Experimental Evidence of Consumer and Physician Detection and Rejection of Misleading Prescription Drug Website Content

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ABSTRACT

Background: Consumers and primary care physicians (PCPs) sometimes encounter deceptive promotional claims about prescription drugs. Whether consumers and PCPs can detect deceptive claims or whether those claims negatively affect medical decision making, however, remain important, unanswered research questions.

Objectives: This article explores (1) the ability of consumers and PCPs to identify deceptive prescription drug promotion at various levels of deception, (2) the influence of such tactics on obstructing risk recognition, and (3) whether perceived deception mediates relationships between exposure to deceptive tactics and various outcomes (including false-claim acceptance, attitudes, information-seeking intentions, and interest toward the promoted drug).

Methods: Two experiments—1 with consumers (N=366) and 1 with PCPs (N=378)—were conducted to determine whether participant exposure to deceptive prescription drug website content corresponds to detection and acceptance (or rejection) of claims and tactics. In each experiment, we varied the number of deceptive claims and tactics on a consumer- or PCP-targeted website for a fictitious chronic pain medication, in a 1 x 3 (none, fewer, more) between-subjects design.

Results: Among consumers, exposure to more deceptive claims or tactics did not increase suspicion about the veracity of the website (relative to fewer claims and tactics) and actually had a limited positive direct effect on false-claim acceptance and attitudes toward the drug. Among PCPs, a mediation effect existed such that exposure to more deceptive claims and tactics resulted in higher perceived website deceptiveness relative to those in the fewer deceptive claims condition, which, in turn, resulted in lower acceptance of deceptive claims and tactics, lower perceived drug effectiveness, more negative attitudes toward the drug, and lower interest and intentions.

Conclusion: These experiments demonstrate potential differences between consumers and PCPs as well as implications for consumer and PCP vulnerability to website deception.

Keywords: prescription drug promotion, prescription drugs, Food and Drug Administration, misinformation

INTRODUCTION*

Understanding the impact of deceptive promotional tactics is particularly important in high-consequence markets, like health care and prescription drug promotion. Both patients and healthcare professionals (HCPs) are likely to encounter medical misinformation from a variety of sources. The availability of false and misleading medical information is problematic because of the threat posed to the ability of consumers and HCPs to make informed decisions about prescription drugs. Pharmaceutical promotion, in particular, can include misinformation. For example, a content analysis of consumer-targeted television advertisements found that 55% of prescription drug advertisements contained potentially misleading information with 2% being expressly false.[1]

Prescription drug promotion is required to provide truthful, balanced, and accurate information about the prescription drug being promoted.[2] Nonetheless, examples of prescription drug promotion containing misleading information or omitting or downplaying material information remain.[1, 3-9] A content analysis of warning letters issued by the FDA to pharmaceutical manufacturers from years 2003-2008 found that over half (55%) of the letters referenced 2 to 3 misleading claims. The authors also found problematic content in both HCP- and consumer-targeted promotion, with 57% of the promotional materials referenced in the warning letters targeting HCPs.

Despite research on the prevalence[1, 3-9], correction,[10, 11] and downstream effects[12-14] of medical misinformation, a recent literature review revealed that relatively little empirical evidence sheds light on exactly who is able to detect misleading or false information in health-related promotion, when that detection is relatively more likely to happen, and the exact influence of detecting deception on outcomes such as perceived drug efficacy, interest in the drug, or other perceptions.[15] Additionally, researchers do

* PCP = primary care physician; HCP = health care professional

not know the effects of a higher concentration of multiple false or misleading claims and tactics in a promotion relative to a single claim.

This study presents experimental evidence to address these gaps in the literature. With a set of 2 experiments, this study explores (1) the ability of consumers and PCPs to identify deceptive prescription drug promotion at various levels of deception in a fictitious pharmaceutical website for a chronic pain medication, (2) the influence of such tactics on obstructing risk recognition, and (3) whether perceived deception mediates relationships between exposure to deceptive tactics and various outcomes (false-claim acceptance, attitudes, information-seeking intentions, and interest toward the promoted drug). This study also assesses whether consumers or PCPs appear to be better able to detect and reject deceptive tactics.

Bias toward Claim Acceptance

Outside of the specific context of prescription drug promotion, a robust body of research focuses on people's susceptibility to believe misleading or deceptive claims or accept deceptive message tactics. Cognitive and social psychology research, for example, suggests humans have a truth bias whereby people tend to accept new information as true, at least upon initial exposure.[16-23] Only with extra effort do people tag encoded information as false. From this perspective, one can have relatively constrained expectations for falsehood detection in the context of prescription drug promotion. In encountering prescription drug promotion in the midst of everyday life, people likely find deception judgment to be challenging. Problematic claims and tactics, if not countered directly, will likely be processed and remembered as true, requiring relatively timely and explicit effort to relabel that information as false. What's more, source monitoring effects can also play a role upon repeated exposure, such that people forget that the information originated in an ad, perhaps giving the claims even more credibility.[24]

Number of Deceptive Claims and Tactics and Perceived Deception

Some have argued that exposure to relatively blatant misinformation should be more likely to trigger suspicion compared with more subtle deception.[25] If people recognize deceptive persuasion tactics, in turn, they may exercise greater diligence in making sense of the presented information. These

considerations raise an important question that remains relatively unaddressed in the available literature, especially with regard to prescription drug promotion. Is there a threshold at which deception in prescription drug promotion tends to trigger awareness or claim rejection among consumers and PCPs? As the number of deceptive claims and tactics increases, people may become more aware of attempts to mislead them. As Johnson et al[26] suggest, as the amount of deception increases, people have greater opportunities to note deception. Based on issues and literature summarized above, the following hypotheses are proposed:

> **Hypothesis 1a**: As the number of deceptive claims and tactics increases, perceived deception will increase. Consumers or PCPs who view the websites containing deceptive claims and tactics will have greater **perceived website deception** than participants who view the website containing no deceptive claims and tactics.
>
> **Hypothesis 1b**: Consumers or PCPs who view the websites containing more deceptive claims and tactics will have greater **perceived website deception** than participants who view the website containing fewer deceptive claims and tactics.

At the same time, these hypotheses have an important potential constraint. As noted earlier, the human tendency is to accept information at face value, which suggests deception detection is not subject to the simple number of false or misleading claims and tactics, per se, depending perhaps instead on the novelty or logical coherence of claims and tactics. It is expected that the number of problematic claims and tactics on a website would not necessarily affect viewers' perceived deceptiveness because they would tend to believe the information presented as true regardless of the amount of deception present. That argument suggests one should examine the process that could link exposure to claims and tactics with persuasive outcomes.

When people detect an initial attempt to deceive, does that affect their subsequent perceptions and actions regarding an advertised product? Do people resist or reject subsequent or related messages if they

are aware of deception on the part of the message source? In other words, might deceptive claim exposure be related to message rejection through a mediating variable such as perceived deception? Research by Darke and Ritchie[13] suggests that when people perceive an intent to deceive this activates defensive motivation. Similarly, Pena et al.[27] found that the extent of misinformation in a mock crime video that participants saw led to skepticism regarding the video. Once defensive motivation is activated, it is more likely that people will become skeptical of subsequent information, thereby reducing the persuasive impact of advertising. Exposure to websites with a greater number of deceptive claims and tactics should increase perceptions that a website is misleading or using deceptive claims and tactics, which should result in people adjusting perceptions about the product to be less positive (and thereby resisting deceptive tactics).

