2000s) whimpered. Indeed, the 2000s witnessed a continuation of the decades-long trend for psychologists to prioritize research on internal mental processes over research on behavior. Baumeister, Vohs, and Funder (2007) illustrated this trend away from studying behavior with a content analysis of a sample of studies in the *Journal of Personality and Social Psychology* (*JPSP*). This analysis of the field's flagship journal found that ~80% of the studies employed behavioral measures in 1976, but only ~15% did so in 2006.

Scholars have identified several causes of the decreasing emphasis on behavior in psychology research (Baumeister et al., 2007; Cialdini, 2009). The increasing influence of psychology's cognitive revolution in the 1970s and 1980s shifted the emphasis in psychological science toward mental processes. The near-requirement for multi-study articles in many of the field's top journals, especially *JPSP*, made it increasingly costly for scholars to conduct behavioral studies, which are frequently much more labor-intensive than self-report or computer-based studies. The advent of increasingly restrictive institutional review boards (IRBs) likely undermined the science of behavior more than it undermined the science of mental processes because behavioral studies may be perceived as higher-risk. The field's increasing prioritization of mediational evidence catalyzed a redoubled emphasis on cognitive and affective processes at the expense of behavioral ones.

Regardless of the reasons for the decline in the study of behavior, the existence of the decline is problematic for both scientific and practical reasons. At a scientific level, self-reports of

behavior, especially reports of how one is likely to behave in hypothetical scenarios, can deviate in profound and systematic ways from actual behavior, which calls into question the degree to which such self-reports provide veridical insight into the processes that actually underlie behavior. For example, as noted by Baumeister and colleagues (2007), people tend to be moderately risk averse regardless of the amount of money at stake in hypothetical decisions, but they tend to become increasingly risk averse as amounts increase when real money is at stake (Holt & Laury, 2002). At a practical level, funding agencies tend to favor research that yields insights that go beyond mental processes to yield insights into how people actually behave (Baumeister et al., 2007; Cialdini, 2009), and these are the sorts of insights that tend to be most admired by introductory psychology students and the general public. Who can forget, for example, Asch's (1956) conformity studies, Latané and Darley's (1970) helping studies, and Milgram's (1975) obedience studies?

I share the view that the decline of research on behavior in psychology is due in part to the cognitive revolution, the increasing emphasis on multi-study articles, the advent of increasingly restrictive IRBs, and the increasing emphasis on mediational evidence, but I would also like to introduce an additional reason: The field lacks a general-purpose framework oriented toward conceptualizing behavior and toward guiding research across behavioral domains. My hope is that the I^3 Model will fill this void in a manner that fosters increased scholarly attention to the study of behavior across a broad range of topical domains.[1]

Theory and Metatheory

Before providing a detailed discussion of the I^3 Model, I situate this analysis in a broader epistemological context. Most importantly, the I^3 Model is primarily a metatheory rather than a

[1] In a way, this point about the field lacking a general-purpose framework for conceptualizing behavior not only complements the point that Baumeister et al. (2007) were making about the decline of research employing behavioral measures, but also cross-cuts it. Although I share the enthusiasm for behavioral measures, I recognize that self-reports of behavior can frequently serve as reasonable (albeit inexact) proxies for actual behavior. As such, in empirical investigations derived from the I^3 Model, self-reports of behavior are acceptable (although any research program would surely benefit from ensuring that at least some proportion of the studies employ behavioral measures).

theory. Recognition of this epistemological niche is essential for understanding what aims the model seeks to achieve. As such, before discussing the I^3 Model, I first distinguish theory from metatheory and then situate both constructs within the broader context of scientific inquiry.

Defining Theory and Metatheory

In scientific inquiry, and in psychological science in particular, the term *theory* refers to a set of principles that can be used to explain and predict observable phenomena (see Gawronski & Bodenhausen, in press). These principles are assertions about the nature of reality that can guide the development of concrete hypotheses. Indeed, the primary function of a theory is to stitch together principles that, in combination, help to explain a particular set of phenomena *in a manner that readily lends itself to the generation of falsifiable hypotheses*.

In contrast, the term *metatheory* refers to a set of assumptions that can be used to generate research questions and guide the development and refinement of theories. These assumptions are background beliefs that, for most purposes, are stipulated as true and that provide the foundation upon which scholars can construct theories. Indeed, as René Descartes (1637) discovered in his dogged pursuit of skepticism, true knowledge of reality is impossible without first adopting at least one metatheoretical assumption. Descartes' skepticism led him to doubt all forms of knowledge, including those derived from sensory experience, a pursuit that caused him to despair because it provided no foundation upon which to scaffold the edifice of truth. Eventually, however, he derived one of the most famous insights in the Western canon, *cogito ergo sum* ("I am thinking, therefore I exist"—or, more pithily, "I think, therefore I am"): There must be some entity that is doing all of this doubting. Descartes did not view this insight as a falsifiable postulate, but rather as a foundational assumption upon which he could derive other truths.

The distinction between theory and metatheory has received relatively little attention in psychological science, but those scholars who have addressed it have converged upon the view

that statements about psychological reality vary in the extent to which they (a) are relatively narrow and lend themselves to precisely falsifiable hypotheses (theory) versus (b) are relatively broad and unfalsifiable on the basis of any particular study (metatheory). Descartes' *cogito ergo sum* is prototypical of metatheoretical statements in its breadth and difficulty of falsification, but similar statements apply much closer to home. For example, the Diathesis-Stress Model begins with the metatheoretical statement that mental illness is caused by the conjunction of an underlying vulnerability and the presence of a relevant life stressor (Bleuler, 1963), and the Cognitive-Affective Processing System Model begins with the metatheoretical statement that people exhibit distinctive, stable patterns of behavior variability across situations (Mischel & Shoda, 1995). Evans and Stanovich (2013b) recently situated the basic tenets of dual-process models within a metatheoretical, "broad framework" context:

> Broad frameworks, like dual-process theory, have a very important role to play in psychology, and there are numerous examples of research programs organized within and around such frameworks (e.g., cognitive dissonance theory, attribution theory, social learning theory, mental model theory, attachment theory, or operant learning theory). What we can expect at this level is general principles, coherence, plausibility, and the potential to generate more specific models and the experiments to test them. Such metatheories tend to survive as long as they continue to stimulate new research and accumulate enough supportive evidence. It must be understood, however, that such frameworks cannot be falsified by the failure of any specific instantiation or experimental finding. Only specific models tailored to the tasks can be refuted in that way.

This analysis echoes that of Abrams and Hogg (2004, p. 98), who observed that a metatheory "places specific research questions within a broader framework and encourages the integration of theorizing for a range of potentially disparate phenomena," adding that it "sets parameters for predictions by specific theories and contexts." They elaborated as follows: "A metatheory is like a good travel guide—it tells you where to go and where not to go, what is worthwhile and what is not, the best way to get to a destination, and where it is best to rest a while. Metatheoretical conviction provides structure and direction, it informs the sorts of questions one asks and does not ask." In short, a metatheory lacks any pretense that their assumptions are falsifiable in any given

investigation (Buss, 1995; Evans & Stanovich, 2013b; Sklair, 1988). Its primary function is to stitch together assumptions that, in combination, help scholars both *to identify interesting research questions and to facilitate the development of theories*.

Situating Theory and Metatheory within the Broader Scientific Enterprise

The dominant epistemology of science is *empiricism*, which employs data collection regarding observable phenomena as the primary basis for discovering truth. Figure 1 situates metatheory and theory within the broader scientific enterprise. Metatheory resides at the top of the figure, as it consists of the overarching assumptions that facilitate the identification of novel research questions and the development of theory, which integrates principles about the associations among variables. With theory in hand, scholars develop concrete, falsifiable hypotheses about the links among the variables in the theory, with *hypothesis* referring to an empirically testable conjecture.

Following Evans and Stanovich (2013b), I illustrate the workings of this broader scientific enterprise with a dual-process example, beginning with the metatheoretical assumption (top box in Figure 1) that people have two distinct modes of thought: a fast, associative system and a slow, propositional system (Chaiken & Trope, 1999; Gawronski & Bodenhausen, 2006; Kahneman, 2011). Adoption of this metatheoretical assumption might inspire scholars to ask (second box) whether the fast mode tends to be more strongly linked to stereotypical thoughts about, or prejudicial behavior toward, outgroup members. This question might inspire scholars to develop the theoretical principle (third box) that even egalitarian people have negative outgroup stereotypes embedded in their fast mode (Devine, 1989), which might in turn cause scholars to advance the hypothesis (fourth box) that people whose slow mode generally functions poorly will be especially prone toward behaving in a manner that is consistent with negative stereotypes of outgroup members (Payne, 2005). The process then pivots to empirical methods—the use of systematic observation that can either falsify the hypothesis or leave it unrefuted (Popper, 1934).

Scholars then design a study (fifth box), which involves operationalizing all of the variables contained in the hypothesis in a quantifiable manner and designing the procedures required to implement the study. For example, they might operationalize the construct of "compromised propositional system" by assessing poor voluntary attentional ability with an antisaccade task (Payne, 2005), and they might operationalize the construct of "behaving in accord with negative stereotypes" as the relative likelihood that participants will misperceive a tool as a gun when primed with the face of a black rather than a white man. Once scholars have operationalized all relevant constructs, they collect data (sixth box)—that is, they run the study, ideally in a manner that provides sufficient statistical power to allow for reasonable confidence about the implications of the results for evaluating the relevant theory. Scholars glean such results through a process of data analysis (seventh box), which involves statistical procedures that help them discern whether the results are consistent or inconsistent with the hypothesis that it was designed to test.

If the results are consistent with the hypothesis, then confidence in the theory grows. If not, then scholars can either revise the theory or design a new study that can potentially provide a more refined test of it (see arrows at the left of Figure 1). If the research process requires changes to the theory, then that refined theory can yield novel hypotheses, and the empirical process can begin anew. If the research process provides evidence that the theory is largely incorrect, scholars might even reevaluate which research questions are worth asking and perhaps even whether the metatheoretical assumptions they have adopted provide the most useful framework for conceptualizing the phenomenon of interest (see arrows at the right of Figure 1).

From the perspective of the broader scientific enterprise depicted in Figure 1, the I^3 Model begins with the metatheoretical statement that all behavior is determined by a combination of instigation, impellance, and inhibition (first box). Scholars might apply this statement to a research question like "When are people especially likely to be aggressive toward their romantic partner?"

(second box), and they might advance the theoretical principle that people are especially likely to be aggressive when instigation and impellance are strong and inhibition is weak (third box). From this principle, they might derive the hypothesis that provocation from the partner (instigator), dispositional aggressiveness (impellor), and executive control (inhibitor) interact to predict violent behavior, with participants characterized by high instigation, high impellance, and low inhibition being much more aggressive than participants characterized by any of the seven situations formed by other high/low combinations of the three processes (fourth box)—the "perfect storm" perspective I elaborate below. To test this hypothesis (as Finkel et al., 2012, did), they might ask participants to complete a self-report measure of dispositional aggressiveness and a computer-based version of the Stroop color-naming task (a measure of executive control) and then complete a diary questionnaire every night for 35 consecutive nights on which they reported how provoking their partner had been that day (fifth box). They might ask undergraduate couples to complete the study in exchange for monetary compensation (sixth box). Finally, their data analysis might reveal evidence consistent with the predicted daily provocation × dispositional aggressiveness × Stroop performance interaction effect—with participants being especially aggressive in the "perfect storm" case in which provocation and dispositional aggressiveness are high and executive control is low (seventh box).

The I^3 Model

Pivoting from broad epistemological considerations, I now provide a detailed discussion of the I^3 Model. This discussion represents a major extension beyond all previous discussions of the model, which it supersedes.[2]

The Structure of the I^3 Model

[2] Here is a chronological list of the 10 previous presentations of the I^3 Model, some of which employed the now-jettisoned term "I^3 Theory": Finkel (2007a, 2007b); Finkel (2008); Finkel and Slotter (2009); DeWall, Finkel, and Denson (2011); Slotter and Finkel (2011); Finkel et al. (2012); Slotter et al. (2012); Denson, DeWall, and Finkel (2012); and Finkel and Eckhardt (2013).

I begin discussing the structure of the I^3 Model by providing elaborated definitions of its three core processes. *Instigation* encompasses the effects of exposure to a particular target object in a particular context that normatively affords a certain behavior, with "affords" referring to the target-object-directed behavioral options that the target object furnishes the individual. For example, in most contexts, being flagrantly insulted affords a strong aggressive response, and encountering a tantalizingly presented free-sample cinnamon roll affords a strong eating response.

As a matter of practice, scholars typically make implicit assumptions about which instigators normatively afford a certain behavioral response in the research population under investigation. For example, every time aggression researchers employ a procedure that involves the research participant receiving either an insult or praise, they assume that being insulted affords aggressive behavior to a greater extent than being praised does. Every time researchers investigating eating behavior employ a procedure that involves presenting a research participant with either normal-flavored or quinine-tainted ice cream, they assume that normal-flavored ice cream affords eating behavior to a greater extent than quinine-tainted ice cream does. A more empirically grounded approach to identifying the strength of a given instigator is to procure assessments from a sample of participants of the extent to which a specific target object in a specific context normatively affords a particular behavioral response. For example, the authors of a study of verbal aggression during a competitive reaction-time task asked coders to rank 12 statements in terms of how "offensive" they were (with 1 being the least offensive and 12 being the most), and these coders exhibited strong agreement that some of the statements were offensive and others were not (Santor, Ingram, & Kusumakar, 2003). This consensus-seeking procedure revealed that "Keep trying, you can do better" ($M = 1.25$) and "I know you're trying your hardest" ($M = 2.00$) were inoffensive, whereas "You're a loser" ($M = 11.00$) and "I'm kicking your sorry ass" ($M = 11.38$) were extremely offensive. To be sure, and as elaborated below, even these extremely offensive

statements afford multiple responses (e.g., laughter, telling the other person to relax), but there is little doubt that they afford aggressive responding more than the inoffensive statements do.

Of course, all of these instigator examples involve variation in the nature of, or the context surrounding, a particular target object—whether feedback involves an insult versus praise, whether ice cream is tainted or untainted, etc. This is the sort of variation that typically interests psychologists, but it is worth noting that the most powerful instigation-relevant variation is whether the target object is available versus unavailable. For example, a dieter obviously is much more likely to endure a faculty meeting without eating cookies when there are no cookies in the room (lack of instigation) than when a diabolical colleague passes a large plate of cookies around the room (high instigation). Instigation is absent when no cookies are present, moderate when the cookies are resting on a table across the room, and strong when your colleague hands them to you.

Impellance encompasses the effects of situational or stable factors that increase the likelihood that (or the intensity with which) the individual will enact the afforded behavior when encountering that target object in that context. It does so either by influencing the psychological state the individual is experiencing upon encountering the instigator or by altering the experience of the instigator immediately after encountering it. For example, people high in trait aggressiveness or who ruminate about a provocation during the ensuing five minutes may tend to respond to the provocation with a stronger tendency toward aggression than that experienced by people low in trait aggressiveness or who are distracted from ruminating about the provocation.

The distinction between instigation and impellance is crucial. In the cookie example, instigation refers to behavior-promoting forces that are inherent to the experience of this particular target object in this particular situation—not only the presence of the cookies themselves, but also how many cookies are on the plate, the size of the plate, the social norms about whether these cookies should be consumed one at a time versus in pairs, etc. In contrast, impellance refers to

behavior-promoting forces that are not inherent to the experience of the target object in this way—a deep and abiding love of homemade cookies, a desire to make a good impression on one's diabolical colleague, an enhanced state of hunger due to having skipped lunch that day, etc.

Finally, *inhibition* encompasses the effects of situational or stable factors that increase the likelihood that (or the intensity with which) people will override the effects of instigation and impellance on behavior, thereby reducing the likelihood or the intensity of the behavior. For example, people characterized by strong (vs. weak) trait executive control might be more likely to override the proclivity to aggress, and people whose self-control resources are at full strength (vs. depleted) might be more likely to override the proclivity to consume the cinnamon roll (if they are watching their caloric intake). The three processes—instigation, impellance, and inhibition—are conceptually orthogonal; that is, any one of them can vary independently of the other two.

A fundamental tenet of the I^3 Model is that various instantiations of a given process (instigation, impellance, or inhibition) are interchangeable. For example, the strength of impellance in a particular situation consists of the overall intensity that results from combining all impellance-relevant factors. For example, in a given aggression-relevant situation (e.g., when the individual's spouse has been overly insulting and condescending because the individual forgot to pick up dinner on the way home from work), it would include the individual's trait aggressiveness, frustration from a fender-bender two hours earlier, priming from the violent music playing during the drive home, and so forth. Indeed, the list of relevant factors may be sufficiently long, and the interrelations among them may be sufficiently complex, that achieving a comprehensive assessment of the process in a given context will generally be a practical impossibility. This fact, however, should not in any way discourage scholars from the pursuit of the sort of process-oriented clarity emphasized by the I^3 Model. After all, operationalizing a given process, such as impellance, with a single *process-pure construct*—one that influences behavior predominantly

through one of the three I^3 Model processes rather than through more than one—is a productive approach for understanding behavior.

According to the I^3 Model, the proximal predictor of the enactment of a behavior is the presence of a *behavioral proclivity*, which refers to an inclination to enact the behavior. This proclivity will result in the enactment of the behavior unless inhibitory processes override it. Behavioral proclivity can arise either from hot, affective processes or from cool, cognitive processes—or from a combination of the two. Affective behavioral proclivity typically arises in the form of an urge, craving, or impulse, whereas cognitive behavioral proclivity typically arises from mental states characterized by little affect. Regardless of the affective or cognitive nature of the behavioral proclivity, the individual who experiences it might or might not be consciously aware of this experience. For example, subliminal drug-related primes can automatically trigger a proclivity to use drugs (Wiers & Stacy, 2006), and observing a person who is shaking her foot can automatically cause one to shake one's own foot (Chartrand & Bargh, 1999; also see Dijksterhuis & Bargh, 2001; Ferguson & Bargh, 2004; Keysers & Gazzola, in press).

In terms of operationalization, a broad range of variables can be used to assess behavioral proclivity—as long as they assess a state-level construct that temporally follows the relevant instigator and temporally precedes the relevant behavior. For example, scholars might assess behavioral proclivity with self-report measures (e.g., state-level anger in response to a provocation, self-reported behavioral intention to eat a given target food), implicit measures (e.g., accessibility of aggression-related constructs in memory in response to a provocation, implicit associations of the target food with positively valenced objects), or physiological measures (e.g., testosterone reactivity in response to a provocation, activation of neural reward circuitry in response to tempting food), or any other measure that can serve as a proxy for the extent to which the individual is oriented toward enacting a given behavior vis-à-vis the target object.

The I^3 Model is, at its core, a framework for understanding the push and pull factors that influence how people behave with regard to a given target object in their immediate environment. In a general sense, scholars have developed several models suggesting that behavior results from a tension between forces that push for enactment of the behavior and forces that push against its enactment. For example, forces that push for the consumption of those cookies at the faculty meeting might include the anticipated hedonic pleasure of eating them, whereas forces that push against such consumption might include the desire to lose 10 lbs. Various models use different terminology for these processes, including desire and control (Hoch & Loewenstein, 1991), impulse and self-regulation (Baumeister & Heatherton, 1996), impellance and inhibition (Finkel, 2007a), impulse and self-control (Hofmann, Friese, & Strack, 2009), and driving force and restraining force (Kruglanski et al., 2012). In the I^3 Model, the closest analogue is the distinction between behavioral proclivity and inhibition. Regardless of the terminology, the central idea is that individuals enact the behavior when the strength of the push to do so exceeds the strength of the push against doing so. The I^3 Model is unique in its analysis that the strength of the push consists of two distinct processes: instigation and impellance.

Taken together, and as depicted in Figure 2, the I^3 Model distills down to three fundamental principles. First, all behavior emerges from main effects and interactions involving instigation, impellance, and inhibition. Second, the associations of (a) the main effects and the interaction effect involving instigation and impellance with (b) behavior are mediated by the proclivity to enact the behavior. And third, the association of this proclivity to enact the behavior with its actual enactment is moderated by inhibition.

These three principles yield a model with 12 paths. Paths 1–7 in Figure 2 (in solid lines) represent the model's core main and interactive effects on the behavioral outcome. Paths 1–3 represent the main effects of instigation, impellance, and inhibition, respectively. Paths 4–6

represent the model's 2-way interaction effects: instigation × impellance (Path 4), instigation × inhibition (Path 5), and impellance × inhibition (Path 6). Path 7 represents the theory's instigation × impellance × inhibition 3-way interaction effect. Paths 8–12 (in dotted lines) represent the model's effects involving behavioral proclivity. Paths 8 and 9 represent the main effects of instigation and impellance, respectively, on the proclivity to enact the behavior. Path 10 represents the instigation × impellance effect on this proclivity. Path 11 represents the link between this behavioral proclivity and its actual enactment. Finally, Path 12 represents the behavioral proclivity × inhibition interaction effect on the behavioral outcome—the moderation by inhibition of the link between the behavioral proclivity and the actual enactment of the behavior.

These 12 paths help scholars predict behavior by delineating 18 questions that are potentially relevant to the prediction of behavior in a given context. I present these 18 questions in Table 1, where each question occupies a row, and in Figure 3, where each question occupies a panel. Table 1 and Figure 3 are intended to be used hand-in-hand, with Row 1 aligning with Panel 1, Row 2 with Panel 2, and so forth. To be sure, scholars will frequently determine, using either *a priori* theoretical analysis or empirical evidence, that some of these questions are irrelevant to the prediction of behavior in that context because one or more of the processes exerts no influence (e.g., that the inhibition main effect path has a weight of 0 in predicting behavior when an individual who wishes to eat broccoli encounters a buffet table with plenty of broccoli), but it is recommended that the scholars consider the potential relevance of all 18 questions, as such consideration will ensure that they have considered the issue from every angle.

Rows 1-7 in Table 1 and Panels 1-7 in Figure 3 align with Paths 1-7 in Figure 2. These seven effects represent the direct (unmediated) links of instigation, impellance, and inhibition on behavior. Rows 8-12 in Table 1 and Panels 8-12 in Figure 3 align with Paths 8-12 in Figure 2. These five effects represent the direct (unmediated) links involving behavior proclivity, three in

which it is the outcome variable (Paths 8-10) and two in which it is the predictor variable (Paths 11-12). Rows 13-18 in Table 1 and Panels 13-18 in Figure 3 represent the I^3 Model's six mediated effects, all of which involve multiple paths in Figure 2. Rows 13-15 in Table 1 and Panels 13-15 in Figure 3 represent the simple, nonmoderated mediation effects in which inhibition is irrelevant to behavior (e.g., the broccoli example from the previous paragraph). Finally, Rows 16-18 in Table 1 and Panels 16-18 in Figure 3 represent the moderated mediation effect in which the link between behavioral proclivity and the enactment of the behavior is moderated by inhibition.

Situational Affordance

The I^3 Model's emphasis on instigation, and its distinction between instigation and impellance, owes a debt to Gibson's (1966, 1986) concept of affordance. Gibson was concerned with perception, which led him to focus on the environment—the immediate surroundings that organisms can perceive. An *affordance* refers to what a particular environmental feature offers, provides, or furnishes the organism. For example, "If a terrestrial surface is nearly horizontal (instead of slanted), nearly flat (instead of convex or concave), and sufficiently extended (relative to the size of the animal) and if its substance is rigid (relative to the weight of the animal), then the surface *affords support*" (Gibson, 1986, p. 127, emphasis in original). Echoing Koffka's (1935, p. 7) observation that "Each thing says what it is .... a fruit says 'Eat me'; water says 'Drink me,'" Gibson (1986, p. 138) noted that "The postbox 'invites' the mailing of a letter" and that "the handle 'wants to be grasped.' Hence, they have what Koffka called 'demand character.'"

The distinction between affordance and demand character has important parallels in the I^3 Model, with affordance paralleling instigation and demand character paralleling behavioral proclivity. Just as instigation refers to the effects of exposure to target objects that *normatively afford* a certain behavior, affordance refers to "properties of things *taken with reference to an observer* but not properties of the *experiences of the observer*" (Gibson, 1986, p. 137, emphasis in

original). That is, an affordance is something that the external stimulus makes available to any organism that possesses comparable qualities—the same species, similar size, similar physical development, and so forth. For example, when a young man leans in to kiss a young woman at a party, his behavior affords her the opportunity to, among other things, kiss him back, shove him away, or whip out her smartphone to capture the drunken moment in a photo. Those affordances are normative in the sense that they apply to virtually anybody in her position—not only her physical position vis-à-vis the man, but also her culturally bound awareness of the norms of party behavior and of the symbolic value of a kiss in such a context, her understanding of how to use a smartphone and the circumstances under which using it to take a photo might make sense, and so forth. The affordances would not apply to organisms from another species or to organisms from the same species with species-atypical characteristics. Having the man lean in for a kiss would not afford the smartphone option if the kiss had been directed at a puppy rather than a woman, and it would not afford the shoving option if the woman had been quadriplegic. But those are exceptions that make the rule—his behavior normatively affords kissing, shoving, and smartphone photography for women of a given culture confronting that situation.

However, his behavior only has demand character vis-à-vis a given affordance when the behavior afforded is relevant to the woman. Imagine, for example, that Karen is attracted to him but Lori finds him repulsive. In that case, although his behavior affords both women the option of kissing him back (akin to the presence of the mailbox), it has demand character only for Karen (akin to the individual's desire to mail a letter). According to Gibson (1986, pp. 138-139):

> The observer may or may not perceive or attend to the affordance, according to his needs, but the affordance, being invariant, is always there to be perceived. An affordance is not bestowed upon an object by a need of an observer and his act of perceiving it. The object offers what it does because it is what it is. … [The postbox] affords letter-mailing to a letter-writing human in a community with a postal system. This fact is perceived when the postbox is identified as such…. Everyone above the age of six knows what it is for and where the nearest one is. The perception of its affordance should therefore not be confused with the temporary special attraction it may have."

In the terminology of the I^3 Model, the man's kissing attempt functions as an instigator for the target woman because it affords kissing behavior (e.g., she is more likely to kiss him if he leans in to kiss her than if he attempts to give her a high-five). To adapt Gibson's terminology, it affords a kissing response to any woman (or man, for that matter) toward whom he directs the attempt. Her level of interest in kissing him in that moment—which might result from her having a long-standing crush on him or from a currently activated goal to make her ex-boyfriend jealous—functions as an impellor because it moderates the link between his behavior (the instigator) and her likelihood of kissing him. In short, demand character is similar to behavioral proclivity in the sense that the instigator fosters a stronger proclivity to enact a given behavior (e.g., mailing a letter, returning a kiss) when impellance is strong rather than weak (e.g., when one wishes to mail a letter, when the woman has a long-standing crush on the man).

Of course, the I^3 Model extends beyond this discussion of affordance and demand character in suggesting that the behavioral proclivity will only result in the enactment of the behavior when it is not overridden by inhibition. For example, if the letter one wishes to mail expresses outrage at one's mother, one might decide at the last minute that although the urge to mail the letter is strong, the costs of doing so are substantial enough that sending the letter is unwise. In that case, the individual might override the urge to mail the letter, perhaps instead depositing it in the recycling bin near the mailbox. In the party example, even if Karen experiences an intense desire to reciprocate the kiss, she might override that desire if she is in love with her current boyfriend.

Distinguishing the I^3 Model from Other Models

The I^3 Model has cosmetic similarities with many extant models, even beyond the competing-forces models discussed previously. In this section, I briefly discuss how the I^3 Model differs both from other general-purpose models of behavior and from dual-process models. Psychology has certainly had general-purpose models of behavior in the past, most notably when behaviorism

dominated the field from the 1920s into the 1950s (e.g., Skinner, 1938; Watson, 1924), but the priority placed upon such frameworks began to decline with the emergence of the cognitive revolution in the 1950s (e.g., Broadbent, 1958; G. A. Miller 1956). Kurt Lewin (1936), who is linked to the gestalt rather than the behaviorist perspective, proposed his famous dictum that behavior is a function of the person and the environment: $B = f(P, E)$. This elegant metatheoretical statement has been remarkably generative, especially in helping social psychologists to understand not only that the environment exerts profound influences on behavior, but also that this influence varies as a function of the characteristics of the individual confronting that environment.

In recent decades, scholars have developed models oriented toward discerning the circumstances under which attitudes predict behavior. For example, according to the Theory of Planned Behavior, the immediate antecedent of behavior is behavioral intention (a type of behavioral proclivity), which is determined by three factors: the individual's attitude toward behavior, subjective norms, and perceived behavioral control (Fishbein & Ajzen, 1975; Ajzen, 1991). According to the "motivation and opportunity as determinants of the attitude-behavior relation" (MODE) model, a dual-process model, there are two types of attitude-to-behaviors processes, an automatic type that involves spontaneous reactions to the immediate situation and a controlled type that involves active deliberation among behavioral alternatives (Fazio, 1990; Fazio & Olson, 2003). Although such models of the link from attitudes to behavior have been enormously influential, they are designed to address a subset of questions about the predictors of behavior—those that focus on attitudes. For example, if a scholar wished to investigate whether, or the circumstances under which, highly narcissistic individuals are especially aggressive, it is not clear that models of attitude-to-behavior consistency will be especially helpful.

Regarding dual-process models, social psychologists have developed dozens of models suggesting that human thought consists of two distinct modes or processes (e.g., Chaiken, 1980;

Gawronski & Bodenhausen, 2006; Metcalfe & Mischel, 1999; Petty & Cacioppo, 1986; Smith & DeCoster, 2000; Strack & Deutsch, 2004; for a recent collection of such models, see Sherman, Gawronski, & Trope, in press). Although there is important variation across such models, and this research area remains both generative and contentious, many scholars have argued that these models loosely converge in suggesting that human cognition consists of one mode of thought that is predominantly intuitive and associative and a second mode of thought that is predominantly reflective and propositional. In an attempt to distill the essence of these various models without adopting potentially contentious terminological differences among them, Stanovich (1999) used the term *System 1* to refer to the intuitive and associative mode of thought and the term *System 2* to refer to the reflective and propositional mode of thought.

Kahneman (2011) adopted this terminology in his recent book, *Thinking, Fast and Slow*. According to Kahneman (2011, pp. 20-21, emphasis in original), "*System 1* operates automatically and quickly, with little or no effort and no sense of voluntary control. *System 2* allocates attention to the effortful mental activities that demand it, including complex computations. The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration." In their recent integration, Evans and Stanovich (2013a) suggested that the two systems differ in terms of two defining features: Whereas System 1 is autonomous (i.e., does not require controlled attention) and does not require working memory, System 2 involves explicit processing effort (which can include hypothetical thinking) and requires working memory.

Although this brief summary glosses over important subtleties and controversies in the dual-process literature, it provides enough background to allow me to distinguish such models from the I^3 Model. In addition to the obvious distinctions (e.g., the I^3 Model involves three processes rather than two, the I^3 Model is a model of behavior whereas most dual-process models focus on affect or cognition), the crucial distinction is that the I^3 Model's three processes *cross-cut* the two processes

in all dual-process models. That is, depending upon the factors at play in a particular situation, instigation, impellance, and inhibition can all function through either System 1 or System 2, creating a 3 × 2 factorial structure. In this important sense, it is incorrect to think of the I^3 Model as some sort of extension of dual-process models; it is a different animal altogether.

Consider the case of eating behavior. Specifically, consider the behavior of John and Catherine, who are eating dinner at a restaurant on their first date. Let us assume that John believes that women tend to be impressed by men who eat large portions and that Catherine believes that men tend to be impressed by women who eat small portions. As a result, John eats more than he would like, whereas Catherine eats less than she would like. Although John and Catherine are both behaving in accord with System 2, John's motivation functions as an impellor that increases his proclivity to consume whereas Catherine's functions as an inhibitor that increases her tendency to override her proclivity to consume.

In short, whereas prevailing models of behavior in psychology tend either to be focused on specific behaviors (e.g., aggression) or to investigate a specific type of behavior (e.g., attitude-linked behavior), the I^3 Model applies across all types of behavior and across all factors that link to behavior—not only attitudes, but also personality, situational factors, etc. In addition, the I^3 Model's three processes are orthogonal to the two processes identified by dual-process models.

