License to Lapse: The Effects of Weight Management Product Marketing on a Healthy Lifestyle

Amit Bhattacharjee
The Wharton School
University of Pennsylvania

Lisa Bolton
Pennsylvania State
University

Americus Reed II
The Wharton School
University of Pennsylvania

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Risk Management and Decision Processes Center
The Wharton School, University of Pennsylvania
3730 Walnut Street, Jon Huntsman Hall, Suite 500
Philadelphia, PA, 19104
USA
Phone: 215-898-4589
Fax: 215-573-2130
http://opim.wharton.upenn.edu/risk/

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Amit Bhattacharjee

University of Pennsylvania

Lisa Bolton

The Pennsylvania State University

Americus Reed II

University of Pennsylvania

Abstract

Five experiments demonstrate that the marketing of weight management drugs, but not supplements, undermines healthy lifestyle behaviors. Results suggest that drug marketing can affect behavior in both a mindful way, by undermining healthy behavioral intentions, or in a relatively mindless way, by increasing actual unhealthy consumption after mere exposure. Furthermore, two field studies suggest that erroneous consumer beliefs about drugs and supplements underlie this boomerang effect on consumer health, and only very high levels of expertise (e.g., medical training) are sufficient to eliminate it.

Health care practitioners, policy makers, researchers, and consumer groups alike have expressed concern over the recent rise in obesity rates in the United States. The National Center for Health Statistics (2002) has estimated a 3% annual compound rate of growth in the proportion of obese adults between 1991 and 2001. As of 2004, 32.9% of adults in the United States were obese, and 66.2% were obese or overweight (compared to 15% and 47% in 1980; Ogden et al., 2006).[1] Increasing obesity rates are troubling in light of the associated health risks. For example, the Center for Disease Control has declared obesity a public health epidemic (Seiders & Petty, 2004), and obesity has been linked to increased risks for serious health conditions, such as hypertension, osteoarthritis, high cholesterol, diabetes, heart disease, stroke, gallbladder disease, sleep apnea, respiratory problems, and some cancers (e.g., Koplan, Liverman, & Kraak, 2005; National Center for Chronic Disease Prevention and Health Promotion, 2008; Sturm, 2002). Furthermore, it is estimated that obesity costs the U.S. health care system an additional $100 billion each year (Cleland et al., 2002), with health care costs increasing by 36% and medication costs by 77% (Fitch, Pyenson, Abbs, & Liang, 2004).

Meanwhile, even as obesity rates have risen, people have been trying harder to achieve and maintain a healthy lifestyle. The proportion of U.S. adults consuming low-calorie foods and beverages has grown at a 2.3% annual compound rate (to 60% in 2001), while the proportion of consumers attempting to eat a healthy diet has grown at a 6% annual rate (Calorie Control Council National Consumer Surveys, 2004; Food Marketing Institute, 2005). Moreover, an estimated 72 million Americans are regular dieters, shifting from one purported weight management solution to another (Marketdata Enterprises, 2007). This coincidence of increasing obesity rates and increasing interest in healthier eating and lifestyle habits has been noted by

researchers and dubbed the "American obesity paradox" (Heini & Weinsier, 1997; Seiders & Petty, 2004).

This paradox is especially intriguing in light of the emergence of a multitude of products designed to assist consumers in losing and managing their weight. Presumably, such weight management solutions should mitigate the obesity trend, thereby increasing overall consumer health. However, might the marketing of such products actually be contributing to the prevalence of obesity? The current research proposes that weight management product marketing actually undermines healthy lifestyle behaviors—a *boomerang* effect of such marketing on a healthy lifestyle. Five experiments provide evidence of the boomerang of weight management advertising on intentions to live a healthy lifestyle as well as actual behavior. To our knowledge, no prior research has ever demonstrated a boomerang of weight management advertising on actual consumption *behavior*. Moreover, our research provides the first demonstration that the boomerang phenomenon can arise from *mere exposure* to weight management advertising, underscoring the power and potential importance of the boomerang effect. Further highlighting its robustness, our research demonstrates that nearly all consumers are potentially susceptible to the boomerang of weight management marketing, not just certain types of consumers. Finally, we contribute to the existing literature by systematically examining the erroneous consumer beliefs that underlie this phenomenon, as well as demonstrating how a corrective intervention can mitigate the boomerang of weight management marketing.

Weight Management Products

As the obesity epidemic has attracted increasing attention, researchers have examined many potential drivers of the trend, including nutrition labeling (e.g. Wansink & Chandon, 2006), food packaging sizes (e.g. Scott, Nowlis, Mandel, & Morales, 2008), food marketing

practices (e.g. Seiders & Petty, 2004), portion sizes at restaurants and other consumption environments (e.g., Brownell & Horgen, 2003; Wadden, Brownell, & Foster, 2002), calorie underestimation (e.g., Chandon & Wansink, 2007a; Nestle, 2003), and individual genetic factors (e.g., Dietz, 1991; Stunkard et al., 1991). In the spirit of such research, our work responds to the call made by researchers and policy makers to examine the consequences of weight management advertising on consumer health and welfare (Cleland et al., 2002). Thus, we address an important gap in the literature by investigating consumer response to weight management product marketing in order to shed light on its potential contribution to the obesity epidemic via its impact on a healthy lifestyle.

Indeed, the demand for safe and effective remedies to help lose and manage weight has intensified as obesity rates have risen (Christensen, Kristensen, Bartels, Bliddal, & Astrup, 2007), resulting in a massive and lucrative market for weight management solutions and fat-fighting products. The weight loss product industry in the United States earned an estimated $58.7 billion in 2007, and revenues are projected to reach $68.7 billion by 2010 (Marketdata Enterprises, 2007). Moreover, these weight loss products have promoted themselves heavily to consumers, with the prevalence of weight loss advertising, as well as the number of products, dramatically increasing (Cleland et al., 2002). Given the rise in obesity levels despite increasing efforts to live a healthier lifestyle, consumers are likely to welcome such weight loss products. However, recent research suggests that these appeals may have unintended consequences that actually undermine consumers' efforts to manage weight and live a healthy lifestyle.

The Boomerang Effect

Perceived risk is often a factor in consumer's decision to pursue a healthy lifestyle. A number of decision-making models often applied in the health domain (e.g., protection

motivation theory, the health belief model, subjective expected utility theory, and the theory of reasoned action) maintain that health-protective behavior results from a consideration of the perceived probability and severity of health outcomes, the perceived effectiveness of the protective behavior, and the perceived costs of the action (for a review, see Weinstein, 1993). Thus, threat appraisal (i.e. probability and severity) and coping appraisal (response efficacy and self-efficacy) lead to behaviors that reflect adaptive coping with the perceived risk in the environment (Floyd, Prentice-Dunn, & Rogers, 2000; Milne, Sheeran, & Orbell, 2000). In other words, when people perceive more danger in the environment, they tend to behave more cautiously. Conversely, if people perceive that risk has been reduced, they will adjust their behavior and act less carefully. Evidence of these tendencies, referred to as risk compensation, has been found across various health domains, such as drinking alcohol (Rogers & Greenfield, 1999) and HIV/AIDS (Richens, Imrie, & Copas, 2000). These dynamics of risk compensation have interesting implications for remedies—products and services that, by definition, mitigate risk. The above findings suggest that reducing perceived risks in this manner may result in less cautious behavior by consumers. Thus, information about remedies may encourage the very risky behaviors that the remedies are intended to ameliorate.

Consistent with these findings, recent research suggests that marketing messages for remedies can have unintended consequences, and can sometimes boomerang by undermining risk avoidance and increasing risky behavioral intentions (Bolton, Cohen, & Bloom, 2006). Furthermore, the effect of remedy messages on consumers is moderated by problem status (or the relative attractiveness of the risky behavior), such that those consumers most at risk are most susceptible to this boomerang effect. In other words, as attraction to the risky behavior grows, consumers increasingly perceive remedies as “get out of jail free” cards that remove the risk

from risky behaviors (Bolton et al., 2006). Thus, the marketing of weight management products may actually encourage risky behaviors such as high-fat consumption, especially for those consumers most attracted to unhealthy eating behaviors. Furthermore, bridging the gap between behavioral intentions and behavior is seen as a critical challenge in health psychology (e.g., Sniehotta, Scholz, & Schwarzer, 2005). Although Bolton et al. (2006) demonstrate that remedies can boomerang on behavioral intentions, the effects on actual behavior remain unexplored. This important gap is addressed in the present research, which examines actual consumption behavior.

Weight Management Products and a Healthy Lifestyle

Given the scope and nature of the obesity epidemic, the boomerang phenomenon assumes particular importance in this domain. Moreover, recent findings suggest that drug marketing can undermine consumer health, with two psychological mechanisms driving the effect (Bolton, Reed, Volpp, & Armstrong, 2008). First, drug marketing reduces consumer perceptions of health risk and the perceived importance of complementary health-protective behaviors. Thus, consumers are less motivated to engage in these healthy behaviors, undermining a healthy lifestyle. This mechanism is consistent with the notion of adapting one's behavior to perceived risk (e.g., Floyd et al., 2000; Milne et al., 2000). Second, drugs are associated with poor health, reducing consumers' perceptions of their own health. Thus, their self-efficacy is reduced, leaving consumers feeling less capable (e.g., Bandura, 1977; 1986), and thereby diminishing their perceived ability to engage in complementary behaviors. Lacking both motivation and perceived ability to undertake health-supportive behaviors, consumers' intentions to lead a healthy lifestyle are undermined (Bolton et al., 2008). Interestingly, this pattern does not hold for supplements. Unlike drugs, supplements are not associated with poor health, and suggest by their very name that they are meant to be used in conjunction with other health-protective behaviors as part of a

healthy lifestyle. While this research is an important addition to the literature, Bolton et al. (2008) again restrict their inquiry to hypothetical scenarios and do not test actual behavior. Furthermore, although lay definitions of drugs and supplements have been explored, a more systematic investigation of the role of lay beliefs about weight management remedies has not been conducted. This important gap is also addressed in the present research, which measures consumer beliefs and tests susceptibility to the boomerang effect of weight management products at different levels of knowledge.