> **Hypothesis 2**: For both consumers and PCPs, the relationship between the number of deceptive claims and tactics and persuasive outcomes will be mediated by perceived deception.

Minimization of Risk Information as a Deceptive Tactic

An often-cited issue in prescription drug promotion is minimization of risk information.[7] Risk information can be minimized through design decisions related to location, proximity, type size, type style, and contrast, all of which negatively affect the prominence or readability of the risk information. Risk information may also be minimized by the language used or the amount of risk information in contrast to efficacy information. This study focused on minimizing risk through design decisions. The present studies offered an opportunity to demonstrate the effects of deceptive claims and tactics by including a control group that did not see such claims and tactics. Insofar as tactics that minimize risk information make the information harder to read and remember or introduce confusion about risk, those exposed to such deceptive claims and tactics ought to exhibit lower risk recognition compared to control participants.

Research Question 1: Do consumers or PCPs who view websites that minimize the risks through design decisions have lower risk recognition than consumers and PCPs who view a version of the same website that does not minimize the risks?

Laypeople versus Experts

Might consumers and PCPs differ in their tendency to detect and reject deceptive claims and tactics in prescription drug promotion? PCPs, who have a higher domain knowledge of prescription drugs than consumers, may have a better chance of noticing (and being suspicious of) questionable claims and tactics and judging that the advertisement is deceptive. Nonetheless, the evidence is inconclusive as to whether PCPs fare better than consumers in terms of detecting misleading and false information. Bone et al[28] found that expertise matters: if consumers have used a product, they have a greater tendency toward advertising claim skepticism relative to consumers who have little or no experience with the product. Given that PCPs prescribe medications regularly, their knowledge of the class of drugs should afford a similar level of skepticism. At the same time, education and knowledge indicators have not consistently differentiated participants in their ability to detect deception. Held and Germelmann[29] hypothesized that educational attainment, domain-specific knowledge (about the advertised product), and knowledge about persuasion techniques all would bear a positive relationship to people's ability to detect deception, but they found none of the hypothesized moderators significantly accounted for variance in deception.

Work on deception detection beyond the advertising literature also offers some insight as to whether detection may be difficult for both laypersons and experts.[30-34] Generally, these studies tend to find that experts are no better than novices at detecting deception. To examine whether consumers are more vulnerable to misleading promotional content than PCPs, the present research considered results 2 experiments, each with a different population of participants. Although these experiments do not offer group comparison evidence from within the same randomized controlled study, the pair of experimental results were qualitatively assessed in terms of deception perception, claim rejection, and risk recognition as a foundation for future research.

Research Question 2: Do consumers and PCPs differ in their response to the number of deceptive claims and tactics in prescription drug promotion?

METHOD

Experimental Design and Stimuli

For each population, a 1 x 3 between-subjects experimental design was used to assess participants' responses to pharmaceutical websites for a chronic pain medication that included varying amounts of false or misleading presentations. A website for the fictitious prescription drug Dolafex specific to each population (i.e., consumers viewed websites targeted to consumers and PCPs viewed websites targeted to physicians) that varied in the number of deceptive presentations (e.g., none, fewer, more) was developed. The website with fewer deceptive claims and tactics contained a subset of the deceptive claims and tactics included in the website with more deceptive claims and tactics. For example, the website with fewer deceptive claims and tactics included 2 deceptive presentations (a reduction in risk information via the use of smaller font and reduced text contrast as well as a mischaracterization of efficacy and risk conveyed through a claim about "safe and complete relief from chronic pain"), and the website with more deceptive claims and tactics included the same 2 deceptive presentations plus 3 additional deceptive presentations (in the form of various claims and tactics, see Supplement A). One version of the website included no deceptive claims and tactics and was considered the control condition. Project staff designed the websites to mimic typical pharmaceutical websites from the U. S. marketplace in appearance and design (although the sites did not contain working links) and were examined for realism by an expert reviewer (Consumer Safety Officer) at FDA. Before beginning the study, the project team also conducted a set of cognitive interviews with consumers and PCP to ensure that the websites were realistic and the questionnaire items were clear. Participants were told they would look at a picture of a website that is under development for a new prescription drug (and were subsequently debriefed after the study that the website was not real).

Participants

Consumers, recruited from an opt-in online panel, consisted of English-speaking adults who self-identified as having been diagnosed with chronic pain by a physician or other qualified medical professional. Consumers were excluded who worked in the health care, marketing, advertising, or pharmaceutical industries.

PCPs, recruited from an opt-in online health care panel, consisted of English-speaking physicians who indicated that their primary medical specialty was family practice, general practice, or internal medicine. Physicians' practicing status was verified against association and governmental databases such as the Drug Enforcement Agency number and the American Medical Association Medical Education Number. A screener item also confirmed that physicians specialized in primary care or internal medicine. In addition, PCPs needed to spend at least 50% of their time on direct patient care and treat patients with chronic pain to be eligible for the study.

Eligible participants were randomly assigned (using simple random assignment) to 1 of the 3 experimental arms and directed to the appropriate stimuli and questionnaire. Figures 1 and 2 illustrate the recruitment and study assignment process for each study, which resulted in 366 consumers in Experiment 1 and 378 PCPs in Experiment 2. At the completion of the study, participants were debriefed that the prescription drug websites were fictitious. Consumers were offered $5 in eRewards and PCPs were offered $27 for completing the study. This research was approved by FDA's Research Involving Human Subjects Committee and RTI's Institutional Review Board.

Insert Figure 1. Participant Recruitment and Assignment: Consumers

Insert Figure 2. Participant Recruitment and Assignment: PCPs

Measures

The independent variable of exposure to deceptive claims and tactics was operationalized through random assignment to an experimental condition, such that participants in each study were assigned to a

control group (that saw a control version of the website in question) or to a version of the website with fewer or more deceptive claims and tactics.

Perceived deception was assessed using 2 composite variables adapted from available literature.[29, 35-39] The first measure, *perceived website deceptiveness*, captured participants' perceptions of the website's accuracy (on a scale with response options ranging from 1 [accurate] to 6 [inaccurate]), factuality (1 [factual] to 6 [false]), truthfulness (1 [honest] to 6 [misleading]) and believability (1 [believable] to 6 [not believable]). Participants' responses to these 4 questions were averaged to form the scale (Cronbach's α=.91 among consumers and Cronbach's α=.89 among PCPs).

The second measure, *perceptions about misleading portrayal of risks and benefits*, captured participants' responses to 4 questions assessing agreement that the website exaggerates the benefits of Dolafex and that the website tries to minimize the side effects of Dolafex (on a scale ranging from 1 [strongly disagree] to 6 [strongly agree]) and that the website misleads people about the *effectiveness* of Dolafex and about the *risks* of Dolafex (on a scale ranging from 1 [no, definitely not] to 6 [yes, definitely]). Participants' responses to these 4 questions were averaged to form the scale (Cronbach's α=.84 among consumers and Cronbach's α=.81 among PCPs).