Summary: The I^3 Model by the Numbers

The I^3 Model consists of 3 processes (instigation, impellance, and inhibition), 1 mediator (behavioral proclivity), and 1 outcome (behavior). As presented in Figure 2, Figure 3, and Table 1, it has 12 unmediated effects (7 of which are unmoderated and 5 of which are moderated) and 6 mediated effects (2 of which are unmoderated and 4 of which are moderated).

The model is complex—18 effects, many of which are mediated, moderated, or both. On the other hand, behavior is complex, and the I^3 Model provides a comprehensive framework for

predicting any behavior in any context, and from that perspective, it is elegant (or at least efficient). To be sure, a great deal of complexity takes place once scholars have pivoted from metatheory to theory and operationalization, when they must identify which constructs tap which I^3 Model process, operationalize these constructs, etc. However, from the perspective of metatheory, the I^3 Model helps scholars focus their attention on the crucial processes and effects—a manageable number of them—involved in predicting any behavior they might wish to study.

The Challenge of Operationalization

At its core, the I^3 Model is a model of processes, not of constructs. As such, it does not come prepackaged with constructs that researchers can simply insert into their own studies. Nor does it come prepackaged with operationalizations once researchers have identified their constructs of interest. In this section, I discuss the process of using the I^3 Model to develop empirical investigations. Identifying process-pure constructs is an extraordinarily difficult task, but scholars can use both theoretical analysis and empirical evidence as clues for making probabilistic judgments regarding the process (or processes) tapped by a given construct in a given situation.

Using the I^3 Model to Develop Empirical Investigations: A 3-Step Process

Scholars seeking to build empirical investigations from the I^3 Model must follow three general steps (Finkel et al., 2012; Finkel & Eckhardt, 2013). First, they must develop specific, testable hypotheses at the *process level*—that is, at the level of instigation, impellance, and inhibition. According to the scholar's theoretical analysis of how behavior works in a given domain, how should these three processes influence behavior? The scholar can use Figure 2, Figure 3, and Table 1 to guide the hypothesis-generation process.

Second, scholars must identify specific *constructs* to represent both (a) the process or processes (instigation, impellance, and/or inhibition) they hypothesize to be relevant to the prediction of behavior in the present context and (b) the behavioral proclivity. In the eating

domain, for example, a scholar might hypothesize that a dieter will be especially susceptible to consuming lots of calories when encountering fresh rather than stale brownies, when he is hungry rather than satiated, and when his self-regulatory resources are temporarily depleted. Encountering the fresh brownies functions as an instigator because such an experience normatively affords a proclivity to eat them. The hunger functions as an impellor because it psychologically prepares him to experience an especially strong behavioral proclivity (a craving) to eat the brownies. Finally, the temporary depletion of self-regulatory resources functions as a disinhibitor because it decreases the likelihood that he will override this proclivity rather than acting upon it.

Third, scholars must *operationalize* each construct. For example, the scholar might operationalize the instigator of brownie freshness by confronting the dieter with either fresh-based brownies or brownies that have been left uncovered for two days. She might operationalize the impellor hunger by having the participant complete a self-report instrument upon arrival at the experiment. She might operationalize the disinhibitor of self-regulatory strength depletion by using laboratory procedures to manipulate whether the addict's self-regulatory strength had been depleted before encountering the brownies. She might operationalize the behavioral proclivity to eat by asking the dieter to self-report his level of craving or by using eye-tracking technology to assess the extent to which objects linked to brownies automatically capture his attention.

The Difficulty of Establishing Process-Oriented Clarity

Psychologists tend to be deeply interested in psychological mechanisms—in determining *why* one variable influences another—and with good reason. Such "why" questions are inherently fascinating, and the emphasis on them in psychology is in some respects a major factor that distinguishes our own discipline from other social sciences. Recently, however, several methodological and statistical critiques have raised doubts about the extent to which the methods psychologists generally use for answering such question are as definitive as we had long believed.

For example, statistical mediation analysis (e.g., Baron & Kenny, 1986) has been critiqued on many grounds (e.g., MacKinnon, Fairchild, & Fritz, 2007; Spencer, Zanna, & Fong, 2005). In particular, scholars have increasingly recognized the stringency of the assumptions underlying mediation analysis, calling into question how often these assumptions are actually met (Bullock, Green, & Ha, 2010; Judd & Kenny, 2010). Indeed, according to a recent editorial in *JPSP* (Smith, 2012, p. 2), "mediation generally cannot be established with a single statistical procedure, nor within a single study, nor (usually) even in a multistudy article. It is a goal of an entire program of research, probably over several years and often with contributions from multiple laboratories."

This analysis is sobering, as it suggests that it is extremely difficult to establish strong evidence of the psychological process (or processes) underlying a given effect. To be sure, statistical evidence for mediation is not meaningless—it suggests that the scholar's theoretical model is at least *consistent with* the data (and, indeed, I discuss such findings in the literature reviews below)—but it is far from definitive. This problem is exacerbated by the fact that many, perhaps most, of the major constructs in the field are more process-ambiguous than process-pure. For example, and as elaborated below, the "dietary restraint" construct (Herman & Mack, 1975) was initially intended to assess eating-related inhibition, but it almost surely also (perhaps even predominantly) assesses eating-related impellance. This state of affairs poses problems for scholars wishing to derive hypotheses from the I^3 Model because it does not allow for certainty that, for example, a given construct (or a given operationalization of that construct) in a given context predominantly exerts its effects on behavior via impellance rather than inhibition. To be sure, this issue applies to the field at large every bit as much as it applies to the I^3 Model, but the I^3 Model's emphasis on process-oriented clarity brings the issue to the fore.

The Perfect Cannot Be the Enemy of the Good: Deriving Strong Clues to Underlying Process from Theory and Data

As a field, what shall we do about the fact that we have not (yet) developed procedures that allow for definitive conclusions about the process or processes through which a given construct influences a given outcome in a given context? One option would be to jettison efforts to develop process-oriented conclusions, but that option is far too extreme. Just because we can never be certain that a given construct (e.g., trait aggressiveness) exerts its effects through a given process (e.g., by *impelling* the individual toward aggressive behavior) does not mean we cannot gather clues that allow for reasonable assumptions about the extent to which a given construct influences a given outcome predominantly through one process rather than another. More simply, just because we can never achieve absolute certainty does not mean that we must always experience absolute ignorance. Indeed, although the problem of process ambiguity is vexing, the field has reached a stage where many major constructs are linked to clues that allow scholars to draw reasonably confident process-oriented conclusions.

Several empirical examples will help to illustrate what I mean when I say that scholars can search for clues to discern the process through which a given construct influences behavior in a given context. Consider "executive control," a construct that scholars have long assumed predominantly exerts its effects through inhibition; that is, that it inhibits behavior rather than (dis)impelling it. Many executive control tasks possess face validity that aligns with this assumption, and empirical clues enhance confidence in it. In a study of stereotyping, for example, participants completed an executive control task called the antisaccade task before completing a behavioral task called the weapon identification task (Payne, 2005). The antisaccade task measured participants' voluntary attentional control by examining their ability to override their automatic visual orienting response when the instructions called for them to do so. The weapon identification task measured participants' racial bias by asking them to identify, as quickly and accurately as possible, whether a photo flashed on the computer screen depicted a gun or a tool.

Each of these photos was immediately preceded by a separate photo, which depicted the face of either a black or a white male and which appeared for one-fifth of a second. Payne (2005) used the data from this weapon identification task to glean a measure of participants' "automatic" racial bias as well as a measure of their "controlled" tendencies to override this bias. Correlating participants' antisaccade scores with these measures revealed that, as expected, executive control correlated with controlled behavior, but not with automatic behavior, on the weapon identification task. Although such findings do not provide definitive evidence that the antisaccade task taps inhibition, they provide compelling clues that, under these circumstances, it exerts its effects predominantly by bolstering this process (rather than by weakening impellance).

In a second example of how scholars can search for clues to discern the process through which a given construct influences behavior in a given context, Houben, Roefs, and Jansen (2010) employed single-category implicit association tests (IATs) to gain new insight into the psychological processes related to dietary restraint. Participants completed a self-report measure of dietary restraint before completing single-category IATs designed to assess participants' implicit association of calorie-dense food with positive words (e.g., delicious, good) and with negative words (e.g., disgusting, bad). Results revealed that self-reported restraint correlated with implicit positivity toward calorie-dense food, but not with implicit negativity toward calorie-dense food. Although such findings do not provide definitive evidence that the restraint scale taps impellance, they provide compelling clues that, under these circumstances, it exerts its effects predominantly by bolstering this process (rather than by weakening inhibition).

In a third example, Gal (2012) assessed salivary production to gain new insight into the psychological processes at play when low-power people are exposed to money-related stimuli. By random assignment, participants wrote about a time they either possessed or lacked power before being exposed to stimuli related to money or office supplies. They provided one saliva sample

before viewing the relevant stimuli and a second while being exposed to the stimuli. Exposure to money-related stimuli generally increased salivation more than exposure to office supplies did, and this effect was especially strong among participants in the low-power condition. Although such findings do not provide definitive evidence that having low power makes people especially likely to "hunger for" money, they provide compelling clues that, under these circumstances, it exerts its effects predominantly by bolstering impellance (rather than by weakening inhibition).

These examples suggest that scholars should not be paralyzed by a lack of absolute certainty about the process through which a given construct exerts its effects. Scholars can capitalize upon the sorts of evidence and logic exhibited in the preceding paragraphs to build a case that a given construct in their study exerts its effects predominantly through one process rather than another.

A High-Profile Example: Through what Process (or Processes) Does Ego Depletion Influence Behavior?

To illustrate the complexity of establishing definitive process-oriented clarity, let us consider *ego depletion*, an enormously influential construct in the self-regulation literature. Indeed, Google Scholar reports that the first four major articles presenting the depletion model have collectively been cited over 5,000 times (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Baumeister & Heatherton, 1996; Muraven & Baumeister, 2000; Muraven, Tice, & Baumeister, 1998). According to Baumeister and colleagues (1998, p. 1252), "The core idea behind ego depletion is that the self's acts of volition draw on some limited resource, akin to strength or energy and that, therefore, one act of volition will have a detrimental impact on subsequent volition." Since the construct was first introduced, scholars have exhibited near-universal agreement that ego depletion functions as a disinhibitor—that it diminishes one's tendency to override the proclivity to enact a particular behavior. For example, in Baumeister and Heatherton's (1996) seminal analysis, their exploration of ego depletion is designed in part to understand "what enables a person to override a habitual or

motivated response sequence" (p. 2); after all, "If the impulses have strength, then whatever stifles them must presumably consist of some greater strength" (p. 3). Recent reviews of the ego depletion literature echo this early theorizing (e.g., Baumeister, Vohs, Tice, 2007; Hagger, Wood, Stiff, & Chatzisarantis, 2010), and, indeed, virtually every major theoretical statement in this tradition conceptualizes ego depletion as a disinhibitor.

Although this depletion-as-disinhibitor analysis has typically been assumed rather than demonstrated, the limited empirical evidence has been supportive. For example, Govorun and Payne (2006) manipulated ego depletion before participants performed a version of the weapon identification task described previously. Results demonstrated that although the depletion manipulation had no (significant) effect on the automatic parameter, which assessed automatic stereotype activation, it altered the controlled parameter. Specifically, relative to their nondepleted counterparts, depleted participants exhibited impaired controlled processing, rendering them less capable of overriding or inhibiting this automatic stereotype activation. In addition, although the strength of participants' automatic stereotype activation was positively linked to stereotype-consistent responses on the weapons identification task, this effect was especially strong among participants in the depletion condition. This interaction effect suggests that depleted participants were less successful than their nondepleted counterparts at overriding or inhibiting their automatic stereotyping tendencies, which caused them to act upon these tendencies—an impellor × disinhibitor interaction effect (Effect 6 in Figure 3 and Table 1).

Neuroscientific research complements these behavioral results. For example, Friese, Binder, Luechinger, Boesiger, and Rasch (2013) randomly assigned participants to a depleting or a nondepleting task (suppressing emotions vs. experiencing them naturally) before having them perform a second task that required executive control (a Stroop color-naming task). Participants' brains were scanned via fMRI throughout the procedure. Results revealed that greater activation in

a cluster in the right lateral prefrontal cortex (including the dorsolateral prefrontal cortex) when performing the depleting task was linked to diminished activation in that cluster when performing the subsequent executive control task. Given that prefrontal cortical activation is robustly linked to inhibitory processes, these results suggest that exerting effort to inhibit a dominant response on a first task yields reduced activation of inhibitory processes on a second task performed shortly thereafter. Indeed, these findings echo earlier ones from Richeson and colleagues (2003), who showed that the magnitude of prefrontal cortical activation that white participants exhibited when viewing white (versus black) target faces predicted impaired executive functioning following the discussion of racially charged topics with a black confederate. These results suggest that inhibiting prejudice activates self-control-linked regions of the prefrontal cortex, and such activation is linked to diminished ability to inhibit a dominant response on the subsequent task.

Recently, however, scholars have begun to suggest that depletion also encompasses some amount of impellance—that it not only undermines inhibition, but that it also strengthens the behavioral proclivity people experience when encountering instigation. For example, in an unpublished report, a team of scholars with extensive expertise on ego depletion—Vohs, Baumeister, Mead, Hofmann, Ramanathan, and Schmeichel (2013)—presented evidence that ego depletion also increases the intensity of urges and feelings. For example, an experience-sampling study demonstrated that participants experienced stronger urges later in the day to the extent that they had reported attempting to control themselves earlier in the day. In an experimental study, depleted participants ate more cookies than nondepleted participants, an effect that was mediated by the subjective experience of an urge to eat the cookies (i.e., a behavioral proclivity).

Taken as a whole, one reasonable reading of the literature is that depletion functions predominantly as a disinhibitor, but also nontrivially as an impellor. As such, although definitive conclusions await future research, in the reviews of the aggression and eating behavior literatures

below, I will (tentatively) adopt the longstanding convention of conceptualizing depletion in terms of its predominant function of disinhibition.

The Process through which a Given Construct Influences Behavior Depends upon Context

Despite its complexity, the preceding discussion of whether, or the extent to which, depletion should be conceptualized in terms of inhibition versus impellance glosses over a more fundamental, even trickier issue: The process (or processes) through which a given construct influences behavior can vary depending upon the behavioral domain and the immediate circumstances. Consider, for example, the link between self-control and aggression (for an application in the eating domain, see Salmon, Fennis, de Ridder, Adriaanse, & de Vet, in press). The evidence available to date suggests that high self-control typically functions as an inhibitor, increasing the likelihood that individuals will override a proclivity to aggress (Denson, DeWall, & Finkel, 2012). However, there are circumstances under which self-control functions as an impellor, increasing the strength of the proclivity to aggress. For example, a frightened infantryman's ability to immerse himself in a firefight is almost certainly enhanced rather than undermined by his level of self-control. And, in Shakespeare's *Macbeth*, the major reason why Lady Macbeth was able to murder King Duncan after her husband had failed to do so is that she had stronger self-control than her husband did (Finkel, 2007a). Indeed, she had previously framed the murder in self-control terms when she was exhorting her husband to commit it: "But screw your courage to the sticking-place, and we'll not fail" (*Macbeth*, Act 1, Scene 7).

This issue is pervasive. For example, although cognitive load typically functions as a disinhibitor, it can also function as a disimpellor under certain circumstances (Giancola & Corman, 2007; Mann & Ward, 2007). Which function load exerts depends upon various situational factors, including whether the instigator remains salient despite the load and whether the load interferes with the ability to enact the target behavior. Load typically functions as a

disinhibitor when the instigator remains salient and when the ability to enact the target behavior remains intact, but it can function as a disimpellor when the instigator loses its salience or when the ability to enact the target behavior is compromised. Most research has focused on cognitive load as a disinhibitor, employing methods in which the instigator is salient and the ability to enact the target behavior remains intact despite the cognitive load. For example, Ward and Mann (2000) showed that when dieters (who tend to experience especially strong desires to eat calorie-dense food) were saliently confronted with potato chips, m&m's, and cookies, they consumed more if they were assigned to the high-load rather than the low-load condition.

More recently, however, scholars have employed empirical paradigms in which cognitive load reduces participants' ability to attend to the instigator and, consequently, functions as a disimpellor. For example, Van Dillen, Papies, and Hofmann (2013) demonstrated that although individuals generally exhibit strong attention to tempting food stimuli, cognitive load reduced this effect, thereby decreasing the intensity of food cravings. In the aggression domain (Ward et al., 2008), a physiological arousal manipulation—which, like cognitive load, typically induces attentional narrowing—increased participants' aggressive responding to a provocation in the presence of aggressive cues (e.g., a poster of Clint Eastwood holding a large gun) but decreased participants' aggressive responding in the presence of calming cues (e.g., a poster of a placid beach scene). In such cases, it seems that the inattention to the tempting food stimuli reduced the strength of the proclivity to eat and the presence of the calming cues reduced the strength of the proclivity to aggression; that is, the load manipulation functioned in these cases as a disimpellor.

In addition, contextual factors can alter whether a given construct bolsters versus reduces the strength of *a single process*. For example, Fold and Robinson (1998) demonstrated that the presence of bystanders reduced men's tendencies toward violence against women, presumably by inhibiting men's behavioral proclivity in that situation, but increased women's tendencies toward

violence against men, presumably by reducing women's perception that the man would violently retaliate (also see Straus, 1999). That is, the same construct—presence of bystanders—functions as an *inhibitor* of violence for men, but as a *disinhibitor* of violence for women.

These issues surrounding process-oriented clarity are neither a strength nor a weakness of the I^3 Model—they simply characterize how the world works—and, indeed, they apply to other models as well. Consider, for example, an elaboration likelihood model analysis of the effect that the number of arguments has on persuasion (Petty & Cacioppo, 1984). According to the elaboration likelihood model, attitude change occurs through either a central route or a peripheral route. Attitude change through the central route "results from a person's careful consideration of information that reflects what that person feels are the true merits of a particular attitudinal position," whereas attitude change through the peripheral route occurs "because the person associates the attitude issue or object with positive or negative cues or makes simple inference about the merits of the advocated position based on various simple cues in the persuasive context" (Petty & Cacioppo, 1984, p. 70). In this study, participants considered a persuasive appeal on a topic that had either low or high personal relevance. The appeal consisted of either three or nine arguments that were either all cogent or all specious. When the topic had low personal relevance, number of arguments influenced attitude change via the peripheral route, increasing the persuasiveness of the appeal regardless of whether the arguments were cogent or specious. In contrast, when the topic had high personal relevance, number of arguments influenced attitude change via the central route, increasing the persuasiveness of the appeal when the arguments were strong but decreasing the persuasiveness of the appeal when the arguments were weak. As such, scholars interested in understanding whether number of arguments influences attitudes through the peripheral or the central route must attend to the nature of the specific context under consideration; in this example, this variable functioned via peripheral processing when personal relevance was

low and via central processing when personal relevance was high. This situation is directly analogous to the I^3 Model situations discussed in the preceding paragraphs and lends credence to the assertion that, regardless of their metatheoretical or theoretical perspective, scholars interested in determining the process through which a given construct exerts effects on a given outcome must attend to the relevant contextual cues in that particular situation.

Perfect Storm Theory

To date, the main theory that has been derived from the I^3 Model is *Perfect Storm Theory*, which suggests that the likelihood and intensity of a behavior are highest when instigation and impellance are strong and inhibition is weak.[3] Various concrete hypotheses are consistent with this theory, and, in the future, scholars can pit some of these hypotheses against one another to allow for greater clarity regarding the precise ways in which instigation, impellance, and inhibition combine to predict a particular behavior in a particular context.

Overview

In the empirical literature, the main hypothesis that has been derived from Perfect Storm Theory is that instigation, impellance, and inhibition interact such that the likelihood and intensity of the behavior is much higher in the high instigation/high impellance/low inhibition situation than in any of the situations formed by the other seven possible combinations of high or low levels of the three processes. Figure 4 depicts two variants of Perfect Storm Theory. Panel A, which does not explicitly incorporate behavioral proclivity, depicts the strongest version of the hypothesis—that the likelihood and intensity of behavior is especially high *only* in that critical situation, implying a 1 vs. 7 contrast (high instigation/high impellance/low inhibition vs. all other situations) (e.g., Finkel, 2008; Finkel et al., 2012). In this variant of the theory, scholars sequentially ask

[3] All previous discussions of the I^3 Model conflated metatheory and theory, using the term "I^3 Model" or "I^3 Theory" to refer both to the overarching metatheory and to Perfect Storm Theory. This chapter is the first place where I have established the metatheory/theory distinction, so it is also the first place where I have used the term "Perfect Storm Theory."

whether instigation is strong, impellance is strong, and inhibition is weak. If the answer to all three of these questions is yes, then the likelihood or intensity of the behavior is high. If the answer to any of them is no, then the likelihood or intensity of the behavior is low.

Panel B, which adapts logic developed by Fals-Stewart, Leonard, and Birchler (2005), depicts an alternative, less extreme version of Perfect Storm Theory, albeit one that is likely to be a closer approximation to the empirical reality of behavioral prediction across a broader range of behaviors and contexts (e.g., Finkel & Eckhardt, 2013; Slotter & Finkel, 2011). In this version, instigation is plotted on the x-axis, whereas behavioral proclivity is plotted on the y-axis. The dashed line represents a situation in which impellance is strong, whereas the dotted line represents a situation in which impellance is weak. The top solid line represents a situation in which inhibition is strong, whereas the bottom solid line represents a situation in which inhibition is weak. Those solid lines function as thresholds: The individual enacts the behavior when the strength of the behavioral proclivity exceeds the relevant threshold, whereas the individual does not enact the behavior when the behavioral proclivity is equal to or weaker than the relevant threshold. Of course, as is the case with instigation, both impellance and inhibition vary continuously rather than categorically, so it is necessary to view the dashed and dotted lines as representing two of an infinite array of instigation × impellance links to behavioral proclivity and to view the solid lines as representing two of an infinite array of inhibition thresholds. According to the Panel B version of Perfect Storm Theory, instigation, impellance, and (dis)inhibition all exert main effects on behavior, and each process amplifies the influence of the others, yielding an especially strong effect in the perfect storm situation. (The Panel A variant of the theory also would yield main effects and 2-way interaction effects because the effect of the perfect storm situation can masquerade as lower-order effects.)

Situations vary not only in terms of whether individuals enact a behavior, but also in terms of the intensity of the behavior they enact. The extent to which the behavioral proclivity exceeds the

threshold determines behavioral intensity. For example, both of the brackets in Panel B depict situations in which instigation is strong and inhibition is weak (i.e., their lower boundary is on the line representing the weak inhibition threshold), but the Bracket 1 situation involves strong impellance whereas the Bracket 2 situation involves weak impellance. In both cases, the strength of the behavioral proclivity exceeds the threshold, which means that the individual will enact the behavior. However, the behavioral proclivity is stronger in the Bracket 1 situation than in the Bracket 2 situation, which means that, in situations where behavior can vary not only in terms of presence versus absence but also in terms of intensity, the intensity of the behavior will be stronger in the Bracket 1 situation. For example, the individual might aggress in both situations, but the intensity of the aggression will be stronger in the Bracket 1 situation.

I now present detailed reviews of the aggression and the eating literatures from the perspective of Perfect Storm Theory. The decision to make the aggression literature the first domain of application of the I^3 Model and Perfect Storm Theory derived from my longstanding interest in understanding how people navigate relationship conflict, including the research I conducted for my master and doctoral degrees (Finkel & Campbell, 2001; Finkel, Rusbult, Kumashiro, & Hannon, 2002). The decision to make the eating literature the second domain of application derived from my desire to explore the generality of this framework by investigating it in an important behavioral domain that cosmetically has very little in common with aggression.

A Perfect Storm Theory Perspective on the Aggression Literature

The only domain that has received significant attention from the perspective of the I^3 Model and Perfect Storm Theory is aggression, including intimate partner violence (e.g., Denson et al., 2012; Finkel et al., 2012; Finkel & Eckhardt, 2013; Slotter & Finkel, 2011; Slotter et al., 2012). In the present section, and in Table 2, I review the aggression literature from the perspective of the Perfect Storm Theory as a means of illustrating the theory's integrative potential.

Aggression, which refers to behavior that is intended to harm another person who does not wish to be harmed (Baron & Richardson, 1994), has rich theoretical and empirical traditions in social psychology (for a review, see Bushman & Huesmann, 2010). For example, Frustration-Aggression Theory suggests that having one's goals thwarted yields an urge to aggress (Dollard et al., 1939), and Cognitive Neoassociation Theory extended this idea to suggest that any aversive stimulus yields such an urge (Berkowitz, 1989, 1990, 1993). Social Learning Theory suggests that people become aggressive when they witness another person aggress, especially when that target person has high status or is rewarded for the aggression (Bandura, 1973, 1977). Social Information Processing Theory suggests that people are especially prone toward aggression to the extent that they adopt hostile attributions for others' behavior (Dodge, 1980; Crick & Dodge, 1994).

The aggression literature has also benefited from the development of integrative metatheoretical perspectives, the most generative of which is the General Aggression Model (C. A. Anderson, Deuser, & DeNeve, 1995; Bushman & Anderson, 2002). This model delineates the inputs, routes, and outcomes related to aggression-relevant episodes. The term "inputs" refers to person factors (e.g., traits, beliefs) and situation factors (e.g., aggressive cues, provocation). The term "routes" refers to the individual's cognitive qualities (e.g., hostile thoughts, aggressive scripts), affective experiences (e.g., mood, expressive motor responses), and arousal-relevant states, all of which are highly interconnected. The term "outcomes" refers to the individual's appraisal and decision-processes, which foster either thoughtful or impulsive action. Those actions influence the social encounter, which begins the process anew.

That the General Aggression Model is more metatheory than theory is readily apparent from this brief review. It functions as a framework that helps scholars identify which research questions are interesting and important, and it facilitates theory development and hypothesis generation. For example, a given scholar might wish to examine whether a given personality trait (say,

neuroticism) predicts thoughtful and impulsive aggression and whether such effects are mediated by cognitive and affective responses to provoking situations. Such research questions are important, and they clearly emerge from the General Aggression Model, but they are *derived from* rather than inherent to the model. As such, the General Aggression Model is not particularly amenable to falsification, and it should be evaluated primarily in terms of its generativity. Given that a Google Scholar search in 2013 revealed that the *Annual Review of Psychology* article on this model (C. A. Anderson & Bushman, 2002) tends to be cited well over 100 times every year, there is little doubt that it is an extremely successful metatheory.

That said, no metatheory is comprehensive, and even the most generative of metatheories directs attention toward some questions and away from others. As just one example, the General Aggression Model does not shine particularly bright light on the ways in which a given individual might experience conflicting motives regarding the enactment of aggressive behavior in a particular situation, or on how such conflicting motives are likely to be resolved. The I^3 Model, as applied to the aggression domain, shines light on a different set of topics and, consequently, tends to facilitate the development of different research questions, theories, and hypotheses. In other words, although the General Aggression Model and the I^3 Model are entirely compatible, they foster distinct programs of research and, taken together, yield a much more complete understanding of aggression than either model could achieve on its own.

To date, empirical research explicitly derived from the I^3 Model has focused on effects of instigation, impellance, and inhibition without attending closely to behavioral proclivity as the mediator. That is, it has focused on Effects 1-7 (Paths 1-7 in Figure 2, Panels 1-7 in Figure 3, and Rows 1-7 in Table 1), and I build the present literature review around those seven effects. Subsequently, I briefly discuss evidence relevant to the role of behavioral proclivity in aggression (Effects 8-18), interpreting the extant literature from the perspective of Perfect Storm Theory.

The aggression literature encompasses a broad range of constructs that vary in the degree to which they are process-pure versus process-ambiguous. That said, as discussed previously, it is reasonable for scholars to capitalize upon theoretical and empirical clues to develop concrete, testable hypotheses about the process through which a given construct predicts aggression (e.g., impellance). In the present review, I focus on constructs that appear to be relatively process-pure.

In addition, this review focuses primarily on physical aggression, but, given that the Perfect Storm predictions are identical for other forms of aggression (e.g., verbal aggression), it occasionally touches upon those other forms, too. Scholars have employed a wide range of measures for assessing physical aggression, including various self-report measures and diverse behavioral measures of aggression in the laboratory (for reviews, see DeWall et al., in press; Giancola & Chermack, 1998; Ritter & Elsea, 2005; Suris et al., 2004). By design, the present review encompasses research employing many of these measures.

Effects 1-3: Perfect Storm Theory's main effects. According to Perfect Storm Theory, instigation, impellance, and (dis)inhibition should, *ceteris paribus*, all predict greater aggression. Even in the strong form of the theory depicted in Panel A of Figure 4, the existence of the robust increase in the likelihood and the intensity of aggression in the perfect storm situation will mean that scholars looking only at main effects will find evidence for those effects. For example, if aggression is especially intense when provocation is high (strong instigation), trait aggressiveness is high (strong impellance), and self-control resources are depleted (weak inhibition), then a test with sufficient statistical power and capturing a range of contexts is likely to reveal that any of these constructs predicts aggression on its own. For example, even if individuals who are high versus low in trait aggressiveness are no more likely to aggress in the absence of a provocation (or when self-control resources are intact), trait aggressiveness will still predict aggression on average, as people sometimes encounter provocation (or depleted self-control resources).

In this section, I discuss several instigators, impellors, and (dis)inhibitors that tend to predict aggression on average. Although this review encompasses a range of instigators, impellors, and inhibitors, it is intended to be illustrative rather than exhaustive. Indeed, given that the primary focus of Perfect Storm Theory is on interaction effects, this review of main effects will be brief.

Effect 1: instigation main effect. Scholars have investigated many instigators of aggression—of discrete behaviors enacted by a potential target of aggression that, all else equal, increase how likely people are to aggress and how intensely they do so (e.g., Buss & Duntley, 2011; Peterson, 1983; Wilkinson & Hamerschlag, 2005). For example, controlling for the relevant impellors and inhibitors, people are especially likely to aggress when the potential target of aggression has, in that behavioral episode, insulted them, rejected them, obstructed their goal pursuit, stolen something from them, or inflicted physical pain on them—or enacted such behaviors toward other members of their ingroup. Such behaviors from the potential target of aggression normatively afford the proclivity to respond aggressively. In other words, holding constant all other factors that are relevant to aggression in the given situation, including all individual difference variables, people are more likely to aggress in response to such treatment than in response to the opposite treatment, such as after the target praises them, includes them, and so forth.

Given the social psychological emphasis on the subjective construal of situations (Ross & Nisbett, 1991), it might not be intuitive that a specific behavior enacted by a target of aggression might *normatively afford* a proclivity to respond aggressively; after all, the strength of that proclivity will vary from person to person and from circumstance to circumstance. Although such variability is a crucial component of the I^3 Model and Perfect Storm Theory, it enters the model as impellance rather than as instigation. Indeed, consistent with the analysis presented previously of what certain environmental features (including behaviors enacted by others) normatively afford, there is little doubt that some behaviors that other people might enact are normatively more

provoking than other behaviors. For example, as noted previously, the statement "I'm kicking your sorry ass" is normatively more provoking than the statement "I know you're trying your hardest" (Santor et al., 2003). To be sure, any given behavior from the target person will, as a function of impellance, vary across individuals (and within an individual across situations) in the degree to which it triggers the proclivity to aggress, but that does not alter the fact that some statements are normatively more offensive than others. More generally, some behaviors enacted by another person afford aggressive responding more than others do.

Effect 2: impellance main effect. Scholars have also investigated many impellors of aggression—of factors that, all else equal, increase how likely people are to aggress when confronting a particular instigator and how intensely they do so. For example, controlling for the relevant instigators and inhibitors, people are especially likely to aggress when they possess high levels of certain individual difference characteristics (e.g., aggressiveness, testosterone), when they are experiencing aversive environmental circumstances (e.g., extremely hot temperatures, painfully loud noises), or when they have a general tendency to prefer physical to cerebral activities. In addition, they are especially likely to aggress if they spend the immediate post-instigation interlude ruminating about how angry the instigation made them. Holding constant all other aggression-relevant factors, people are more likely to aggress, and to do so more intensely, under such circumstances than under the opposite circumstances, such as when they are low in trait aggressiveness, are experiencing a pleasant physical environment, spend the post-instigation interlude being distracted from angry rumination, and so forth.