Related Phenomena

A growing body of findings reinforces the importance of examining ways in which weight management products can undermine consumer health. For instance, recent research suggests that low-fat labels on foods and health claims at fast food restaurants may have similar boomerang effects on consumer health, encouraging overconsumption (Chandon & Wansink, 2007b; Wansink & Chandon, 2006). These effects of low-fat labels were particularly acute among overweight consumers, suggesting a parallel to the problem status construct proposed by Bolton et al. (2006). Indeed, the relative attraction of the consumer to risky behaviors such as high-fat eating is a critical construct in the domain of obesity and weight management.

For instance, Hays et al. (2002) have demonstrated that overweight people exhibit a greater tendency to lose control when eating. A large stream of literature has examined restrained eaters, who are concerned with dieting and resisting their impulses to eat (e.g., Fedoroff, Polivy, & Herman, 1997; Herman & Polivy, 1984; Scott et al., 2008). Consistent with the findings of Bolton et al. (2008), restrained eaters must use cognitive resources to regulate eating behavior, and require adequate motivation and ability to do so. Impairing one or both may lead to overconsumption (Herman & Polivy, 1984; Stroebe, Mensink, Aarts, Schut, & Kruglanski,

2008). Furthermore, because food items are likely to be highly emotionally arousing to them, restrained eaters are particularly vulnerable to self-control breakdowns and resulting bouts of unhealthy consumption (Baumeister & Heatherton, 1996). Food cravings have been pinpointed as precursors of binge eating, and are thus important risk factors associated with the development of obesity (e.g., Kemps & Tiggemann, 2007; Kemps, Tiggemann, & Grigg, 2008).

Thus, examining characteristics of consumers and consumption situations that alter the attraction of consumers to such risky behaviors is an important avenue of research. Our work adds to this growing body of literature, while also addressing fundamental questions about robustness of the boomerang of weight management marketing. Specifically, are only certain "types" of consumers susceptible to the effects of weight management product marketing? Will the effects hold for more health-conscious or better-educated consumers? Does the boomerang extend beyond healthy lifestyle intentions to actual behavior? If the phenomenon is indeed robust and important, then what underlies it and how can its deleterious effects be mitigated? The current research addresses these unanswered yet critical questions.

Overview and Contributions

The current research makes five notable contributions above and beyond existing research. Figure 1 outlines these contributions, and the focus of each experiment, in an organizing framework. To begin, past research (e.g., Bolton et al., 2006; 2008) has tested the boomerang effect of remedy marketing exclusively on behavioral intentions in response to hypothetical scenarios. We test the generalizability of these findings to the important domain of weight management products in Experiment 1A. However, prior research has failed to examine the effects of drug marketing on *actual behavior*. Experiment 1B is the first empirical test of the influence of weight management product marketing on the actual consumption of a high-fat

snack food. Second, extant research (Bolton et al., 2006; 2008) has investigated the boomerang phenomenon only after imagined consumption of a remedy. Experiment 1B also addresses this limitation by providing the first test of the potential of *a single exposure* to a weight management product to produce a boomerang effect on healthy lifestyle behavior.

Third, Experiments 1A and 1B respectively examine the moderating influence of a stable individual psychological difference (i.e., body image) and a transient visceral state (i.e., hunger) that alter the relative attractiveness of the risky behavior on the boomerang effect. Past research has investigated differential attraction to risky behavior, typically by looking at different types of individuals with distinct behavioral tendencies (such as restrained eating; e.g., Herman & Polivy, 1984; Scott et al., 2008). In other words, these findings suggest that only certain types of people are especially susceptible to risky behaviors that undermine health. In contrast, the present research tests whether all consumers might potentially be susceptible, due to transitory hunger states, to the boomerang effect of weight management product marketing.

Insert Figure 1 about here

Fourth, the present research identifies and investigates the specific lay beliefs about weight management products that underlie the boomerang on a healthy lifestyle. Although Bolton et al. (2008) point to the potential importance of consumer beliefs, the role of consumer knowledge was neither measured nor systematically tested. In addition to identifying specific lay beliefs about weight management products, the present research tests whether such beliefs underlie the boomerang phenomenon. In doing so, experiments 2A and 2B examine the susceptibility of actual consumers with varying levels of knowledge to the boomerang phenomenon using both laboratory and field samples.

Finally, our research addresses the interesting question of the normatively correct response: that is, how *should* consumers respond to the marketing of weight management products? To address this question, Experiment 2A investigates the beliefs of consumers versus individuals with specialized training in order to examine the extent to which typical consumer beliefs are normatively correct. Inasmuch as our research establishes that non-normative beliefs are held by consumers who lack such training, Experiment 3 builds on the first four studies by testing the potential of a corrective intervention to neutralize the boomerang of weight management drug marketing. In doing so, we also provide further evidence for the psychological mechanisms of perceived ability and motivation that mediate the boomerang effect on a healthy lifestyle.

Experiment 1A: Boomerang of Weight Management Product Marketing

The current study sought to investigate the boomerang effect on consumer health in the domain of obesity and weight management products. We measured the impact of weight management drug marketing on behavioral intentions to engage in healthy lifestyle behaviors. We also examined the influence of body image as a stable psychological operationalization of problem status. Consistent with recent findings on the marketing of remedies (Bolton et al., 2006; 2008), we predicted that weight management drugs (vs. supplements) would reduce risk perceptions, and, in turn, healthy behavioral intentions. Furthermore, we predicted that body image would moderate this relation, with at-risk consumers more susceptible to the boomerang effect.

Method

Participants and Design. The experiment was a 2-group (Drug vs. Supplement) between-subjects design, with body image as a measured covariate. Participants were staff and students

(recruited from two local universities and a hospital) who received financial payment for participating in the study. Sixty-six participants completed the study.

Materials and Procedure. Participants completed the experiment in three phases. In the first phase, participants completed a "self-perception questionnaire". Embedded in this longer questionnaire was a 10-item six-point self-image scale (Cooper, Taylor, Cooper, & Fairburn, 1986; Evans & Dolan, 1993). This scale included items reflecting participants' self-perceptions about their body (e.g., "Have you avoided wearing clothes which make you particularly aware of the shape of your body?", "Have you felt that it is not fair that other people are thinner than you?"). This covariate was intended as a subjective measure of problem status related to the risky behavior (eating fatty foods). Participants also provided height and weight information as an objective complement to this measure.

In the second phase, participants completed a "consumer promotion study" and were exposed to one of two advertisements. Each message began by warning about the risks of high-fat eating and recommended that participants "Avoid fatty foods and follow a sensible eating plan. This is the only way to achieve an overall healthy lifestyle." The message continued with the exclaimer "Until Now! Introducing Chitosan RX Ultra" and then provided additional information about a fat-fighting product ("When taken with fatty foods, [it] absorbs up to 60% of the fat in your food so that it doesn't end up in your digestive system or on your body"). In the drug condition, the product was described as an FDA-approved drug and a label on the bottle indicated FDA Drug. In the supplement condition, the product was described as a natural herbal supplement and a label on the bottle indicated Supplement. After an open-ended thought-listing task, participants rated the ad on four five-point scales (with endpoints "very unfavorable/very favorable", "bad/good", "really dislike/really like", "negative/positive") and rated the product's

perceived performance on five-point scales (with endpoints “low quality/high quality”, “ineffective/effective”, “harmful/harmless”, “useless/useful”, “a bad means of protection/a good means of protection”, “risky/safe”, “addictive/non-habit forming”, and “unreliable/reliable”). As a manipulation check, participants also rated their perception of the product as a supplement or drug on two seven-point scales (with endpoints “a medicine/a supplement”, “a drug/a vitamin”).

In the third phase, participants completed a “restaurant dining study”. In the cover story, participants were instructed to imagine themselves dining out with family and friends, looking forward to a meal because moderately hungry, and taking the product. Participants were then shown four menus, each with multiple items for 3 meals (lunch, dinner and dessert). The menu items within each meal varied in terms of fat content and always included at least one low-fat item. Participants then chose a menu item from each meal on each menu (i.e., 4 menus X 3 meals = 12 choices). Participants were also asked to provide behavioral intention ratings (“please indicate the likelihood that you would order each item on the menu”) on 0-100% scales (with endpoints “definitely would not order / definitely would order”) for a subset of each menu’s items, some high-fat. These measures were designed to capture unhealthy lifestyle intentions. Finally, subjects provided overall ratings of each menu on various dimensions as part of the cover story. As part of this task, participants were asked to rate their personal perceptions of the fat content (“how fatty do you personally find each menu item”) on eleven-point scales (with end-points “low fat/high fat”) for a subset of each menu’s items, some high-fat.

Results

Subsequent results are reported based on analyses of dependent variables as a function of drug/supplement, body image (a measured covariate), and their interaction. As outlined above, we predicted an interaction of drug/supplement and problem status on health risk perceptions and

behavioral intentions.

Manipulation Checks. Average perceptions (coefficient $\alpha = 0.77$) of the product as a supplement were marginally higher in the supplement versus drug conditions ($M_{supplement} = 4.62$ (1.88) vs. $M_{drug} = 3.58$ (1.98); $F(1, 62) = 3.72$, $p = .06$)—indicating that our manipulation was reasonably successful. In addition, average performance perceptions (coefficient alpha 0.87) did not differ for the drug or supplement ($M_{drug} = 1.81$ (0.68) vs. $M_{supplement} = 2.04$ (0.67); $F(1, 62) = 1.37$, $p = .25$) nor did average attitude (coefficient $\alpha = 0.96$; $M_{drug} = 2.10$ (1.01) vs. $M_{supplement} = 1.74$ (0.82); $F(1, 62) = 2.00$, $p = .16$). As intended, the manipulation did not influence other perceptions or preference (e.g., the drug and supplement are perceived as equally effective, safe, a good means of protection, etc.).

The body image scale (coefficient $\alpha = 0.91$) was averaged and then standardized ($M = 0$ (1)) for use as a covariate reflecting problem status (with higher values indicated more body image concerns, and thus greater risk) in subsequent analyses. (Recall that we predicted a boomerang effect for drugs versus supplements as a function of body image.) Note that body image correlated positively ($r = 0.27$, $p < .01$) with Body Mass Index (calculated using height and weight information), indicating that self-image does reflect a more objective measure of risk or problem status (i.e., BMI).