Risk recognition was assessed by showing participants 9 side effects and asking them to indicate via checkboxes which of the side effects were present on the website. Of the side effects presented, 6 were present on the website, and 3 were not (foils). Correct responses were summed to form the risk recognition measure, which ranged from 0 to 9.

Persuasion outcomes. Persuasion outcomes included efficacy perceptions, false-claim acceptance, attitudes toward the drug, behavioral intentions, and interest in the drug. Efficacy perceptions captured participants' efficacy likelihood and magnitude perceptions. Specifically, participants indicated the likelihood that the drug would relieve their (among consumers) or their patients' (among PCPs) chronic pain (on a 6-point scale ranging from 1 [not at all likely] to 6 [extremely likely]); participants also

indicated their level of agreement with the statement that the drug would completely eliminate their or their patients' chronic pain (on a scale ranging from 1 [strongly disagree] to 6 [strongly agree]). Responses to the 2 items were averaged to form the efficacy scale (Spearman-Brown reliability coefficient[40]=.88 among consumers and .76 among PCPs).

False-claim acceptance assessed the extent to which participants believed 2 statements were true or false (with response options ranging from 1 [definitely false] to 6 [definitely true]). The first statement, "Dolafex provides safe and complete relief from chronic pain," was highlighted as a graphical callout in both the few deceptive claims and tactics condition and the more deceptive claims and tactics condition. The second statement, "Dolafex is a risk-free option for managing chronic pain," was present only in the more deceptive claims and tactics condition and was highlighted in a red text bar in the upper half of the website (in the same visual region as the graphical callout). Each item was analyzed separately.

Attitude toward the drug captured participants' evaluations of the drug. On a 6-point scale, participants were asked whether the drug is a bad option (1) to good option (6); harmful (1) to helpful (6); and useless (1) to useful (6). The responses to these 3 items were averaged to create the final scale (Cronbach's α=.92 among consumers and Cronbach's α=.87 among PCPs).

Behavioral intentions toward the promoted prescription drug included 2 measures: (1) participants' self-reported likelihood of looking for more information about the drug and the likelihood of mentioning the drug to a family member or close friend (among consumers) and (2) the likelihood of mentioning the drug to their patients (among PCPs). Response options ranged from 1 (not at all likely) to 6 (extremely likely). The items were averaged to form the scale (Spearman-Brown reliability coefficient[40]=.86 among consumers and .89 among PCPs). Finally, interest in the drug was captured by asking participants whether they would consider taking the drug (among consumers) or prescribing the drug (among PCPs), on a 6-point scale ranging from 1 (strongly disagree) to 6 (strongly agree).

Demographic and background variables. In addition to the dependent variables, several items related to patient characteristics, such as age, race, ethnicity, gender, and, among consumers only, education, were measured. Participants' self-reported illness knowledge was also measured by asking them to rate their current knowledge about prescription drugs that treat chronic pain on a scale of 0 to 10, where 0 reflected knowing nothing about the topic and 10 meant knowing everything they could possibly know about the topic. Participants' general skepticism toward prescription drug websites (adapted from Huh et al[41]; Obermiller and Spangenberg[42]) was assessed. Specifically, participants were asked, on a 6-point scale ranging from 1 (strongly disagree) to 6 (strongly agree), their level of agreement with 7 statements: (1) prescription drug websites are a reliable source of information about the quality and performance of medications, (2) I feel I've been accurately informed after seeing most prescription drug websites, (3) in general, prescription drug websites present a true picture of the drug being advertised, (4) we can depend on getting the truth in most prescription drug websites, (5) prescription drug websites' aim is to inform consumers/providers, (6) prescription drug websites are informative, and (7) most prescription drug websites provide consumers/providers with essential information. Participants' responses to these items were averaged to form the general skepticism scale (Cronbach's α=.95 among consumers and Cronbach's α=.95 among PCPs).

Analysis

SAS Enterprise Guide Version 7.13 and SPSS Version 25.0 were used to conduct study analyses. Before conducting significance testing, whether covariates should be included in the model was explored using Pearson's r for bivariate associations between continuous variables and the square root of the R^2 for bivariate associations between a categorical and continuous variable. The inclusion of potential covariates in the model was only justified if relationships showed a moderate to strong association (absolute r or square root of $R^2 \geq .30$) with the dependent variable. Based on those results, among consumers and PCPs, skepticism toward prescription drug websites was included as a covariate for 5 dependent variables:

perceived website deceptiveness, attitude toward the drug, intentions, interest in the drug, and perceived efficacy, including the mediation models that included these variables.

To examine the research questions and hypotheses, analysis of variance (ANOVA) or covariance (ANCOVA) tests were conducted. For the ANOVA models, Levene's test was used to determine whether the assumption of homogeneity of variance for each of the dependent variables was satisfied. For the models that did not meet this assumption, the more conservative Welch's *F* statistic was used to examine the overall model results along with maximum likelihood estimation to examine pairwise comparisons. For the ANCOVA models, homogeneity of variance was examined using a restricted maximum likelihood estimation based on the covariance matrix. For the models that did not meet this assumption, the *F* statistic for the omnibus tests and the test statistics for the planned comparisons based on the restricted maximum likelihood estimation were reported.

In the case of a significant main effect of experimental condition based on *P* value <.05, planned contrasts were conducted to test for differences between experimental groups using a Bonferroni-adjusted significance threshold of .0167. Eta-squared is reported as a measure of effect size for the overall test and planned contrasts. For models for which the tests that examined homogeneity of variances between experimental conditions were significant—indicating a violation of the assumption of equal variances—the η^2 for the overall effects and planned comparisons based on the standard *F* test, which should be viewed as an approximation, were reported.

Finally, regression path analysis was conducted using the PROCESS macro for SPSS[43] to assess mediation effects specifically examining perceived deception as the mediator and false-claim acceptance, efficacy perceptions, attitude toward the drug, interest in the drug, and behavioral intention as the outcomes. The analyses followed the causal-steps approach for testing mediation hypotheses,[44] but without requiring a significant total effect of the experimental conditions on the dependent variable. In accordance with these steps, the study did not proceed with the mediation analysis if in a previous analysis the experimental condition was not significantly associated with the mediator. When the

independent variable is multi-categorical, as it is here (i.e., experimental condition is a nominal variable with 3 groups), the mediation models require estimation of *k*-1 direct and indirect effects, where *k* is the number of groups represented by the independent variable.[45] The convention proposed by Hayes and Preacher of referring to these as *relative direct effects* and *relative indirect effects* to acknowledge that the effects are quantified relative to a reference group was adopted. In addition to reporting regression estimates of relative direct effects and relative indirect effects, bootstrap standard errors and 95% confidence intervals for relative indirect effects to test for mediation were computed.[43] These estimates were generated using the PROCESS bootstrapping procedure with at least 10,000 replications. Relative indirect effects with confidence intervals that do not include zero show evidence of mediation.