To be sure, a given impellor might predict aggression in response to some instigators more than in response to others. In a recent study, for example, people high (vs. low) in sensitivity to provocation became more aggressive when they were provoked than when they were not, whereas people high (vs. low) in sensitivity to frustration did not (Lawrence & Hutchinson, 2013). In

another recent study, people high (vs. low) in narcissism tend to be especially aggressive in response to an ego threat (insulting, disrespectful feedback on an essay), whereas people high (vs. low) in psychopathy tend to be especially aggressive in response to physical provocation (intense, painful noise blasts) (Jones & Paulhus, 2010). However, when averaging across the instigation and inhibition individuals experience over time, people who are higher on any of these impellors (sensitivity to provocation, sensitivity to frustration, narcissism, psychopathy) are likely to aggress more than people who are lower.

Effect 3: inhibition main effect. Finally, scholars have investigated many inhibitors of aggression—of factors that, all else equal, decrease how likely people are to aggress (when they are experiencing a proclivity to aggress) and how intensely they do so. For example, controlling for the relevant instigators and impellors, people are especially *unlikely* to aggress when they possess high levels of certain individual difference characteristics (e.g., trait self-control, executive functioning), when they currently possess relatively high self-control resources (e.g., self-control training, lack of self-control depletion), when they are sober rather than under the influence of alcohol or other drugs that impair frontal-lobe functioning, when they hold the belief that enacting aggressive behavior will yield negative outcomes for themselves, and when they are strongly committed to maintaining a relationship with the potential target of aggression for the long-run. Holding constant all other factors that are relevant to aggression in the given situation, people on average are less likely to aggress, and to aggress less intensely, under such circumstances than under the opposite circumstances, such as when they are low in trait self-control, currently have depleted self-control resources, are intoxicated, and so forth.

The recognition that people frequently override proclivities to aggress rather than acting upon them has been a central feature of theorizing in the aggression literature for at least 75 years. Indeed, the frustration-aggression theorists (Dollard et al., 1939; N. E. Miller, 1941) discussed the

distinction between the "instigation to aggression," which is akin to the I^3 Model's proclivity to aggress, and the actual enactment of aggression. That said, the aggression literature has devoted relatively little attention to the circumstances under which people override versus act upon such proclivity, an oversight that social psychologists have started to address in earnest within the past decade (e.g., DeWall, Baumeister, Stillman, & Gailliot, 2007; Finkel et al., 2009, 2012).

Effects 4-6: Perfect Storm Theory's two-way interaction effects. I now review evidence consistent with the three two-way interaction effects implied by Perfect Storm Theory. The goal is not to provide comprehensive reviews of all relevant literatures, but rather to present a range of evidence consistent with specific theory-derived hypotheses. I will present the results from four studies for each of the theory's two-way interaction terms (12 studies in total).

Effect 4: instigation × impellance interaction effect. Figure 5 presents results for four instigation × impellance interaction effect findings. Panel A depicts the results from a study investigating the interactive effects of *verbal insult* (instigator) and *narcissism* (impellor) on aggressive behavior, which was operationalized in terms of the intensity of the noise blasts participants administered to a person who had previously provoked them (Bushman & Baumeister, 1998). Verbal insult was operationalized in terms of whether the potential target of aggression had previously given participants insulting or praising feedback on an essay they had written in defense of their position on abortion, and narcissism was operationalized with a self-report instrument. Results aligned with the perfect storm instigation × impellance interaction effect prediction: The association of narcissism with aggression was stronger among participants who had been insulted rather than praised.

Panel B of Figure 5 depicts the results from a study investigating the interactive effects of *hit teammates* (instigator) and *temperature* (impellor) on aggressive behavior, which was operationalized in terms of the likelihood that a pitcher hits a batter on the opposite team during a

game of baseball (Larrick, Timmerman, Carton, & Abrevaya, 2011). Hit teammates was operationalized in terms of how many times the pitcher's teammates had been hit by a pitcher on the opposing team, and temperature was operationalized in terms of how hot it was at game time. Results aligned with the perfect storm instigation × impellance interaction effect prediction: The association of temperature with aggression was stronger among pitchers whose teammates had previously been hit a larger rather than a smaller number of times.

Panel C of Figure 5 depicts the results from a study investigating the interactive effects of *physical provocation* (instigator) and *noise intensity* (impellor) on aggressive behavior, which was operationalized in terms of the intensity of electric shocks participants administered to the person who had provoked them (Donnerstein & Wilson, 1976). Physical provocation was operationalized in terms of whether the potential target of aggression had subjected participants to mild or severe shocks, and noise intensity was operationalized in terms of whether the volume of random noise blasts piped into participants' headsets was low or high. Results aligned with the perfect storm instigation × impellance interaction effect prediction: The effect of noise intensity on aggression was stronger when paired with high rather than low physical provocation.

Panel D of Figure 5 depicts the results from a study investigating the interactive effects of *verbal insult* (instigator) and *rumination about a previous provocation* (impellor) on aggressive behavior, which was operationalized in terms of the number of grams of hot sauce participants assigned the spice-averse target to consume (Bushman, Bonacci, Pedersen, Vasquez, & N. Miller, 2005). Early in the study, the experimenter (who was not the potential target of aggression) either behaved in an insulting or a respectful manner toward the participants, and, as expected, the key results emerged among participants who had been insulted. Verbal insult was operationalized in terms of whether the other participant (who was the potential target of aggression) gave participants an insulting or a praising evaluation of their performance on an anagram task.

Rumination about a previous provocation was operationalized in terms of whether, during the 20 minutes between the experimenter's behavior and the other participant's evaluation, participants wrote an essay about their experiences in the study thus far (i.e., about how the experimenter had treated them) or created a detailed map of the physical features of the campus. Among participants who had been previously provoked by the experimenter (the relevant circumstances), results aligned with the perfect storm instigation × impellance interaction effect prediction: The effect of ruminating about a previous provocation on aggression was stronger among participants who had been insulted rather than praised by the potential target.

Effect 5: instigation × inhibition interaction effect. Figure 6 presents results for four instigation × inhibition interaction effect findings. Panel A depicts the results from a study investigating the interactive effects of *physical provocation* (instigator) and *frontal lobe functioning* (inhibitor) on aggressive behavior, which was operationalized in terms of the intensity of electric shocks participants administered to a person who had previously provoked them (Lau, Pihl, & Peterson, 1995). Physical provocation was operationalized in terms of the extent to which the potential target of aggression had subjected participants to a mild or a severe shock on the preceding trial, and frontal lobe functioning was operationalized in terms of neuropsychological tests. Results aligned with the perfect storm instigation × inhibition interaction effect prediction: The inhibiting effect of strong frontal lobe functioning on aggression was stronger among participants who had been strongly rather than weakly physically provoked on the previous trial.

Panel B in Figure 6 depicts the results from a study investigating the interactive effects of *insult* (instigator) and *depletion* (disinhibitor) on aggressive behavior, which was operationalized in terms of the duration of time participants required their romantic partner to maintain painful body positions (Finkel et al., 2009). Provocation was operationalized in terms of whether the partner had previously given participants insulting or praising feedback on a creativity task, and

depletion was operationalized in terms of whether participants did or did not have to regulate their attention while viewing a video clip shortly before assigning the body position durations. Results aligned with the perfect storm instigation × inhibition interaction effect prediction: The disinhibiting effect of depletion on aggression was stronger among participants who had been insulted rather than praised.

Panel C in Figure 6 depicts the results from a study investigating the interactive effects of *insult* (instigator) and *glucose consumption* (inhibitor) on aggressive behavior, which was operationalized in terms of the intensity of noise blasts participants administered to a person who had previously provoked them (Denson, von Hippel, Kemp, & Teo, 2010). Insult was operationalized in terms of whether the potential target of aggression had previously given participants insulting or neutral feedback on a speech task, and glucose consumption was operationalized in terms of whether participants drank lemonade that contained 50 grams of sugar or a placebo that contained 2.4 grams of sugar (glucose is argued to be a crucial factor underlying impulse regulation; Gailliot & Baumeister, 2007). Results aligned with the perfect storm instigation × inhibition interaction effect prediction: The inhibiting effect of glucose consumption on aggression was stronger among participants who had versus had not been insulted.

Panel D in Figure 6 depicts the results from a study investigating the interactive effects of *provocation* (instigator) and *relationship commitment* (inhibitor) on aggressive behavior, which was operationalized in terms of the number of virtual pins participants inserted into a computer-based depiction of a voodoo doll representing their romantic partner (Slotter et al., 2012). Provocation was operationalized in terms of whether participants immersed themselves in a vivid scenario in which their romantic partner either flirted openly with another person or was unreceptive to the flirtatious overtures of that person, and relationship commitment was operationalized in terms of the speed with which participants associated the term “romantic

partner" (vs. a generic "other") with commitment-related words (e.g., commitment, loyalty) on an implicit association task. Results aligned with the perfect storm instigation × inhibition interaction effect prediction: The inhibiting effect of implicit relationship commitment on aggression was stronger among participants who had versus had not been provoked.

Effect 6: impellance × inhibition interaction effect. Figure 7 presents results for four impellance × inhibition interaction effect findings. Panel A depicts the results from a study investigating the interactive effects of *trait aggressiveness* (impellor) and *self-control training* (inhibitor) on aggressive behavior, which was operationalized in terms of the intensity of noise blasts participants administered to a person who had previously provoked them (Denson, Capper, Oaten, Friese, & Schofield, 2011). Trait aggressiveness was operationalized with a self-report instrument, and self-control training was operationalized in terms of whether participants had or had not been assigned to a two-week self-control-bolstering regimen. Results aligned with the perfect storm impellance × inhibition interaction effect prediction: The inhibiting effect of self-control training on aggression was stronger among participants who were high rather than low in trait aggressiveness.

Panel B in Figure 7 depicts the results from a study investigating the interactive effects of *trait aggressiveness* (impellor) and *glucose consumption* (inhibitor) on aggressive behavior, which was operationalized in terms of the intensity of the noise blasts participants administered to a person who had previously provoked them (Denson et al., 2010). Trait aggressiveness was operationalized with a self-report instrument, and glucose consumption was operationalized in terms of whether participants drank lemonade that contained 40 grams of sugar or a placebo that contained 2 grams of sugar. Results aligned with the perfect storm impellance × inhibition interaction effect prediction: The inhibiting effect of glucose consumption on aggression was stronger among participants who were high rather than low in trait aggressiveness.

Panel C in Figure 7 depicts the results from a study investigating the interactive effects of *conflict focus* (impellor) and *alcohol consumption* (disinhibitor) on aggressive behavior, which was operationalized in terms of the intensity of electric shocks participants administered to a person who had previously provoked them (Giancola & Corman, 2007). Conflict focus was operationalized in terms of whether participants were able to focus all of their attention on an adversarial task they were engaged in with the other person or were instead required to focus their attention elsewhere, and alcohol consumption was operationalized in terms of whether participants were assigned to consume alcohol or a placebo beverage before engaging in the adversarial task. Results aligned with the perfect storm impellance × inhibition interaction effect prediction: The effect of alcohol consumption on aggression was stronger among participants who focused on the adversarial task than on participants who focused their attention elsewhere.

Panel D in Figure 7 depicts the results from a study investigating the interactive effects of *physicality* (impellor) and *negative outcome expectancies* (inhibitor) on aggressive behavior, which was operationalized in terms of the number of violent behaviors teenage participants had enacted against a romantic partner over the previous year (Finkel & Foshee, 2010). Physicality was operationalized with a self-report instrument assessing participants' preference for physical over cognitive activities, and negative outcome expectancies was operationalized with a self-report instrument assessing participants' beliefs that enacting violent behaviors against their partner would yield negative consequences for them. Results aligned with the perfect storm impellance × inhibition interaction effect prediction: The inhibiting effect of negative outcome expectancies on aggression was stronger among participants who were high rather than low in physicality.

Effect 7: Perfect Storm Theory's three-way interaction effect. I now turn to the instigation × impellance × inhibition three-way interaction effect (Effect 7)—the crucial "perfect storm" effect depicted in Figure 4—presenting the results from four relevant studies in Figure 8. Panel A

depicts the results from a longitudinal study investigating the interactive effects of *provoking partner* (instigator), *trait anger* (impellor) and *depletion* (disinhibitor) on aggressive behavior, which was operationalized in terms of the number of physically aggressive behaviors participants enacted against their partner over a six month period, controlling for previous physically aggressive behavior (Finkel et al., 2012). Provoking partner was assessed with the spouse's self-report of his or her own trait neuroticism (which included items like "I get irritated easily").[4] Trait anger was operationalized in terms of the average of participants' self-reported daily anger over a seven-day period. Depletion was operationalized in terms of the amount of self-reported life stress participants had endured across 13 life domains during the six-month period during which the researchers assessed changes in aggression. Results aligned with the perfect storm prediction, with the three-way interaction effect emerging as significant. Trait anger and depletion did not interact when the partner was not prone toward provoking behavior (left side of Panel A), but they did interact when the partner was prone toward provoking behavior (right side of Panel A). Specifically, for participants with highly provoking partners, the association of anger with aggression was stronger among participants experiencing high rather than low depletion.

Panel B in Figure 8 depicts the results from a study investigating the interactive effects of *provocation* (instigator), *trait aggressiveness* (impellor) and *serotonergic augmentation* (inhibitor) on aggressive behavior, which was operationalized in terms of the intensity of electric shocks participants administered to a person who had previously provoked them (Berman, McCloskey,

[4] This assessment of (proneness toward) instigation is indirect, but the logical inference from the partner's provoking personality tendencies to the individual's tendency to experience instigation at the partner's hands aligns with the existing literature. For example, in a laboratory study, the partner's report of his or her own trait aggressiveness predicts his or her level of actual provocation toward the individual (C. A. Anderson, Buckley, & Carnagey, 2008). Similarly, the partner's mental disorder status (e.g., depression, anxiety, posttraumatic stress disorder) strongly predicts the individual's tendency to enact intimate partner violence against him or her (Trevillion, Oram, Feder, & Howard, 2012), which suggests that partner behaviors linked to the mental disorder function as instigators. With regard to the Finkel et al. (2012) study in particular (Figure 8a), abundant evidence suggests that highly neurotic people are especially prone to enact provoking behavior during couple interaction (e.g., Buss, 1991; Caughlin, Huston, & Houts, 2000; Caughlin & Vangelisti, 2000; Donnellan, Conger, & Bryant, 2004; McNulty, 2008).

Fanning, Schumacher, & Coccaro, 2009). Provocation was manipulated within-participant by having the ostensible target of aggression shock the participant with increasing intensity during the course of their interaction, concluding with a severe shock. Trait aggressiveness was assessed with a semistructured interview. Serotonergic augmentation was manipulated by having participants ingest either a placebo or 40 mg of paroxetine via the drug Paxil® (serotonin activity in the prefrontal cortex is crucial in helping people regulate negative affective experiences that would otherwise be linked to aggressive behavior; Siever, 2008). Results aligned with the perfect storm prediction, with the three-way interaction effect emerging as significant. Although the authors did not break down their simple effects tests in this manner, it appears that trait aggressiveness and serotonergic augmentation did not interact when the ostensible target had inflicted a mild shock (left side of Panel B), but they did interact when the ostensible target had inflicted a severe shock (right side of Panel B). Specifically, when the ostensible target inflicted a severe shock, the association of trait aggressiveness with aggression was weaker among participants in the serotonergic augmentation than in the placebo condition.

Panel C in Figure 8 depicts the results from a 35-day diary study investigating the interactive effects of *provocation* (instigator), *trait retaliation* (impellor) and *relationship commitment* (inhibitor) on aggressive behavior, which was operationalized in terms of the number of virtual pins participants inserted into a computer-based depiction of a voodoo doll representing their partner (Slotter et al., 2012). Whereas trait retaliation was assessed at study intake with a self-report instrument, both provocation and relationship commitment were operationalized in terms of the degree to which a participant's report on a given day deviated from his or her own mean report across all days. That is, participants reported every day how much their partner had provoked them that day and how committed they were to their relationship that day, and each of these constructs was centered within each participant across days, such that a high score represents a deviation

from a given individual's average score on that variable. Results aligned with the perfect storm prediction, with the three-way interaction effect emerging as significant. Although the authors did not break down their simple effects tests in this manner, it appears that trait retaliatory tendencies and relationship commitment did not interact on low provocation days (left side of Panel C), but they did interact on high provocation days (right side of Panel C). Specifically, on high provocation days, the association of retaliatory tendencies with aggression was stronger among participants experiencing lower-than-usual rather than higher-than-usual relationship commitment.

Panel D in Figure 8 depicts the results from a study investigating the interactive effects of *rejection* (instigator), *trait rejection-sensitivity* (impellor) and *depletion* (disinhibitor) on a type of aggression called "obsessive relational intrusion," which was operationalized with a self-report instrument assessing behaviors such as harassment, intimidation, coercion, and direct aggression (Sinclair, Ladny, & Lyndon, 2011). Rejection was manipulated by having participants immerse themselves in a scenario in which they had been involved with a romantic partner for three years and, seeking to advance the relationship, had planned a surprise romantic evening with tickets to a special concert. In the high rejection condition, the partner rejects the offer callously (e.g., "I really am not interested in you anymore. There is nothing I find appealing about you."); in two low-rejection conditions, the partner rejects the offer (and, in one case, the participant more generally) in a kind manner, blaming external circumstances. Trait rejection-sensitivity was assessed with a self-report measure. Depletion was manipulated by randomly assigning half of the participants to regulate their attention during a five-minute writing task. Results aligned with the perfect storm prediction, with the three-way interaction effect emerging as significant. Although the authors did not break down their simple effects tests in this manner, it appears that trait rejection-sensitivity and depletion did not interact in the mild rejection condition (left side of Panel D), but they did interact in the severe rejection condition (right side of Panel D). Specifically, in the severe

rejection condition, the association of trait rejection sensitivity with obsessive relational intrusion was stronger when participants were depleted than when they were not.

Effects involving behavioral proclivity. In short, the aggression literature is packed with findings that dovetail cleanly with the main effect and interaction effect hypotheses derived from Perfect Storm Theory (see Figure 4). However, the preceding review did not address any effects involving behavioral proclivity (see links 8-12 in Figure 2, Panels 8-18 in Figure 3, and rows 8-18 in Table 2). In this section, I briefly review findings involving behavioral proclivity.

Before delving into this literature review, we briefly consider the various ways of assessing behavioral proclivity in an aggression context. As a roadmap, I revisit the General Aggression Model, which, as noted previously, suggests that variability in the affective, cognitive, and physiological states that individuals experience following instigation are crucial in determining whether, and the extent to which, they aggress (C. A. Anderson & Bushman, 2002). For example, a straightforward affective assessment is state-level anger experienced in response to the instigator, a straightforward cognitive assessment is state-level revenge cognitions experienced in response to the instigator, and a straightforward physiological assessment is state-level testosterone reactivity experienced in response to the instigator. In addition, as in other domains, behavioral proclivity in the aggression domain can manifest not only in the form of a hot visceral process (e.g., Barlett, Harris, & Bruey, 2008; Berkowitz, 1989), but also in the form of cool cognitive processes, such as an unconscious accessibility of aggression-related thoughts (e.g., C. A. Anderson, Benjamin, & Bartholow, 1998; Carlson, Marcus-Newhall, & N. Miller, 1990). Finally, regardless of whether the behavioral proclivity is hot or cool (or a blend of the two), it can occur within or outside of the individual's conscious experience (Todorov & Bargh, 2002).

Scholars have learned a great deal about the neural correlates of anger-related (hot) proclivities toward aggression. In general, in a distinction similar to the one from the behavioral literature

between factors that increase individuals' urge to aggress and factors that override this urge (Davidovich, Bell, Ferguson, Gorski, & Campbell, 2011; Finkel, 2007a), scholars have argued that one set of brain regions undergirds the proclivity to aggress, especially for relatively hot proclivities, whereas another set undergirds the inhibition of this proclivity (for reviews, see Filley et al., 2001; Siever, 2008). Regions linked to the proclivity to aggress include the amygdala and related limbic regions, whereas regions linked to the inhibition of this proclivity include the orbital frontal cortex and the anterior cingulate gyrus. Of particular relevance to this discussion of the neural correlates of the (hot) proclivity to aggress, experimental research has shown that experiencing anger-inducing provocation increases dorsal anterior cingulate cortex activation (Denson, Pedersen, Ronquillo, & Nandy, 2009) and relative left-to-right prefrontal cortical activation (Harmon-Jones & Sigelman, 2001), and that stronger levels of such activation are linked not only to self-reported anger, but also to elevated aggressive behavior.

The role of cool behavioral proclivities to aggress has received less attention, but scholars have identified instigators and impellors that trigger cool cognitive processes that increase this proclivity. For example, this proclivity is stronger when a weapon is present rather than absent or when people have been unconsciously primed with aggression-related words (C. A. Anderson, Buckley, & Carnagey, 1998; Todorov & Bargh, 2002). As a means of situating the role of behavioral proclivity within the broader aggression literature, I provide illustrative examples of Effects 8-18 from Figure 3 and Table 1—at least insofar as such examples exist in the literature.

Effect 8 is the link between instigation and behavioral proclivity. Example effects include the effect of insult on cognitive accessibility of anger-related constructs (Cohen, Eckhardt, & Schagat, 1998), the effect of social rejection on negative affect (Zwolinski, 2012), and the effect of social rejection on hostile cognitive bias (DeWall, Twenge, Gitter, & Baumeister, 2009). In this last study, participants were slated to interact with an appealing same-sex stranger, and they recorded a

brief video describing themselves so the stranger could get a sense of them before meeting face-to-face (see Row 8 in Table 2). Five minutes after taking the video to the other participant, the experimenter returned and informed the participant either (a) that, after viewing the video, the stranger did not want to meet the participant (high rejection) or (b) that the stranger was not able to meet the participant due to extenuating circumstances (low rejection). Next, when participants completed a word stem completion task that allowed for both hostile and nonhostile completions (e.g., "r_pe" can be completed as "rape" or "ripe"), participants in the high rejection condition created a greater number of hostile words than did participants in the low rejection condition. That is, they were more likely to perceive ambiguous stimuli to be hostile rather than nonhostile.

Effect 9 is the link between impellance and behavioral proclivity. Example effects include the effect of hot temperature on state hostility (C. A. Anderson et al., 1995), the effect of an aggression prime on testosterone reactivity (Klinesmith, Kasser, & McAndrew, 2006), and the effect of trait aggressiveness on activation in the dorsal anterior cingulate cortex, a brain region linked to the experience of state-level anger (Denson et al., 2009). In this last study, participants completed a self-report trait aggressiveness measure approximately 12 days before attending a laboratory session at which they completed an anagram task in an fMRI scanner (see Row 9 in Table 2). They were presented with 12 anagrams via a computer monitor, and they were asked to state, out loud, either the solution or that they could not solve it. Regardless of how loudly the participants spoke, the experimenter interrupted them on three occasions to request that they speak louder. The third time, the experimenter adopted a rude tone in saying: "Look, this is the third time I have had to say this! Can't you follow directions?" All participants were provoked in this manner. Trait aggression strongly predicted postprovocation activation in left dorsal anterior cingulate cortex. That is, individuals who were high rather than low in trait aggressiveness experienced strong activation in a brain region linked to the subjective experience of anger.

Effect 10 is the link between the instigation × impellance interaction effect and behavioral proclivity. Example effects include the provocation × trait hostility interaction effect on blood pressure (Suls & Wan, 1993), the social rejection × narcissism interaction effect on state anger (Twenge & Campbell, 2003), and the physical provocation × trait hostility interaction effect on aggressive cognition (K. B. Anderson, C. A. Anderson, Dill, & Deuser, 1998). In this last study, participants reported on their trait hostility before the experimenter manipulated their experience of physical pain by randomly assigning them either to maintain a physically painful or a nonpainful body position for three minutes (see Row 10 in Table 2). After giving them a 30-second rest, the experimenter had participants reassume the same position while indicating the degree to which the two words in each of 10 word pairs—one unambiguously aggression-relevant (e.g., choke, hatchet) and the other ambiguous (e.g., bottle, stick)—were similar to each other. The pain manipulation interacted with trait hostility: It did not predict similarity ratings among low-hostility participants, but it did predict similarity ratings among high-hostility participants. That is, high-hostility participants were more likely to perceive ambiguous words as having aggression-relevant meaning when physical pain had been inflicted upon them than when it had not.

Effect 11 is the link between behavioral proclivity and aggression. Example effects include the effect of testosterone reactivity on hot sauce administration (Klinesmith et al., 2006), the effect of postprovocation hostile motives toward the target on noise blasts (C. A. Anderson et al., 2008), and the effect of daily anger on self-reported aggression (Wilkowski & Robinson, 2010). In this last study, participants completed a self-report questionnaire nightly for 21 consecutive nights (see Row 11 in Table 2). Anger was assessed with an instrument tapping how strongly participants felt six anger-related emotions that day (e.g., anger, hostility). Given that physical aggression is rare on any given day, daily aggression was assessed with an instrument tapping how many times participants had engaged in each of eight psychologically or relationally aggressive behaviors

(e.g., insulted someone, spread negative rumors about someone). The daily anger measure was strongly positively correlated with the daily aggression measure, which is consistent with the hypothesis that greater levels of anger in one's daily interactions with others increases the likelihood that individuals will behave aggressively toward them.

Effect 12 is the link between the behavioral proclivity × inhibition interaction effect and aggression. In general, the aggression literature (and the literature on behavior more generally) has insufficiently investigated this potentially crucial moderating effect of inhibition on the link between the proclivity to enact a behavior and actual enactment of that behavior. Indeed, to my knowledge, only one aggression study has investigated Effect 12, an experimental investigation of the moderating effects of alcohol consumption (disinhibitor) on the link between postprovocation revenge cognitions (behavioral proclivity) and aggression (Borders & Giancola, 2011; see Row 12 in Table 2). In this study, participants consumed alcohol or a placebo beverage before engaging in a competitive reaction time task with a fictitious opponent in which the winner of each trial chose the intensity of the electric shock that the loser of that trial endured. Immediately following this procedure, participants reported the postprovocation revenge cognitions they were experiencing toward the fictitious other participant (e.g., "I am having thoughts of revenge or retaliation against my opponent"). Postprovocation revenge cognitions predicted the intensity of the electric shocks participants inflicted upon the other person, but this link was weaker (indeed, entirely eliminated) among participants who were sober rather than intoxicated.

Effect 13 is the mediational effect of behavioral proclivity on the link between instigation and aggression. Example effects include the mediational effect of postprovocation hostile cognitions on the link between rejection and aggression (DeWall et al., 2009), the mediational effect of heart rate reactivity on the link between provocation and aggression (Gerra et al., 2001), and the mediational effect of postprovocation hostile motivation on the link between provocation and

aggression (C. A. Anderson et al., 2008). In this last study, participants performed a competitive reaction-time task against another same-sex participant, and the winner of a given trial was able to set the intensity and duration of the noise blast the other participant would experience (see Row 13 in Table 2). In reality, wins and losses were preset, with participants winning 13 of the 25 trials. Provocation was determined by the intensity of the noise blasts the interaction partner inflicted on participants during the first half of the task, and aggression was determined by the intensity of the noise blasts participants inflicted on the interaction partner in the second half. Hostile motivation during the task were assessed with a self-report measure participants completed after it was over (e.g., "I wanted to hurt my opponent"). Hostile motivation significantly mediated the link between provocation and aggression: Participants inflicted more painful noise blasts on their interaction partner during the second half to the extent that the interaction partner had inflicted more painful noise blasts on them during the first half, and this effect was mediated by hostile motivation.

Effect 14 is the mediational effect of behavioral proclivity on the link between impellance and aggression. Example effects include the mediational effect of state anger on the link between implicit trait hostility and aggression (Wilkowski & Robinson, 2010), the mediational effect of provocation-relevant thought confidence (i.e., confidence in the thoughts one experiences in response to a provocation) on the link between trait driving-related anger and aggression (Blankenship, Nesbit, & Murray, 2013), and the mediational effect of testosterone reactivity on the link between an aggression prime and hot sauce infliction (Klinesmith et al., 2006). In this last study, the experimenter told participants that the study investigated taste sensitivity, which provided a compelling cover story for why participants would be asked to provide saliva samples—actually for assessing testosterone levels—and why they would be adding hot sauce to a cup of water for another participant to drink—actually the measure of aggression (see Row 14 in Table 2). The experimenter primed aggressiveness by seating participants at a table with either a

gun (akin to an automatic rifle) or the children's game Mouse Trap and asked them to spend 15 minutes handling the object and writing a set of instructions about how to use it. The cover story for this procedure was that the experimenter was studying whether taste sensitivity was associated with the sort of attention to detail required to perform well on such a task. Participants provided saliva samples before and after the task. Testosterone reactivity (increases from before to after handling the object) significantly mediated the link between the prime object and aggression. That is, participants inflicted more hot sauce on the other person if they had handled the gun rather than the children's game, and this effect was mediated by testosterone reactivity.

Effect 15 is the mediational effect of behavioral proclivity on the link between the instigation × impellance interaction effect and aggression. Example effects include the mediational effect of state anger on the link between the instigating trigger (instigator) × previous provocation (impellor) interaction effect and relational aggression (Pedersen, Gonzales, & N. Miller, 2000), the mediational effect of state anger on the link between the provocation (instigator) × prayer (disimpellor) interaction effect and aggression (Bremner, Koole, & Bushman, 2011),[5] and the mediational effect of hostile attributions about a provocation on the link between the provocation (instigator) × rumination about a prior provocation (impellor) interaction effect and hot sauce infliction (Bushman et al., 2005). In this last study, participants were either provoked or not toward the beginning of the session (see Row 15 in Table 2). Specifically, regardless of how loudly the participants spoke during a verbal anagram task, the experimenter interrupted them three times to request that they speak louder, adopting an especially rude tone the third time. Next, participants spent 20 minutes writing an essay either about their experiences in the session thus far (rumination condition) or about the physical structure of the university campus (distraction condition). Next, participants received either mildly provoking feedback or nonprovoking

[5] The Bremner et al. (2011) paper did not provide a clear test of the mediational moderation hypothesis in any study, but the pattern across studies strongly implies the existence of the effect.

feedback from a new person. Finally, they had the opportunity to prepare a snack for this new person, who reported hating spicy foods, deciding how much hot sauce to include in the snack. Participants also reported their level of hostile attributions regarding this second provocation (the mild one from the new person)—the degree to which it was overly critical, nasty, and made them angry. These hostile attributions significantly mediated the link between the second provocation (instigator) × rumination about the first provocation (impellor) interaction and hot sauce infliction. That is, participants subjected the other person to more hot sauce if that person had provoked them and if they had ruminated about the previous provocation from the experimenter, and this interaction effect was mediated by hostile attributions about the other participant's provocation.

To my knowledge, no aggression research has provided a clear test of Effect 16, 17, or 18. This void in the literature results in large part from the lack of focus on the combined influence of such processes in extant models of aggression, which means that almost no studies have assessed constructs that would be necessary for tests of such effects. A second, related issue is that in those rare instances in which scholars have included assessments of all relevant constructs, they have not investigated the relevant statistical model. For example, let us again consider Borders and Giancola's (2011) elegant alcohol–aggression study, which included data that allow for a test of *Effect 17*—the mediational effect of behavioral proclivity on the link between impellance and aggression, in conjunction with the moderational effect of inhibition on the proclivity–aggression link (see Panel 17 in Figure 2). As described when discussing Effect 12 above, this study included a manipulation of alcohol consumption (disinhibitor) and assessments of both postprovocation revenge cognitions (behavioral proclivity) and electric shock administration (aggression). In addition, this study also included an assessment of a construct that was irrelevant to Effect 12 but essential to Effect 17: trait hostility (impellor). We already know that postprovocation revenge cognitions predicted the intensity of the electric shocks participants inflicted upon the other

participant and that this link was weaker among participants who were sober rather than intoxicated. In separate analyses, the authors also demonstrated that trait hostility predicts both postprovocation revenge cognitions and aggression, and a test of the model represented in Effect 17 likely would have shown not only that postprovocation revenge cognitions mediated the link between trait hostility and aggression, but also (and consistent with the Effect 12 results) that the postprovocation revenge cognitions to aggression component of this mediational chain was moderated by alcohol consumption. Of course, definitive conclusions would require a test of the full statistical model, but the broader point remains: It is not difficult to test Effects 16, 17, and 18, and it seems likely that the only important reason why scholars have not done so is that previous theoretical models have not identified such effects as important.