Risk Perceptions. An index reflecting average fattiness perceptions for high-fat menu items was calculated. ANOVA of this index indicates a significant effect of drug/supplement ($M_{drug} = 7.65$ (0.92) vs. $M_{supplement} = 8.23$ (0.99); $F(1, 62) = 6.12$, $p < .05$), such that fattiness perceptions were lower in the drug versus supplement condition. This result is suggestive of a boomerang effect, regardless of problem status, on risk perceptions for the drug versus the supplement. That is, the drug alone is sufficient to neutralize the fat in food; the supplement is

not (because other accompanying activities are needed to neutralize it in the consumer).

Behavioral Intentions. Two behavioral intention measures were constructed: 1) the number of high-fat items chosen across menus; and 2) average intention scores for high-fat menu items. As expected, MANOVA revealed a significant interaction of body image and drug/supplement ($F(1, 62) = 4.88$, $p < .05$). Choice of high-fat items increased with body image in the drug versus supplement condition ($b_{drug} = 0.87$ (0.54) vs. $b_{supplement} = -0.36$ (0.44)). Similarly, the intentions index increased with body image in the drug versus supplement condition ($b_{drug} = 2.72$ (1.34) vs. $b_{supplement} = -2.24$ (1.09)). This pattern of coefficients reflects a boomerang effect of the drug (vs. supplement) on behavioral intentions as a function of body image concerns.

To summarize: risk perceptions declined, and healthy lifestyle intentions decreased as body image concerns increased, for a weight management drug versus a supplement. We argue that the boomerang effect on behavioral intentions emerges as body image concerns rise due to the perception that the drug *alone*, in contrast to the supplement, is sufficient to take the risk out of risky behavior.[2] In later studies, we argue that erroneous beliefs about weight management products facilitate such reasoning. A supplement, by its very name, reminds consumers that the product is meant to be used in conjunction with other complementary protective behaviors that contribute to a healthy lifestyle (such as low-fat eating). In contrast, a drug acts as a get-out-of-jail-free card (Bolton et al., 2008), taking the risk out of unhealthy behavior and thereby encouraging it.

Experiment 1B: Boomerang on Actual Consumption Behavior after Mere Exposure

Though Experiment 1A provides evidence of the boomerang effect of weight management drug marketing on consumer healthy behavioral intentions, whether these findings

will generalize to actual behavior is an open question. Experiment 1A asked participants to imagine themselves in hypothetical scenarios. Although a scenario-based approach has ample precedent in the literature, the current study was designed to investigate the effects of weight management drug marketing on *actual* behavior relevant to a healthy lifestyle: consumption of a high-fat food. In order to provide a conservative test, consumption was recorded after a single exposure to weight management marketing; demonstrating a boomerang under these conditions would support the robustness of the phenomenon. Moreover, Experiment 1A instantiated problem status as a stable psychological trait, in accordance with the large literature on certain types of consumers being more prone to overconsumption and unhealthy behavior (e.g. restrained eaters; Fedoroff, Polivy, & Herman, 1997; Herman & Polivy, 1984; Scott et al., 2008). Instead, the current study examines hunger, a visceral drive-state, as an alternate operationalization of problem status, since it should also alter the relative attractiveness of the risky behavior. We predicted greater consumption of a high-fat snack after mere exposure to a weight management drug (vs. supplement) advertisement, a tendency that should increase with hunger.

Method

Participants and Design. The experiment was a 2-group (Drug vs. Supplement) between-subjects design, with hunger as a measured covariate. Participants were staff, students, and area residents, recruited through a local university, who received financial payment for participating in the study. A total of 162 participants took part in the experiment.

Materials and Procedure. Participants completed the experiment in three phases. In the first phase, participants completed a "self-perception questionnaire," including a measure assessing their self-reported hunger on a seven-point scale: "Please rate how hungry you are at

this moment," with endpoints "very full" and "very hungry". Since problem status concerns the relative attractiveness of the risky behavior to the consumer, this hunger measure serves as a visceral operationalization of problem status in the consumption setting.

The second phase mirrored the second phase from Experiment 1A. Participants completed a "consumer promotion study" and were exposed to one of two advertisements for a weight management product. Each message began by asking "Are you fighting fat unarmed?" and warned about the risks of high-fat eating. The advertisement continued: "But a powerful new weapon has arrived…Introducing Chitosan RX Ultra." Chitosan was introduced as a fat-fighting product capable of absorbing "up to 60% of the fat in your food so that it doesn't end up in your digestive system or on your body". As in Experiment 1A, in the Drug condition, the product was described as an FDA-approved drug, while in the Supplement condition, the product was described as a natural herbal supplement. After exposure to the advertisement, using the same measures described in Experiment 1A, participants rated Chitosan on measures of attitude, likelihood of use, perceived performance, perceived effectiveness, and, as a manipulation check, perception as a drug or supplement.

In the third phase, participants completed a "viewing experience study". Participants were instructed to relax and watch a series of entertaining video clips. During this task, participants were offered M&Ms (a high-fat food)[3] as a snack (which they were told were left over from another study). Participants were not required to eat any M&Ms, but were free to consume as few or as many as they liked. Watching videos was intended to represent a typical consumption setting. After the viewing task ended, participants' bowls were collected and the number of M&Ms consumed was discreetly counted by a research assistant blind to condition.

Results

In total, 150 participants completed all phases of the study. The hunger item was standardized ($M = 0$ (1)) for use as a covariate reflecting problem status. Note that hunger did not correlate with Body Mass Index (calculated using height and weight information; r = 0.020, $p = 0.808$) or with a measure of body image (r = 0.007, $p = 0.930$), suggesting that this measure of problem status concerns a transient visceral factor unrelated to stable traits relevant to health or consumption. Subsequent analyses were conducted as a function of product (drug/supplement), hunger, and their two-way interaction.

Manipulation Checks. The success of our drug/supplement manipulation was assessed by creating an index of the perceptions of the product as a drug or a supplement. Average perceptions of the product as a drug were marginally higher in the Drug versus Supplement condition ($M_{drug} = 3.63$ (0.089) vs. $M_{supplement} = 3.39$ (0.101); $F(1, 152) = 3.22$, $p = 0.075$), indicating that our manipulation was reasonably successful. In addition, average perceptions of effectiveness did not differ across the Drug or Supplement conditions ($M_{drug} = 2.45$ (0.091) vs. $M_{supplement} = 2.44$ (0.104); $F(1, 152) < 1$), nor did attitude toward the product ($M_{drug} = 2.55$ (0.116) vs. $M_{supplement} = 2.44$ (0.133); $F(1, 152) < 1$). Thus, as intended, the manipulation affected perception of the product as a drug versus supplement but did not influence other perceptions or preferences (i.e., the product was perceived as equally positive, effective, safe, a good means of protection, etc., whether it was described as a drug or supplement).[4]

Consumption Behavior. The amount of high-fat food (M&Ms) consumed was predicted to vary as a function of problem status (i.e., hunger), product (Drug vs. Supplement), and their two-way interaction. As expected, the distribution of M&M consumption among participants was not normally distributed, and displayed significant skewness (Shapiro-Wilk tests and Kolmogorov-Smirnov tests both yielded highly significant test statistics, $p < 0.001$, indicating

significant deviation from normality). Because the assumption of normality was violated, traditional regression models are inappropriate (Irwin & McClelland, 2001). Given the nature of the response data, a Poisson regression model was used (McCullagh & Nelder, 1989).

A Poisson regression analysis indicated highly significant effects of drug/supplement (M_{drug} = 26.62 (0.586) vs. $M_{supplement}$ = 18.29 (0.541); b = 0.375; $\chi^2(1) = 103.51$, $p < 0.0001$) and hunger (b = 0.198; $\chi^2(1) = 221.89$, $p < 0.0001$), qualified by their interaction (b = 0.139; $\chi^2(1) = 14.94$, $p < 0.001$).[5] Specifically, participants consumed more high-fat food when the advertisement described a drug versus a supplement, and participants consumed significantly more M&Ms as self-reported hunger increased prior to consumption. More importantly, hunger increased M&M consumption more after exposure to a drug than a supplement (b = 0.139, reflecting the effect of hunger in the drug condition relative to a supplement baseline of b = 0). Figure 2 illustrates the interaction of weight management product type and hunger.

Insert Figure 2 about here

These results reflect a boomerang effect of weight management drug marketing: consistent with predictions, as hunger intensified, high-fat consumption increased faster for participants exposed to drug (but not supplement) advertising. Importantly, a *single exposure* to weight management product marketing was sufficient to drive the boomerang, which is particularly worrisome given the prevalence of such weight loss advertisements in the marketplace. Furthermore, the current results indicate that transient drive-states like hunger can moderate the boomerang effect. Thus, it is not only certain "types" of consumers (e.g. restrained eaters) who are susceptible to this effect, but rather anyone to whom unhealthy consumption behavior is either consistently or momentarily attractive.

Discussion

Together, Experiments 1A and 1B provide evidence for a boomerang effect of weight management drug marketing on consumer behavior in two contexts: 1) when consumers imagine taking the drug and indicate health-relevant behavioral intentions; and 2) when consumers are merely exposed to the drug and engage in actual high-fat eating behaviors. Furthermore, the boomerang effect is exacerbated by both stable psychological traits such as at-risk body image and visceral drive-states like hunger. These results point to the robustness of the phenomenon and its potential importance in the context of weight management and obesity. A natural question then arises: What underlying factors drive the boomerang of weight management product marketing?

Many researchers have argued for the need to examine consumer lay theories that guide such decisions, particularly in domains such as weight management, where self-regulation is important (Molden & Dweck, 2006). Furthermore, a large body of research suggests that inaccurate or distorted consumer beliefs underlie many decisions related to nutrition, consumption, and health (e.g., Chandon & Wansink, 2007a; Nestle, 2003; Raghunathan et al., 2006). Meanwhile, others have argued that even greater levels of nutrition knowledge may not correct erroneous inferences (e.g., Andrews, Netemeyer, & Burton, 1998; Moorman, 1990). Hence, the role of consumer beliefs in producing the boomerang effect seems important to explore, particularly in the domain of weight management and obesity.