RESULTS

Participant Characteristics

Table 1 provides a summary of consumers' and PCPs' characteristics. The average age for consumers in the sample was 62 years. Most of them were white (89%), female (61%), reported a college degree or higher education (56%), and were currently taking prescription drugs for chronic pain (63%). PCPs in the sample were 53 years old, on average, and had been practicing medicine for an average of 21 years. The majority were white (67%) and male (67%). About one-third of the PCPs (35%) indicated that at least half of their patients are seen for chronic pain; 62% said that only a small portion of their patients are seen for chronic pain.

Insert Table 1. Participant Characteristics for the Consumer and PCP Samples

Results for Hypothesis 1

It was predicted that as the number of deceptive claims and tactics increased, perceived deception would increase. Among consumers, the number of deceptive claims and tactics in a website largely did not affect participant detection of deception. No significant difference was found between experimental groups with regard to the first deception detection measure regarding overall perceived website deceptiveness. Also, no differences between experimental groups were found regarding the second

detection deception measure (perception that risks and benefits are portrayed in a misleading way). Although a statistically significant omnibus statistic (*P*=.046) was found, pairwise analyses showed that none of the planned comparisons reached the Bonferroni-adjusted significance threshold of.0167.

Among PCPs, the number of deceptive claims and tactics in a website affected participants' detection of deception, but the results differed slightly for the 2 deception measures (see Table 2). The first deception detection measure captured overall perceptions of website deceptiveness, and PCPs who saw the website with more deceptive claims and tactics reported higher perceived deception compared with PCPs who saw the website with fewer deceptive claims and tactics, *P*=.011, η^2=.01. The second deception detection measure captured the perception that risks and benefits are portrayed in a misleading way, and PCPs who saw the website with more deceptive claims and tactics reported higher perceptions (*P*=.001, $\eta^{2=}$.03) compared with PCPs who saw the website with no deceptive claims and tactics. The comparison between the more deceptive claims and tactics and fewer deceptive claims and tactics conditions approached but did not reach the Bonferroni-threshold for statistical significance (*P*=.024).

Insert Table 2. Effects of Number of Deceptive Claims and Tactics on Dependent Variables for Consumers and PCPs

Results for Hypothesis 2

It was predicted that the relationship between the number of deceptive claims and tactics and persuasive outcomes would be mediated by perceived deception. Given that the number of deceptive claims and tactics was not significantly associated with either measure of perceived deception (based on the omnibus test for perceived website deceptiveness and based on pairwise comparisons for the misleading portrayal of risks and benefits) in the consumer sample, mediation analysis was not conducted. However, a direct effect of the number of deceptive claims and tactics on acceptance of 1 of the 2 false claims and tactics, attitudes toward the drug and interest in the drug was found. Specifically, consumers who saw the website with more deceptive claims and tactics believed the statement that "Dolafex provides safe and complete relief from chronic pain" with greater certainty compared with consumers

who saw the website with no deceptive claims and tactics P=.004, η^2=.03. In addition, consumers who saw the website with more (P=.003, η^2=.02) and fewer (P=.008, η^2=.01) deceptive claims and tactics reported more favorable attitudes toward the drug than consumers who saw the website with no deceptive claims and tactics; and those who saw the website with fewer deceptive claims and tactics reported higher interest in the drug compared with those who saw the website with no deceptive claims and tactics (P=.007, η^2=.02). The comparison between the more deceptive claims and tactics and no deceptive claims and tactics conditions approached but did not reach the Bonferroni-threshold for statistical significance (P=.028).

Among PCPs, perceptions regarding misleading portrayal of risks and benefits did not mediate the effect of the number of deceptive claims and tactics on acceptance of false claims and tactics, attitude toward the drug, interest in the drug, intentions, or efficacy perceptions. In contrast, controlling for general skepticism, perceived website deceptiveness mediated a the effect of the number of deceptive claims and tactics on acceptance of false claims and tactics, efficacy perceptions, attitude toward the drug, interest in the drug, and behavioral intentions.

Specifically, relative to PCPs exposed to the website with fewer deceptive claims and tactics, PCPs assigned to the version with more deceptive claims and tactics had lower acceptance of the false claims and tactics, lower efficacy perceptions, less favorable attitudes toward the drug, lower interest in the drug, and lower intentions, which was partly the result of their higher perceptions of website deceptiveness (see Figure 3 and Table 3). The relative indirect effect on attitude toward the drug for the no deceptive claims and tactics control group compared with the group exposed to fewer deceptive claims and tactics was not significant.

Insert Figure 3. Indirect Effects of Number of Deceptive Claims and Tactics through Perceived Deception among PCPs

Insert Table 3. Indirect Effects of Number of Deceptive Claims and Tactics through Perceived Deception among PCPs

Evidence for Research Question 1

Research Question 1 asked whether minimizing the drug's risks would result in lower risk recognition for consumers and PCPs who view a version of the same website containing no deceptive claims and tactics. Among consumers, minimizing the risks in the conditions that included fewer and more deceptive claims and tactics had a significant effect on risk recognition ($P<.001$, $\eta^2=.06$) such that those who saw the website where the risks were *not* minimized (i.e., control condition) had greater risk recognition than consumers in the conditions with fewer ($P<.001$, $\eta^2=.04$) and more deceptive claims and tactics ($P<.001$, $\eta^2=.04$).

Among PCPs, minimizing the risks in the conditions that included fewer and more deceptive claims and tactics had a significant effect on risk recognition ($P< .001$, $\eta^2=.06$). PCPs who saw the website where the risks were *not* minimized (i.e., control condition) had greater risk recognition than PCPs in the fewer ($P<.001$, $\eta^2=.05$) and more conditions ($P<.001$, $\eta^2=.05$).

Evidence for Research Question 2

Research Question 2 asked whether consumers and PCPs differ in their tendency to respond to deceptive claims and tactics in prescription drug promotion. Although we cannot draw inference from a direct statistical comparison of the two studies, we can look qualitatively at the patterns from each study. It is clear from the 2 sets of study results that increasing the number of deceptive claims and tactics only altered judgments of deceptiveness among PCPs. In contrast, consumers exposed to the website with more and fewer deceptive claims and tactics did not report higher perceived deception compared with those who were exposed to the website with no deceptive claims and tactics. They also reported higher claim acceptance and more positive attitudes toward the drug. In line with Johnson and colleagues,[26] PCPs' greater domain knowledge may have made them better able than consumers, in general, to notice misleading content or deceptive cues on drug websites.

GENERAL DISCUSSION

The available literature provides little empirical evidence on the tendency of consumers and PCPs to independently identify false or deceptive information in prescription drug promotion or about the effect of deceptive information on viewers' false-claim acceptance attitudes, interest in the drug, or intentions to use the drug. Furthermore, evidence on the persuasive effects of the amount of deceptive claims and tactics has been lacking, as has been research on whether physicians versus patients would be better equipped to perceive and reject medical misinformation. These experiments aimed to address these gaps in the context of prescription drug website material by examining the ability of consumers and PCPs to identify deceptive prescription drug promotion tactics at various levels of deception and to explore whether detecting an initial attempt to deceive influences subsequent perceptions and actions regarding an advertised product.