Summary: A Perfect Storm Theory perspective on the aggression literature. This section reviewed the aggression literature from the perspective of Perfect Storm Theory. It began by reviewing findings relevant to the hypotheses derived from the depiction of Perfect Storm Theory in Figure 4, focusing on Effects 1-7—the nonmediated effects of instigation, impellance, and inhibition. It then reviewed findings relevant to Effects 8-18—the effects involving the proclivity to aggress. The literature has largely neglected the moderating effect of inhibition on the link between behavioral proclivity and aggressive behavior, so it was not possible to discuss findings relevant to Effects 16 or 18, and the review of findings relevant to Effects 12 and 17 was, of necessity, limited. This neglect aside, and although definitive conclusions await a more systematic review, the literature provides extensive evidence in support of the Perfect Storm Theory predictions regarding the remaining 14 effects (see Figures 5-8 and Table 2). In addition, although the present analysis focused on aggression between individuals, it can be extended to cases in which an individual aggresses against a group (e.g., Gaertner, Iuzzini, & O'Mara, 2008) or when groups aggress against other (e.g., Lickel, N. Miller, Stenstrom, Denson, & Schmader, 2006).

A Perfect Storm Theory Perspective on the Eating Literature

A second topic that has received attention from the I^3 Model and Perfect Storm Theory is eating behavior (Finkel, Herbst, & Fitzsimons, 2013), although this topic has received far less attention than aggression has. In the present section, and in Table 3, I review the eating literature from the perspective of Perfect Storm Theory.

Eating research, like aggression research, has rich theoretical and empirical traditions in social psychology (for reviews, see Stroebe, van Koningsbruggen, Papies, & Aarts, in press; Wansink, 2006). For example, emotional eating theories suggest that people overeat as a means of managing fear or anxiety (Kaplan & Kaplan, 1957) or because they misperceive emotional states as hunger (Bruch, 1961). Externality theory suggests that some people are insensitive to internal cues of satiety and are therefore susceptible to external eating cues even when they are not hungry, which causes them to overeat to the point of obesity (Schachter, 1971; Stunkard & Koch, 1964). Setpoint theory suggests that each individual has a biologically directed target weight, and that deviations from this target weight elicit homeostatic processes designed to counteract those deviations; as such, efforts to lose weight will be counteracted by homeostatic processes designed to return the individual to the setpoint (Nisbett, 1972).

The most influential social psychological theory of eating in recent decades is the Boundary Model, which suggests that biological pressures function to keep food intake within a range demarcated at the lower end by the "hunger boundary" and at the higher end by the "satiety boundary" (Heatherton, Herman, Polivy, King, & McGree, 1988; Herman & Polivy, 1984). According to this model, people experience aversive physiological states when they are below the hunger boundary (hunger pangs) or when they are above the satiety boundary (feeling overly full). Whereas "normal eaters" (nondieters) use these physiological cues to sustain healthy behavior, eating when they are hungry and stopping when they are satiated, "restrained eaters" (dieters)

impose an artificial boundary at the higher end that is well below the physiological satiety boundary. Consequently, whereas the eating behavior of normal eaters is controlled by internal physiological processes, the eating behavior of restrained eaters is controlled to a large extent by cognitive processes requiring that these individuals compare their eating behavior to certain dieting rules. This process partially decouples eating behavior from internal physiological cues and makes restrained eaters increasingly sensitive to external rather than internal eating cues. In addition, given that the successful implementation of the cognitive processes requires concentration and exertion, restrained eaters are especially vulnerable to factors, such as cognitive load or motivational lapses, that can unleash restrained eaters' pent-up desire to eat, causing them to eat well beyond the now-compromised physiological satiety boundary.

In recent years, a new theory of eating has offered a different perspective on why restrained eaters frequently overeat. According to this theory, called the Goal Conflict Model, restrained eaters experience a conflict between the incompatible goals to experience eating enjoyment and to control their body weight (Stroebe, 2008; Stroebe et al., in press). In food-rich environments, which bombard people with palatable food cues, the eating enjoyment goal frequently overpowers the weight control goal, resulting in cognitive deactivation of the weight control goal and preferential cognitive processing of palatable food cues. These processes frequently cause restrained eaters to overeat when confronted with the opportunity to consume palatable food.

Although the I^3 Model is entirely compatible with the major existing theories of eating, it facilitates distinct programs of research and, when viewed in conjunction with the existing models, yields a more complete perspective on eating behavior. For example, because (in contrast to the prevailing models of eating behavior) the I^3 Model is first-and-foremost a metatheory rather than a theory, its emphasis is on fundamental processes rather than on specific constructs (e.g., obesity, eating restraint, palatability). Crucially, it seeks to apply a unitary framework for predicting the

behavior of both dieters and nondieters (and both obese and nonobese individuals), suggesting that both groups are susceptible to instigation, impellance, and inhibition, even if the specific constructs and contexts that influence these processes differ for dieters and nondieters. The extant literature has been dominated by research emphasizing the distinction between restrained and unrestrained eaters or between obese and nonobese people, but those distinctions are relevant to the I^3 Model perspective only insofar as it is possible to determine the extent to which (or the circumstances under which) they exert their effects through impellance versus disinhibition.

As in the aggression literature, (the few) applications of the I^3 Model in the eating literature have focused on effects of instigation, impellance, and inhibition without attending closely to behavioral proclivity as the mediator (Finkel et al., 2013). Indeed, in deriving Perfect Storm Theory from the I^3 Model, scholars have focused particular attention on the perfect storm instigation × impellance × inhibition interaction effect (Effect 7), which is depicted most clearly in Panel A of Figure 4. The logic is that even a particularly enticing slice of chocolate cake (strong instigator) might yield negligible consummatory proclivity, obviating the need for inhibition, in a person who has just gorged himself during a cake-eating contest (strong disimpellor). And even a ravenous person (strong impellor) encountering that slice of cake (strong instigator) might not eat it if she is determined to fit into her wedding gown next month (strong inhibitor).

As with the review of the aggression literature, the present review of the eating literature primarily focuses on effects of instigation, impellance, and inhibition (Effects 1-7) without attending closely to behavioral proclivity as the mediator. Following this review, I briefly discuss evidence relevant to the role of behavioral proclivity in eating behavior (Effects 8-18).

Effects 1-3: Perfect Storm Theory's main effects. In this section, I discuss several instigators, impellors, and (dis)inhibitors of eating behavior. Given that the primary focus of Perfect Storm Theory is on interaction effects, this review of main effects will be brief.

Effect 1: Instigation main effect. Scholars have investigated many instigators of eating behavior—of discrete situational phenomena regarding a particular food that, all else equal, increase how likely people are to eat and how much they eat. In general, the most potent instigators are the presence (vs. absence) of the food and the normative palatability of the food. However, a broad range of additional factors influence the degree to which a given food in a given context triggers eating behavior. For example, controlling for the relevant impellors and inhibitors, eating behavior is strongest—either eating rather than not eating or eating large rather than small quantities—when the food is presented in a tantalizing manner, or when situational cues imply that a larger rather than a smaller quantity is the normative portion size, such as when food is served out of a large rather than a small bowl or when other people are consuming a large rather than a small amount of the food. In other words, holding constant all other factors that are relevant to eating behavior in the given situation, including all individual difference variables, eating behavior is stronger in response to such circumstances than in response to the opposite circumstances, such as when the food is not palatable, when it is presented in a nontantalizing manner, and so forth.

Given the large individual differences in how much people like certain foods, it might not be immediately intuitive that a specific food in a specific context might *normatively afford* eating behavior. Such variability is crucial, but it enters the model as impellance rather than as instigation. Indeed, there is little doubt that some foods in some contexts normatively afford stronger eating tendencies than others do. To be sure, dispositional and situational impellors will moderate the degree to which any given food, in a particular context, will afford the proclivity to eat. However, such moderation does not alter the fact that some foods normatively afford stronger eating behavior than others—that is normatively affords strong eating behavior in the typical person in this population. When Rozin, Millman, and Nemeroff (1986) served participants fudge in the shape of a muffin versus in the shape of dog feces, for example, they made no assumptions

about individual differences in disgust reactions to dog feces. Rather, they simply assumed that there would be a powerful normative tendency for people to experience a stronger consummatory inclination in the muffin condition than in the dog feces condition. Validating this assumption, the normative fudge preference in that direction was huge—almost a full standard deviation.

Effect 2: Impellance main effect. Scholars have also investigated many impellors of eating behavior—of factors that, all else equal, increase how strongly people eat when confronting a particular instigator. For example, controlling for the relevant instigators and inhibitors, people are especially likely to eat (and to eat larger amounts) when they are hungry, when they particularly like the target food, when they have previously been primed with thoughts about the target food, or if they are generally susceptible to temptation. Holding constant all other factors that are relevant to eating behavior in the given situation, eating behavior is stronger under such circumstances than under the opposite circumstances, such as when they are not hungry, dislike the target food, are not especially susceptible to temptation, and so forth.

I suggest that restrained eating, perhaps the most central construct in the eating literature, taps both impellance and inhibition, but that it predominantly assesses impellance. Restrained eating is typically assessed with self-report instruments, particularly various versions of the "restraint scale" (Heatherton et al., 1988; Herman & Mack, 1975), which includes items such as "Do you eat sensibly in front of others and make up for it alone?" and "Do you give too much time and thought to food?" People who splurge while alone and are cognitive preoccupied with food receive high scores. Although this scale was originally intended to identify individuals who restrain their eating, it generally identifies individuals who tend to fail in their restraint attempts (Stroebe, 2008). Indeed, research has shown substantial positive associations between the scale and outcomes such as body-mass index, percentage overweight, and implicit liking for high-calorie food (e.g., Herman & Polivy, 1980; Houben et al., 2010). From this perspective, tendencies

toward overeating appear to be a cause rather than a consequence of dietary restraint—the desire to restrict their food intake comes online after their eating tendencies have caused physical or psychological distress associated with their body weight (Lowe & Kral, 2006). However, given that controversy about what the restraint scale assesses persists (e.g., Stice, Fisher, & Lowe, 2004; van Strien, Engels, Herman, & van Staveren, 2006), my review of the eating literature includes a small number of restraint scale examples, all of which conceptualize the construct as an impellor.

Effect 3: inhibition main effect. Finally, scholars have investigated many inhibitors of eating behavior—of factors that, all else equal, decrease how likely people are to eat (when they are experiencing a proclivity to eat) and how much they eat. For example, controlling for the relevant instigators and impellors, eating behavior is *weakest* when people possess certain individual difference characteristics, including trait self-control, strong executive functioning, and low trait tendencies toward disinhibited eating; when they possess the goal to avoid overeating, whether as a chronically accessible goal or as a situationally primed goal; when they currently possess intact self-control resources; when they are sober; or when they are not under cognitive load that compromises their inhibitory control. Holding constant all other factors that are relevant to eating behavior in the given situation, people exhibit weaker eating tendencies under such circumstances than under the opposite circumstances, such as when they are low in trait self-control, currently possess depleted self-control resources, are intoxicated, and so forth.

Effects 4-6: Perfect Storm Theory's two-way interaction effects. I now review evidence consistent with the three two-way interaction effects implied by Perfect Storm Theory. As I did when reviewing the aggression literature, I will present the results from four studies for each of the theory's two-way interaction terms (12 studies in total).

Effect 4: instigation × impellance interaction effect. Figure 9 presents results for four instigation × impellance interaction effect findings. Panel A depicts the results from a study

investigating the interactive effects of *food palatability* (instigator) and *hunger* (impellor) on eating behavior, which was operationalized in terms of how much milkshake participants consumed over a 10-minute period (Kauffman, Herman, & Polivy, 1995). Food palatability was operationalized in terms of whether scholars tainted the milkshake with quinine, and hunger was operationalized in terms of whether participants were asked not to eat for 4 versus 24 hours before attending the laboratory session. Results aligned with the perfect storm instigation × impellance interaction effect prediction: The association of hunger with eating behavior was stronger among participants who consumed the palatable rather than the bad-tasting milkshake (and, indeed, the effect of hunger actually trended in the negative direction for the bad-tasting milkshake).

Panel B of Figure 9 depicts the results from a study investigating the interactive effects of *anchoring* (instigator) and *visual processing* (impellor) on eating behavior, which was operationalized in terms of how many snack-size pretzels participants consumed (Madzharov & Block, 2010). Anchoring was operationalized in terms of whether the pretzel packaging depicted 5 or 25 pretzels, and visual processing was assessed with an individual-difference measure tapping the extent to which individuals enjoy and rely on visual information when engaging in cognitive tasks. Results aligned with the perfect storm instigation × impellance interaction effect prediction: The association of visual processing with eating behavior was stronger among participants who ate out of the package depicting 25 rather than 5 pretzels.

Panel C of Figure 9 depicts the results from a study investigating the interactive effects of *food palatability* (instigator) and *restraint scale score* (impellor) on eating behavior, which was operationalized in terms of how much milkshake participants consumed (Woody, Costanzo, Liefer, & Conger, 1981). Palatability was operationalized in terms of whether or not the researchers tainted the ice cream with quinine, and restraint scale score was assessed with Herman and Polivy's (1975) self-report instrument. Results aligned with the perfect storm instigation ×

impellance interaction effect prediction: The effect of the restraint scale score on eating behavior was stronger when participants were eating the good-tasting rather than the bad-tasting ice cream.

Panel D of Figure 9 depicts the results from a study investigating the interactive effects of *social anchoring* (instigator) and *hunger* (impellor) on eating behavior, which was operationalized in terms of how many grams of cocktail nuts participants consumed (Hermans, Herman, Larsen, & Engels, 2010). Social anchoring was operationalized in terms of whether participants were in a room with a confederate who consumed a large versus a small number of nuts (10 handfuls versus 0-2 handfuls). Hunger was assessed with a self-report instrument. Results aligned with the perfect storm instigation × impellance interaction effect prediction: The association of hunger with eating behavior was stronger when the confederate consumed a large rather than a small number of nuts.

Effect 5: instigation × inhibition interaction effect. Figure 10 presents results for four instigation × inhibition interaction effect findings. Panel A depicts the results from a study investigating the interactive effects of *palatability* (instigator) and *trait disinhibited eating* (disinhibitor) on eating behavior, which was operationalized in terms of how much pasta participants ate (Yeomans, Tovey, Tinley, & Haynes, 2004). Palatability was operationalized in terms of whether the pasta was served with unseasoned versus seasoned tomato sauce (a within-participants variable—participants were presented with both dishes), and trait disinhibited eating was assessed with a self-report instrument. Results aligned with the perfect storm instigation × inhibition interaction effect prediction: The effect of trait disinhibited eating tendencies on eating behavior was stronger vis-à-vis the highly palatable rather than the less palatable pasta dish.

Panel B of Figure 10 depicts the results from a study investigating the interactive effects of *palatability* (instigator) and *depletion* (disinhibitor) on eating behavior, which was operationalized in terms of how much snack food participants consumed (Evers, Stok, & de Ridder, 2010). Palatability was operationalized in terms of whether the target foods were chocolate and potato

chips versus salted and unsalted crackers (a within-participants variable—participants were presented with both categories of food), and depletion was operationalized in terms of whether participants had or had not been required to regulate their emotions moments earlier in response to an emotionally evocative film clip. Results aligned with the perfect storm instigation × inhibition interaction effect prediction: The effect of depletion on eating behavior was stronger when participants consumed the highly palatable rather than less palatable snacks.

Panel C of Figure 10 depicts the results from a study investigating the interactive effects of *tantalizing presentation* (instigator) and *cognitive load* (disinhibitor) on eating behavior, which was operationalized in terms of the percentage of participants who chose to consume a slice of chocolate cake instead of a serving of fruit salad (Shiv & Fedorikhin, 1999). Tantalizing presentation was operationalized in terms of whether participants made their choice while looking at the actual food options or while looking at pictorial representations of the food options, and cognitive load was operationalized in terms of whether participants were assigned to keep either a two-digit or a seven-digit number in their mind while making the choice. Results aligned with the perfect storm instigation × inhibition interaction effect prediction: The effect of cognitive load on eating behavior was stronger when participants made their choice while looking at the actual food options rather than the pictorial representations of those options.

Panel D of Figure 10 depicts the results from a study investigating the interactive effects of *palatability* (instigator) and *caloric preload* (disinhibitor) on eating behavior, which was operationalized in terms of how much milkshake participants consumed (Woody et al., 1981). As noted previously, in this study, palatability was operationalized in terms of whether or not the researchers tainted the ice cream with quinine. Caloric preload was operationalized in terms of whether participants did or did not consume a "preload" milkshake (which the experimenter informed them was highly caloric) in advance of the milkshake consumption task. Previous

research had shown that people who believe they have already blown their diet frequently relinquish their efforts to restrain their eating during that episode, a phenomenon known as the "what-the-hell effect" (Cochran & Tesser, 1996; Herman & Mack, 1975). Results aligned with the perfect storm instigation × inhibition interaction effect prediction: The effect of the caloric preload on eating behavior was stronger among participants exposed to the good-tasting rather than the bad-tasting ice cream.[6]

Effect 6: impellance × inhibition interaction effect. Figure 11 presents results for four impellance × inhibition interaction effect findings. Panel A depicts the results from a study investigating the interactive effects of *temptation proneness* (impellor) and *cognitive load* (disinhibitor) on eating behavior, which was operationalized in terms of the percentage of participants' who chose to consume a slice of chocolate cake instead of a serving of fruit salad (Shiv & Fedorikhin, 1999). Temptation proneness was operationalized with a self-report instrument assessing how impulsive and "easily tempted" they tend to be, and cognitive load was operationalized in terms of whether participants were assigned to keep either a two-digit or a seven-digit number in their mind while making the choice. Results aligned with the perfect storm impellance × inhibition interaction effect prediction: The effect of cognitive load on eating behavior was stronger when participants were high rather than low in temptation proneness.

Panel B in Figure 11 depicts the results from a study investigating the interactive effects of implicit *liking of potato chips* (impellor) and *trait self-control* (inhibitor) on eating behavior, which was operationalized in terms of how many potato chips participants ate (Friese & Hofmann, 2009). Implicit liking of potato chips was operationalized with a single-category IAT assessing individual differences in the strength of mental associations of potato chips with positive- rather

[6] This study also included a condition in which participants were given the preload milkshake but were informed that it was low in calories; as expected, the results in this condition were similar to those in the no preload condition. These results support the idea that the preload effect described in the main text (which applies only to "restrained eaters") results from the what-the-hell-effect and is independent of physiological experiences linked to hunger or satiety.

than negative-affect words, and trait self-control was assessed with a self-report instrument. Results aligned with the perfect storm impellance × inhibition interaction effect prediction: The inhibiting association of self-control with eating behavior was stronger among participants with high rather than low implicit liking of potato chips.

Panel C in Figure 11 depicts the results from a study investigating the interactive effects of implicit *liking of m&m's* (impellor) and *alcohol consumption* (disinhibitor) on eating behavior, which was operationalized in terms of how many m&m's participants ate (Hofmann & Friese, 2008). Implicit liking of m&m's was operationalized with a single-category IAT assessing individual differences in the strength of mental associations of m&m's with affectively positive rather than negative pictures or words, and alcohol consumption was operationalized in terms of whether participants drank an alcoholic or a nonalcoholic beverage before engaging in the eating task. Results aligned with the perfect storm impellance × inhibition interaction effect prediction: The effect of alcohol on eating behavior was stronger among participants with high rather than low implicit liking of m&m's.

Panel D in Figure 11 depicts the results from a study investigating the interactive effects of *hunger* (impellor) and *depletion* (disinhibitor) on eating behavior, which was operationalized in terms of how many Peanut m&m's participants ate (Finkel et al., 2013). Hunger was operationalized in terms of having participants either fast for four hours before the experimental session or eat within the hour preceding it, and depletion was operationalized in terms of whether participants wrote about a recent trip and watched a video either while either regulating their behavior (avoiding the use of the letters "a" or "n" in their trip description and regulating their attention during the video) or not. Results aligned with the perfect storm impellance × inhibition interaction effect prediction: The effect of depletion on eating behavior was stronger among participants in the hungry than in the satiated condition.

Effect 7: Perfect Storm Theory's three-way interaction effect. I now turn to the instigation × impellance × inhibition three-way interaction effect (Effect 7)—the crucial "perfect storm" effect depicted in Figure 4—presenting the results from four relevant studies in Figure 12. Panel A depicts the results from a study investigating the interactive effects of *tantalizing presentation* (instigator), *hunger* (impellor) and *depletion* (disinhibitor) on eating behavior, which was operationalized in terms of the number of grams of free-sample cinnamon roll that supermarket shoppers consumed (Finkel et al., 2013). Tantalizing presentation was operationalized by whether the researchers presented the cinnamon roll to shoppers in terms of its visceral versus nonvisceral qualities (e.g., sweet flavor and scent vs. the flour in the mixing bowl), and both hunger and depletion were assessed with self-report instruments (these two measures were uncorrelated). Results aligned with the perfect storm prediction, with the three-way interaction effect emerging as significant. Hunger and depletion did not interact in the low tantalizing presentation condition (left side of Panel A), but they did interact in the tantalizing presentation condition (right side of Panel A). Specifically, in the tantalizing presentation condition, the association of hunger with eating behavior was stronger when participants were depleted than when they were not.

Panel B in Figure 12 depicts the results from a study investigating the interactive effects of *bowl size* (instigator), *perceived habituation rate* (impellor) and *trait disinhibited eating* (disinhibitor) on eating behavior, which was operationalized in terms of how many m&m's participants consumed (Finkel et al., 2013). Bowl size was operationalized in terms of whether the experimenter gave participants 150 m&m's in either a large or a small bowl. Perceived habituation rate was operationalized in terms of whether the experimenter informed participants about ostensible new research demonstrating that the pleasure of hedonic consumption (e.g., smell, sight, and taste) diminishes either much more rapidly or much more slowly than scholars had previously recognized. Trait disinhibited eating was assessed with a self-report instrument. Results aligned

with the perfect storm prediction, with the three-way interaction effect emerging as significant. Perceived habituation rate and disinhibited eating did not interact in the small bowl condition (left side of Panel B), but they did interact in the large bowl condition (right side of Panel B). Specifically, in the large bowl condition, the association of the belief that hedonic pleasure fades slowly (i.e., that hedonic experiences remain pleasurable for a long time) with eating behavior was stronger when participants were high rather than low in disinhibited eating tendencies.

Panel C in Figure 12 depicts the results from a study investigating the interactive effects of *palatability* (instigator), *restraint scale score* (impellor) and *caloric preload* (disinhibitor) on eating behavior, which was operationalized in terms of how much milkshake participants consumed (Woody et al., 1981). As noted previously, in this study, palatability was operationalized in terms of whether or not the researchers tainted the ice cream with quinine, restraint scale score was assessed with Herman and Polivy's (1975) self-report instrument, and caloric preload was operationalized in terms of whether participants did or did not consume a preload milkshake (which can foster a what-the-hell-effect mindset). Results aligned with the perfect storm prediction, with the three-way interaction effect emerging as significant. Restraint scale scores and caloric preload did not interact in the bad-tasting ice cream condition (left side of Panel C), but they did interact in the good-tasting ice cream condition (right side of Panel C). Specifically, in the good-tasting ice cream condition, the association of restraint scale scores with eating behavior was stronger when participants were in the caloric preload condition.

Panel D in Figure 12 depicts the results from an experience sampling study investigating the interactive effects of *food unhealthiness* (instigator), *restraint scale score* (impellor) and *executive control* (inhibitor) on eating behavior, which was operationalized in terms of the probability that participants ate the target food despite wishing to resist doing so (Hofmann, Adriaanse, Baumeister, & Vohs, in press). In this study, participants were randomly signaled via smartphone

seven times per day for one week, and they reported whether they were currently experiencing a desire or had experienced a desire within the previous 30 minutes. The most common type of desire was food-related, with the 204 participants reporting on a total of 2,203 food-related desires throughout the week. Food unhealthiness was operationalized in terms of whether participants described the desire as being for a healthy or an unhealthy food [e.g., "healthy snack" versus "sweet snack (chocolate, ice cream, etc.)"]; 61% of the food cravings were for unhealthy food. Restraint scale score was assessed with Herman and Polivy's (1980) self-report instrument. Executive control was operationalized in terms of participants' baseline performance on the Stroop color-naming task. (Restraint scale and Stroop scores were uncorrelated.) Results aligned with the perfect storm prediction, with the three-way interaction effect emerging as significant. Restraint scale scores and executive control did not interact when participants desired healthy food (left side of Panel D), but they did interact when participants desired unhealthy food (right side of Panel D). Specifically, for unhealthy foods, the association of restraint scale scores with consumption likelihood was stronger when participants were low rather than high in executive control.

Effects involving behavioral proclivity. Before delving into the review of the eating literature relevant to behavioral proclivity (see links 8-12 in Figure 2, Panels 8-18 in Figure 3, and rows 8-18 in Table 3), I briefly consider the various ways of assessing behavioral proclivity in an eating context. The extent to which a given behavioral proclivity tends to be hot (visceral) rather than cool is heavily influenced by the nature of the food-relevant instigator. For example, hot behavioral proclivity, or craving, tends to result from instigators such as food palatability (e.g., fresh-baked vs. stale cinnamon rolls), visual or olfactory cues related to the food (e.g., tempting vs. unappealing scent), visceral descriptions of the food (e.g., presence vs. absence of words like "succulent" on menus), and the like. In contrast, cool behavioral proclivity tends to result from instigators such as container size (e.g., large bowls trigger greater eating inclination than small

bowls), social anchoring (e.g., being surrounded by people eating large quantities triggers greater eating inclination than being surrounded by people eating small quantities), and the like.

In recent years, scholars have discovered a great deal about food craving (e.g., Hill, 2007; Kemps & Tiggemann, 2007; King, 2013; Lowe & Butryn, 2007) and its neural correlates (for reviews, see Berridge, Ho, Richard, & DeFiliceantonio, 2010; Kenny, 2011; Stroebe et al., in press; Volkow, Wang, Fowler, & Telang, 2008). For example, food and food-related sensory cues activate brain regions linked to reward processes and hedonic experiences, including the orbitofrontal cortex, amygdala, insula, hypothalamus, striatum, and midbrain regions including the ventral tegmental area and substantia nigra. Of particular relevance for Perfect Storm Theory, the effects of visceral food cues on such brain regions is stronger among hungry than among nonhungry people (Berthoud, 2004, 2011; Goldstone et al., 2009; see Kenny, 2011). Indeed, participants infused with a gut hormone that suppresses hunger exhibited reduced activation in such brain regions (Batterham et al., 2007), as did participants undergoing a balloon-implemented gastric distention procedure that mimics fullness (Wang et al., 2008).

The role of cool proclivity to eat has received less attention, but, as noted previously, scholars have devoted a great deal of attention to the more general topic of the ways in which certain instigators consciously or unconsciously trigger cool cognitive processes that increase the likelihood or intensity of behavior. For example, Dijksterhuis and Bargh (2001, p. 1) observe that "we have an innate tendency to imitate. We whisper to someone who is whispering; we start to speak much louder when others do so. We scratch our head upon seeing someone else scratch his or her head. We walk slower in the presence of the elderly." Given this robust tendency for people to imitate others (also see Chartrand & Bargh, 1999), it is not surprising that people tend to experience a proclivity to eat larger amounts of food when they are surrounded by people who are consuming large rather than small quantities (Herman, Roth, & Polivy, 2003; McFerran, Dahl,

Fitzsimons, & Morales, 2010; Polivy, Herman, Younger, & Erskine, 1979; Vartanian, Herman, & Wansink, 2008). As a means of situating the role of behavioral proclivity within the broader eating literature, I provide illustrative examples of Effects 8-18 from Figure 3 and Table 1—at least insofar as such examples exist in the literature.

Effect 8 is the link between instigation and behavioral proclivity. Example effects include the effect of food- and context-specific consumption norms on self-served portion size (Wansink, 2004), the effect of tantalizing presentation (e.g., "Succulent Italian Seafood Filet" versus "Seafood Filet") on ratings of how appealing the food is (Wansink, van Ittersum, & Painter, 2005), and the effect of disgusting presentation on participants' desire to consume the food (Rozin et al., 1986). In this last study, which I mentioned previously, participants consumed a small piece of chocolate fudge before indicating their desire to consume a second piece of the fudge (see Row 8 in Table 3). Participants were presented with two options for this second piece, and they indicated their desire to eat each of them. One was molded into the shape of a disc (high instigation), whereas the other had been molded into the shape of dog feces (low instigation). Participants reported greater desire to consume the disc-shaped than the feces-shaped piece of fudge.

Effect 9 is the link between impellance and behavioral proclivity. Example effects include the effect of hunger on perceptual vigilance for food cues (Radel & Clément-Guillotin, 2012), the (negative) effect of visual distractor activities on chocolate craving (Kemps and Tiggemann 2007), and the effect of peptide $YY_{3–36}$ (PYY) infusion on anticipated food consumption during an upcoming meal (Batterham et al., 2007). In this last study, hungry participants attended a laboratory session on two separate days, one in which they received an intravenous PYY infusion and one in which they received an intravenous saline infusion (see Row 9 in Table 3). PYY reduces food craving by mimicking the satiated state, whereas saline is inert. Thirty minutes after the infusion concluded, participants were offered a large buffet lunch and allowed to consume *ad*

libitum. During the interim period between the infusion and the meal, participants responded to the following question: "How much do you think you could eat right now?" Consistent with Perfect Storm Theory, PYY infusion was linked to lower eating estimates; specifically, these estimates increased over time on the saline day, but not on the PYY day.

Effect 10 is the link between the instigation × impellance interaction effect and behavioral proclivity. Example effects include the palatability × hunger interaction effect on activation in the brain's reward centers (Goldstone et al., 2009), the palatability × mindfulness interaction effect on implicit approach tendencies toward the target food (Papies, Barsalou, & Custers, 2012), and the food exposure × hunger interaction effect on implicit food evaluations (Seibt, Häfner, & Deutsch, 2007). In this last study, participants who varied in their level of hunger performed two categorization tasks, the first of which trained them to associate one key on a computer keyboard with positive stimuli and another key with negative stimuli (see Row 10 in Table 3). In the second task, participants categorized the print color of letter strings using these same two keys. Prior research had shown that participants respond to letter strings with a positive valence more quickly when they are linked to the positive key rather than the negative key; indeed, the degree to which participants respond more quickly with the positive than the negative to a letter string serves as an implicit evaluation of the degree to which participants have positive rather than negative associations to that letter string. This task included three sets of target strings (the food exposure manipulation): food-related strings (e.g., pizza), flower-related strings (e.g., tulip), and non-word strings (e.g., tanibe). Consistent with Perfect Storm Theory, string set interacted with hunger: It was a stronger predictor of implicit evaluations among hungry than among satiated participants. This interaction effect was driven by differences in implicit evaluation of food strings in hungry versus satiated participants, with hungry participants showing much more positive evaluations.

Effect 11 is the link between behavioral proclivity and eating behavior. Example effects include the effect of post-evaluative-conditioning implicit attitudes toward energy-dense foods on the decision to consume energy-dense snacks rather than fruit (Hollands, Prestwich, & Marteau, 2011) and the link between reward-related hypothalamic activation and caloric intake during a subsequent meal (Batterham et al., 2007). In this latter study, for example, hungry participants attended a laboratory session during which an fMRI scanner measured their brain activity for 90 minutes while they intermittently rested or answered questions pertaining to food and their bodily sensations (see Row 11 in Table 3).[7] A half-hour after the scanning concluded, participants consumed *ad libitum* from a large lunch buffet. Consistent with Perfect Storm Theory, increases in hypothalamic activation (a neural structure known to be linked to food intake) over the 90-minute scanning session predicted how much food participants consumed during the subsequent meal.

Effect 12 is the link between the behavioral proclivity × inhibition interaction effect and eating behavior. I am not aware of any research that provides a compelling test of Effect 12 in predicting eating behavior. Addressing this void is an important direction for future research.