Although weight management drugs and supplements are defined according to federal regulations, it seems likely that consumers may not fully comprehend these regulatory differences, and may thus make relevant decisions on the basis of erroneous beliefs. Drug and supplement marketing often rely on scientific jargon that may not be clearly understood (Haard,

Slater, & Long, 2004), and consumers are not likely to be knowledgeable enough to make the necessary fine distinctions (Mason, 1998). Moreover, consumers may simply process marketing messages regarding drugs and supplements in a biased fashion (France & Bone, 2005). Faced with making decisions with incomplete information and insufficient expertise, consumers are likely to generate inferences on the basis of their lay theories (Broniarczyk & Alba, 1994; Sujan & Dekleva, 1987). Thus, it is crucial to understand the nature of consumers' beliefs about weight management products and how they guide consumer decision-making (cf. Alba & Hutchinson, 1987). Experiments 2A and 2B systematically explore these consumer lay beliefs.

Experiment 2A: Erroneous Lay Beliefs Underlying the Boomerang

The present experiment has two purposes: for external validity, we seek 1) to broaden our investigation of consumer perceptions of drugs and supplements to other population samples, and 2) to examine the role of lay knowledge of weight management products. First, we utilize both laboratory and field samples of consumers with a range of knowledge levels to provide evidence for the generalizability of the boomerang phenomenon. Second, we utilize a quantitative measure of consumer knowledge. If erroneous consumer beliefs underlie the weight management product boomerang, then it seems reasonable to surmise that accurate knowledge of drugs and supplements will reduce the previously observed effects.

Method

Participants and Design. The experiment was a 2-group between-subjects design, with information about the drug and supplement manipulated at two levels, and drug/supplement knowledge as a measured covariate. Participants were drawn from two sources: 1) 80 adults recruited from the mailing list of a university-affiliated daycare center that received a financial donation for each completed response in a field study; and 2) 162 staff and students (recruited

from two local universities and a hospital) who received financial payment for participating in the study.

Materials and Procedure. Participants responded to a short scenario describing a drug and a supplement for weight management. For exploratory purposes, information about the relative effectiveness of the drug and supplement was manipulated at two levels, as shown in square brackets:

> "Assume that there are 2 brands of weight management products in the marketplace. One is a drug available over-the-counter at your local drug store; one is a supplement available in the vitamin and supplement section of your local drug store. Both products are taken when eating to reduce fat absorption from foods. [In independent testing, both were equally safe and effective. / In independent testing, both were equally safe.]"

Participants then responded to the following dependent variables: "With which product will it be more important that you also follow a low-fat eating plan?" and "With which product will it be more important that you also exercise regularly?" Responses were collected on two seven point scales, with endpoints "The drug/The supplement" and midpoint "No difference". The scenario then continued as follows:

> "Imagine two men: each man is 40 years old and six feet tall and weighs 185 pounds (about ideal for a man of this age and height). To help manage his weight, Bob takes the over-the-counter drug and Bill takes the supplement."

Participants were then asked: "Who has a more serious weight problem?"; "Who has more ability to… engage in an exercise program?" and "…follow a low-fat diet?", "Who is more motivated to… engage in an exercise program?" and "… follow a low-fat diet?" These responses, intended as measures of health perceptions and motivation and ability to engage in healthy lifestyle practices, were collected on five seven-point scales, with endpoints "Bob/Bill" and mid-point "No difference". Participants were also asked to rate perceptions of efficacy on six seven-point scales (with endpoints "Bob/Bill" and mid-point "No difference") as follows: "Who

is more… powerful, strong, self-reliant, dependent, weak, ineffectual?" The latter three items were reverse-coded.

Participants then responded to a 10-item questionnaire designed to measure their knowledge of weight management products. Sample items included: "Supplements are natural substances whereas drugs are man-made chemicals (T/F)"; "The FDA evaluates reports of supplement studies before supplements can be marketed (T/F)". Finally, participants responded to additional background questions, including "whether your background or occupation involves special knowledge or training about drugs and/or supplements. (For example, check yes if you are a doctor, nurse, pharmacist, nutritionist, or other health care professional.)".

Results

For ease of reporting, indices were constructed to reflect: 1) healthy lifestyle beliefs, by averaging the two items measuring the importance of low-fat eating and exercise (coefficient α = 0.80); 2) motivational beliefs, by averaging the two items measuring motivation to engage in low-fat eating and exercise (coefficient α = 0.87); 3) ability beliefs, by averaging the two items measuring ability to engage in low-fat eating and exercise (coefficient α = 0.75); 4) an efficacy index, by averaging the six-item efficacy scale (coefficient α = 0.87); and, 5) a knowledge score, by counting the number of correct responses on the ten-item drug/supplement knowledge survey. For the first four indices, higher numbers represent judgments favoring the supplement over the drug (i.e., higher importance of healthy lifestyle practices, and higher perceived motivation, ability and efficacy for supplements than drugs).

Descriptive results for each index are reported in Table 1. For illustrative purposes, we have broken down responses into three groups, separating out as "experts" those respondents in the field (i.e. daycare mailing list) sample who reported specialized knowledge or training

concerning weight management products. The mean ratings of these experts (N = 26) were then compared with the ratings of the nonexpert field sample respondents (N = 54) and the lab sample respondents (N = 162). The mean scores on the knowledge survey bear out this distinction, with the experts scoring higher than both other groups ($M_{field\text{-}expert}$ = 8.12 (1.45), $M_{field\text{-}nonexpert}$ = 7.02 (2.18), M_{lab} = 6.55 (1.03), p's < .01). Moreover, the experts also revealed very high levels of education, with 73.1% reporting graduate-level degrees (i.e., Master's or PhD), compared to 59.6% in the non-expert field group (consistent with the university affiliation of most of the daycare parents) and 10.2% in the lab group.

Insert Table 1 about here

Notably, among the expert group, judgments across all dependent variables (healthy lifestyle beliefs, health severity perceptions, perceived motivation, ability and efficacy) favored neither drug nor supplement (in non-neutral t-tests, all n.s.). This evidence can be interpreted as support for the argument that weight management drug and supplement reactions should not differ on these measures (i.e., that differences reflect a non-normative "bias"). In contrast, participants in the other samples showed the expected results favoring the supplement over the drug (in non-neutral t-tests, all p's < .05). That is, consumers were perceived as less motivated, able, and likely to engage in healthy lifestyle behaviors while taking the drug versus supplement—consistent with the expected boomerang. This evidence suggests that even consumers with high levels of formal education (such as our non-expert field group) may be susceptible to boomerang effects of weight management drug marketing. Results for the four healthy lifestyle indices are displayed in Figure 3.

Insert Figure 3 about here

Planned analyses of the dependent variables were then conducted as a function of an exploratory information manipulation (equally effective vs. no information), drug/supplement knowledge covariate (standardized $M = 0$ (1)), and their interaction. The effectiveness information manipulation and its interaction with knowledge yielded no significant results (with one exception[6]); in contrast, knowledge had consistent effects as expected. First, ANOVA of the healthy lifestyle index revealed a significant effect of knowledge ($F(1, 239) = 10.50$, $p < .01$; $b = -0.32$ (0.14)). As the coefficient of the knowledge covariate indicates, low-fat eating and exercise ratings declined (i.e., favored supplements over drugs *less*) as drug/supplement knowledge increased. This result reflects a decline in the boomerang with increased knowledge. Second, ANOVA of the health severity rating revealed a significant effect of knowledge ($F(1, 230) = 8.82$, $p < .01$; $b = 0.47$ (0.14)): as knowledge increased, health severity perceptions increased (i.e., favored supplements over drugs less). Third, ANOVA revealed a significant effect of knowledge for the ability index ($F(1, 230) = 14.03$, $p < .01$; $b = -0.36$ (0.11)), motivation index ($F(1,230) = 4.90$, $p < .05$), $b = -0.30$ (0.15)), and efficacy index ($F(1, 230) = 14.94$, $p < .01$; b = -0.30 (0.10)): as knowledge increased, motivation, ability and efficacy ratings all declined (i.e., favored supplements over drugs less).

In other words, as knowledge increases, consumer response shifts toward the midpoint on the healthy lifestyle index. The midpoint represents no difference in response for drugs and supplements (i.e., no boomerang of drug versus supplement marketing), which the opinion of the expert group establishes as the normatively correct response. A similar pattern is expected and observed on all key dependent variables: responses favor the supplement over the drug (i.e., consumers are perceived as less motivated, able, and likely to engage in healthy lifestyle

behaviors while taking the drug versus supplement), and knowledge reduces that bias. These results are entirely consistent with the idea that erroneous consumer beliefs underlie the boomerang, and that higher levels of accurate knowledge about weight management products will reduce responses favoring supplements over drugs, thereby reducing the boomerang of weight management drugs. Nonetheless, as a median split of the knowledge covariate indicates (not reported for brevity's sake), even at higher levels of knowledge, participant responses on all dependent variables continue to favor the supplement over the drug (in non-neutral t-tests, all p's $< .05$). These results are also consistent with the descriptive statistics for each group reported previously.

In sum, although accurate knowledge does reduce the bias favoring supplements over drugs indicative of a drug boomerang, only the highest levels of knowledge—reflecting specialized training or background in weight management products—appear sufficient to eliminate it. Thus, even otherwise highly educated consumers appear susceptible to boomerang effects for weight management drug marketing. We interpret this evidence as suggesting that our findings thus far are likely to generalize to other populations in which knowledge about drugs and supplements is likely to be far less than that of trained professionals.

Experiment 2B: Further Field Evidence of Erroneous Lay Beliefs

For generalizability purposes, we conducted another follow-up study in a field sample—specifically, members of a fitness club. On the one hand, it could be argued that such respondents place more importance on healthy lifestyle practices such as regular exercise (as evidenced by their fitness club membership) and therefore will be less susceptible to the previously observed effects.[7] On the other hand, Experiment 2A suggests that drug and supplement differences may be quite robust across knowledge levels. However, Experiment 2A

manipulated drug/supplement within-subject—asking respondents to make relative judgments. In the present experiment, we return to a between-subjects design to more conservatively test the existence of the bias identified in Experiment 2A. We also include a no-product control group, providing a contrast of the boomerang of weight management product consumption against no-consumption at all.

Method

Participants and Design. The experiment was a 3-group between-subjects design, with product manipulated at three levels (drug, supplement, and a no-product control group). Participants were members of a fitness center group who received a financial donation for participating in the study. A total of 91 subjects participated.

Materials and Procedure. Participants responded to a short description of a target individual, where the weight management product was manipulated as follows:

> Chris is 40 years old and weighs about the ideal based on age and height. To help with weight management, Chris takes a [over-the-counter drug / supplement.]