Results suggest that the number of deceptive claims and tactics did not affect perceived deception among consumers, indicating that consumers believed the website's deceptive claims and tactics regardless of the number of deceptive claims and tactics it included. Specifically, this study suggests that consumers tended to believe that the websites with deceptive claims and tactics were just as accurate, believable, or true as the website with no deceptive claims and tactics, and consumers did not tend to think the deceptive websites exaggerated benefits, minimized risks, or otherwise misled people about the effectiveness or risks of the drug any more than the control. Consequently, overall, the findings suggest that increasing the number of deceptive claims and tactics did not raise consumers' suspicions or create doubts about the veracity of the claims and tactics on the websites enough to alter their judgments of deceptiveness. The presence of any deceptive claims and tactics thus can be problematic for consumers because they tend not to detect deceptive information in prescription drug promotion.

However, a different pattern was found among PCPs. Specifically, the results provide evidence that PCPs who saw more deceptive claims and tactics were more suspicious about the information presented on those websites relative to those who saw fewer claims and tactics. They also rated the

website as more misleading with regard to the risks and benefits of the drug compared with PCPs who saw the website with no deceptive claims and tactics. What is clear is that those exposed to more deceptive claims and tactics reported the highest perceived deception, on average, across both measures, while the extent of perceived deception for those exposed to fewer and no deceptive claims and tactics depended on the type of perceived deception assessed.

The experiments also examined whether exposure to a website with deceptive claims and tactics had an effect relative to not seeing such claims and tactics. Among consumers, those who viewed websites with either fewer or more deceptive claims and tactics reported more positive attitudes than those who viewed the website with no deceptive claims and tactics. Acceptance of 2 specific deceptive claims and tactics—that the drug is a "risk-free choice" and that it provides "safe and complete relief"—was also examined to understand whether the websites were effective in deceiving viewers. The expectation was that viewers who were deceived by the websites would report greater acceptance of the deceptive claims and tactics than viewers in the control condition who were not exposed to the claims and tactics.

The results show some evidence that exposure to deceptive websites affected specific claim acceptance among consumers generally. Specifically, consumers exposed to the website with more deceptive claims and tactics reported greater acceptance of the claim that the drug offered "safe and complete relief from chronic pain" compared with consumers exposed to the website with no deceptive claims and tactics. Although the "safe and complete relief" claim appeared in both the few deceptive claims and tactics condition and the more deceptive claims and tactics condition, the findings suggest that being exposed to additional deceptive claims and tactics influenced acceptance of this "safe and complete relief" claim. So, consumers who viewed more deceptive claims and tactics not only failed to perceive deception but also reported higher acceptance of the claim that the drug provides "safe and complete relief."

The website with fewer deceptive claims and tactics also generated greater interest in the drug than the website with no deceptive claims and tactics, but deceptive websites did not generate different efficacy perceptions or behavioral intention. So, we found mixed evidence that the number of deceptive claims and tactics affects persuasive outcomes.

Among PCPs, no significant effects of the number of deceptive claims and tactics on outcomes such as false claim acceptance, attitudes toward the drug, interest in the drug, behavioral intentions, or perceived drug efficacy was found. This result again offers support that PCPs are better able to assess deceptive claims and tactics and potentially to reject their influence.

Considering the results presented above, it appears that unlike consumers, PCPs had some doubts about the accuracy of the website in the more condition that included 5 false claims and tactics and did not believe the claims made about the drug on the website. In line with Johnson and colleagues,[26] PCPs' greater domain knowledge may have made them better able than consumers, in general, to notice misleading content or deceptive cues on drug websites. Together, these findings suggest that consumers are relatively more likely than PCPs to be deceived by a prescription drug website with many deceptive claims and tactics. PCPs' expertise and experience with this category of products may offer some protection against deceptive promotion in this case. It is important to note that only PCPs exposed to more deceptive claims and tactics reported higher perceived deception compared to those exposed to fewer deceptive claims and tactics, but not relative to the no-deception control website. For example, PCPs may not be alerted to deceptive claims and tactics when there is a limited number of these used in a message (e.g., 2). This finding highlights that PCPs are not impervious to being deceived.

It was also hypothesized that perceived deception would mediate the effects of the number of deceptive claims and tactics. Consumers did not differ in their perceived deception (i.e., neither perceived website deceptiveness nor misleading portrayal of risks/benefits); therefore, this study did not explore any mediation effects among this population. Among PCPs, the study explored whether overall perceived website deceptiveness mediated the effects of the number of deceptive claims and tactics on the outcomes

of interest comparing those exposed to the website with more deceptive claims and tactics with those exposed to the website with fewer deceptive claims and tactics. The findings of the mediation analysis suggest a negative mediation effect such that PCPs exposed to the websites with more deceptive claims and tactics reported greater perceived website deceptiveness, which in turn resulted in less acceptance of false claims and tactics, less positive drug-related attitudes, lower behavioral intentions, less interest in the drug, and lower efficacy perceptions compared with PCPs exposed to the website with fewer deceptive claims and tactics. A mediation effect was not observed for the misleading portrayal of risks and benefits construct. It is unclear why only perceptions of overall website deceptiveness significantly mediated effects. It is possible that having a general perception that a website is deceiving is more likely to influence more distant drug-related outcomes, rather than perceptions about specific content being deceptive (e.g., content about portrayal or risks or benefits).

Minimization of risk information in deceptive versions of the presented websites was expected to lead participants to pay less attention to the risk information and thus to be less likely to report having seen such information when answering a subsequent recognition question. The findings support this proposition; both consumers and PCPs exposed to the website with relatively few deceptive claims and tactics and the website with more deceptive claims and tactics were less likely to report key risk information from the website than consumers and PCPs exposed to the website with no deceptive claims and tactics (the control). This finding has important implications for decision-making because consumers and PCPs may retain limited information about prescription drug side effects.

Limitations

The set of 2 studies has several limitations. The manipulation of deceptive claims and tactics exposure included 3 levels of deception intended to mimic common website content: a condition with no deceptive claims and tactics, 1 with 2 deceptive claims and tactics, and 1 with 5 deceptive claims and tactics were included. Having additional levels between the 2 and 5 deceptive claims and tactics or having

more than 5 deceptive claims and tactics may have allowed us to explore more threshold possibilities with regard to perceived deception, drug-related attitudes, and intentions than what was investigated here.

Also, consumers and PCPs who opted into our study from an existing online panel all had household broadband Internet access. Although consumers with a high school education or less were oversampled, the sample may be skewed toward individuals of at least moderate socioeconomic status. Further, this study focused on consumers who reported being diagnosed with chronic pain and PCPs who treat patients with chronic pain. Thus, the results cannot be generalized to describe the full U.S. population of consumers or PCPs and future studies should examine these effects in other settings and other medical conditions.