Effect 13 is the mediational effect of behavioral proclivity on the link between instigation and eating behavior. Here, again, I am not aware of many investigations of this link, although the evaluative conditioning study by Hollands and colleagues (2011) provides some evidence consistent with it (see Row 13 in Table 3). In this study, participants were randomly assigned either to a control condition or to a negative evaluative conditioning condition that paired images of snacks like chocolate and potato chips with images of potential adverse health consequences of eating such foods—obesity, arterial disease, and heart surgery. Both before and after this manipulation, participants completed an IAT assessing their implicit attitudes toward energy-dense snacks like chocolate and potato chips. Finally, they chose to eat either fruit or the sorts of

[7] These data come from the PYY study described previously, although the results relevant to Effect 11 are those from the control condition, for which the PYY infusion was irrelevant.

snacks from the evaluative conditioning procedure. Given that the foods in the evaluative conditioning task overlapped so strongly with the target foods, it is reasonable to view the conditioning manipulation as having important similarities with Rozin and colleagues' (1986) fudge study. That is, relative to the control procedure, the evaluative conditioning procedure seemed to increase the extent to which participants confronting the snacks in the food choice task were especially likely to view *those specific snacks* as affording disgusting and unhealthy outcomes, thereby rendering the snacks viscerally less appealing (akin to the effect of being confronted with fudge in the shape of feces), an instigation effect.[8] Consistent with Perfect Storm Theory, the evaluative conditioning procedure (instigator) decreased participants' implicit liking for the target snack foods (behavioral proclivity), which in turn predicted an increased tendency to select fruit rather than those snack foods in the choice task (behavior).

Effect 14 is the mediational effect of behavioral proclivity on the link between impellance and eating behavior. Here, yet again, I am not aware of any direct investigations of this link, although indirect evidence from it comes from a recent article by Morewedge, Huh, and Vosgerau (2010), who made an important distinction between being primed by thoughts about a target food and being satiated by imagining consuming the target food many times. These authors hypothesized that whereas vividly imagining a single exposure to a target food sensitizes people to the food and increases their desire to consume it when given the opportunity (a priming effect), many repeated mental simulations of consuming the target food engenders habituation to it and decreases their desire to consume it (a satiation effect). In one 2 × 2 study (Study 4), participants simulated eating (a) either cheese cubes or m&m's (b) either 3 or 30 separate times before consuming as many cheese cubes as they desired (see Row 14 in Table 3). As predicted, participants who imagined consuming a cheese cube 30 separate times subsequently consumed fewer cheese cubes than

[8] To the degree that it reduced liking for the target snack food in a relatively enduring manner, creating a learned aversion that persists into the future, its effects on eating behavior would also operate through impellance.

participants in the other three conditions, which did not differ from one another. A follow-up study (Study 5) presented evidence consistent with the hypothesis that this effect of simulating cheese consumption many times (disimpellor) on actual cheese consumption (behavior) is mediated by reduced craving for cheese (behavioral proclivity). This study assessed craving by measuring how hard participants were willing to work on a frustrating computer task in order to earn more cheese cubes for consumption. Participants who had imagined consuming a cheese cube 30 times worked less hard on this task than did participants who had imagined consuming a cheese cube 3 separate times. Although future research is required for a statistical test of mediation within a given study, this pattern of results is consistent with Perfect Storm Theory: Many repeated simulations of consuming the target food (disimpellor) appears to reduce people's craving for that food (behavioral proclivity), which in turn appears to reduce actual consumption of the food (behavior).

Effect 15 is the mediational effect of behavioral proclivity on the link between the instigation × impellance interaction effect and eating behavior. Example effects include the mediational effect of estimates of the other person's nut consumption on the link between the social anchoring × hunger interaction effect and one's own nut consumption (Hermans et al., 2010), the mediational effect of cheese craving on the link between the type of food visualized (cheese vs. m&m's) × many repeated simulations of consuming the relevant food interaction effect and cheese consumption (Morewedge et al., 2010), and the mediational effect of postpriming implicit liking on the link between the disgusting presentation × baseline implicit liking interaction effect and the choice of snacks versus fruit (Hollands et al., 2011).[9] In this last study, participants completed an IAT regarding snack foods, such as chocolate and potato chips, twice: at study intake and following the disgust-relevant evaluative priming procedure described previously. Whereas the first IAT provided a baseline assessment of individual differences in their implicit liking for these

[9] The Hermans et al. (2010) and the Morewedge et al. (2010) articles did not provide a clear test of the mediational moderation hypothesis in any study, but the pattern across studies strongly implies the existence of the effect.

foods (impellance), the second IAT provided a postmanipulation assessment of the proclivity to eat (behavioral proclivity) (see Row 15 in Table 3). At the end of the study, participants chose between these snack foods and fruit. Consistent with Perfect Storm Theory, postpriming implicit liking (behavioral proclivity) mediated the link between the disgusting presentation (instigator) × baseline implicit liking (impellor) interaction effect and the choice of snacks versus fruit.

To my knowledge, no eating research has provided a clear test of Effect 16, 17, or 18. My sense is that this void in the literature results in large part from the lack of focus on the combined influence of such processes in extant models of eating behavior, which means that almost no studies have assessed constructs that would be necessary for tests of such effects. If scholars were interested in testing Effect 18, they could, for example, replicate any of the Effect 7 studies from Figure 12 while adding a measure of behavioral proclivity. As noted previously, the scholars would have broad latitude in determining what measure of behavioral proclivity they wished to use—including, but not limited to, a self-report measure (e.g., participants' self-reported desire to eat the target food, as reported before consuming it), an implicit measure (e.g., proportion of time participants stared at the target food during a two-minute period during which they were waiting to consume), or a physiological measure (e.g., salivation response during that two-minute period). Once a behavioral proclivity measure is included, the scholars have access to operationalized versions of all five of the key I^3 Model constructs (see Figure 2), which allows them to test not only Effect 18, but also any of the other 17 effects in the model. In general, it is not difficult to design tests of Effects 16, 17, and 18; it seems likely that the only important reason why scholars have not done so is that previous theoretical models have not identified such effects as important.

Summary: A Perfect Storm Theory perspective on the eating literature. This section reviewed the eating literature from the perspective of Perfect Storm Theory. It began by reviewing findings relevant to the hypotheses derived from the depiction of Perfect Storm Theory in Figure

4, focusing on Effects 1-7—the nonmediated effects of instigation, impellance, and inhibition. It then reviewed findings relevant to Effects 8-18—the effects involving behavioral proclivity. As was the case with the aggression literature, the literature has largely neglected the moderating effect of inhibition on the link between behavioral proclivity and eating behavior, so it was not possible to discuss findings relevant to Effects 12, 16, 17, or 18. This neglect aside, and although definitive conclusions await a more systematic review, the literature provides extensive evidence in support of the Perfect Storm Theory predictions regarding the remaining 14 effects (see Figures 9-12 and Table 3).

A Call for Meta-Analytic Integration

As depicted in Figures 5-12, these literature reviews demonstrate that instigation, impellance, and inhibition interact to predict aggression and eating behavior. They leave little doubt that the scholarly literature provides robust support for predictions derived from Perfect Storm Theory.

That said, these reviews made no pretense toward comprehensiveness, and there are surely many findings that are not as easy to subsume under Perfect Storm Theory. Indeed, all conclusions must remain tentative until a whole corpus of relevant studies on a given topic has been subjected to a meta-analytic synthesis. The approach that is likely to advance the field the most is for scholars interested in a given topic to select a small number of relatively process-pure instigators, impellors, and inhibitors, and then meta-analyze how those risk factors interact. If these interactions generally align with the findings in Figures 5-12, that will provide additional support for the current iteration of Perfect Storm Theory. To the degree that these interactions deviate from the findings presented in those figures, that will provide evidence that the theory must be refined or, depending upon the extent to which the findings are incompatible, perhaps jettisoned. Conducting such meta-analytic syntheses is a crucial direction for future research.

Discussion

This chapter presented the first general-purpose overview of the I^3 Model and Perfect Storm Theory. According to the I^3 Model (see Figure 2, Figure 3, and Table 1), a given target object normatively affords certain behavioral responses, a process called instigation. These affordances combine with impellance to predict the strength of the proclivity to enact a given behavior vis-à-vis the target, which in turn predicts the actual enactment of that behavior unless inhibition overrides it. According to Perfect Storm Theory (see Figure 4), which was derived from the I^3 Model, the highest likelihood or intensity of behavior emerges when instigation and impellance are strong and when inhibition is weak. Extensive reviews of the aggression and the eating literatures provided strong support for the I^3 Model and Perfect Storm Theory (see Figures 5-12).

Implications

The advent of this framework—the I^3 Model in conjunction with Perfect Storm Theory—has many implications, and I discuss three of them here. First, although this framework raises a number of complex issues, it is parsimonious and generative, and it may have the potential to introduce a common language across the various subdisciplines of psychology. At a metatheoretical level, the I^3 Model has only five components: three processes (instigation, impellance, and inhibition), one mediator (behavioral proclivity), and one outcome (behavior). I have argued that scholars can use these five components to develop novel research questions, theories, and empirical investigations about behavior in any domain of interest—aggression, eating, helping, kissing, voting, sleeping, studying, Facebooking, driving, and anything else imaginable. In addition, my sense is that scholars can use these five components in similar ways to predict the behavior not only of humans, but also of mice, orangutans, dogs, and vast swaths of the animal kingdom. If these claims turn out to be true, then the I^3 Model packs enormous bang for the buck—huge generativity and integrative potential with few constructs.

Indeed, the reviews of the aggression and the eating literatures above illustrate the application of the model to specific behavioral domains, but these applications are just the tip of the iceberg. In the alcohol consumption domain, for example, perhaps a recovering alcoholic whose self-control resources have been depleted by cramming for her medical boards (low inhibition) and who decides to join her study partners at their favorite pub (high impellance) starts imbibing when a sexy man offers to buy her a drink (high instigation). In the consumer behavior domain, perhaps a man who is low in trait self-control (low inhibition) and who desperately wants a new iPad (high impellance) succumbs to the desire to purchase one after walking past an Apple Store window (high instigation). In the helping domain, perhaps a woman who believes that god rewards people who are kind to others (high impellance) and who is not currently in a hurry (low inhibition) is especially likely to help a stranger who has fallen down on the sidewalk in front of her (high instigation). The list goes on.

Second, the first applications of this framework, in the domains of aggression and eating behavior, illustrate its potential for yielding new insights into topics that are central to clinical intervention and public health. For example, the framework helps to clarify the fundamental processes underlying eating behavior, especially spontaneous eating behavior, and it may help to explain why caloric consumption has increased so rapidly in recent decades (Cutler, Glaeser, & Shapiro, 2003; Swinburn et al., 2011). Modern Western culture represents a perfect storm of instigation, impellance, and disinhibition. For example, in terms of instigation, Western culture serves food to consumers in massive portions and hurls tantalizing food descriptions at them (Wansink, 2006). In terms of impellance, it has perfected the art of tailoring food so it has an irresistible combination of fat, sugar, and salt (Kessler, 2009). In terms of inhibition, it has made unhealthy, calorie-dense food less expensive than healthy food (Brownell & Horgen, 2004), which reduces the likelihood that consumers will resist the urge to purchase, and consume, such food.

Still, although this perfect storm is regrettable, the present analysis also offers some good news: Reducing the impact of just one of these three processes yields substantial benefits in terms of reducing caloric intake. As the perfect storm results reveal, people eat much more when all three of these processes are consumption-promoting than when even just one of them trends in the opposite direction (see Figure 12). To be sure, substantially reducing the consumption-promoting influence of even just one of these processes will be a challenge; the real world is much more complex than any experiment can be, with each process determined not by a single variable but by the combination of countless variables. For example, inhibition in a given situation may be determined by cognitive load, dispositional self-control, self-regulatory depletion, vacation plans, the belief that your spouse wants you to be thin, diet-related advertisements, reality television shows, and countless other variables. But the perfect storm results suggest that systematically targeting just one of the three processes could substantially reduce caloric intake.

The I^3 Model's distinction between instigation and impellance also has implications for clinical intervention and public health, some of which are especially theoretically interesting. Sticking with the eating domain, for example, Hoch and Loewenstein (1991) showed that people can either reduce their desire or bolster their willpower. In line with this analysis, a man who has sworn off dessert in the weeks before a beach vacation can override the craving he experiences when the dessert cart arrives (a) by distracting himself from the temptation in order to reduce the strength of the craving (e.g., by visiting the restroom or focusing on a particular conversation topic) or (b) by focusing on the costs of giving in to the craving in order to bolster the strength of his willpower (e.g., by forcing himself to think about how he will feel if his flab is in full force on the vacation). This analysis can be expanded by emphasizing that there are two general approaches to reducing craving strength: minimizing instigation and minimizing impellance. For example, one can not only use distraction to reduce impellance, but also situation selection to reduce instigation.

A fast food addict might adopt a route home from work that avoids any exposure to McDonald's Golden Arches, or a chocoholic might leave the kitchen devoid of Bon Bons. Either approach—reducing instigation or reducing impellance—is likely to diminish the strength of the craving to overeat, thereby reducing stress on people's limited self-control resources. For example, even if a man is incapable of distracting himself from thinking about dessert and cannot discipline himself to focus on the costs of eating it, he can still avoid overeating through situation selection.

Third, and most speculatively, this framework may be able to help psychology work toward a constructive resolution to the "replicability crisis" currently roiling the discipline (e.g., Ioannidis, 2012; Pashler & Harris, 2012; Shimmack, 2012; Simmons, Nelson, & Simonsohn, 2011; Simonsohn, Nelson, & Simmons, in press). The crux of the replicability crisis is that standard practices among psychological scientists (and among scientists in many other disciplines) results in an empirical literature riddled with findings that are not replicable. These standard practices, which Simmons and colleagues (2011, p. 1359) characterized in terms of "researcher degrees of freedom," include biased answers to questions such as: "Should more data be collected? Should some observations be excluded? Which conditions should be combined and which ones compared? Which control variables should be considered? Should specific measures be combined or transformed or both?" The answers are biased because the researchers systematically seek to reject the null hypothesis (no effect in the population) in favor of finding a statistically significant effect (an effect in the population), which has a far better chance of being publishable and impactful. From this perspective, a nominal endorsement of an α-level of, say, .05 is a charade because many researchers stack the cards with their biased answers to such questions.

Over the past year or two, researchers have sought to conduct many direct replications of published effects, sometimes failing to replicate the original findings (e.g., Doyen, Klein, Pichon, & Cleeremans, 2012; Pashler, Rohrer, & Harris, 2013). One explanation for such failures, which

has been a source of considerable consternation (and occasional schadenfreude) among psychological scientists, is that some very influential findings in the field are in fact "false positives." Although there is little doubt that some effects in the published literature will turn out to be false positives, another perspective on this issue is that many social psychological effects, especially the most subtle of them, are highly susceptible to situational variation, some of which goes unrecognized even by the scholars who conducted the initial research. Indeed, scholars are developing an increasingly systematic recognition of this issue, as illustrated by a recent article entitled "The replication recipe: What makes for a convincing replication?" (Brandt et al., 2013). This recipe includes "faithfully recreating the original study while keeping track of differences, achieving high statistical power, checking the study's assumptions in new contexts, and pre-registering the study." Brandt and colleagues (2013) "also discuss methods for evaluating and reporting replications. Identifying differences between replication and original (sample, culture, lab context, etc.) allows researchers to identify where their replication is on the continuum from 'close' to 'conceptual'."

The I^3 Model, with its central emphasis on moderation, could be a sensible candidate to provide a general framework for helping scholars to identify the circumstances under which a close replication is more versus less likely to yield similar findings to the initial report. To illustrate this point, consider a thought experiment regarding Cohen, Nisbett, Bowdle, and Schwarz's (1996) famous experimental ethnography of insult, aggression, and the Southern culture of honor. In this series of experiments, the authors investigated the extent to which being insulted yielded aggressive behavior among male University of Michigan Students who were from either a Northern or a Southern state in the U.S. Results revealed that, relative to Northerners, Southerners responded to the insult with greater testosterone and cortisol reactivity, greater cognitive priming of aggression-related concepts, greater perceived threat to their masculinity, and

greater levels of aggressive and dominant behavior. From the perspective of the I^3 Model and Perfect Storm Theory, these are clear effects of the instigation (insult) × impellance (region) on behavioral proclivity (cortisol, testosterone, priming, and perceived threat) and on behavior (aggression and dominance).

However, imagine an alternate reality in which Cohen and colleagues conducted an initial study on the effects of insult on these various outcomes at the University of Alabama. Imagine further that their hypothesis was not that regional differences moderate responses to insults, but rather that men in general respond to insults with such changes in physiology, cognition, perceived threat, and behavior. Now imagine that the publication of this imagined University of Alabama study inspired a different team of scholars at the University of North Dakota to conduct their closest possible replication of the initial study. If we assume that the initial article by Cohen and colleagues (1996) correctly characterized South versus North regional differences, this North Dakota study would fail to replicate the University of Alabama study. To be sure, one explanation for this failure to replicate would be that the initial study was flawed or happened to yield strange results merely as a result of sampling quirkiness. But, in this case, the correct explanation would be that there was a crucial moderating variable (regional differences in responses to being insulted) that escaped the cognizance of both the Arkansas and the North Dakota research teams.

Perhaps this example represents an extreme case. Indeed, some failures to replicate surely occur in the same laboratory at the same university in contiguous semesters. But even in such cases, one must consider the possibility that the effects are moderated by some unassessed variable, such as the temperature, the presence of spring semester seniors, or the pervasiveness of people sunning themselves in swimsuits as participants walk to the laboratory. Once we begin focusing more attention on such seemingly extraneous variables, ideally while thinking carefully about processes through which each one might influence the relevant dependent measure in the

experimental context (e.g., through disinhibition), it is likely that we will be able to interpret some replication "failures" not in terms of limitations of the initial or the replication study, but rather as crucial advances in helping us identify important moderators of published effects.

How an Instigator Can Transform into an Impellor as a Situation Unfolds

As discussed previously, determining the process (or processes) through which a given construct influences behavior requires careful attention to the characteristics of the situation under investigation. One interesting case that I have skirted thus far involves situations in which an instigator transforms into an impellor as a situation unfolds. Consider an instance in which a college student, Sam, gets into a shouting match with his roommate Dave. If Sam punches Dave in response to an insult Dave spewed at him, then Dave's insult functioned as an instigator. But now consider a variant of this instance in which their third roommate, John, enters the room before Sam and Dave's argument had escalated to physical aggression, asking them to be quiet so he can study for a final exam. Under normal circumstances, Sam would have greeted such a request congenially. However, in this instance, when he was already so amped up, Sam turned his attention away from Dave and gave John a hard shove. In this latter instance, Dave's insult functioned as an impellor; it affected Sam in a way that increased the likelihood that he would aggress in response to John's subsequent provocation. In short, the identical behavior (Dave's insult) functioned as an instigator in the former case but as an impellor in the latter case. Within the I^3 Model, the target object is *always* the source of instigation, and any other variable that increases or decreases the behavioral proclivity in response to that target object is always an impellor. That is the reason why the target of Sam's aggression—Dave in the first instance and John in the second—functioned as the source of the instigation in both cases and why Dave's insult functioned as the impellor in the latter case.

This roommate example raises the broader topic of *triggered displaced aggression*, which refers to instances in which people are especially likely to respond aggressively to a minor provocation if it had been recently preceded by a larger provocation from an unrelated third party (Bushman et al., 2005; Marcus-Newhall, Pedersen, Carlson, & N. Miller, 2000; Pedersen, Gonzales, & N. Miller, 2000; also see N. E. Miller, 1941). A Perfect Storm Model analysis of this form of aggression, which dovetails with existing explanations (N. Miller, Pedersen, Earleywine, & Pollock, 2003) and couches them in broader theoretical terms, suggests that the first (larger) provocation functions as an impellor, in that it increases the intensity of the proclivity to aggress that results from the second (smaller) provocation, which functions as an instigator.

Statistical Considerations

Moving from large conceptual issues to practical ones, scholars wishing to employ an I^3 Model or a Perfect Storm Theory analysis in their own research may wish to note several statistical considerations. First, detecting statistical interactions generally requires considerably larger sample sizes than does detecting main effects, especially in field studies (McClelland & Judd, 1993), so power analysis is highly recommended. Second, a related issue is that scholars may prefer to analyze their data using planned contrasts rather than using a test of the highest-order interaction effect followed by tests of simple effects. Conducting such planned contrasts can be tricky, especially when one or more of the predictor variables is continuous rather than categorical and one wishes to test, for example, the instigation × impellance × inhibition three-way interaction effect (see Figures 8 and 12). Fortunately, scholars can turn to resources like Dawson and Richter's (2006) *Journal of Applied Psychology* article for conducting such tests. Third, scholars wishing to analyze intensive longitudinal data, such as daily diary or experience sampling data, can employ the procedures developed by Wickham and Knee (in press) for investigating moderational effects with observations across contiguous data points. For example, imagine an

experience sampling study in which undergraduates completed a brief, smartphone-based questionnaire every time they had a difficult social interaction, reporting their level of anger and verbal aggression toward their interaction partner and providing a verbatim report of what that person said that made the interaction difficult. Scholars can use Wickham and Knee's procedures to test the instigation × impellance interaction effect prediction that the level of anger experienced during the previous social interaction (impellor) interacts with coder-assessed provocation level derived from the current interaction partner's comment (instigator) to predict verbal aggression toward the current partner.

Fourth, scholars can capitalize upon Hayes' (2013) PROCESS macro to test the I^3 Model effects involving mediation or moderation—and particularly to test conditional indirect effects (mediated moderation or moderated mediation). As noted by Hayes (2013, p. 419), "PROCESS is a computational tool for path-analysis-based moderation and mediation analysis as well as their integration in the form of a conditional process model. … PROCESS generates direct and indirect effects in mediation models, conditional effects (i.e., "simple slopes") in moderation models, and conditional indirect effects in conditional process models." He provides on www.afhayes.com (as of July, 2013, at least) conceptual and statistical descriptions of 74 unique models, each of which aligns with a specific understanding of how a particular phenomenon or process works.

Effects 1-14 in the I^3 Model all involve basic tests of main effects, interaction effects, or mediation effects, and many user-friendly procedures exist for testing such effects. In contrast, Effects 15-18 are conditional process models—mediated-moderation, moderated-mediation, or both—and it is for those effects that PROCESS is especially useful. For example, the conditional process model in which the effects of inhibition are negligible (Effect 15) can be tested with PROCESS Model 7 or 8, depending upon whether the impellor moderates both the link from instigation to behavioral proclivity and the link from instigation to behavior or only the first of

these two links. The conditional process model in which the effects of impellance are negligible (Effect 16) can be tested with PROCESS Model 14 or 15, depending upon whether the inhibitor moderates both the link from behavioral proclivity to behavior and the link from instigation to behavior or only the first of these two links. Similarly, the conditional process model in which the effects of instigation are negligible (Effect 17) can also be tested with PROCESS Model 14 or 15, depending upon whether the inhibitor moderates both the link from behavioral proclivity to behavior and the link from instigation to behavior or only the first of these two links.

The conditional process model in which instigation, impellance, inhibition, and behavioral proclivity all exert effects (Effect 18) can be tested with PROCESS Model 21, 22, 28, or 29. Model 21 provides the most straightforward test of the model depicted in Panel 18 of Figure 3 and Row 18 of Table 1, as the impellance moderates only the link from instigation to behavioral proclivity and inhibition moderates only the link from behavioral proclivity to behavior. Model 22 is a variant of Model 21 in which impellance also moderates the link from instigation to behavior. Model 28 is a variant of Model 21 in which inhibition also moderates the link from instigation to behavior. Finally, Model 28 is a variant of Model 21 in which impellance also moderates the link from instigation to behavior and inhibition also moderates the link from instigation to behavior.

In addition to providing a simple means of testing these complex I^3 Model Effects, PROCESS is also useful in those in-between cases in which a given variable influences a given behavior through *both* impellance and inhibition. For example, perhaps the belief that people have unlimited willpower (Job, Dweck, & Walton, 2010) functions not only as an inhibitor that reduces the likelihood that one will act upon an urge to retaliate when one feels provoked (because one's own willpower is strong enough to override such urges), but also as an impellor that bolsters this urge to retaliate in the first place (because the provoking behavior seems especially unacceptable). Although such cases do not fit cleanly into the standard presentation of the I^3 Model (see Figure 2,

Figure 3, and Table 1), it is straightforward to adapt the model to encompass them. Also, with particular relevance to the present discussion, PROCESS is well-equipped to test such models. For example, PROCESS Model 58 tests this variant of I^3 Model Effect 18 (see Figure 3 and Table 1) in which impellance and inhibition are assessed with the same variable. Specifically, Model 58 treats this variable (beliefs that willpower is unlimited) as a moderator of both the link from instigation (provocation) to behavioral proclivity (urge to aggress) and the link from behavioral proclivity to behavior (aggression). Model 59 provides a variant of Model 58 in which the same variable also moderates the link from instigation to behavior.

Conclusion

Before concluding, I revisit the questions that began this chapter. Why did the professional basketball player with the sterling reputation deliberately stomp on the face of an opposing player following a frustrating battle for a rebound? The basketball player was Kevin Love, who stomped on the face of Luis Scola. In a game five days earlier, Scola, who was falling out of bounds, maintained possession by hurling the ball into Love's groin at point-blank range. From a Perfect Storm Theory perspective, that event likely functioned as an impellor, which increased Love's proclivity to aggress when he battled with Scola for the rebound in the next game, an incident that functioned as an instigator. We lack information about the relevant inhibitory processes, although it seems likely that Love would have been less likely to stomp on Scola's face if he had caught a glimpse of the referee one second before he made the stomping decision.

Why did the overweight supermarket shopper who encountered a free sample tray rapidly consume 400 calories? This example came from the recent study that confronted supermarket shoppers with free-sample cinnamon rolls (Finkel et al., 2013). Shoppers in that study consumed substantially more cinnamon roll in the perfect storm situation—tantalizing presentation / hungry / depletion—than in any of the other seven situations.

Why did a passerby who witnessed a plane crash dive into the icy water to rescue survivors? The passerby was Lenny Skutnik, whose heroic efforts began moments after Air Florida Flight 90 crashed into the Potomac River in Washington, DC. When he witnessed one survivor of the plane crash, Priscilla Tirado, repeatedly fail to hold onto the line attached to the rescue helicopter, he dived into the icy water, ultimately saving her life. In contrast to the aggression and the eating examples, I did not focus on helping behavior in the present chapter. However, if I have succeeded in my presentation of the I^3 Model and Perfect Storm Theory, then scholars interested in understanding helping behavior (or any other kind of behavior) can use the information presented herein (especially Figures 2-4 and Table 1) to develop hypotheses about the key variables underlying Skutnik's heroism. The range of possible hypotheses is vast, and the specific variables of interest will differ from one scholar to the next. As such, I leave the development of an I^3 Model analysis of Skutnik's behavior as an exercise for the reader. If the reader's experience matches my own, such an exercise—whether applied to Skutnik or to any other behavior imaginable—will yield a trove of exciting new ideas and testable hypotheses.

References

Abrams, D., & Hogg, M. A. (2004). Metatheory: Lessons from social identity research. *Personality and Social Psychology Review, 8(2),* 98-106.

Anderson, C. A., Benjamin, Jr. A. J., Bartholow, B. D. (1998). Does the gun pull the trigger?: Automatic priming effects of weapon picture and weapon names. *Psychological Science, 9(4),* 308-314.

Anderson, C. A., Buckley, K. E., & Carnagey, N. L. (2008). Creating your own hostile environment: A laboratory experiment of trait aggressiveness and the violence escalation cycle. *Personality and Social Psychology Bulletin, 34,* 462-473. doi: 10.1177/0146167207311282

Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual Review of Psychology, 53,* 27-51.

Anderson, C. A., Deuser W. E., & DeNeve K. (1995). Hot temperatures, hostile affect, hostile cognition, and arousal: tests of a general model of affective aggression. *Personality and Social Psychology Bulletin, 21*, 434–448.

Anderson, K. B., Anderson, C. A, Dill, K. E., & Deuser, W. E. (1998). The interactive relations between trait hostility, pain, and aggressive thoughts. *Aggressive Behavior, 24,* 161-171.

Asch, S. E. (1956). Studies of independence and conformity: A minority of one against a unanimous majority. *Psychological Monographs, 70* (Whole no. 416).

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179–211.

Bandura, A. (1973). *Aggression: A social learning theory analysis*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1977). *Social learning theory* . Englewood Cliffs, NJ: Prentice Hall.

Baron, R. A., Richardson D. R. (1994). *Human Aggression*. New York: Plenum. 2nd ed.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173–1182. doi:10.1037/0022-3514.51.6.1173

Barlett, C. P., Harris, R. J., & Bruey, C. (2008). The effect of the amount of blood in a violent video game on aggression, hostility, and arousal. *Journal of Experimental Social Psychology, 44,* 539-546.

Batson, C. D., & Shaw, L. L. (1991). "Evidence for altruism: Toward a pluralism of prosocial motives." *Psychological Inquiry*, *2*, 107–122. doi:10.1207/s15327965pli0202_1

Batterham, R. L., Ffytche, D. H., Rosenthal, J. M., Zelaya, F. O., Barker, G. J., Withers, D. J., & Williams, S. C. R. (2007). PYY modulation of cortical and hypothalamic brain areas predicts feeding behaviour in humans. *Nature, 450*, 106-109.

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology, 74,* 1252–1265. doi:10.1037/0022-3514.74.5.1252

Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry, 7,* 1–15. doi:10.1207/s15327965pli0701_1

Baumeister, R. F., Vohs, K. D. & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior? *Perspectives on Psychological Science*, *2*, 396–403.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science, 16,* 351–355. doi:10.1111/j.1467-8721.2007.00534.x

Berkowitz, L. (1989). Frustration-aggression hypothesis: Examination and reformulation. *Psychological Bulletin, 106(1),* 59-73.

Berkowitz, L. (1990). On the formation and regulation of anger and aggression: A cognitive-neoassociationistic analysis. *American Psychologist, 45(4),* 494-503.

Berkowitz, L. (1993). *Aggression: Its causes, consequences, and control*. New York: McGraw-Hill.

Berman, M. E., McCloskey, M. S., Fanning, J. R., Schumacher, J. A., & Coccaro, E. F. (2009), Serotonin augmentation reduces response to attack in aggressive individuals. *Psychological Science, 20(6),* 714-720.

Berridge, K. C., Ho, C. Y., Richard, J. M., & DiFeliceantonio, A. G. (2010). The tempted brain eats: Pleasure and desire circuits in obesity and eating disorders. *Brain Research, 1350*, 43-64. doi:10.1016/j.brainres.2010.04.003

Berthoud, H.-R. (2004). Neural control of appetite: Cross-talk between homeostatic and non-homeostatic systems. *Appetite, 43,* 315–317. doi: 10.1018/j.appet2004.04.009

Berthoud, H.-R. (2011). Metabolic and hedonic drives in the neural control of appetite: Who is the boss? *Current Opinion in Neurobiology, 21,* 888–896. doi:10.1016/j.conb.2011.09.004

Blankenship, K. L., Nesbit, S. M, & Murray, R. M. (2013). Driving anger and metacognition: The role of thought confidence on anger and aggressive driving intentions. *Aggressive Behavior, 39,* 323-334.

Bleuler, M. (1963). Conception of schizophrenia within the last fifty years and today. *Proceedings of the Royal Society of Medicine: Psychiatry Section, 56,* 945-952.

Borders, A., & Giancola, P. R. (2011). Trait and state hostile rumination facilitate alcohol-related aggression. *Journal of Studies on Alcohol and Drugs, 72,* 545-554.

Brandt, M. J., IJzerman, H., Dijksterhuis, A., Farach, F. J., Geller, J., Giner-Sorolla, R., Grange, J. A., Perugini, M., Spies, J. R., & van Veer, A. (2013). *The Replication Recipe: What Makes for a Convincing Replication?* Unpublished manuscript, Tilburg University.

Bremner, R. H., Koole, S. L., & Bushman, B. J. (2011). "Pray for those who mistreat you": Effects of prayer on anger and aggression. *Personality and Social Psychology Bulletin, 37(6),* 830-837. Doi: 10.1177/0146167211402215

Broadbent, D. (1958). *Perception and Communication.* London: Pergamon Press.

Brownell, K. D., & Horgan, K. B. (2004). *Food fight: The inside story of the food industry, America's obesity crisis, and what we can do about it*. New York: McGraw-Hill.