In a third no-product control group, the second sentence instead read: "Chris does not take any weight management products (i.e., prescription or over-the-counter drugs or supplements)." Participants were then asked to rate the target person's health on a seven-point scale (with endpoints "very unhealthy" and "very healthy") and to rate the extent of the target's complementary health-protective behaviors on two seven-point scales ("To what extent does Chris follow a low-fat diet?" and "To what extent does Chris exercise?", with endpoints "not at all" and "regularly").

Next, participants were asked to rate the target's capability to "follow a low-fat diet" and to "engage in an exercise program" on two seven-point scales (with endpoints "not at all capable" and "very capable"). Similarly, participants were asked to rate the target's motivation

"to follow a low-fat diet" and "to engage in an exercise program" on two seven-point scales (with endpoints "not at all motivated" and "very motivated"). In addition, participants were asked "How would you describe Chris?" and provided ratings (on seven-point scales, with endpoints "not at all/very much") for the following characteristics: "powerful", "strong", and "self-reliant". These items were intended as a measure of efficacy.

Results

For ease of reporting, indices were constructed to reflect: 1) healthy lifestyle beliefs (coefficient $\alpha = 0.94$); 2) motivational beliefs (coefficient $\alpha = 0.95$); 3) ability beliefs (coefficient $\alpha = 0.96$); and, 4) an efficacy index (coefficient $\alpha = 0.92$).

To analyze the scenario-based responses (see Table 2), planned contrasts were conducted to examine differences among the three conditions for the key dependent variables. For the healthy lifestyle index, ANOVA indicated no difference for supplement and no-product conditions ($F < 1$). However, ratings for the healthy lifestyle index were lower in the drug condition ($F(1, 84) = 11.79$, $p < .01$), consistent with prior results inasmuch as taking a drug reduced the perceived extent of healthy lifestyle behaviors. These findings support a boomerang for weight management drugs but not supplements.

Insert Table 2 about here

Ratings for health perceptions, and capability and motivation to engage in healthy lifestyle practices, revealed a similar pattern of results. Specifically, ANOVA of health perceptions revealed no difference for the supplement and no-product conditions ($F < 1$) but a target taking a drug was perceived as less healthy than a target taking a supplement or no product ($F(1, 88) = 10.08$, $p < .01$). ANOVA of the motivation index indicated no difference for

supplement versus no-product conditions ($F < 1$) but the motivation index was lower in the drug condition ($F(1, 85) = 8.68$, $p < .01$). Similarly, ANOVA of the ability index indicated no difference for supplement versus no-product conditions ($F < 1$) but the ability index was lower in the drug condition ($F(1, 87) = 9.54$, $p < .01$). Finally, ANOVA of the target's perceived efficacy indicated no difference for supplement versus no-product conditions ($F < 1$) but the efficacy index was lower in the drug condition ($F(1, 84) = 7.11$, $p < .01$). These findings are consistent with our rationale that weight management drugs reduce both motivation and perceived ability to engage in health protective behaviors that contribute to a healthy lifestyle.

Discussion

Overall, the findings of experiments 2A and 2B support the notion that inaccurate consumer beliefs underlie the boomerang effect of weight management drugs on consumer health. Specifically, weight management drugs are associated with poor health and lower efficacy to engage in health-protective behaviors that contribute to a healthy lifestyle. Furthermore, drugs are seen as "magic bullets", such that the perceived importance of, and motivation to engage in, complementary health-protective behaviors are diminished. In contrast, supplements are associated with increased salience and importance of such health-protective actions. Thus, consistent with past research (Bolton et al., 2008), erroneous consumer beliefs lead weight management drugs, but not supplements, to be seen as get-out-jail-free cards that take the risk out of risky behavior, thereby undermining intentions to live a healthy lifestyle, as well as actual healthy behavior.

Moreover, only those with specific expertise in health have levels of knowledge about weight management products sufficient to neutralize the boomerang effect. Thus, nearly everyone is potentially susceptible to the boomerang effect of weight management products on

consumer health, speaking to the prevalence of this phenomenon. Given the serious implications of such widespread susceptibility to the boomerang, can anything be done to undo this effect? Specifically, if erroneous consumer beliefs underlie the boomerang, as Experiments 2A and 2B suggest, then correcting these beliefs should eliminate the effect. Accordingly, Experiment 3 investigates the psychological underpinnings of the boomerang, and tests the ability of a corrective intervention targeting these mistaken beliefs to undo the effect.

Experiment 3: An Intervention Correcting Lay Beliefs to "Undo" the Drug Boomerang

The present study investigated the effectiveness of an intervention to 'undo' the boomerang of drug marketing on a healthy lifestyle. Building on the evidence of erroneous consumer beliefs provided by Experiments 2A and 2B, the intervention is designed to target and correct these erroneous beliefs. Furthermore, the current study more precisely examines the psychological processes driving the boomerang effect of weight management products on a healthy lifestyle. Because consumers who are at risk (i.e., those with a negative body image in Experiment 1A and hungry consumers in Experiment 1B) are particularly susceptible to the boomerang effect, the present experiment will focus on relatively vulnerable consumers.

Specifically, we attempt to address two erroneous lay beliefs uncovered by Experiments 2A and 2B: first, that weight management drugs *alone* reduce the risks of risky behavior (and so are associated with reduced motivation to engage in a healthy lifestyle) and second, that weight management drugs are associated with poor health (and so reduce perceived efficacy and ability to engage in a healthy lifestyle). We predict that motivation and perceived ability to practice healthy lifestyle behaviors are instrumental in driving the boomerang and *together* mediate the boomerang effect of weight management product marketing on healthy lifestyle intentions. Our expectations are consistent with recent findings suggesting that consumer motivation and ability

are important precursors to healthy lifestyle behaviors (e.g. Bolton et al., 2008; Goldberg & Gunasti, 2007).

Moreover, scholars have long argued that changing beliefs should influence subsequent behavioral intentions (e.g., Ajzen, 1991; Fishbein & Ajzen, 1975). Thus, as Experiments 2A and 2B seem to suggest, targeting and correcting these inaccurate consumer beliefs that affect motivation and ability should neutralize the boomerang effect. Accordingly, the current study tests the power of an intervention that corrects these erroneous consumer beliefs—by reinforcing perceived motivation and ability—to "undo" the boomerang effect of weight management products on healthy lifestyle intentions.

Method

Participants and Design. The experiment was a 3-group (Drug vs. Drug + Intervention vs. Supplement) between-subjects design. Participants were staff and students (recruited from two local universities and a hospital) who received financial payment for participating in the experiment. A total of 58 subjects participated.

Materials and Procedure. Participants completed the experiment in two phases. In the first phase, participants completed a "self-perception questionnaire" including the self-image scale utilized in Experiment 1A (Cooper et al., 1986; Evans & Dolan, 1993). Participants were screened on the body image scale, with those scoring above median retained for analysis (reflecting higher problem status or higher-risk participants).

In the second phase, participants completed a "consumer promotion study" and were exposed to one of the two advertisements used in Experiment 1A. As before, each message began by warning about the risks of high-fat eating ("Watch Out For Fat"), continued by "Introducing Chitosan RX Ultra", and then provided additional information about a fat-fighting

product. The product information was the same as in Experiment 1A, manipulating whether the product was described as a drug or a supplement. Following exposure to the ad, participants indicated their attitude toward the ad on five seven-point scales (with endpoints "very unfavorable/very favorable", "bad/good", "really dislike/really like", "negative/positive" and "ineffective/effective") and rated their perception of the product on three seven-point agree/disagree scales ("Chitosan is like a drug", "Chitosan is like a supplement", and "Chitosan is like a vitamin"). The first item was reverse-coded.

All participants were then told:

> "Imagine that, after seeing this advertisement, you check with a qualified health care professional about Chitosan. S/he assures you that the product is safe and effective."

In the intervention condition, participants also read:

> "S/he adds: 'Sometimes, people who take this product forget about the importance of continuing with other fat-fighting behaviors, like daily exercise and low-fat eating. Some people also think that, because they are taking a drug to help manage their weight, that they are in poor health and therefore incapable of carrying out activities like daily exercise and low-fat eating. This just isn't the case. You should exercise and eat healthy foods even when taking the drug. Just do it!'"

Participants then rated their attitude toward the product on four seven-point scales (with endpoints "very unfavorable/very favorable", "bad/good", "really dislike/really like", and "negative/positive"). Participants also rated the product's perceived performance on eight five-point scales (with endpoints "low quality/high quality", "ineffective/effective", "harmful/harmless", "useless/useful", "a bad means of protection/a good means of protection", "risky/safe", "addictive/non-habit forming", and "unreliable/reliable").

Participants were next instructed to answer an open-ended thought-listing task as follows:

> "Now imagine that you decide to start taking Chitosan on a regular basis. Take a moment to imagine yourself in that situation, what it would be like, what your life would be like, how you would think, feel, and act. Then answer the questions that follow, imagining yourself in that situation."

Given this scenario, participants were asked to rate their health on a seven-point scale (with endpoints "poor health/good health"). Participants also indicated their behavioral intentions to "follow a low-fat diet" and to "exercise" on two-seven-point scales (with endpoints "No, never/Yes, regularly"). Participants then rated their motivation to follow a low-fat diet and to exercise on two seven-point scales (with endpoints "not at all motivated/very motivated") and also rated their capability on two seven-point scales (with endpoints "not at all capable/very capable"). Participants were also asked to describe themselves on six seven-point scales (with endpoints "powerless/powerful", "weak/strong", "reliant/self-reliant", "dependent/independent", "undisciplined/disciplined", and "ineffectual/effectual"), intended as a measure of perceived efficacy.

Lastly, as additional measures of behavioral intentions, participants were asked "How likely would you be to do the following?" and indicated the probability on 0-100% scales (with endpoints "very unlikely/very likely) for the following behaviors: "Exercise regularly (e.g., working out at home or at the gym)", "Work in physical activity as part of your day (e.g., walking, taking the stairs, etc."), "Eat healthy foods", and "Avoid all high-fat foods". Finally, participants responded to additional background questions (omitted for brevity's sake).