This study also did not assess consumers' and PCPs' free recall of drug risks in the context of minimizing risk information. However, given that recall is more cognitively demanding than recognition,[46] it is suspected that the effects of minimization of risk on recall—such as lower recall among consumers or PCPs exposed to websites with deceptive claims and tactics—likely would have been similar or even more pronounced; the key to that outcome likely lies in whether participants deeply processed risk information. Moreover, in developing the stimuli for consumers and PCPs, the goal was to keep the websites as similar as possible yet to include appropriate content for the target audience. Tailoring the stimuli to PCPs and consumers introduced an experimental confound such that any observed differences between consumers and PCPs could be reasonably attributed to the population-targeted features of the website rather than the number of deceptive manipulations. Consequently, no direct statistical comparisons were made between consumers and PCPs, although comments on the qualitative differences between results from the 2 experiments are provided.

Finally, this study focused on deceptive claims and tactics in pharmaceutical websites; future research could explore whether consumers and PCPs are more or less likely to detect deception in various other forms of pharmaceutical promotion (e.g., social media posts, TV ads, promotional brochures, or conference exhibits). Focusing on online promotion is reasonable, nonetheless. Sullivan et al.[47] examined

trends in the types of prescription drug promotional materials submitted to FDA from 2001 to 2014; unlike broadcast or print advertisements, which have plateaued since 2007, Internet promotion has continued to increase through the period in question. Southwell and Rupert[48] also note that little peer-reviewed research has explored information engagement on branded prescription drug websites.

Practical Implications and Directions for Future Research

Consumers and PCPs appear to be operating from different perspectives when assessing deception in prescription drug websites. This discrepancy between perspectives could lead to miscommunication or tension between consumers and physicians and thus is noteworthy.

Physician deception detection appears to be a function of the actual number of deceptive claims and tactics to which they are exposed (rather than just stemming from general skepticism on the part of physicians). This study suggests that consumer detection of deception, in contrast, was largely not activated even in the most extensive presentation of deceptive claims and tactics. Although one would expect based on the study results that PCPs will notice relative differences between websites with more and fewer deceptive tactics, the results suggest consumers could use assistance generally in discerning deception on prescription drug websites. Information tools that directly raise consumer perceptions of website deception, in turn, might help consumers reject deceptive claims and tactics.

It is possible that for consumers an even higher number of deceptive claims and tactics than were included—or perhaps more blatant deceptive claims and tactics than were included in this study—could have encouraged skepticism about the website. Future research could explore this further by altering either the number of deceptive claims and tactics or how exaggerated or extreme the claim is to see if number or type of claim, or some combination of both, has the greatest impact on perceived deception and deception detection.

Other areas that warrant further attention include exploring the use of graphics or figures that might mislead readers. Awareness of visual deception—presented through graphics, charts, or

photographs—in advertisements is a new arena for research, so researchers do not have much evidence to date. However, researchers have noted that a sizable proportion of drug advertisements include graphical elements that could potentially mislead people.[38] Future studies could explore the effect of visually deceptive content on deception detection.

The lack of difference in acceptance of the "safe and complete relief" claim among viewers in the fewer deceptive claims and tactics condition relative to the control condition points to the possibility that people do not interpret a claim in isolation. For example, for consumers in the more deceptive claims and tactics condition to accept the claim as true, they may have relied on other supporting information on the website, which was also manipulated to be deceptive. The additional claims and tactics in the more deceptive claims and tactics condition could have reinforced the "safe and complete relief" message, which consumers in the more deceptive claims and tactics condition integrated to form a stronger assessment (albeit inaccurate) of that claim's truth. However, this study did not find differences regarding acceptance of the claim about the drug being a "risk-free" choice, even though this claim was in the condition with more deceptive claims and tactics as well. It is possible that effects depend on the type of claim as well. For instance, claims and tactics discussing effectiveness may be more susceptible to being believed than claims and tactics about the drug's side effects and especially when those claims and tactics mention that the drug is risk free. People may be less likely to believe a drug is risk free. Finally, to understand how and why people are influenced by false or misleading information, this study focused on exploring two populations and experimentally manipulating the amount and type of deceptive claims and tactics (controlling for general skepticism in prescription drug websites both statistically and through randomization). Future research might focus on other correlates or causes of one's willingness to accept medical misinformation.

CONCLUSIONS

Overall, the results suggest that detection of deception on prescription drug websites is not automatic for consumers, even when the relative number of deceptive claims and tactics increases. A

somewhat different pattern of detection and rejection among PCPs was found. Upon initial exposure to a website with deceptive claims and tactics, consumers tended to be deceived, whereas PCPs tended to be suspicious. These results stand somewhat in contrast to other evidence in which factual knowledge or expertise does not distinguish between people in their tendency to detect deception. Specifically, PCPs tended to notice deceptive tactics when they saw multiple instances of exaggerated or unsubstantiated efficacy claims and tactics and claims and tactics that minimize the drug's risks. PCPs' heightened suspicion resulted in a combination of less positive attitudes and reduced behavioral intention than would have been expected had deceptiveness gone unnoticed. Among consumers, exposure to overstatements of efficacy and minimization of risk appears to have encouraged more positive evaluations toward the drug in question rather than raising suspicions. Given the mediating role of perceived deception, future research should explore other factors, aside from training, that might make someone more likely to notice deceptive tactics in pharmaceutical marketing. In sum, results suggest consumer vulnerability to deceptive website practices in the context of prescription drug promotion and also suggest some potential differences between consumer and PCP perspectives at least in this domain.

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Appendix A. Supplementary data Supplementary data to this article can be found online at https://doi.org/10.1016/j.sapharm.2020.06.019.

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Figure 1. Participant Recruitment and Assignment: Consumers