Bruch, H. (1961). The transformation of oral impulses in eating disorders: A conceptual approach. *Psychiatric Quarterly, 35,* 458 – 481. doi: 10.1007/BF01573614

Bullock, J. G., Green, D. P., & Ha, S. E. (2010). Yes, but what's the mechanism? (Don't expect an easy answer). *Journal of Personality and Social Psychology, 98,* 550–558. doi:10.1037/a0018933

Bushman, B. J., & Baumeister, R. F. (1998). Threatened egotism, narcissism, self-esteem, and direct and displaced aggression: Does self-love or self-hate lead to violence? *Journal of Personality and Social Psychology, 75(1),* 219-229.

Bushman, B. J., Bonacci, A. M., Pedersen, W. C., Vasquez, E. A., & Miller, N. (2005). Chewing on it can chew you up: Effects of rumination on triggered displaced aggression. *Journal of Personality and Social Psychology, 88(6),* 969-983.

Bushman, B. J., & Huesmann, L. R. (2010). Aggression. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (5th ed., pp. 833-863). New York: John Wiley & Sons.

Buss, D. M. (1991). Conflict in married couples: Personality predictors of anger and upset. *Journal of Personality*, *59*, 663-688.

Buss, D. M. (1995). Evolutionary psychology: A new paradigm for psychological science. *Psychological Inquiry, 6(1),* 1-30.

Buss, D. M., & Duntley, J. D. (2011). The evolution of intimate partner violence. *Aggression and Violent Behavior, 16,* 411-419.

Carlson, M., Marcus-Newhall, A., Miller, N. (1990). Effects of situational aggression cues: A quantitative review. *Journal of Personality and Social Psychology, 58(4),* 622-633.

Caughlin, J. P., Huston, T. L., & Houts, R. M. (2000). How does personality matter in marriage? An examination of trait anxiety, interpersonal negativity, and marital satisfaction. *Journal of Personality and Social Psychology*, *78*, 326-336.

Caughlin, J. P., & Vangelisti, A. L. (2000). An individual difference explanation of why married couples engage in the demand/withdraw pattern of conflict. *Journal of Social and Personal Relationships*, *17*, 523-551.

Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology, 39*, 752-766

Chaiken, S., & Trope, Y. (Eds.). (1999). *Dual-process theories in social psychology*. New York, NY: Guilford Press.

Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: The perception-behavior link and social interaction. *Journal of Personality and Social Psychology, 76*, 893-910.

Cialdini, R. B. (2009). We have to break up. *Perspectives on Psychological Science*, *4*, 5–6.

Cochran, W., & Tesser, A. (1996). The "what-the-hell effect": Some effects of goal proximity and goal framing on performance. In L. L. Martin & A. Tesser (Eds.), *Striving and feeling: Interactions among goals, affect, and self-regulation* (pp. 99–120). Mahwah, NJ: Erlbaum.

Cohen, D. J., Eckhardt, C. I., & Schagat, K. D. (1998). Attention allocation and habituation to anger-related visual stimuli during a visual search task. *Aggressive Behavior, 24,* 399-409.

Cohen, D., Nisbett, R. E., Bowdle, & Schwarz, N. (1996). Insult, aggression, and the Southern culture of honor: An "experimental ethnography." *Journal of Personality and Social Psychology*, *70*, 945-960.

Crick, R. N., & Dodge, K. A. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin, 115(1)*, 74-101.

Cutler, D. M., Glaeser, E. L., & Shapiro, J. M. (2003). Why have Americans become more obese? *Journal of Economic Perspectives*, *17*, 93–118.

Davidovich, A., Bell, K., Ferguson, C., Gorski, E., & Campbell, A. (2011). Impelling and inhibitory forces in aggression: Sex-of-target and relationship effects. *Journal of Interpersonal Violence, 26(15),* 3098-3126. doi: 10.1177/0886260510390953

Dawson, J. F., & Richter, A. W. (2006). Proving three-way interactions in moderated multiple regression: Development and application of a slope difference test. *Journal of Applied Psychology*, *91*, 917-926.

Denson, T. F., Capper, M. M., Oaten, M., Friese, M., & Schofield, T. O. (2011). Self-control training decreases aggression in response to provocation in aggressive individuals. *Journal of Research in Personality, 45,* 252-256.

Denson, T. F., DeWall, C. N., & Finkel, E. J. (2012). Self-control and aggression. *Current Directions in Psychological Science*, *21*, 20-25.

Denson, T. F., Pedersen, W. C., Ronquillo, J., & Nandy, A. S. (2009). The angry brain: Neural correlates of anger, angry rumination, and aggressive personality. *Journal of Cognitive Neuroscience, 21(4),* 734-744.

Denson, T. F., von Hippel, W., Kemp, R. I., & Teo, L. S. (2010). Glucose consumption decreases impulse aggression in response to provocation in aggressive individuals. *Journal of Experimental Social Psychology, 46,* 1023-1028.

Descartes, R. (1637). *Discours de la méthode* (*Discourse on the Method*).

Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology, 56*, 5-18.

DeWall, C. N., Baumeister, R. F., Stillman, T. F, &, Gailliot, M. T. (2007). Violence restrained: Effects of self-regulation and its depletion on aggression. *Journal of Experimental Social Psychology, 43,* 62-76.

DeWall, C. N., Finkel, E. J., & Denson, T. F. (2011). Self-control inhibits aggression. *Social and Personality Psychology Compass, 5(7),* 458-472.

DeWall, C. N., Finkel, E. J., Lambert, N. M., Slotter, E. B., Bodenhausen, G. V., Pond, R. S., Jr., Renzetti, C. M., & Fincham, F. D. (in press). The voodoo doll task: Introducing and validating a novel method for studying aggressive inclinations. *Aggressive Behavior*.

DeWall, C. N., Twenge, J. M., Gitter, S. A., & Baumeister, R. F. (2009). It's the thought that counts: The role of hostile cognition in shaping aggressive responses to social exclusion. *Journal of Personality and Social Psychology, 96(1),* 45-59.

Dijksterhuis, A., & Bargh, J. A. (2001). The perception–behavior expressway: Automatic effects of social perception on social behavior. *Advances in Experimental Social Psychology*, *33*, 1–40.

Dodge, K. A. (1980). Social cognition and children's aggressive behavior. *Child Development, 51*, 620 – 635.

Dollard, J., Doob, L. W., Miller, N. E., Mowrer, O. H., & Sears, R. R. (1939). *Frustration and aggression*. New Haven: Yale University Press.

Donnellan, M. B., Conger, R. D., & Bryant, C. M. (2004). The Big Five and enduring marriages. *Journal of Research in Personality*, *38*, 481-504.

Donnerstein, E., & Wilson, D. W. (1976). Effects of noise and perceived control on ongoing and subsequent aggressive behavior. *Journal of Personality and Social Psychology, 34(5),* 774-781.

Doyen, S., Klein, O., Pichon, C., Cleeremans, A. (2012). Subliminal behavioral priming: It is all in the mind, but whose mind? *PLoS One 7(1)*: e29081. doi:10.1371/journal.pone.0029081

Evans, J. St. B. T., & Stanovich, K. E. (2013a). Dual-Process Theories of Higher Cognition: Advancing the Debate. *Perspectives on Psychological Science, 8(3),* 223-241.

Evans, J. St. B. T., & Stanovich, K. E. (2013b). Theory and metatheory in the study of dual processing Reply to comments. *Perspectives on Psychological Science, 8(3),* 263-271.

Evers C., Stok, F. M., de Ridder D. T. (2010). Feeding your feelings: emotion regulation strategies and emotional eating. *Personality and Social Psychology Bulletin, 36*, 792–804. doi: 10.1177/0146167210371383.

Fals-Stewart, W., Leonard, K. E., and Birchler, G. R. (2005). The occurrence of male-to-female intimate partner violence on days of men's drinking: The moderating effects of antisocial personality disorder. *Journal of Consulting and Clinical Psychology, 73*, 239–248.

Fazio, R. H. (1990). Multiple processes by which attitudes guide behavior: The MODE model as an integrative framework. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 23, pp. 75-109). San Diego: Academic Press.

Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their meaning and use. *Annual Review of Psychology, 54,* 297-327.

Ferguson, M. J., & Bargh, J. A. (2004). How social perception can automatically influence behavior. *TRENDS in Cognitive Sciences, 8(1),* 33-39.

Filley, C. M., Price, B. H., Nell, V., Antoinette, T., Morgan, A. S., Bresnahan, J. F., Pincus, J. H., Gelbort, M. M., Weissberg, M., & Kelly, J. P. (2001). Toward an understanding of violence: Neurobehavioral aspects of unwarranted physical aggression: Aspen neurobehavioral conference consensus statement. *Neuropsychiatry, Neuropsychology, and Behavioral Neurology, 14(1),* 1-14.

Finkel, E. J. (2007a). Impelling and inhibiting forces in the perpetration of intimate partner violence. *Review of General Psychology*, *11*, 193-207.

Finkel, E. J. (2007b). Intimate partner violence. In R. F. Baumeister, & K. D. Vohs (Eds.), *Encyclopedia of social psychology* (Vol. 1, pp. 498-500). Thousand Oaks: Sage.

Finkel, E. J. (2008). Intimate partner violence perpetration: Insights from the science of self-regulation. In J. P. Forgas, & J. Fitness (Eds.), *Social relationships: Cognitive, affective, and motivational processes* (pp. 271-288). New York: Psychology Press.

Finkel, E. J., & Campbell, W. K. (2001). Self-control and accommodation in close relationships: An interdependence analysis. *Journal of Personality and Social Psychology*, *81*, 263-277.

Finkel, E. J., DeWall, C. N., Slotter, E. B., McNulty, J. K., Pond, R. S., Jr., & Atkins, D. C. (2012). Using I^3 theory to clarify when dispositional aggressiveness predicts intimate partner violence perpetration. *Journal of Personality and Social Psychology*, *102*, 533-549.

Finkel, E. J., DeWall, C. N., Slotter, E. B., Oaten, M., & Foshee, V. A. (2009). Self-regulatory failure and intimate partner violence perpetration. *Journal of Personality and Social Psychology*, *97*, 483-499.

Finkel, E. J., & Eckhardt, C. I. (2013). Intimate partner violence. In J. A. Simpson & L. Campbell (Eds.), *The Oxford handbook of close relationships* (pp. 452-474). New York: Oxford.

Finkel, E. J., & Foshee, V. A. (2010). *Physicality, negative outcome expectancies, and intimate partner violence*. Unpublished manuscript, Northwestern University.

Finkel, E. J., Herbst, K. C., & Fitzsimons, G. M. (2013). *An I^3 Model analysis of eating behavior*. Unpublished manuscript, Northwestern University.

Finkel E. J., Rusbult, C. E., Kumashiro, M., & Hannon, P. A. (2002). Dealing with betrayal in close relationships: Does commitment promote forgiveness? *Journal of Personality and Social Psychology*, *82*, 956-974.

Finkel, E. J., & Slotter, E. B. (2009). An I^3 Theory analysis of human sex differences in aggression. *Behavioral and Brain Sciences*, *32*, 31.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Fold, F. L., & Robinson, D. T. (1998). Secondary bystander effects on intimate violence: When norms of restraint reduce deterrence. *Journal of Social and Personal Relationships, 15(2),* 277-285.

Friese, M., Binder, J., Luechinger, R., Boesiger, P., & Rasch, B. (2013). Suppressing emotion impairs subsequent Stroop performance and reduces prefrontal brain activation. *PLoS ONE 8(4)*: e60385. doi:10.1371/journal.pone.0060385.

Friese, M., & Hofmann, W. (2009) Control me or I will control you: Impulses, trait self-control, and the guidance of behavior. *Journal of Research in Personality*, *43*, 795-805. doi: 10.1016/j.jrp.2009.07.004

Gaertner, L., Iuzzini, J., & O'Mara, E. M. (2008). When rejection by one fosters aggression against many: Multiple-victim aggression as a consequence of social rejection and perceived groupness. *Journal of Experimental Social Psychology, 44,* 958–970.

Gailliot, M. T., & Baumeister, R. F. (2007). The physiology of willpower: Linking blood glucose to self-control. *Personality and Social Psychology Review*, *11*, 303-327.

Gal, D. (2012). A mouth-watering prospect: Salivation to material reward. *Journal of Consumer Research, 38(6),* 1022-1029.

Gawronski, B., & Bodenhausen, G. V. (2006). Associative and propositional processes in evaluation: An integrative review of implicit and explicit attitude change. *Psychological Bulletin, 132,* 692–731. doi: 10.1037/0033-2909.132.5.692

Gawronski, B., & Bodenhausen, G.V. (in press). Theory evaluation. In *Theory and Explanation in Social Psychology* (pp. 1-12). New York: Guilford Press.

Gerra, G., Zaimovic, A., Raggi, M. A., Giusti, F., Delsignore, R., Bertacca, S., & Brambilla, F. (2001). Aggressive responding of male heroin addicts under methadone treatment: psychometric and neuroendocrine correlates. *Drug and Alcohol Dependence, 65,* 85-95.

Giancola, P. R., & Chermack, S. T. (1998). Construct validity of laboratory aggression paradigms: A response to Tedeschi and Quigley (1996). *Aggression and Violent Behavior, 3(3),* 237-253.

Giancola, P.R., & Corman, M.D. (2007). Alcohol and aggression: A test of the attention-allocation model. *Psychological Science, 18(7),* 649-655.

Gibson, J. J. (1966). *The senses considered as perceptual systems.* Boston: Houghton Mifflin.

Gibson, J. J. (1986). *The ecological approach to visual perception.* Hillsdale, NJ: Erlbaum. (Original work published 1979).

Goldstone, A. P., Prechtl De Hernandez, C. G., Beaver, J. D., Muhammed, K., Croese, C., Bell, G., Durighel, G., Hughes, E., Waldman, A. D., Frost, G., & Bell, J. D. (2009). Fasting biases brain reward systems towards high-calorie foods. *European Journal of Neuroscience, 30(8),* 1625-1635.

Govorun, O., & Payne, B. K. (2006). Ego-depletion and prejudice: Separating automatic and controlled components. *Social Cognition, 24(2),* 111-136.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin, 136,* 495–525. doi:10.1037/a0019486

Harmon-Jones, E., & Sigelman, J. (2001). State anger and prefrontal brain activity: Evidence that insult-related relative left-prefrontal activation is associated with experienced anger and aggression. *Journal of Personality and Social Psychology, 80(5),* 797-803.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis*. New York: The Guilford Press.

Heatherton, T. F., Herman, C. P., Polivy, J., King, G. A., & McGree, S. T. (1988). The (mis)measurement of restraint: An analysis of conceptual and psychometric issues. *Journal of Abnormal Psychology, 97*, 19-28.

Herman, C. P. & Mack, D. (1975). Restrained and unrestrained eating. *Journal of Personality*, *43,* 647–660. doi: 10.1111/j.1467-6494.1975.tb00727.x

Herman, C. P. & Polivy, J. (1975). Anxiety, Restraint, and Eating Behavior. *Journal of Abnormal Psychology 84*, 666-672. doi: 10.1037/0021-843X.84.6.666

Herman, C. P., & Polivy, J. (1980). Restrained eating. In A. J. Stunkard (Ed.), *Obesity* (pp. 208–225). Philadelphia, PA: Saunders.

Herman, C. P., & Polivy, J. (1984). A boundary model for the regulation of eating. In J. A. Stunkard & E. Stellar (Eds.), *Eating and its disorders* (pp. 141–156). New York, NY: Raven Press.

Herman, C. P., Roth, D. A., & Polivy, J. (2003). Effects of the presence of others on food intake: A normative interpretation. *Psychological Bulletin*, *129*, 873–886.

Hermans, R. C., Herman, C. P., Larsen, J. K., & Engels, R. C. (2010). Social modeling effects on snack intake among young men. The role of hunger, *Appetite, 54*, 378-383. doi:10.1016/j.appet.2010.01.006

Hill, A.J. (2007). Symposium on "Molecular mechanisms and psychology of food intake": The psychology of food craving. *Proceedings of the Nutrition Society, 66*, 277-285. doi:10.1017/S0029665107005502.

Hoch, S. J., & Loewenstein, G. F. (1991). Time-inconsistent preferences and consumer self-control. *The Journal of Consumer Research, 17(4),* 492-507.

Hofmann, W., Adriaanse, M., Vohs, K. D., & Baumeister, R. F. (in press). Dieting and the self-control of eating in everyday environments: An experience sampling study. *British Journal of Health Psychology*.

Hofmann, W., & Friese, M. (2008). Impulses got the better of me: Alcohol moderates the influence of implicit attitudes toward food cues on eating behavior. *Journal of Abnormal Psychology, 117*, 420-427. doi: 10.1037/0021-843X.117.2.420

Hofmann, W., Friese, M., & Strack, F. (2009). Impulse and self-control from a dual-systems perspective. *Perspectives on Psychological Science, 4(2),* 162-176.

Hollands, G. J., Prestwich, A., & Marteau, T. M. (2011). Using aversive images to enhance healthy food choices and implicit attitudes: An experimental test of evaluative conditioning. *Health Psychology, 30*, 195-203.

Holt, C.A., & Laury, S. (2002). Risk aversion and incentive effects (Andrew Young School of Policy Studies Research Paper Series No. 06-12). Retrieved July 14, 2007, from http://ssrn.com/abstract=893797

Houben, K., Roefs, A., & Jansen, A. (2010). Guilty pleasures: Implicit preferences for high calorie food in restrained eating. *Appetite, 55*, 18–24. doi:10.1016/j.appet.2010.03.003

Ioannidis, J. P. A. (2012). Why science is not necessarily self-correcting. *Perspectives on Psychological Science*, *7*, 645–654.

Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego depletion—is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological Science*, *21*, 1686-1693.

Jones, D. N., &, Paulhus, D. L. (2010). Different provocations trigger aggression in narcissists and psychopaths. *Social Psychological and Personality Science, 1(1),* 12-18. doi: 10.1177/1948550609347591

Judd, C. M., & Kenny, D. A. (2010). Data analysis in social psychology: Recent and recurring issues. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (5th ed., Vol. 1, pp. 115–139). Hoboken, NJ: Wiley.

Kahneman, D. (2011). *Thinking, fast and slow*. New York, NY: Farrar, Straus and Giroux.

Kaplan, H. I., & Kaplan, H. S. (1957). The psychosomatic concept of obesity. *Journal of Nervous and Mental Disease, 125,* 181–201.

Kauffman, N.A., Herman, C.P., Polivy, J. (1995). Hunger-induced finickiness in humans. *Appetite*, *24*, 203-218.

Kemps, E., & Tiggemann, M. (2007). Modality-specific imagery reduces cravings for food: An application of the elaborated intrusion theory of desire to food craving. *Journal of Experimental Psychology: Applied, 13(2)*, 95-104.

Kenny, P. (2011). Reward Mechanisms in Obesity: New Insights and Future Directions. *Neuron*, 69, 664-679, doi: 10.1016/j.neuron.2011.02.016

Kessler, D. A. (2009). *The end of overeating: Taking control of the insatiable American appetite*. Emmaus, PA: Rodale.

Keysers, C., & Gazzola, V. (in press). The vicarious brain. In M. Mikulincer & P. R. Shaver (Eds.), *Nature and formation of social connections: From brain to group*. Washington, DC: American Psychological Association Press.

King, B. M. (2013). The modern obesity epidemic, ancestral hunter-gathers, and the sensory/reward control of food intake. *American Psychologist, 68,* 88-96. doi: 10.1037/a0030684

Klinesmith, J., Kasser, T., & McAndrew, F. T. (2006). Guns, testosterone, and aggression: An experimental test of a meditational hypothesis. *Psychological Science, 17(7),* 568-571.

Koffka, K. (1935). *Principles of gestalt psychology.* New York: Harcourt, Brace.

Kruglanski, A. W., Bélanger, J. J., Chen, X., Köpetz, C., Pierro, A., & Mannetti, L. (2012). The energetic of motivated cognition: A force-field analysis. *Psychological Review, 119(1),* 1-20.

Larrick, R. P., Timmerman, T. A., Carton, A. M., & Abrevaya, J. (2011). Temper, temperature, and temptation: Heat-related retaliation in baseball. *Psychological Science, 22(4),* 423-428.

Latané, B., & Darley, J. M. (1970). *The unresponsive bystander: Why doesn't he help?* New York: Appleton-Century Crofts.

Lau, M. A., Pihl, R. O., & Peterson, J. B. (1995). Provocation, acute alcohol intoxication, cognitive performance, and aggression. *Journal of Abnormal Psychology, 104(1),* 150-155.

Lawrence, C., & Hutchinson, L. (2013). The influence of individual differences in sensitivity to provocations on provoked aggression. *Aggressive Behavior, 39,* 212-221.

Lewin, K. (1936). *Principles of topological psychology*.

Lickel, B., Miller, N. Stenstrom, D. M., Denson, T. F., & Schmader, T. (2006). Vicarious Retribution: The Role of Collective Blame in Intergroup Aggression. *Personality and Social Psychology Review*, *10*, 372-390.

Lowe, M. R., Butryn, M. L. (2007). Hedonic hunger: a new dimension of appetite? *Psychology & Behavior, 91*, 432–439. doi:10.1016/j.physbeh.2007.04.006

Lowe, M. R., & Kral, T. V. E. (2006). Stress-induced eating in restrained eaters may not be caused by stress or restraint. *Appetite, 46*, 16–21.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology, 58,* 593–614. doi:10.1146/annurev.psych.58.110405.085542

Madzharov, A. V., & Block, L. G. (2010). Effects of product unit image on consumption of snack foods. *Journal of Consumer Psychology, 20,* 398-409. doi:10.1016/j.jcps.2010.06.007

Mann, T., & Ward, A. (2007). Attention, self-control, and health behaviors. *Current Directions in Psychological Science, 16(5),* 280-283.

Marcus-Newhall, A., Pedersen, W. C., Carlson, M., & Miller, N. (2000). Displaced aggression is alive and well: A meta-analytic review. *Journal of Personality and Social Psychology, 78*, 670-689.

McClelland, G. H., & Judd, C. M. (1993). Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin*, *114*, 376-390.

McFerran, B., Dahl, D. W., Fitzsimons, G. J., Morales, A. C. (2010). Might an overweight waitress make you eat more? How the body type of others is sufficient to alter our food consumption. *Journal of Consumer Psychology, 20*, 146-151. doi: 10.1016/j.jcps.2010.03.006

McNulty, J. K. (2008). Neuroticism and interpersonal negativity: The independent contributions of behavior and perceptions. *Personality and Social Psychology Bulletin, 34*, 1439–1450.

Metcalfe, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: dynamics of willpower. *Psychological Review, 106(1),* 3-19.

Milgram, S. (1975). *Obedience to authority***.** New York: Harper & Row.

Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review, 63*, 81–97. doi:10.1037/h0043158

Miller, N. E. (1941). The frustration-aggression hypothesis. *Psychological Review*, 48, 337-342.

Miller, N., Pedersen, W. C., Earleywine, M., & Pollock, V. E. (2003). A theoretical model of triggered displaced aggression. *Personality and Social Psychology Review, 7*, 75-97.

Mischel, W., & Shoda, Y. (1995). A cognitive-affective system theory of personality: Reconceptualizing situations, dispositions, dynamics, and invariance in personality structure. *Psychological Review. 102(2),* 246-268.

Morewedge, C. K., Huh, Y. E., & Vosgerau, J. (2010). Thought for food: Imagined consumption reduces actual consumption. *Science, 330*, 1530-1533.

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin, 126,* 247–259. doi:10.1037/0033-2909.126.2.247

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology, 74,* 774–789. doi:10.1037/0022-3514.74.3.774

Nisbett, R. E. (1972). Hunger, obesity, and the ventromedial hypothalamus. *Psychological Review, 79*, 433-453.

Papies, E. K., Barsalou, L. W., & Custers, R. (2012). Mindful attention prevents mindless impulses. *Social Psychological and Personality Science, 3*, 291-299.

Pashler, H., & Harris, C. R. (2012). Is the replicability crisis overblown? Three arguments examined. *Perspectives in Psychological Science*, *7*, 531–536.

Pashler, H., Rohrer, D. & Harris, C. (2013). Can the goal of honesty be primed? *Journal of Experimental Social Psychology*, 49, 959-964.

Payne, B. K. (2005). Conceptualizing control in social cognition: How executive functioning modulates the expression of automatic stereotyping. *Journal of Personality and Social Psychology, 89(4),* 488-503.

Pedersen, W. C., Gonzales, C., & Miller, N. (2000). The moderating effect of trivial triggering provocation on displaced aggression. *Journal of Personality and Social Psychology, 78(5),* 913-927.

Petty, R. E., & Cacioppo, J. T. (1984). The effects of involvement on responses to argument quantity and quality: Central and peripheral routes to persuasion. *Journal of Personality and Social Psychology, 46*, 69-81.

Petty, R. E., & Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change*. New York: Springer/Verlag.

Peterson, D. R. (1983). Conflict. In H. H. Kelley, E. Berscheid, A. Christensen, J. H. Harvey, T. L. Huston, G. Levinger, E. McClintock, L. A. Peplau, & D. R. Peterson (Eds.), *Close relationships* (pp. 360-396). New York: Freeman.

Polivy, J., Herman, C. P., Younger, J. C., & Erskine, B. (1979). Effects of a model on eating behavior: The induction of a restrained eating style. *Journal of Personality, 47*, 100-117.

Popper, K. R. (1934). *Logik der Forschung [Logic of scientific discovery]*. Wien: Springer.

Radel, R., & Clément-Guillotin, C. (2012). Evidence of motivational influences in early visual perception: Hunger modulates conscious access. *Psychological Science, 23*, 232-234.

Richeson, J. A., Baird, A. A., Gordon, H. L., Heatherton, T. F., Wyland, C. L., Trawalter, S., & Shelton, J. N. (2003). An fMRI investigation of the impact of interracial contact on executive function. *Nature Neuroscience, 6*, 1323–1328.

Ritter, D., & Elsea, M. (2005). Hot sauce, toy guns, and graffiti: A critical account of current laboratory aggression paradigms. *Aggressive Behavior, 31,* 407-419.

Ross, L., & Nisbett, R. E. (1991). *The person and the situation: Perspectives of social psychology*. New York: McGraw-Hill.

Rozin, P., Millman, L., & Nemeroff, C. (1986). Operation of the laws of sympathetic magic in disgust and other domains. *Journal of Personality and Social Psychology, 50*, 703-712

Salmon, S. J., Fennis, B. M., de Ridder, D. T. D., Adriaanse, M. A., & de Vet, E. (in press). Health on impulse: When low self-control promotes healthy food choices. *Health Psychology*.

Santor, D. A., Ingram, A., & Kusumakar, V. (2003). Influence of executive functioning difficulties on verbal aggression in adolescents: moderating effects of winning and losing and increasing and decreasing levels of provocation. *Aggressive Behavior, 29,* 475-488.

Schachter, S. (1971). Some extraordinary facts about obese humans and rats. *American Psychologist, 26*, 129-144. doi: 10.1037/h0030817

Seibt, B., Häfner, M., & Deutsch, R. (2007). Prepared to eat: How immediate affective and motivational responses to food cues are influenced by food deprivation. *European Journal of Social Psychology, 37*(2), 359-379.

Sherman, J. W., Gawronski, B., & Trope, Y. (Eds.). (in press). *Dual process theories of the social mind*. New York: Guilford Press.

Shimmack, U. (2012). The ironic effect of significant results on the credibility of multiple-study articles. *Psychological Methods*, *17*, 551-566.

Shiv, B., & Fedorikhin, A. (1999). Heart and Mind in Conflict: The Interplay of Affect and Cognition in Consumer Decision Making. *Journal of Consumer Research, 20,* 278-292.

Siever, L. J. (2008). Neurobiology of aggression and violence. *American Journal of Psychiatry, 165,* 429-442.

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False–positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science*, *22*, 1359–1366.

Simonsohn, U., Nelson, L. D., & Simmons, J. P. (in press). *P*-curve: A key to the file drawer. *Journal of Experimental Psychology: General*

Sinclair, H. C., Ladny, R. T., & Lyndon, A. E. (2011). Adding insult to injury: Effects of interpersonal rejection types, rejection sensitivity, and self-regulation on obsessive relational intrusion. *Aggressive Behavior, 37,* 503-520.

Skinner, B.F. (1938). *The behavior of organisms*. New York: Appleton-Century-Crofts.

Sklair, L. (1988). Transcending the impasse: Metatheory, theory, and empirical research in the sociology of development and underdevelopment. *World Development, 16*(6), 697-709.

Slotter, E. B., & Finkel, E. J. (2011). I^3 Theory: Instigating, impelling, and inhibiting factors in aggression. In P. R. Shaver, & M. Mikulincer (Eds.), *Human aggression and violence: Causes, manifestations, and consequences* (pp. 35–52). Washington: American Psychological Association.

Slotter, E. B., Finkel, E. J., DeWall, C. N., Lambert, N. M., Pond, R. S., Bodenhausen, G. V., & Fincham, F. D. (2012). Putting the brakes on aggression toward a romantic partner: The inhibitory influence of relationship commitment. *Journal of Personality and Social Psychology*, *102*, 291-305.

Smith, E. R. (2012). Editorial. *Journal of Personality and Social Psychology*, *102*, 1-3.

Smith, E. R., & DeCoster, J. (2000). Dual-process models in social and cognitive psychology: Conceptual integration and links to underlying memory systems. *Personality and Social Psychology Review*, *4*, 108–131.

Spencer, S. J., Zanna, M. P., & Fong, G. T. (2005). Establishing a causal chain: Why experiments are often more effective than mediational analyses in examining psychological processes. *Journal of Personality and Social Psychology, 89,* 845–851. doi:10.1037/0022-3514.89.6.845

Stanovich, K. E. (1999). Who is rational? *Studies of individual differences in reasoning*. Mahwah, NJ: Erlbaum.

Stice, E., Fisher, M., & Lowe, M. R. (2004). Are Dietary Restraint Scales Valid Measures of Acute Dietary Restriction? Unobtrusive Observational Data Suggest Not. *Psychological Assessment, 16,* 51-59. doi: 10.1037/1040-3590.16.1.51

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review, 8(3),* 220-247.

Straus, M. A. (1999). The controversy over domestic violence by women: A methodological, theoretical, and sociology of science analysis. In X. B. Arriaga & S. Oskamp (Eds.), *Violence in intimate relationships* (pp. 17–44). Thousand Oaks, CA: Sage.

Stroebe, W. (2008). *Dieting, overweight, and obesity: Self-regulation in a food-rich environment*. Washington, DC: American Psychological Association.

Stroebe, W., van Koningsbruggen, G. M., Papies, E. K., & Aarts, H. (in press).Why Most Dieters Fail but Some Succeed: A Goal Conflict Model of Eating Behavior. *Psychological Review*. doi: 10.1037/a0030849

Stunkard, A., & Koch, C. (1964). The interpretation of gastric motility: I. Apparent bias in the reports of hunger by obese persons. *Archives of General Psychiatry, 11,* 74 – 82. doi:10.1001/archpsyc.1964.01720250076010

Suls, J., & Wan, C. K. (1993). The relationship between trait hostility and cardiovascular reactivity: A quantitative review and analysis. *Psychophysiology, 30,* 615-626.

Suris, A., Lind, L., Emmett, G., Borman, P. D., Kashner, M., & Barratt, E. S. (2004). Measures of aggressive behavior: Overview of clinical and research instruments. *Aggression and Violent Behavior, 9,* 165-227.

Swinburn, B. A., Sacks, G., Hall, K. D., McPherson, K., Finegood, D. T., Moodie, M. L., & Gortmaker, S. L. (2011). The global obesity pandemic: Shape by global drivers and local environments. *Lancet*, *378*, 804–814.

Todorov, A., & Bargh, J. A. (2002). Automatic sources of aggression. *Aggression and Violent Behavior, 7,* 53-68.

Trevillion, K., Oram, S., Feder, G., & Howard, L. M. (2012). Experiences of domestic violence and mental disorders: A systematic review and meta-analysis. *PLoS One*, *7(12)*: e51740. doi:10.1371/journal.pone.0051740.