Results

Based on the average score of the body image scale (coefficient $\alpha = 0.81$), participants who scored above the sample median (i.e., "at-risk" participants) were retained for subsequent analyses. Subsequent results are reported based on planned contrasts: we predicted that the weight management drug would reduce healthy lifestyle intentions (compared to the weight management supplement). We further predicted that the weight management drug will not reduce healthy lifestyle intentions when accompanied by the intervention (compared to the

supplement). Lastly, we tested for evidence regarding the psychological mechanisms predicted to underlie the boomerang effect.

Manipulation Checks. Average perceptions of the product as a supplement were marginally higher in the supplement versus drug conditions ($M_{supplement}$ = 3.60 (1.26) vs. M_{drug} = 2.86 (1.31); $F(1, 55) = 3.25$, $p = .08$)—indicating that our manipulation was reasonably successful. In addition, average performance perceptions (coefficient $\alpha = 0.94$) did not differ for the drug or supplement ($M_{supplement}$ = 2.21 (0.73) vs. M_{drug} = 2.27 (1.08); $F < 1$) nor did average attitude toward the ad (coefficient $\alpha = 0.97$; M_{drug} = 3.34 (1.75) vs. $M_{supplement}$ = 3.25 (1.64); $F <$ 1) and product (coefficient $\alpha = 0.98$; M_{drug} = 3.68 (2.00) vs. $M_{supplement}$ = 3.66 (1.76); $F < 1$. As intended, the manipulation did not influence other perceptions or preference (e.g., the drug and supplement are perceived as equally effective, safe, a good means of protection, etc.).

Behavioral Intentions. Two indices of behavioral intentions were created, one a composite of the two behavioral intention items measured on a 7-point scale, and one a composite of the four probabilistic items assessed on a 0-100% scale. As predicted, MANOVA of behavioral intentions (coefficient $\alpha = 0.89$) revealed a significant contrast of drug and supplement conditions ($F(1, 55) = 5.75$, $p < .05$). As expected, intentions to engage in complementary health-protective behaviors were lower in the drug versus supplement conditions—reflecting a boomerang effect of the weight management drug. When the drug message was accompanied by an intervention addressing consumer beliefs, behavioral intentions did not differ from the supplement condition ($F(1, 55) = 1.54$, $p = .22$). That is, the intervention successfully mitigated the boomerang effect of the weight management drug—consistent with predictions. Combining the intervention and supplement conditions and contrasting against the drug condition confirms the drug boomerang ($F(1, 55) = 13.34$, $p < .01$): behavioral intentions

are lower when a weight management drug is not accompanied by a corrective intervention. Overall, these results support our predictions and indicate that a weight management drug undermines complementary health-protective behavior—but a corrective intervention can undo this boomerang effect. Descriptive results (averaged across items scaled similarly for ease of reporting) are shown in Table 3.

Insert Table 3 about here

Psychological Mechanisms. For ease of reporting, indices were constructed to reflect: 1) motivation, by averaging the items measuring motivation to follow a low-fat diet and exercise (coefficient $\alpha = 0.80$); 2) ability, by averaging the two ability items (coefficient $\alpha = 0.73$); and, 3) efficacy, by averaging the six-item efficacy scale (coefficient $\alpha = 0.96$).

Ratings for motivation and efficacy to engage in healthy lifestyle practices revealed a pattern of results similar to the behavioral intentions data. First, ANOVA of the motivation index indicates no difference for supplement and drug intervention conditions ($F < 1$) but motivation is lower in the drug condition ($F(1, 55) = 6.12$, $p < .05$). Second, ANOVA of the efficacy index indicates no difference for supplement versus drug intervention conditions ($F(1, 55) = 2.81$, $p = .10$) but efficacy is lower in the drug condition ($F(1, 55) = 13.97$, $p < .01$). Third, the ability index revealed a similar pattern, although failing to reach traditional levels of significance: no difference for supplement versus drug intervention conditions ($F < 1$) but ability was directionally lower in the drug condition ($F(1, 55) = 2.06$, $p = .16$). Finally, and unexpectedly, health perceptions did not differ across condition (F's < 1). Overall, these results partially supported expectations: as expected, the weight management drug reduces motivation and perceived efficacy to engage in complementary health protection behaviors. Moreover, the

corrective intervention increased both motivation and efficacy, as predicted.

Mediation. A mediation analysis was conducted to test whether motivation and efficacy together mediate the effects of weight management drugs and supplements on behavioral intentions. First (as reported previously), behavioral intentions are reduced for a drug (versus intervention and supplement conditions). Second, the mediator (the product of motivation and efficacy) declines for a weight management drug (versus intervention and supplement conditions) ($F(1, 55) = 10.57$, $p < .01$). Third, when the mediator is added to the model for behavioral intentions, the previously reported contrast is no longer significant ($F(1, 52) = 1.45$, $p = .23$) and the mediator is a significant predictor ($F(1, 55) = 52.47$, $p < .01$). As expected, motivation and efficacy together mediate the effects of weight management product marketing (and a corrective intervention) on healthy lifestyle intentions.

These results suggest that the boomerang effect arises because weight drugs reduce motivation and perceived efficacy to engage in health-protective behaviors whereas supplements do not. Moreover, an intervention accompanying the drug that corrected erroneous consumer knowledge by increasing motivation and efficacy eliminated the boomerang effect. In addition to providing further evidence of the mechanisms at work, the efficacy of the intervention in undoing the boomerang serves as a demonstration of the underlying role of consumer knowledge. The intervention condition represents a boundary condition of the boomerang effect of weight management drug marketing, and bears important implications for marketers, health practitioners, and policy makers.

General Discussion

Overall, the studies provide evidence for a boomerang effect of weight management drug marketing on a healthy lifestyle. Results can be summarized as follows: 1) Healthy behavioral

intentions decrease when participants imagine taking a weight management drug versus supplement, particularly for those participants with body image issues who have a problematic relationship with this domain of unhealthy behaviors. 2) Actual consumption of high-fat foods increases with mere exposure to weight management drug versus supplement messages, particularly as hunger increases the attractiveness of the risky behavior. 3) As theorized, the boomerang effect of weight management drug marketing on healthy behavioral intentions is mediated by decreased motivation and perceived ability to engage in health protective behaviors. 4) Evidence from two field samples of real consumers with a range of knowledge levels suggests that erroneous lay beliefs about drugs and supplements underlie the boomerang effect of weight management drug marketing. While the boomerang is mitigated by more accurate knowledge, only the highest levels of knowledge (reflecting specialized training or expertise in drugs and supplements) are sufficient to eliminate it completely. 5) Notably, however, a corrective intervention that specifically targets the erroneous lay beliefs held by consumers does show promise and merits further research.

Overall, the present research builds on past research and contributes to the literature in several ways. First, past research has tended to investigate the boomerang phenomenon by examining behavioral intentions after imagined consumption of a remedy, and these results are replicated here in the domain of weight management. However, to our knowledge, the present research is the first to demonstrate the boomerang effect of drug marketing on actual behavior, and the first to demonstrate a boomerang arising from merely a single exposure to a drug marketing message. Second, the present research indicates that the boomerang effect can be influenced by both transient visceral factors (e.g., hunger) and relatively stable individual differences (e.g., body image) that alter the relative attractiveness of the risky behavior. Third,

the present research provides evidence for the underlying role of consumer beliefs, suggesting that lay theories regarding weight management products lead consumers to reduce healthy lifestyle behaviors in response to weight management marketing. Finally, the present research investigates the role of consumer knowledge underlying the boomerang phenomenon in a wide range of consumer samples. Only highly specialized training appears to mitigate the erroneous beliefs underlying the boomerang; otherwise, even well-educated consumers are susceptible to making less healthy lifestyle decisions.

Theoretical and Practical Implications

These findings suggest a number of interesting implications. First, consistent with prior research (Bolton et al., 2008), these results provide further evidence that drug marketing can influence mindful, volitional consumer behavior. Through the lens of motivated reasoning (e.g., Kunda, 1990), high problem status consumers are particularly attracted to unhealthy consumption behavior, and are thus highly motivated to arrive at the desired conclusion that such consumption is permissible. As such, consumer beliefs regarding drugs (versus supplements) facilitate (versus inhibit) motivated reasoning that underlies a boomerang effect on consumer health. In other words, the presence of a weight management drug licenses the consumer to consume unhealthily in accordance with their desires. This account is consistent with a recent goal conflict model of unhealthy consumption (Stroebe et al., 2008), and similar recent research suggesting that consumption-relevant information such as small package sizes (Scott et al., 2008) and health claims at fast food restaurants (Chandon & Wansink, 2007b) can license consumers to engage in more unhealthy consumption.

The boomerang on actual behavior arising from mere exposure to weight management drug marketing also raises interesting questions. Though intervening psychological process

measures or intention measures were not administered prior to consumption, so as not to bias participants, these findings raise the intriguing possibility that the consumption behavior was not consciously mediated. An emergent body of research illustrates that, because of capacity constraints in conscious information processing and the need for efficiency, many aspects of human behavior operate below the level of conscious control (e.g., Ouellette & Wood, 1998), and a variety of environmental cues can influence behavior non-consciously (e.g., Bargh & Chartrand, 1999). Notably, a broad stream of research by Brian Wansink and colleagues (e.g., Wansink, 2006; Wansink & Cheney, 2005; Wansink, Painter, & North, 2005; Wansink & Payne, 2007) demonstrates a variety of ways in which simple contextual cues and perceptual factors can lead consumers to substantially alter their consumption behavior without conscious awareness. Accordingly, it is possible that the boomerang mechanism undermining consumer health is activated via mere exposure, through a process akin to non-conscious learning (e.g., Lewicki, 1986). Given the ubiquity of weight management product advertising in the marketplace (Cleland et al., 2002), such effects may play an important role in contributing to the American obesity paradox. The mere presence and prevalence of such advertising may thus be undermining risk avoidance and damaging consumer health.

Furthermore, the current findings reinforce the robustness of the boomerang effect of weight management drugs on consumer health. Though our results are consistent with the notion that people with certain stable psychological characteristics are chronically more susceptible to this effect (e.g., Herman & Polivy, 1984; Scott et al., 2008), they also suggest that even momentary visceral factors may make otherwise well-adjusted consumers temporarily highly susceptible. In other words, even states as universal as hunger, that temporarily enhance the attractiveness of risky consumption behaviors, can serve to exacerbate the boomerang of weight

management product marketing and facilitate detrimental lifestyle decisions. Furthermore, our findings suggest that anyone not possessing specific healthcare expertise is potentially susceptible to the boomerang. Thus, this phenomenon may have implications for the lifestyle decisions of nearly all consumers.