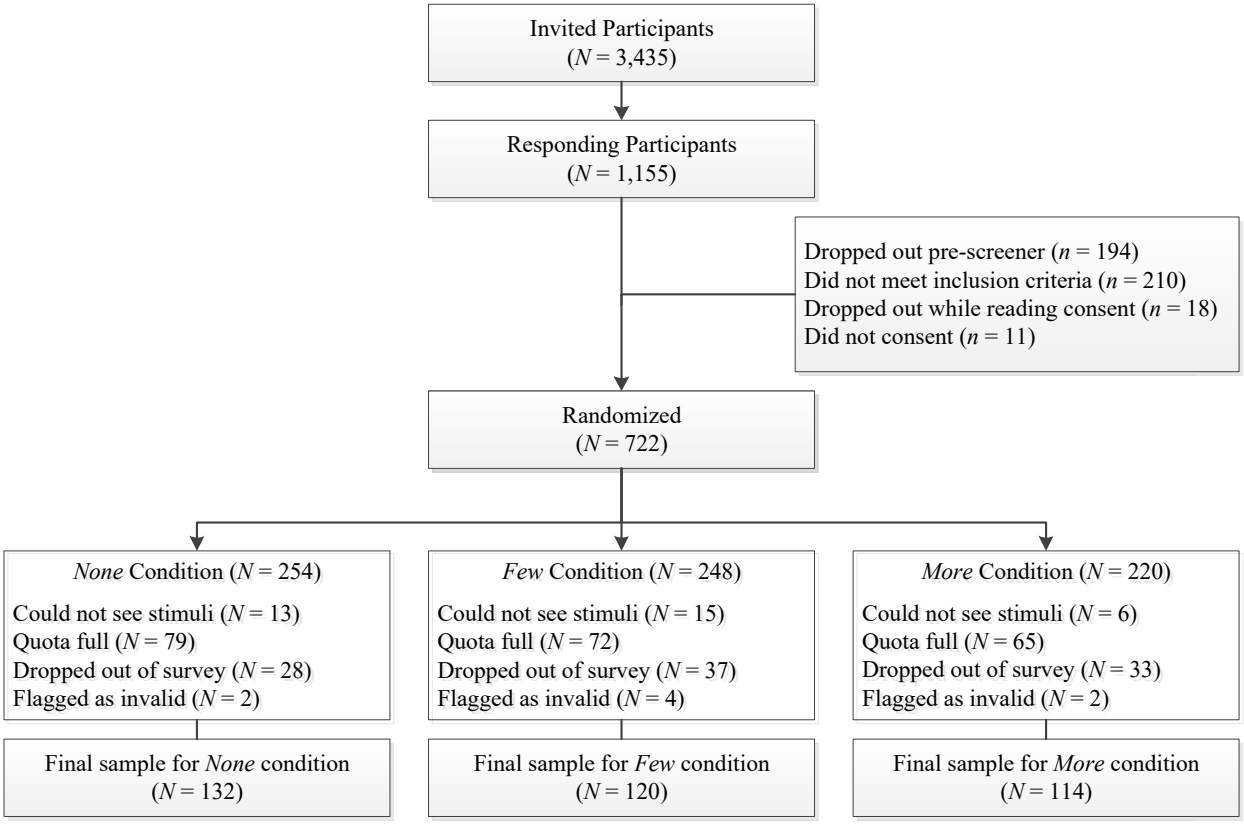


Figure 2. Participant Recruitment and Assignment: PCPs

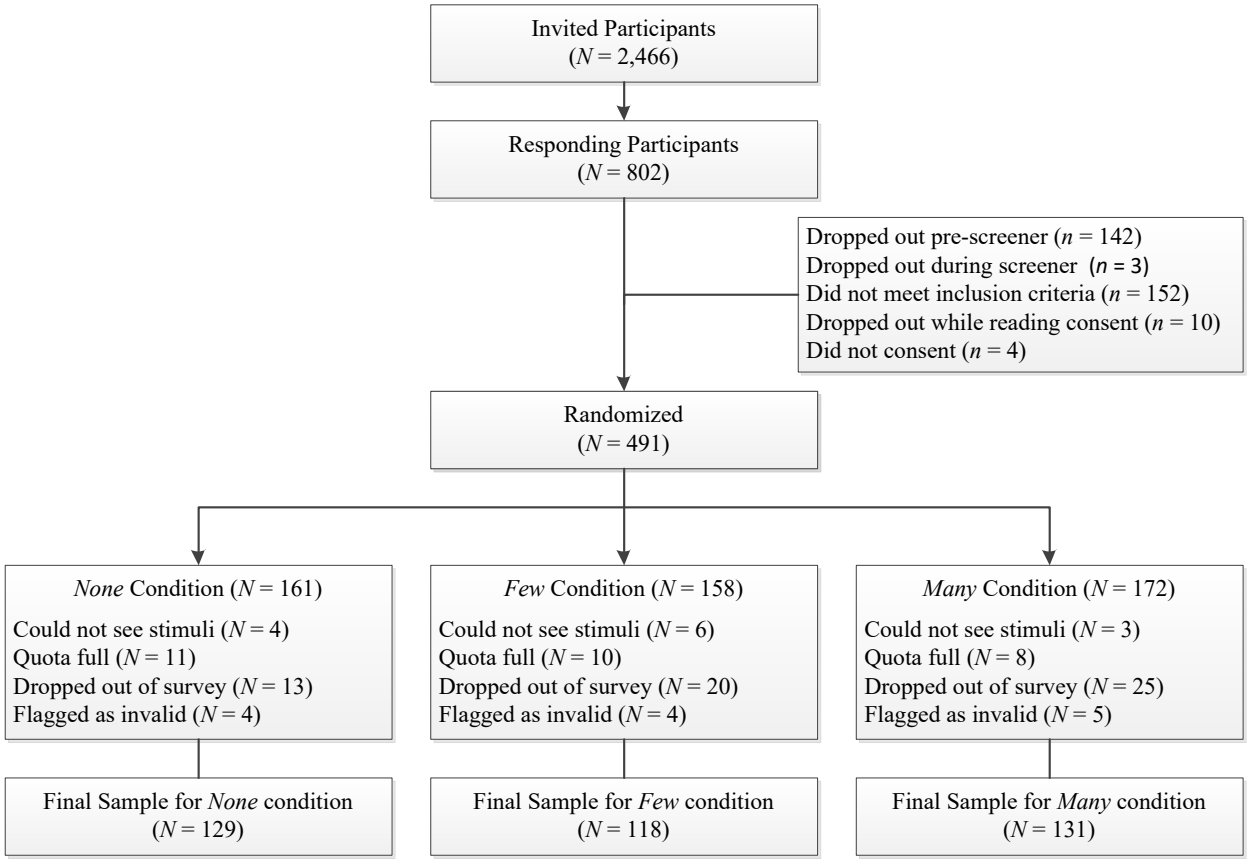
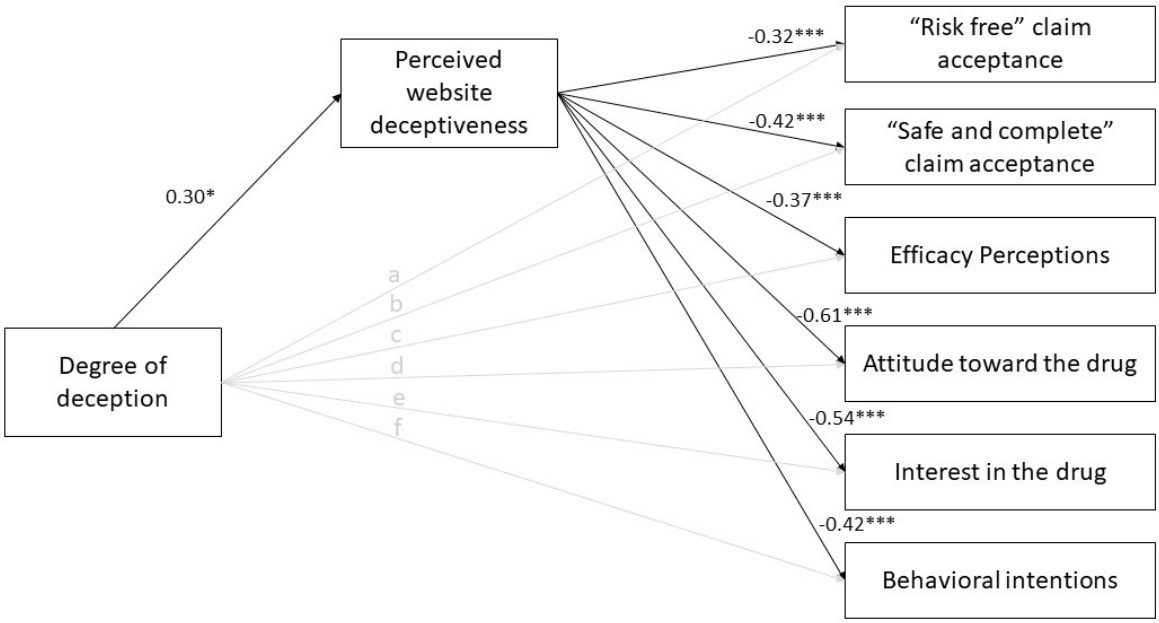


Figure 3. Indirect Effects of Number of Deceptive Claims and Tactics through Perceived Deception among PCPs



Notes. The letters a, b, c, d, e, and f stand for the coefficients for the direct effect of the number of deceptive claims and tactics on the proposed outcomes and can be found in Table 2.
* represents significance *P*<.05, *** represents significance *P*<.001.
Indirect effects are presented in Table 3. General skepticism toward prescription drug websites was included in the model as a covariate; adjusted statistics are reported.