Twenge, J. M., & Campbell, W. K. (2003). "Isn't it fun to get the respect we're going to deserve?": Narcissism, social rejection, and aggression. *Personality and Social Psychology Bulletin, 29(2),* 261-272. doi: 10.1177/0146167202239051

Van Dillen, L. F., Papies, E. K., & Hofmann, W. (2013). Turning a blind eye to temptation: How cognitive load can facilitate self-regulation. *Journal of Personality and Social Psychology, 104(3),* 427-443.

Van Strien, T., Engels, R. C., Herman, C. P., & van Staveren, W. (2006). The Validity of Dietary Restraint Scales: Comment on Stice et al. (2004). *Psychological Assessment, 18,* 89-94. DOI: 10.1037/1040-3590.18.1.89

Vartanian, L. R., Herman, C. P., & Wansink B. (2008). Are We Are of the External Factors That Influence Our Food Intake? *Health Psychology, 27,* 533-538. doi: 10.1037/0278-6133.27.5.533

Vohs, K. D., Baumeister, R. F., Mead, N. L., Hofmann, W., Ramanathan, S., & Schmeichel, B. J. (2013). Engaging in self-control heightens urges and feelings. Unpublished manuscript, University of Minnesota.

Volkow, N. D., Wang, G-J., Fowler, J. S., & Telang, F. (2008). Overlapping neuronal circuits in addiction and obesity: Evidence of systems pathology. *Philosophical Transactions of the Royal Society B: Biological Sciences, 363*(1507), 3191-3200.

Wang, G-J., Tomasi, D., Backus, W., Wang, R., Telang, F., Geliebter, A., Korner, J., Bauman, A., Fowler, J. S., Thanos, P. K., & Volkow, N. D. (2008). Gastric distention activates satiety circuitry in the human brain. *NeuroImage, 39*(4), 1824-1831.

Wansink, B. (2004). Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annual Review of Nutrition*, *24*, 455-479.

Wansink, B. (2006). *Mindless eating: Why we eat more than we think*. New York: Bantam.

Wansink, B., van Ittersum, K., & Painter, J. E. (2005). How descriptive food names bias sensory perceptions in restaurants. *Food Quality and Preference, 16*, 393-400.

Ward, A., & Mann, T. (2000). Don't mind if I do: Disinhibited eating under cognitive load. *Journal of Personality and Social Psychology, 78, 753-763.* doi: 10A037//0022-3514.78.4.753

Ward, A., Mann, T., Westling, E. H., Creswell, J. D., Ebert, J. P., & Wallaert, M. (2008). Stepping up the pressure: Arousal can be associated with a reduction in male aggression. *Aggressive Behavior, 34,* 584-592.

Watson, J. B. (1924). *Behaviorism*. New York: Norton.

Wickham, R. E., & Knee, C. R. (in press). Examining temporal processes in diary studies. *Personality and Social Psychology Bulletin*.

Wiers, R. W., & Stacy, A. W. (2006). Implicit cognition and addiction. *Current Directions in Psychological Science*, *15*, 292-296.

Wilkinson, D. L., & Hamerschlag, S. J. (2005). Situational determinants in intimate partner violence. *Aggression and Violent Behavior, 10,* 333-361.

Wilkowski, B. M., & Robinson, M. D. (2010). Associative and spontaneous appraisal processes independently contribute to anger elicitation in daily life. *Emotion, 10(2),* 181-189.

Woody, E. Z., Costanzo, P. R., Liefer, H., & Conger, J. (1981). The Effects of Taste and Caloric Perceptions on the Eating Behavior of Restrained and Unrestrained Subjects. *Cognitive Therapy and Research, 5,* 381-390.

Yeomans, M.R., Tovey, H.M., Tinley, E.M., & Haynes, C.L. (2004). Effects of manipulated palatability on appetite depend on restraint and disinhibition scores from the Three Factor Eating Questionnaire. *International Journal of Obesity, 28*, 144–151. doi:10.1038/sj.ijo.0802483

Zwolinski, J. (2012). Psychological and neuroendocrine reactivity to ostracism. *Aggressive Behavior, 38,* 108-125.

Table 1. The 18 Effects in the I^3 Model (see Figure 2)

Effect Num.	Figure 2 Paths	Theoretical Question
Nonmediated effects of instigation, impellance, and inhibition on behavior		
1	Path 1	Does the instigator predict the behavior?
2	Path 2	Does the impellor predict the behavior?
3	Path 3	Does the inhibitor predict the behavior?
4	Path 4	Does the impellor moderate the link between the instigator and the behavior?
5	Path 5	Does the inhibitor moderate the link between the instigator and the behavior?
6	Path 6	Does the inhibitor moderate the link between the impellor and the behavior?
7	Path 7	Does the inhibitor moderate the link between the instigator × impellor interaction effect and the behavior?
Nonmediated effects of instigation and impellance on the behavioral proclivity		
8	Path 8	Does the instigator predict the behavioral proclivity?
9	Path 9	Does the impellor predict the behavioral proclivity?
10	Path 10	Does the impellor moderate the link between the instigator and the behavioral proclivity?
Nonmediated effects of the behavioral proclivity		
11	Path 11	Does the behavioral proclivity predict the behavior?
12	Path 12	Does inhibition moderate the link between the behavioral proclivity and the behavior?
Simple mediation effects		
13	Paths 8 and 11	Does the behavioral proclivity mediate the link between the instigator and behavior?
14	Paths 9 and 11	Does the behavioral proclivity mediate the link between the impellor and behavior?
15	Paths 10 and 11	Does the behavioral proclivity mediate the link between the instigator × impellor interaction effect and the behavior?
Mediation effects moderated by inhibition		
16	Paths 8 and 12	Does inhibition moderate the behavioral proclivity→behavior link in the instigator→behavioral proclivity→behavior mediation effect?
17	Paths 9 and 12	Does inhibition moderate the behavioral proclivity→behavior link in the impellor→behavioral proclivity→behavior mediation effect?
18	Paths 10 and 12	Does inhibition moderate the behavioral proclivity→behavior link in the instigator × impellor→behavioral proclivity→behavior mediation effect?

Effect Num. = I^3 Model effect number (see Figure 3)

Table 2. A view of the aggression literature from the perspective of the I^3 Model's 18 effects: A sample of findings consistent with Perfect Storm Theory

Effect Num.	Instigator	Impellor	Proclivity	Inhibitor	Aggression	Citation
1	Rejection				Noise blasts	Twenge et al., 2001, S4
2		Trait aggressiveness			Noise blasts	Taylor & Epstein, 1967
3				Frontal lobe funct.	Electric shocks	Lau et al., 1995
4	Verb. provocation	Trait narcissism			Noise blasts	Bushman & Baumeister, 1998, S1
5	Verb. provocation			Depletion	Painful body poses	Finkel et al., 2009, S4
6		Trait aggressiveness		Negative outcome expectancies	Number of violent acts over a year	Finkel & Foshee, 2010
7	Phys. provocation	Trait aggressiveness		Serotonin augmentation	Electric shocks	Berman et al., 2009
8	Rejection		Hostile cognitions			DeWall et al., 2009, S1b
9		Trait aggressiveness	dACC activation			Denson et al., 2009
10	Phys. provocation	Trait hostility	Aggressive cognitive bias			K. B. Anderson et al., 1998
11			State anger		Daily self-reports	Wilkowski & Robinson, 2010
12			Postprovocation revenge cognitions	Alcohol	Electric shocks	Borders & Giancola, 2011
13	Phys. provocation		Hostile motivation		Noise blasts	C. A. Anderson et al., 2008
14		Aggression prime	Testosterone reactivity		Hot sauce	Klinesmith et al., 2006
15	Current verb. provocation	Rumination about a prior verb. provocation	Hostile attributions about the current provocation		Hot sauce	Bushman, 2005, S2
16	—		—	—	—	—
17		Trait hostility	Postprovocation revenge cognitions	Alcohol	Electric shocks	Borders & Giancola, 2011[a]
18	—	—	—	—	—	—

"Effect Num." = I^3 Model effect number, as presented in Figure 3 and Table 2; "verb." = verbal; "phys." = physical; "dACC" = dorsal anterior cingulate cortex; "funct." = functioning

[a] Borders and Giancola (2011) reported results that were broadly consistent with Effect 17, although they did not test the full model per se. See the main text for an elaborated discussion of this issue.

Table 3. A view of the eating literature from the perspective of the I^3 Model's 18 effects: A sample of findings consistent with Perfect Storm Theory

Effect Num.	Instigator	Impellor	Proclivity	Inhibitor	Eating	Citation
1	Palatability				Ice cream	Nisbett, 1968
2		Attention			Marshmallow/pretzel	Mischel et al., 1972, S1
3				Sleep	Daily food intake	Markwald et al., 2013
4	Visual anchor	Trait visual processing			Pretzels	Madzharov & Block, 2010, S3
5	Tantalizing presentation			Cognitive load	Chocolate cake	Shiv & Fedorikhin, 1999, S1
6		Trait liking for the food		Trait self-control	Potato chips	Friese & Hofmann, 2009, S1
7	Bowl size	Habituation beliefs		Trait disinhibited eating	Peanut m&m's	Finkel et al., 2013
8	Disgusting presentation		Anticipated liking			Rozin et al., 1986
9		PYY infusion	Anticipated consumption during an upcoming meal			Batterham et al., 2007
10	Food exposure	Hunger	Implicit evaluation			Seibt et al., 2007, S2
11			Hypothalamic activation		Meal consumption	Batterham et al., 2007
12			—	—	—	
13	Disgusting presentation		Postpriming implicit liking		Unhealthy snack choices	Hollands et al., 2011
14		Repeated simulated indulgence	Behavioral exertion to acquire the food		Cheese consumption	Morewedge et al., 2010
15	Disgusting presentation	Trait implicit liking	Postpriming implicit liking		Unhealthy snack choices	Hollands et al., 2011
16	—		—	—	—	
17		—	—	—	—	
18	—	—	—	—	—	

"Effect Num." = I^3 Model effect number, as presented in Figure 3 and Table 2. "PYY" = peptide $YY_{3–36}$, a physiological gut-derived satiety signal.

Figure 1. Situating metatheory and theory within the broader scientific enterprise.

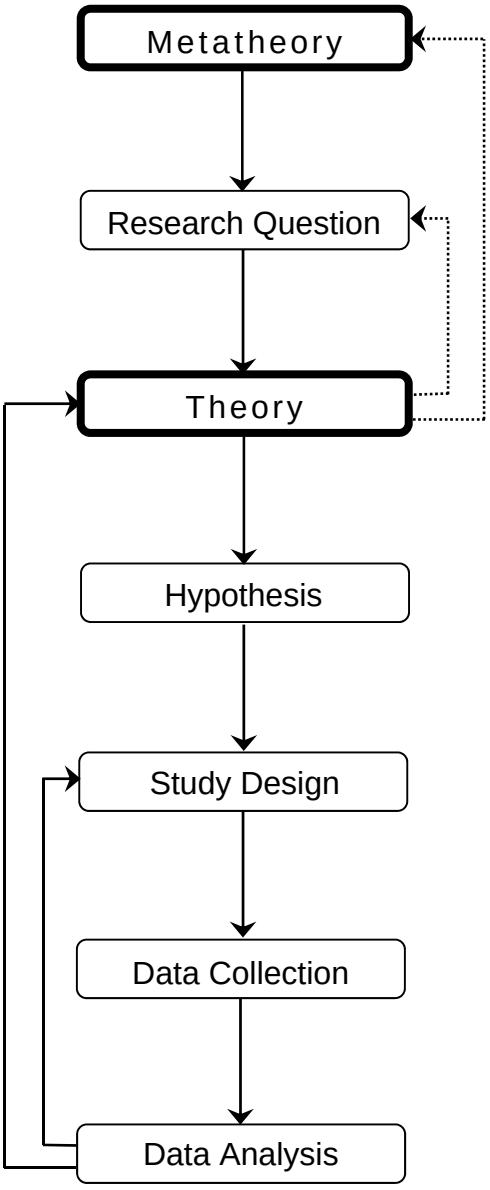
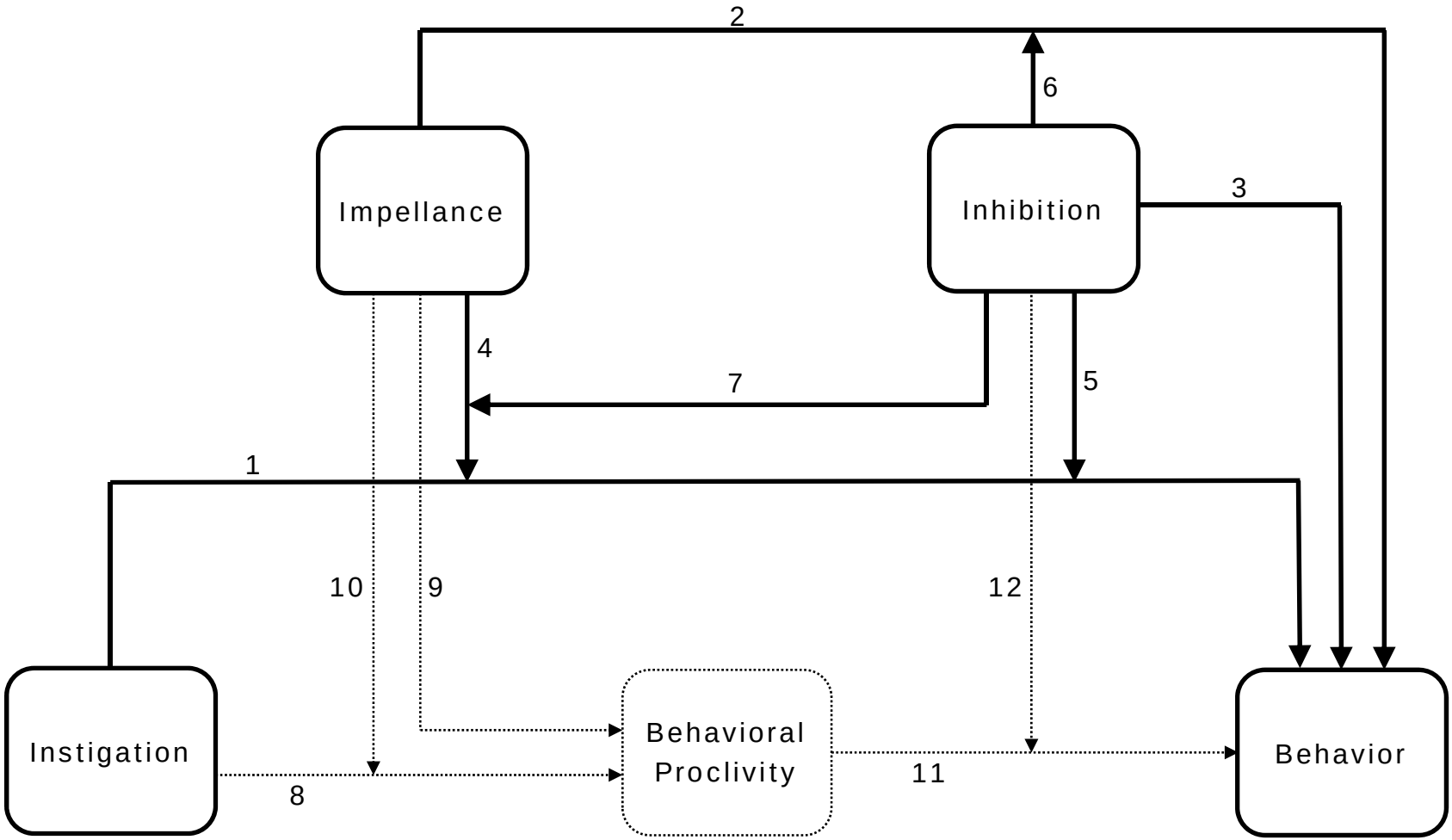


Figure 2. I^3 Theory's 12 paths (also see Table 2). Paths 1–7 (in solid lines) represent the theory's core main and interactive effects, whereas Paths 8–12 (in dotted lines) represent its mediation effects. Paths 1–3 represent the main effects of instigation, impellance, and inhibition, respectively. Paths 4–6 represent the theory's 2-way interaction effects: instigation × impellance (Path 4), instigation × inhibition (Path 5), and impellance × inhibition (Path 6). Path 7 represents the theory's instigation × impellance × inhibition 3-way interaction effect. Paths 8 and 9 represent the links of instigation and impellance, respectively, with the behavioral proclivity (the mediator). Path 10 represents the moderation of Path 8 by impellance. Path 11 represents the link between the behavioral proclivity and the actual enactment of the behavior. Finally, Path 12 represents the moderation of Path 11 by inhibition.



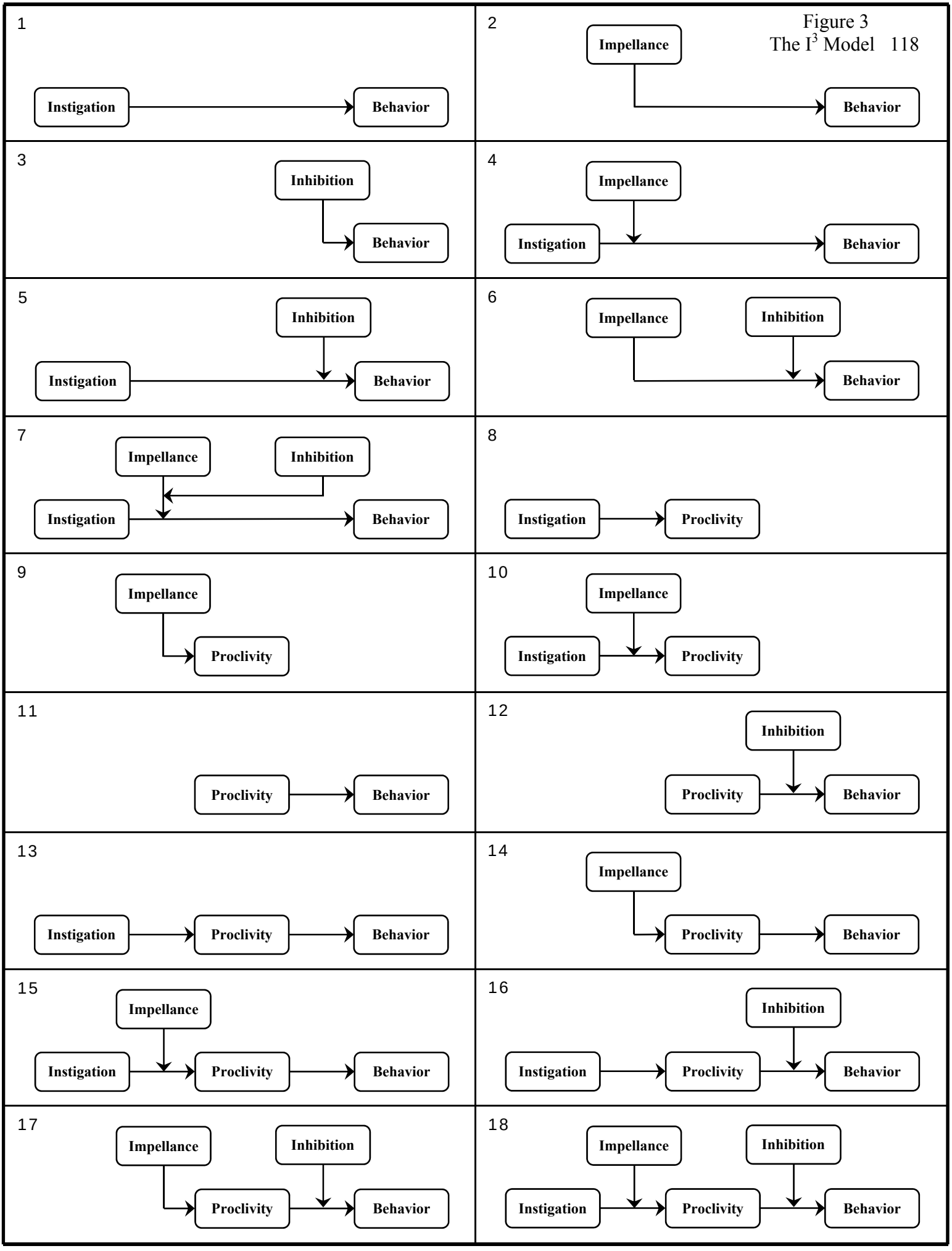

1
Instigation
Behavior
2
Impellance
Behavior
3
Inhibition
Behavior
4
Impellance
Instigation
Behavior
5
Inhibition
Instigation
Behavior
6
Impellance
Inhibition
Behavior
7
Impellance
Inhibition
Instigation
Behavior
8
Instigation
Proclivity
9
Impellance
Proclivity
10
Impellance
Instigation
Proclivity
11
Proclivity
Behavior
12
Inhibition
Proclivity
Behavior
13
Instigation
Proclivity
Behavior
14
Impellance
Proclivity
Behavior
15
Impellance
Instigation
Proclivity
Behavior
16
Inhibition
Instigation
Proclivity
Behavior
17
Impellance
Inhibition
Proclivity
Behavior
18
Impellance
Inhibition
Instigation
Proclivity
Behavior

Figure 4. Two variations of Perfect Storm Theory.

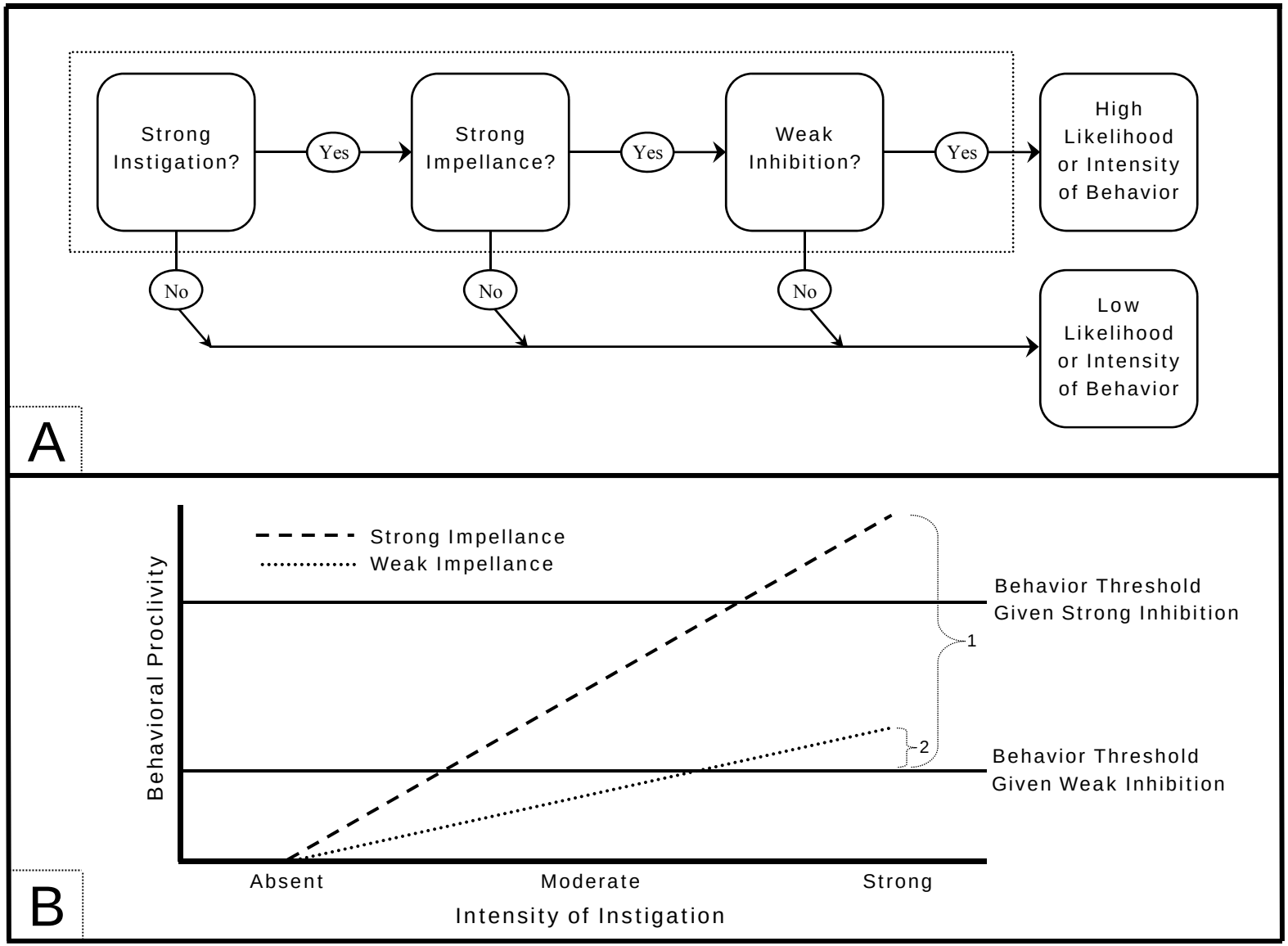
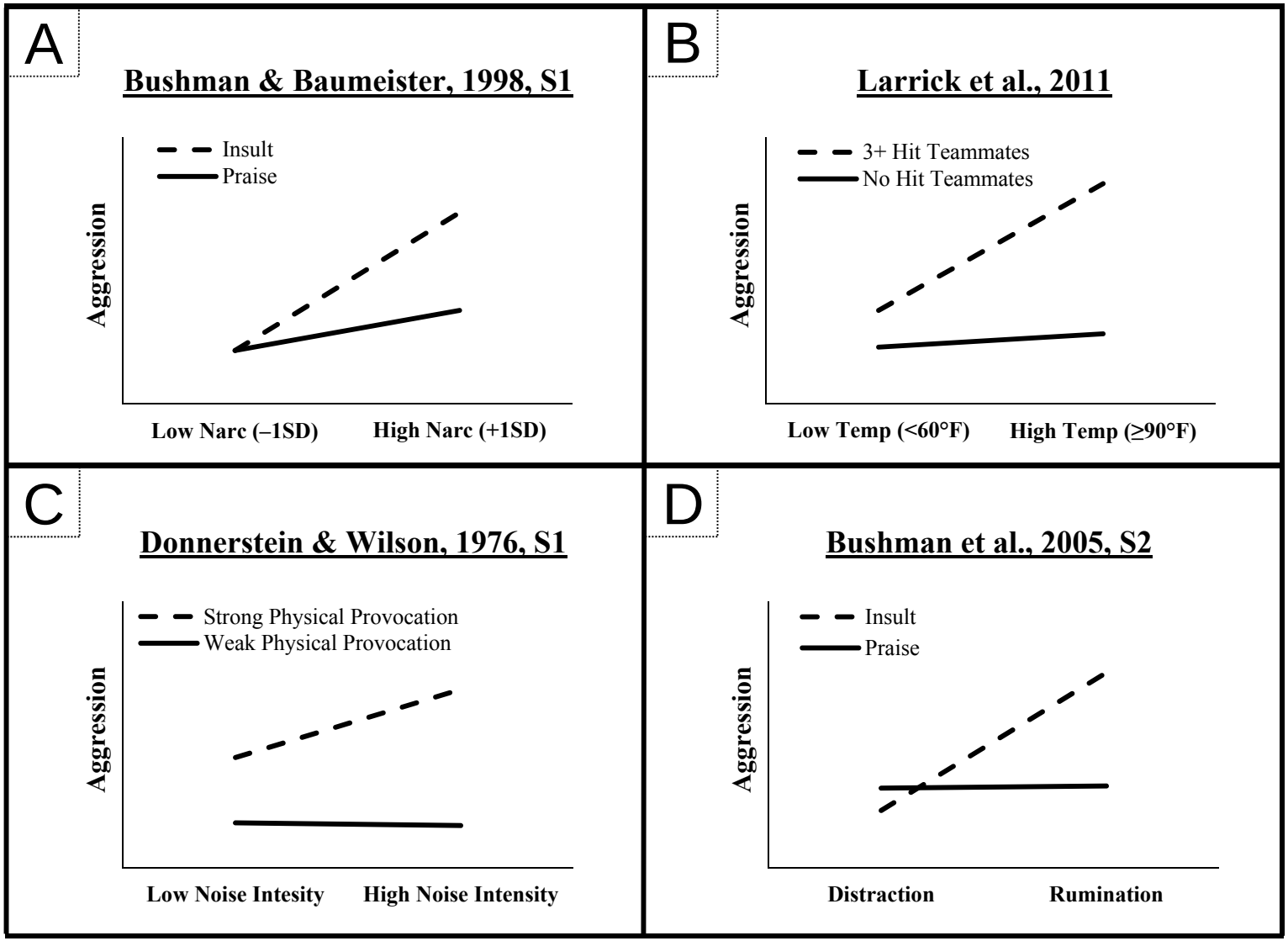
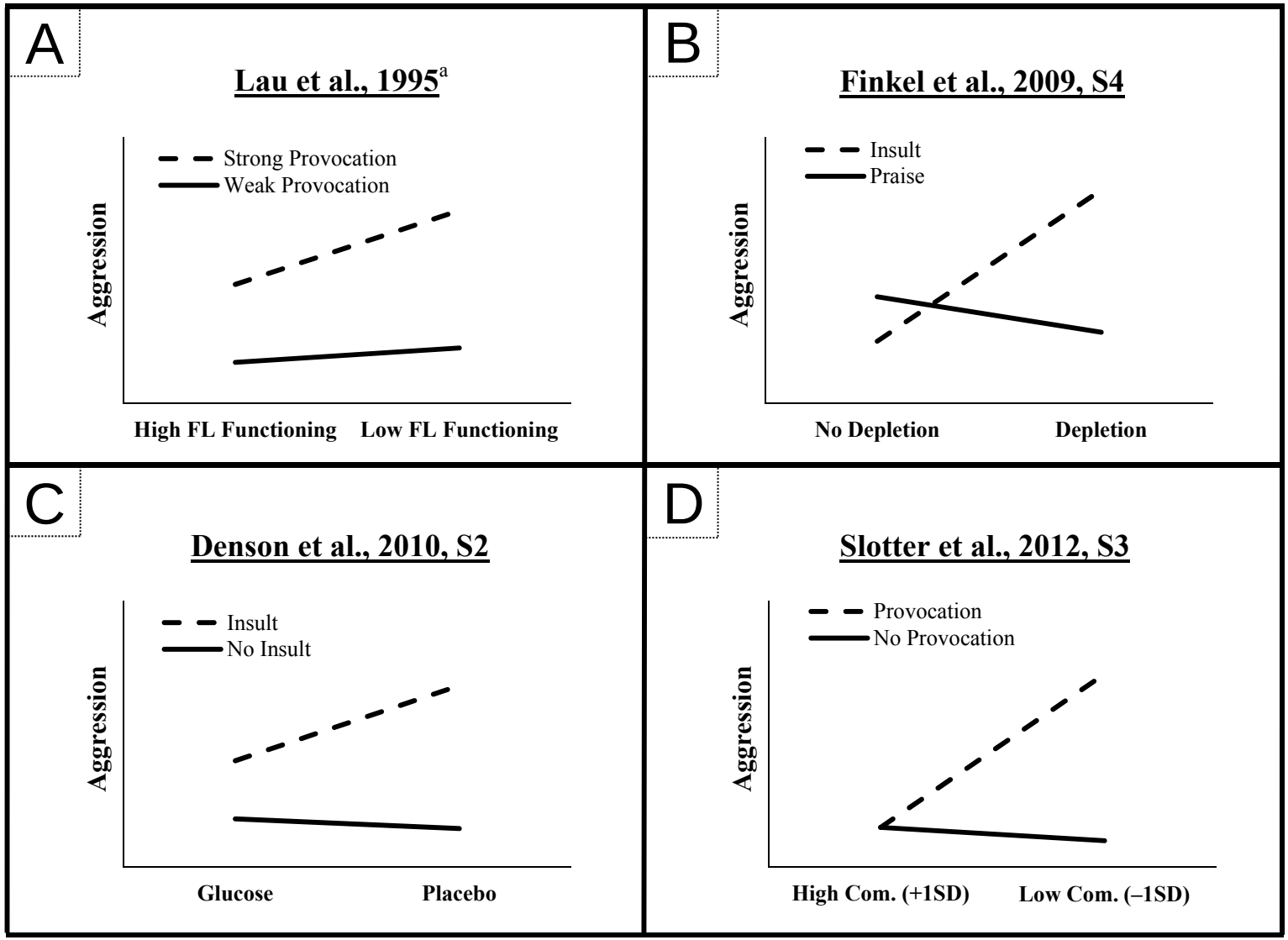


Figure 5. Four examples of instigator × impellor aggression effects (Effect 4) that are consistent with Perfect Storm Theory.