Given the potential prevalence of these effects, it is important to consider interventions that seek to correct fallacious consumer beliefs underlying the boomerang. Interestingly, GlaxoSmithKline, the marketers of Alli, the first FDA-approved over-the-counter weight loss product, are very careful to emphasize the importance of maintaining a healthy diet and exercise regimen while taking the drug, and to reassure consumers that they are up to the challenge (GlaxoSmithKline, 2009). Furthermore, consumers are required to register for an individualized online support plan with customized feedback and guidance. This approach dovetails well with our findings, and has the potential (as illustrated in Experiment 3) to correct erroneous beliefs and support healthy consumer lifestyles.

Conversely, the marketplace is flooded with weight management supplements that appear to make misleading and even deceptive product claims. For instance, weight loss supplements often promise rapid weight loss and emphasize the ease of losing weight with the product and the lack of any need for proper diet and exercise (Cleland et al., 2002; Vladeck, 2000). Though our studies controlled for the content of advertisements, and manipulated only whether weight management products were labeled as drugs or supplements, the prevalence of puffery and even deceptive claims in weight loss supplement advertising raises interesting implications. For instance, just as interventions debiasing drug beliefs can neutralize the boomerang effect, is it possible that these debatable claims actually serve as interventions *biasing* supplement beliefs and creating a supplement boomerang where none existed? Further investigation of weight

management drug and supplement marketing practices would be of great benefit to practitioners and policy makers.

Limitations and Future Directions

We note several limitations of the present set of experiments. First, we use fictitious advertisements for weight management products for purposes of experimental control (as well as to address IRB concerns at our institutions). However, it is important to note that very similar products exist in the marketplace (e.g., with nearly identical names and product claims), somewhat mitigating issues of external validity. Furthermore, while the specific instantiations of weight management product advertising used may not generalize to other domains and stimuli, we used different advertisements (albeit similar in style) for the product in Experiment 1B, as compared to Experiments 1A and 3, suggesting that results were not driven by characteristics of any one particular operationalization. Second, again to ensure proper experimental control, the stimuli did not reflect typical differences in labeling between drugs and supplements. However, controlling for these differences arguably provides a more conservative test, inasmuch as differences in lay perceptions of weight management drugs and supplements must be sufficiently powerful to overcome a detailed product description that is identical on all other counts. As noted above, further investigation of actual weight management product advertising practices would greatly contribute to the regulatory debate among practitioners and policy makers (Vladeck, 2000).

Third, several experiments relied on hypothetical scenarios regarding weight management product usage and indirect judgments of others. Though scenario-based approaches have ample precedent in the literature, many researchers have noted behavioral intentions do not reliably lead to corresponding actual behavior (e.g., Sheeran, 2002). Importantly, we find

convergent evidence of the weight management marketing boomerang across both behavioral intentions and actual consumption behavior. Furthermore, by obtaining consistent results across both first-person and third-person scenarios, we ensure that biases regarding judgments of self versus others (e.g., Pronin, Lin, & Ross, 2002) do not distort our findings. Fourth, these experiments often utilized convenience samples that may not be representative of the general population. However, our findings were consistent across both laboratory and field samples that varied in composition, weight management product knowledge, and healthy lifestyle practices.

In summary, the present research represents a call to action to develop efforts to mitigate the boomerang effect of drug marketing for weight management, a domain crucial to the health and well-being of consumers. It is important to note that weight management drugs represent just one sector within the weight loss product industry. Products such as meal replacements, diet food home delivery, functional foods, home exercise equipment, fitness memberships, and bariatric surgery are also growing in popularity (Marketdata, 2007), and may bring about similar effects on consumer health, essentially facilitating riskier behavior. For instance, some recent research suggests that consumers overestimate calories burned while exercising (Kolata, 2007)—thus, even an unequivocally healthy lifestyle behavior like exercise might conceivably boomerang by providing individuals further license to lapse.

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Author Note

Amit Bhattacharjee is a Doctoral Candidate in Marketing at The Wharton School, University of Pennsylvania, 700 Jon M. Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104, ambhatta@wharton.upenn.edu. Lisa Bolton is an Associate Professor of Marketing at the Smeal College of Business, The Pennsylvania State University, 441 Business Building, University Park, PA, 16802, boltonle@psu.edu. Americus Reed II is the Whitney M. Young, Jr. Associate Professor of Marketing at The Wharton School, University of Pennsylvania, 764 Jon M. Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104, amreed@wharton.upenn.edu. The authors thank Paul N. Bloom for his feedback on an earlier version of this article and Jane Jaskowiak, Catarine Verdi, and Daniela Lejtneker for data collection assistance. Partial support for this research comes from the Collaboration to Reduce Disparities in Hypertension (CHORD) project funded by the Pennsylvania Department of Health. Partial support was also provided by the Ackoff Fund of the Wharton Risk Management and Decision Processes Center.

Footnotes

1. Following the guidelines of the World Health Organization (2000), adults are considered overweight if their body mass index (BMI) is greater than 25, and obese if their BMI is greater than 30. BMI is computed by dividing body weight, measured in kilograms, by squared height, as measured in meters.

2. We also included a no-product control group. Relative to the control group, the drug reduced food fat perceptions and, as problem status rose, increased high-fat eating intentions (i.e., a boomerang effect relative to a no-product baseline). Relative to the control group, the supplement did not reduce food fat perceptions or increase high-fat eating intentions. Taken together, these results indicate that boomerang effects depend upon the product—drugs boomerang, whereas supplements do not. For further details, please contact the authors.

3. Participants were offered servings of 100 M&Ms containing approximately 18 grams of fat and 11 grams of saturated fat, or about 27% and 55%, respectively, of recommended Percent Daily Values (Mars, 2009).

4. One alternative explanation for this study, and the previous findings in Experiment 1A, is that the supplement was perceived as less effective and therefore led to less of a boomerang than the drug. But this explanation is inconsistent with the data that show that the performance ratings of the drug and supplement did not differ. Thus, we attribute the observed differences to consumer perceptions of drugs versus supplements rather than differences in perceived effectiveness of the products. Of course, we acknowledge that effectiveness also has a role to play—inasmuch as products are unlikely to boomerang if perceived as ineffective. Other research (Bolton et al. 2003) has examined and provides evidence supporting the role of effectiveness in the boomerang.

5. In fitting the Poisson model, three high influence observations were omitted, following the criterion of Cook's distance > 1 indicating an influence problem (Cook & Weisberg, 1982). Notably, inclusion of these observations did not change the nature of the results, but reduced model effect sizes. All model fit indices (e.g., -2LL, AIC, BIC) indicated a significantly better fit when these observations were omitted.

6. For completeness' sake, note that ANOVA of health severity ratings revealed a significant interaction of knowledge with information condition ($F(1,230) = 4.07$, $p < .05$), such that knowledge had less effect when effectiveness information was provided ($b = 0.09$ (0.13)) versus omitted ($b = 0.47$ (0.14)). This result does not substantially affect the conclusions drawn from the study.

7. An alternative hypothesis—that fitness club members will be supplement users (and therefore more susceptible to the previously observed effects)—is not borne out by the field sample data (from a swim club). Specifically, 40% of the sample reported never taking supplements (of the 32% who often or always did, the majority reported taking vitamins), and only 6% of the sample reported taking supplements for weight management purposes. Further analysis broken down by supplement usage is not possible (due to limited sample sizes) but merits future research.

Table 1: Scenario Ratings and Knowledge Scores as a Function of Participant Sample

(Experiment 2A)

SAMPLE	N	HEALTHY LIFESTYLE INDEX	HEALTH SEVERITY PERCEPTION	KNOWLEDGE SCORE
Lab	162	**4.47** (1.25)	**3.22** (1.11)	6.55 (1.64)
Field-Nonexpert	54	**4.33** (0.99)	**3.50** (1.18)	7.02 (2.18)
Field-Expert	26	4.12 (0.59)	3.69 (0.88)	8.12 (1.45)
		MOTIVATION INDEX	ABILITY INDEX	EFFICACY INDEX
Lab		**4.46** (1.14)	**4.48** (0.88)	**4.56** (0.78)
Field-Nonexpert		**4.62** (1.28)	**4.44** (1.00)	**4.25** (0.79)
Field-Expert		4.27 (0.87)	4.29 (0.71)	4.22 (0.65)

Note: All means reported in bold are significantly different from neutral (p's < .05). (This does not apply to the knowledge score, where non-neutral comparisons are not meaningful.)

Table 2: Scenario Target Ratings as a Function of Drug/Supplement (Experiment 2B)

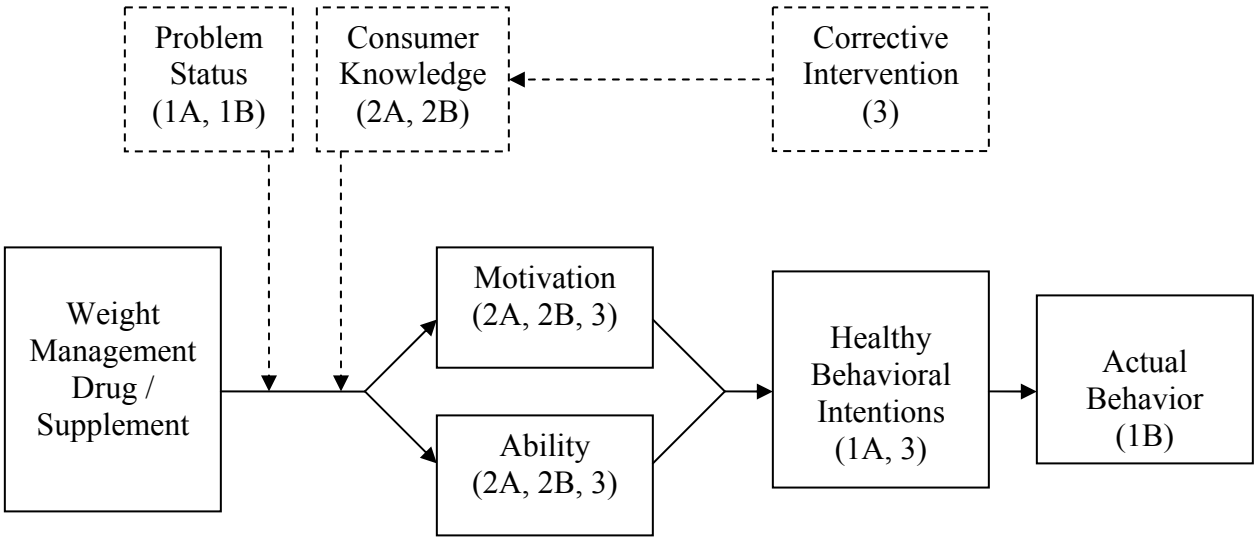
PRODUCT	N	HEALTHY LIFESTYLE INDEX	HEALTH PERCEPTION	MOTIVATION INDEX	ABILITY INDEX	EFFICACY INDEX
Drug	33	3.59 (1.44)	4.39 (1.03)	3.69 (1.60) [a]	4.45 (1.66) [a]	3.72 (1.09) [b]
Supplement	31	4.76 (1.30) [b]	5.23 (1.06)	4.66 (1.39)	5.44 (1.39)	4.41 (1.46) [a]
No Product	27	4.56 (1.47) [b]	5.11 (1.28)	4.54 (1.08) [b]	5.48 (1.33)	4.47 (0.92) [a]