Table 1. Participant Characteristics for the Consumer and PCP Samples

Characteristic	Consumers (N=366) n (%)	PCPs (N=378) n (%)
Gender		
Male	144 (39.3)	254 (67.2)
Female	222 (60.7)	124 (32.8)
Age[±]		
18-29	2 (0.5)	7 (1.9)
30-44	22 (6.0)	73 (20.0)
45-59	113 (30.9)	188 (51.5)
60+	229 (62.9)	97 (26.6)
Race/ethnicity		
White, non-Hispanic	321 (89.2)	228 (66.7)
Black, non-Hispanic	10 (2.8)	16 (4.7)
Hispanic	11 (3.1)	19 (5.6)
Other or 2+ races, non-Hispanic	18 (5.0)	79 (23.1)
Education		
High school or less	73 (19.9)	n/a
Some college	88 (24.0)	
Associate degree	44 (12.0)	n/a
Bachelor's degree	80 (21.9)	n/a
Advanced or postgraduate degree	81 (22.1)	n/a
	Mean (SD)	**Mean (SD)**
Age (in years)	62.0 (10.6)	52.7 (10.3)
Years in practice	n/a	20.9 (9.0)
Current knowledge about prescription drugs to treat chronic pain[a]	5.6 (2.2)	7.1 (1.6)

[±]Three PCPs had missing data for their age.
[a] Respondents were asked to rate their current knowledge of prescription drugs that treat chronic pain on a scale of 0 to 10, where 0 means knowing nothing and 10 means knowing everything you could possibly know.

Table 2. Effects of Number of Deceptive Claims and Tactics on Dependent Variables for Consumers and PCPs

Outcome	Sample	Omnibus Test Statistic	Experimental Condition		
			Control Mean (SE)	Fewer Mean (SE)	More Mean (SE)
Perceived website deceptiveness†	Consumers	$F(2, 354)=0.57$, $P=.565$	2.96 (0.09)	3.07 (0.10)	3.10 (0.10)
	PCPs	$F(2, 366)=3.55$, $P=.030$, $\eta^2=.01$	$3.16^{a,b}$ (0.08)	3.07^{a} (0.08)	3.37^{b} (0.08)
Misleading portrayal of risks/benefits	Consumers	$F(2, 357)=3.10$, $P=.046$, $\eta^2=.02$	2.95 (0.10)	2.96 (0.09)	3.26 (0.10)
	PCPs	$F(2, 374)=5.49$, $P=.004$, $\eta^2=.03$	3.09^{a} (0.08)	3.19^{ab} (0.08)	3.46^{b} (0.09)
Recognition of risks	Consumers	$F(2, 363)=10.69$, $P<.001$, $\eta^2=.06$	6.36^{a} (0.17)	5.35^{b} (0.19)	5.24^{b} (0.22)
	PCPs	$F(2, 375)=12.64$, $P<.001$, $\eta^2=.06$	5.74^{a} (0.14)	4.84^{b} (0.14)	4.84^{b} (0.15)
Persuasion Outcomes					
Efficacy perceptions†	Consumers	$F(2, 356)=1.69$, $P=.186$	3.10 (0.09)	3.15 (0.10)	3.34 (0.10)
	PCPs	$F(2, 366)=0.56$, $P=.569$	3.23 (0.08)	3.36 (0.09)	3.31 (0.08)
"Risk free" claim acceptance	Consumers	$F(2, 357)=2.99$, $P=.052$	2.65 (0.11)	2.81 (0.12)	3.05 (0.12)
	PCPs	$F(2, 367)=1.62$, $P=.200$	2.85 (0.11)	3.07 (0.12)	3.11 (0.11)
"Safe and complete" claim acceptance	Consumers	$F(2, 357)=4.22$, $P=.015$, $\eta^2=.03$	2.98^{a} (0.10)	3.22^{ab} (0.10)	3.42^{b} (0.11)
	PCPs	$F(2, 367)=0.85$, $P=.427$	3.36 (0.10)	3.54 (0.11)	3.49 (0.10)
Attitude toward the drug†	Consumers	$F(2, 357)=5.67$, $P=.004$, $\eta^2=.02$	3.53^{a} (0.09)	3.90^{b} (0.10)	3.96^{b} (0.10)
	PCPs	$F(2, 367)=0.95$, $P=.386$	4.18 (0.08)	4.18 (0.08)	4.04 (0.08)
Interest in the drug†	Consumers	$F(2, 357)=4.23$, $P=.015$, $\eta^2=.02$	3.22^{a} (0.12)	3.69^{b} (0.13)	3.61^{ab} (0.13)
	PCPs	$F(2, 367)=0.29$, $P=.746$	4.13 (0.09)	4.10 (0.09)	4.03 (0.09)
Behavioral intentions†	Consumers	$F(2, 356)=1.51$, $P=.222$	3.38 (0.12)	3.57 (0.13)	3.69 (0.13)
	PCPs	$F(2, 365)=0.68$, $P=.506$	4.26 (0.08)	4.23 (0.09)	4.13 (0.08)

† Indicates that general skepticism toward prescription drug websites was included in the model as a covariate; adjusted statistics are reported. Means with different superscripts are significantly different from each other based on an adjusted P value of < .0167.

Table 3. Indirect Effects of Number of Deceptive Claims and Tactics through Perceived Deception among PCPs

Indirect Path from Number of Deceptive Claims and Tactics through Perceived Website Deceptiveness to:	Coefficient	Bootstrap Standard Error	Bootstrap 95% Confidence Interval	
			Lower Limit	Upper Limit
"Risk-free" claim acceptance	−0.10	0.04	−0.20	−0.02
"Safe and complete" claim acceptance	−0.12	0.05	−0.24	−0.03
Efficacy perceptions	−0.11	0.05	−0.21	−0.03
Attitude toward the drug	−0.18	0.07	−0.32	−0.04
Interest in the drug	−0.16	0.06	−0.29	−0.04
Behavioral intentions	−0.13	0.05	−0.23	−0.03

Note. General skepticism toward prescription drug websites was included in the model as a covariate; adjusted statistics are reported.