Note. "Narc" = narcissim. "Temp" = temperature.

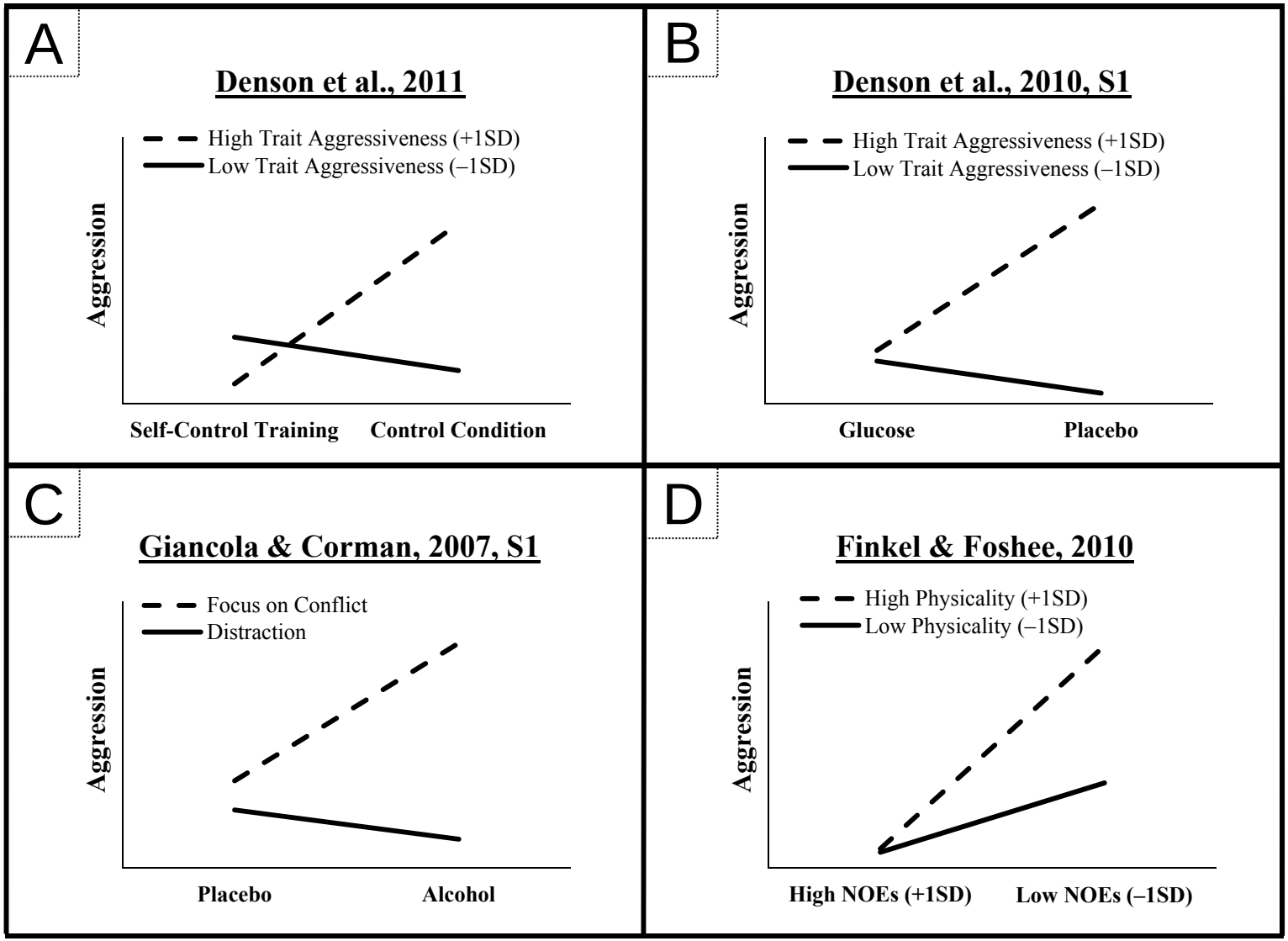
Figure 6. Four examples of instigator × inhibitor aggression effects (Effect 5) that are consistent with Perfect Storm Theory.



Note. "FL" = frontal lobe. "Com" = implicit relationship commitment.

[a] Lau et al. (1995) preselected men with scores in the upper and lower quartile on frontal lobe (FL) functioning.

Figure 7. Four examples of impellor × inhibitor aggression effects (Effect 6) that are consistent with Perfect Storm Theory.



Note. NOEs = negative outcome expectancies.

Figure 8. Four examples of instigator × impellor × inhibitor ("perfect storm") aggression effects (Effect 7) that are consistent with Perfect Storm Theory.

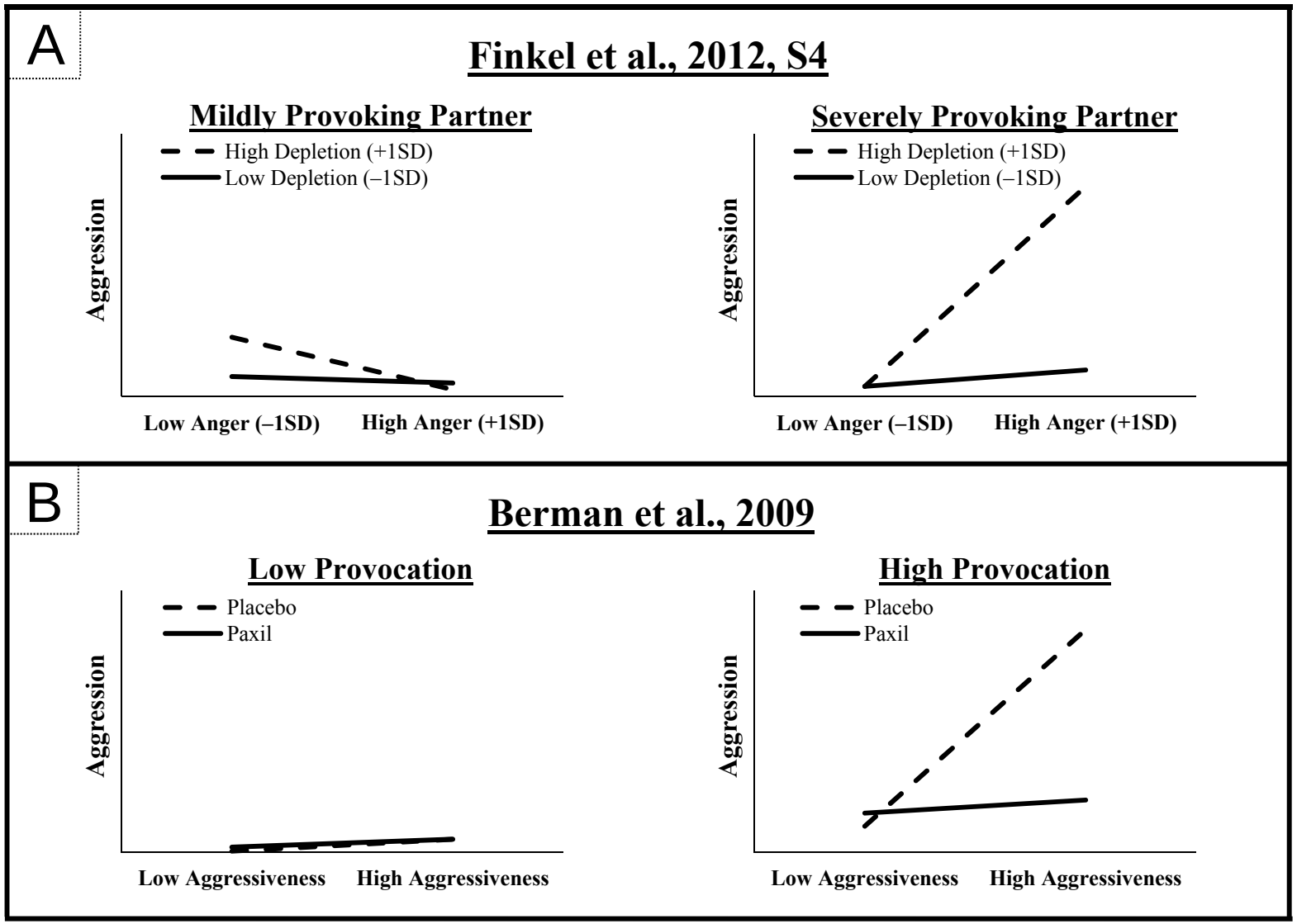
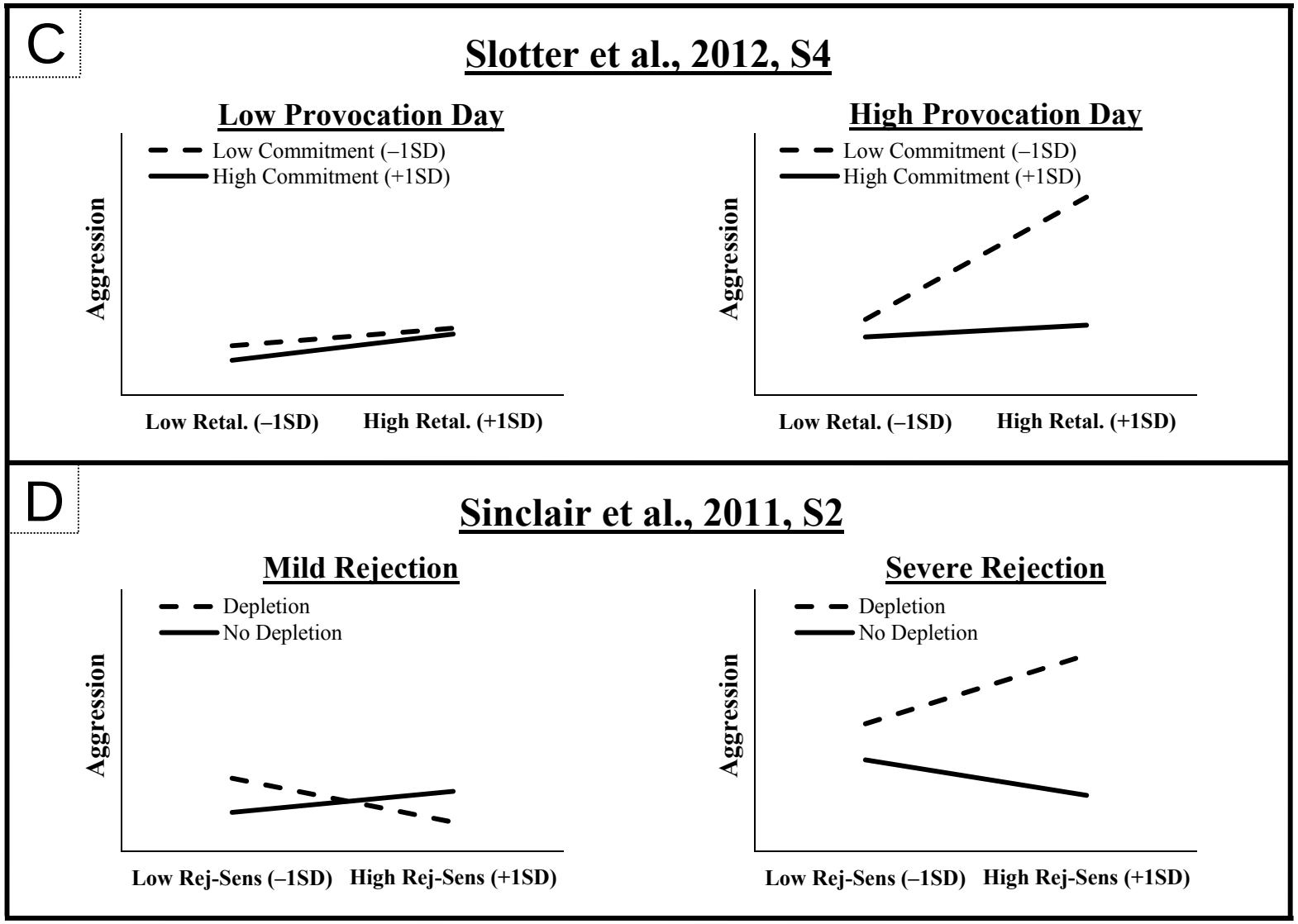
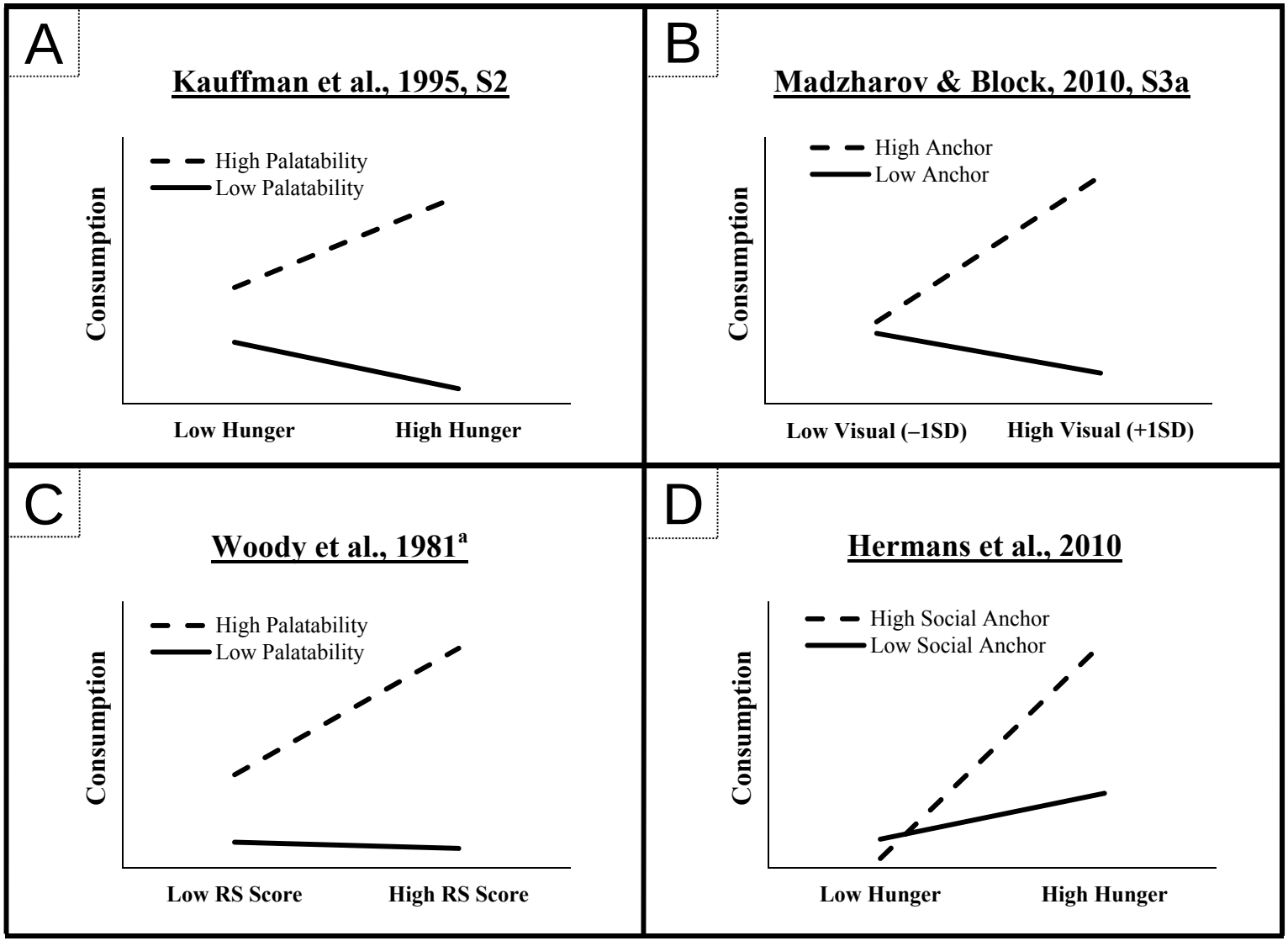


Figure 8 (continued).



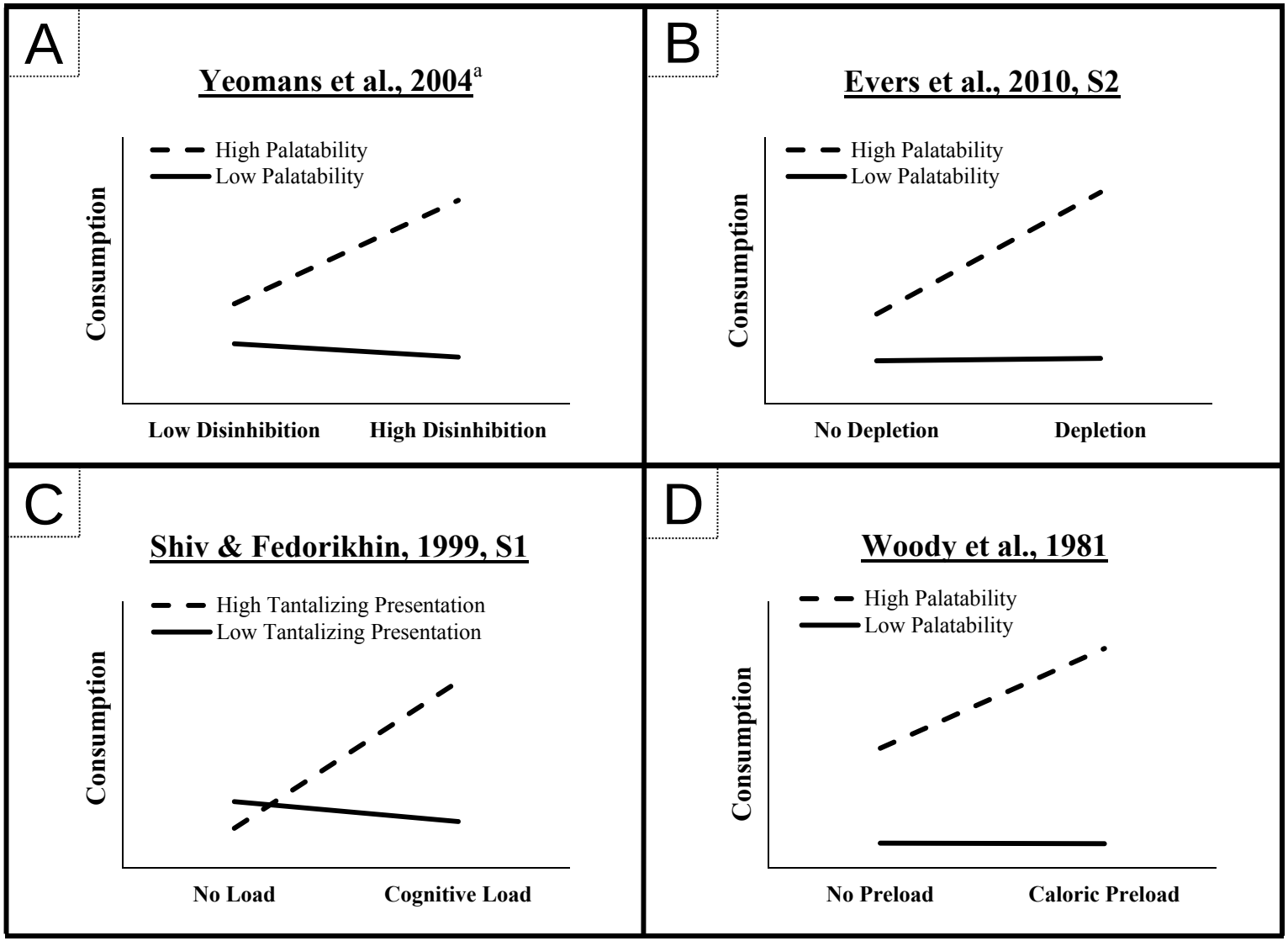
Note. "Retal." = retalation. "Rej-Sens" = rejection-sensitivity.

Figure 9. Four examples of instigator × impellor eating effects (Effect 4) that are consistent with Perfect Storm Theory.



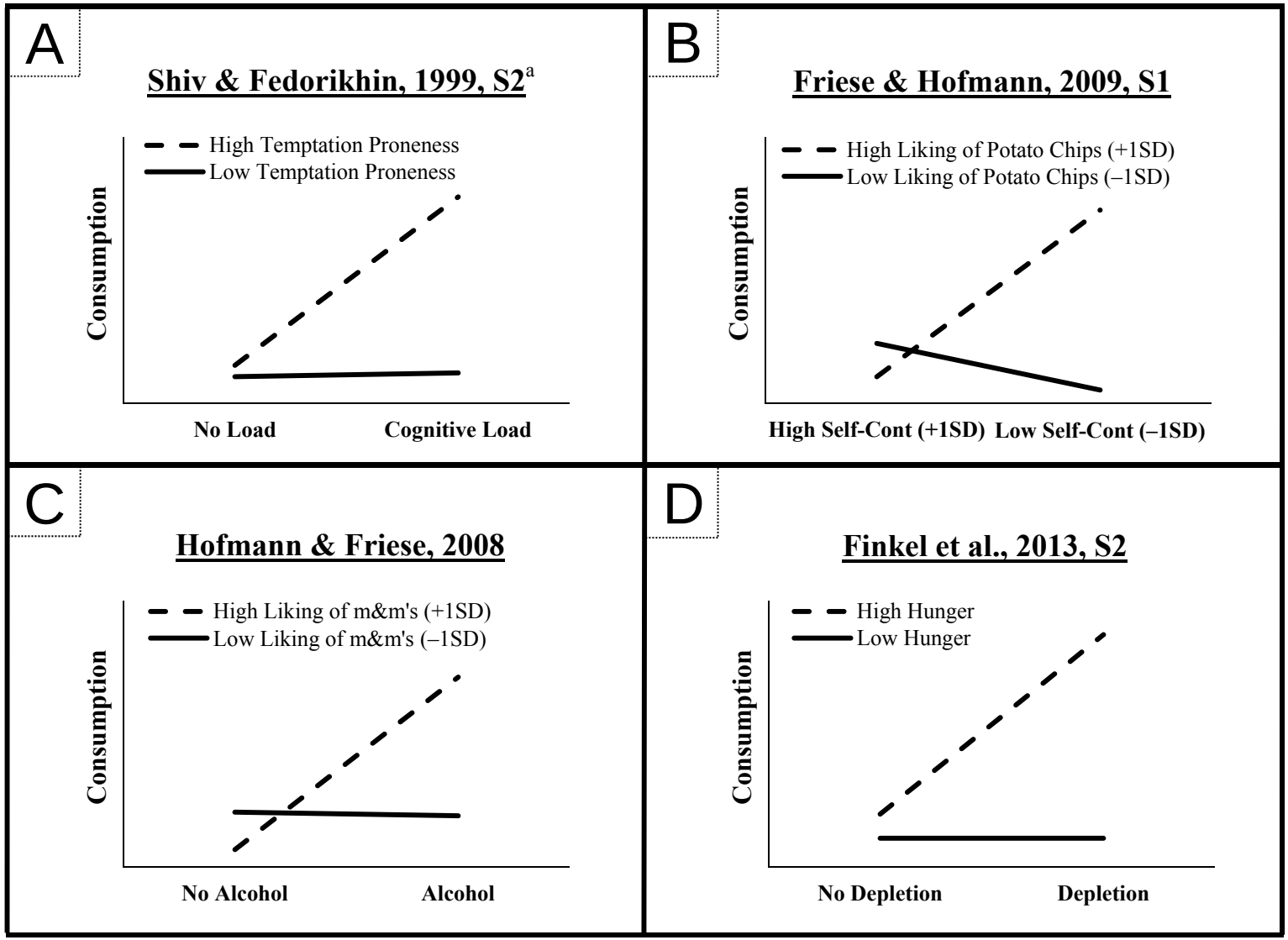
[a] Woody et al. (1981) analyzed and reported data from an ANOVA that employed a median split of the restraint scale (RS).

Figure 10. Four examples of instigator × inhibitor eating effects (Effect 5) that are consistent with Perfect Storm Theory.



[a] Yeomans et al. (2004) analyzed and reported data from an ANOVA that employed a median split of the disinhibition scale.

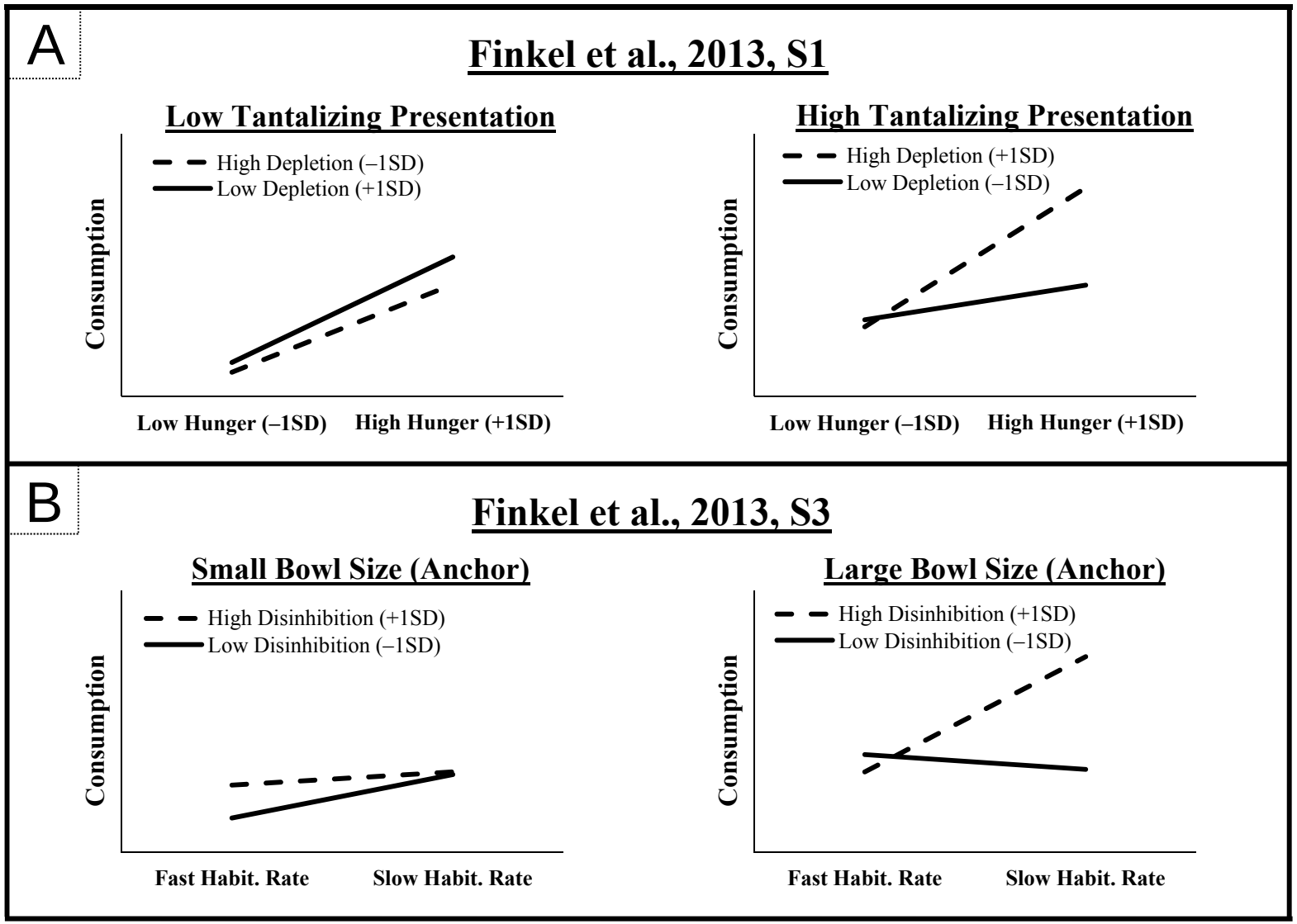
Figure 11. Four examples of impellor × inhibitor eating effects (Effect 6) that are consistent with Perfect Storm Theory.



Note. "Self-Cont" = self-control.

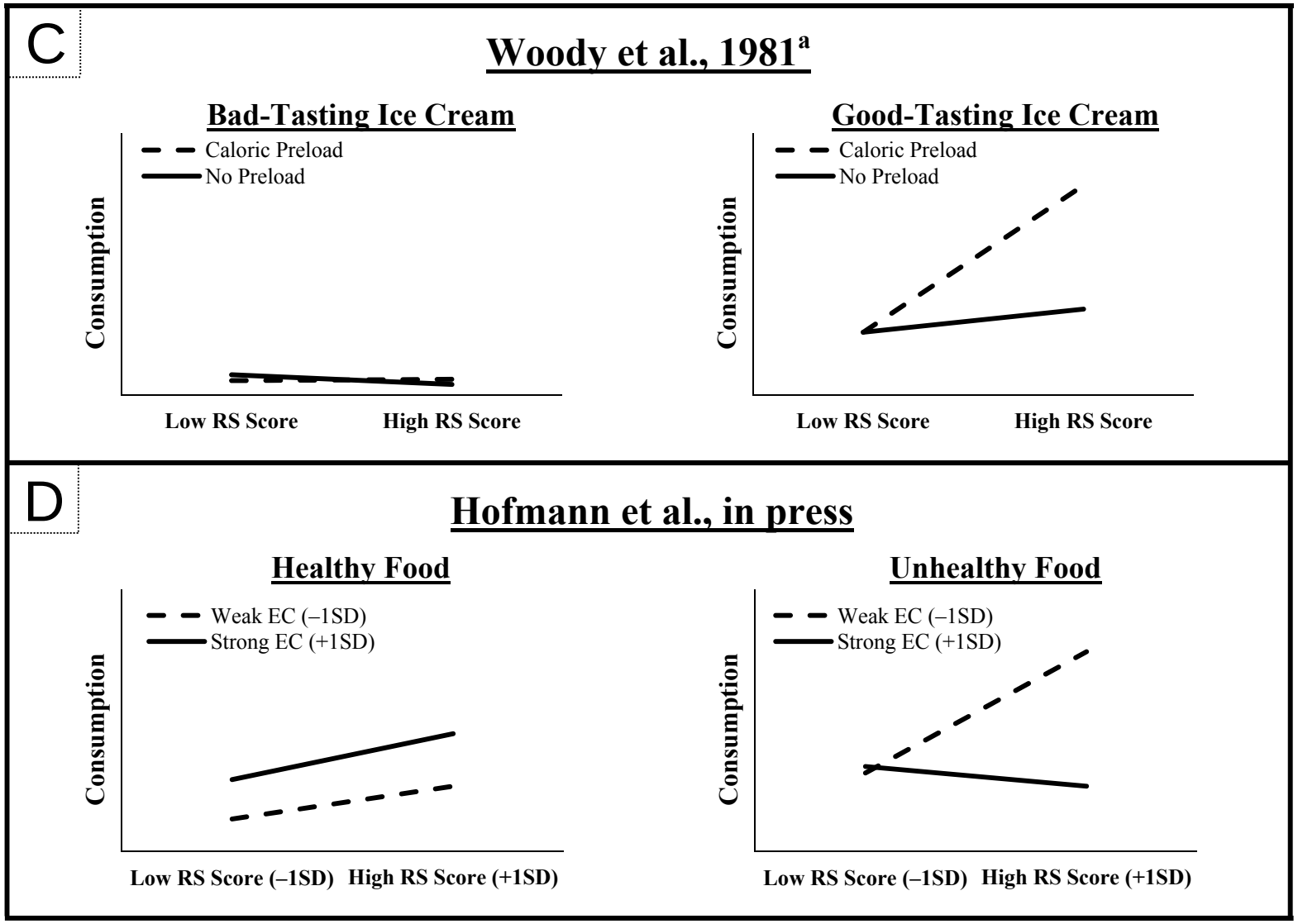
[a] Shiv and Fedorikhin (1999) treated temptation proneness as a continuous variable in their statistical model, although they plotted the means (which form the basis for Panel A) by employing a median split of this variable.

Figure 12. Four examples of instigator × impellor × inhibitor ("perfect storm") eating effects (Effect 7) that are consistent with Perfect Storm Theory.



Note. "Habit. Rate" = habituation rate.

Figure 12 (continued).



EC = executive control.

[a] Woody et al. (1981) analyzed and reported data from an ANOVA that employed a median split of the restraint scale (RS).