[a] data missing from 1 respondent
[b] data missing from 2 respondents

Table 3: Consumer Response as a Function of Drug, Supplement, and Drug + Intervention (Experiment 3)

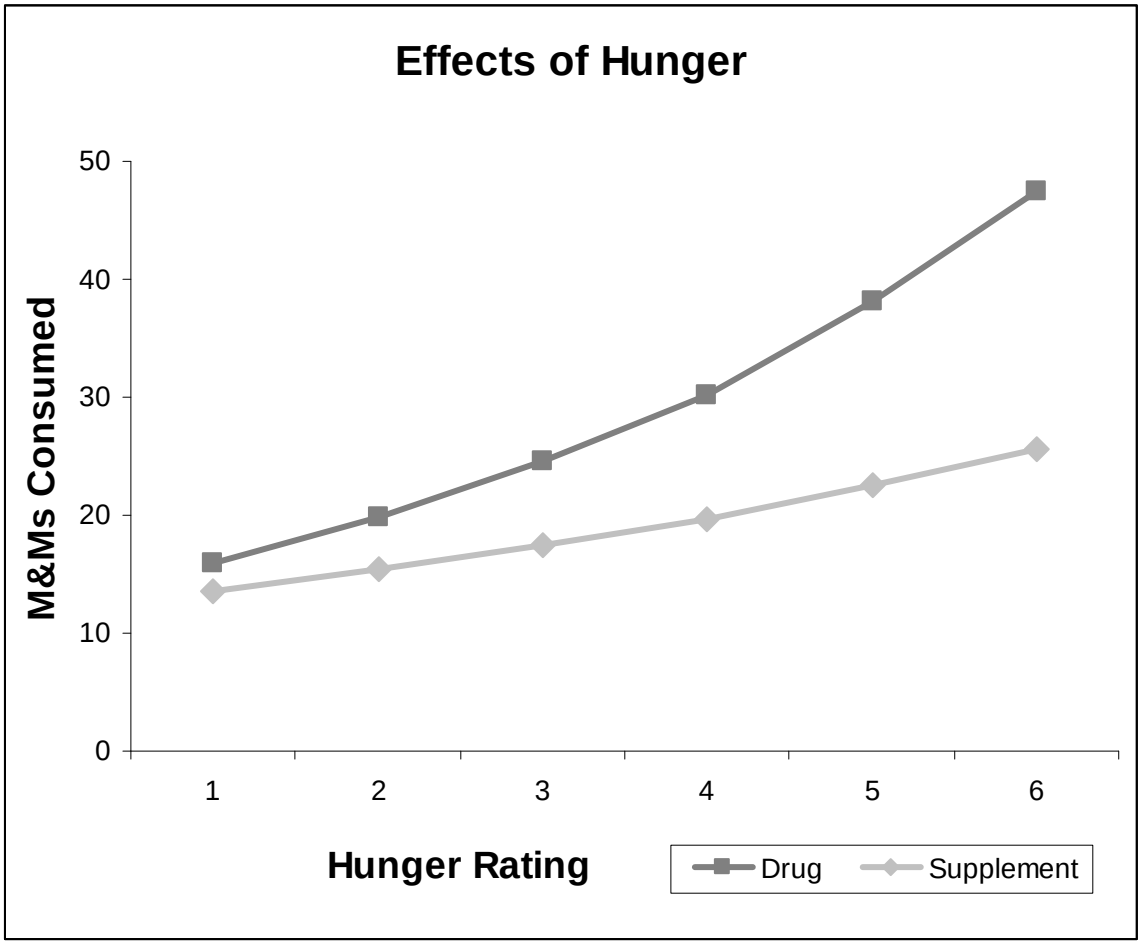
PRODUCT	N	BEHAVIORAL INTENTIONS (7-POINT SCALE)	BEHAVORIAL INTENTIONS (0-100% SCALE)	MOTIVATION INDEX	ABILITY INDEX	EFFICACY INDEX	HEALTH PERCEPTIONS
Drug	21	4.21 (1.60)	42.86 (25.14)	3.81 (1.91)	4.24 (1.71)	2.60 (1.43)	3.76 (1.76)
Drug + Intervention	21	5.17 (1.10)	70.36 (17.58)	4.98 (1.54)	5.29 (1.33)	4.56 (1.40)	4.10 (1.45)
Supplement	16	4.94 (1.52)	60.94 (25.24)	4.97 (1.66)	4.53 (1.76)	3.72 (1.72)	3.56 (1.59)

Figure 1: Organizing Framework



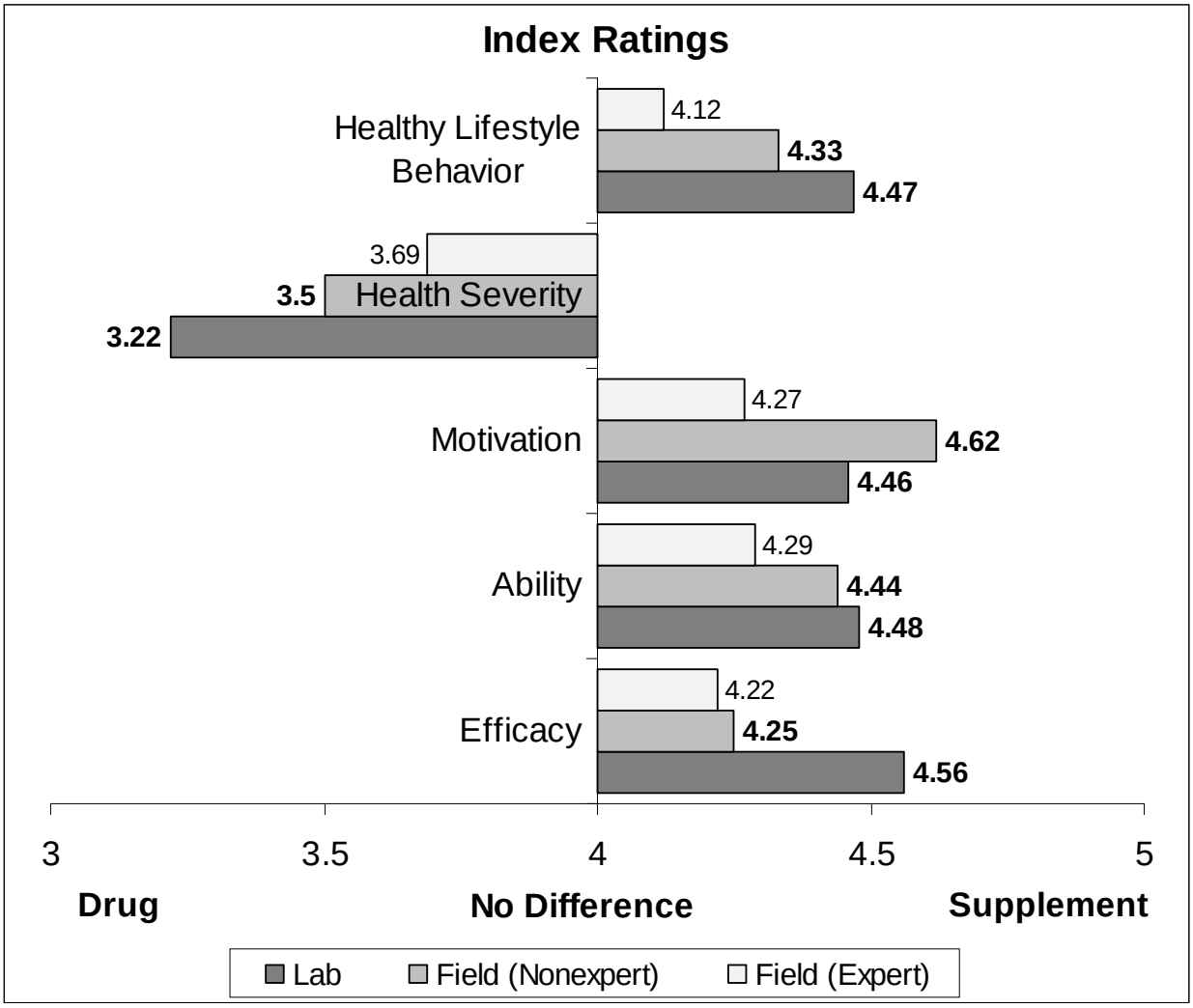
Note: The solid boxes and arrows denote the boomerang mechanism by which weight management drug marketing undermines consumer health. The dashed boxes and arrows indicate factors that influence this established mechanism (i.e. moderators).

Figure 2: Actual Consumption of M&Ms as a Function of Problem Status (Experiment 1B)



Note: The hunger covariate ranges from 1 to 6 because no participants rated their hunger a 7.

Figure 3: Scenario Ratings as a Function of Participant Sample (Experiment 2A)



Note: All means reported in bold are significantly different from neutral (*p*'s < .05). Numbers higher than the midpoint indicate the supplement (e.g., that self-efficacy is greater when using the supplement) and numbers lower than the midpoint indicate the drug (e.g., that perceived severity of health problems is higher when using the drug). Ratings not significantly different from the midpoint indicate no perceived difference for drugs and supplements.