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ORIGINAL RESEARCH

Feeling Is Believing: Evaluative Conditioning and the Ethics of Pharmaceutical Advertising

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Abstract A central goal in regulating direct-to-consumer advertising of prescription pharmaceuticals (DTCA) is to ensure that explicit drug claims are truthful. Yet imagery can also alter viewer attitudes, and the degree to which this occurs in DTCA is uncertain. Addressing this data gap, we provide evidence that positive feelings produced by images can promote favourable beliefs about pharmaceuticals. We had participants view a fictitious anti-influenza drug paired with unrelated images that elicited either positive, neutral or negative feelings. Participants who viewed positive images rated the influenza drug as significantly more effective, safe, and beneficial than did participants who viewed negative images. This effect, known as evaluative conditioning, is well described in experimental social psychology but has not previously been shown with pharmaceuticals. We discuss how evaluative conditioning in DTCA may compromise viewer autonomy, and canvass possible regulatory responses.

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Only two nations, the United States and New Zealand, permit direct-to-consumer advertising of prescription pharmaceuticals (DTCA). Two major concerns ground the decision of all other nations to ban the practice. First, prescription drugs have significant potential to cause harm. Indeed, prescription status—the requirement that a doctor authorise use—is conferred when a drug's toxicity and side effects are such that medical oversight is necessary for safe administration (Brass 2001). Second, because the primary task of advertisers is to persuade rather than inform, there is inducement to present drugs in the most favourable light (Hasman and Holm 2006). The chances are heightened, therefore, that drug claims may be imbalanced, biased, or misleading, risking improper use and harm.

These concerns are not merely speculative. DTCA is effective, generating nearly $US4 for each dollar spent (Mintzes 2009). Reflecting the generous return on investment, U.S. spending on DTCA jumped from $US1.2 billion in 1998 to $US5.4 billion in 2006 (Ventola 2011). Yet DTCA viewers are more likely to request drugs from their doctor that are either clinically inappropriate or of questionable efficacy (Mintzes 2012). Of 459 doctors surveyed by the U.S. Food and Drug administration (FDA), 75 per cent indicated that DTCA caused patients to think that "drugs work better than they actually do" (Aikin et al. 2004, 69). In the same study, 63 per cent of doctors said DTCA caused

patients to want advertised drugs over any others, however effective (Aikin et al. 2004, 74).

Moreover, Kravitz and colleagues found that doctors met 55 per cent of brand-specific requests for an antidepressant in adjustment disorder, a condition where depressed mood follows a stressful life event and for which drug treatment is not indicated (Kravitz et al. 2005). These findings make it unsurprising that a meta-analysis found no evidence for beneficial public health effects of DTCA (Gilbody et al. 2005). Indeed, adverse drug events are the fourth-highest cause of deaths in the United States after stroke, cancer, and heart disease (Lazarou et al. 1998). Annual adverse events reported to the FDA more than doubled to 482,000 in the decade after DTCA was introduced in 1997 (Food and Drug Administration 2007), with both increased (Almasi et al. 2006) and inappropriate (Hollon 2005) prescribing likely contributors.

The United States attempts to mitigate these effects with regulation. The FDA is charged with ensuring that DTCA complies with a range of statutes. For example, the *Food Drug and Cosmetics Act* requires ads to be neither false nor misleading (21U.S.C. 352(a)). And the U.S. Code of Federal Regulations demands "a true statement of information relating to side effects, contraindications, and effectiveness" (Title 21, Section 202.1, 3).

Yet, recent research in consumer psychology suggests it may be ineffective to merely regulate the propositional content of DTCA; that is, the explicit statements and claims made about drug properties. The advertising industry has understood for decades that ads also persuade via their "non-propositional" content; for example, music and imagery (Biegler and Vargas 2013).

Evaluative conditioning comprises a paradigm case of non-propositional persuasion. A variant of classical Pavlovian conditioning, evaluative conditioning produces favourable attitudes by pairing objects with images or music of positive valence—those that elicit pleasing feeling or affect (Hofmann et al. 2010). Critically, studies show that such pairings can produce not just positive feelings towards the paired stimulus, but also positive beliefs and behavioural intentions (Krosnick et al. 1992).

Like most advertising, DTCA employs a range of positive imagery, including majestic scenery, family occasions, and fun activities. A pressing empirical question is whether such imagery can condition positive drug beliefs and, given that images seldom relate to actual drug properties, foster inaccurate appraisals. If so, it raises regulatory concerns about the potential for DTCA to mislead via its pictorial content. A related ethical concern is whether such imagery impairs the autonomy with which DTCA viewers make medicine choices.

While evaluative conditioning has been demonstrated towards a range of commercial products, including beers (Sweldens et al. 2010), toothpaste (Pleyers et al. 2007), and chewing gum (Pleyers et al. 2007), no study has attempted to condition positive attitudes towards pharmaceuticals. We designed the following study to address this knowledge gap.

Methods

We recruited and tested 373 paid participants with Amazon's Mechanical Turk in August 2012. Mechanical Turk is a web-based platform that permits participants to select and complete a range of research tasks on their home computer (Paolacci et al. 2010). Our experiment was only accessible to people aged 18 years and over, with a U.S.-based Internet provider address. The study was approved by a University Human Research Ethics Committee. Each participant provided written informed consent and was debriefed afterwards.

The study was a randomised experiment with a single, between-participants manipulation: positive, neutral, or negative valence imagery conditions. Participants were blinded to the actual purpose of the study. They were informed it would test material for a public service announcement about influenza and a new drug treatment.

A voiceover delivered fifteen statements about the incidence, symptoms, and transmission of influenza (Appendix 1). The voiceover also introduced the fictional but realistic anti-influenza drug Fluvent, whose (fictional) active ingredient is Fluvamivir. Fluvent was described as "a new generation medication with a unique antiviral action," "more effective than existing flu drugs," "an alternative to vaccination," and with side effects including "nausea, headache, diarrhoea, and rash" (Appendix 1).

As each of the fifteen statements was heard, two images were presented on the computer screen, one below the other. The smaller, bottom image was a branded drug box labelled "Fluvent," with "Fluvamivir" in smaller type. It appeared with every statement. The larger, top image differed with each statement. The valence of the top image was the single independent variable.

One third of participants saw the Fluvent box paired with fifteen different positive valence images. Positive images included baby cheetahs, a romantic couple, friends sitting in a waterfall, and a chocolate bar. One third saw the Fluvent box paired with fifteen different neutral valence images. Neutral images included rubber bands, a glass mug, wooden barrels, and a rolling pin. One third saw the Fluvent box paired with fifteen different negative valence images. Negative images included a mutilated seal, a domestic violence scene, a street piled with garbage, and the aftermath of a plane crash. Images were sourced from the International Affective Picture System (IAPS), which contains nearly 1,200 images whose valence has been systematically calibrated (Lang et al. 2008).

Attitudes towards Fluvent were measured using self-report ratings on semantic differential scales employing bipolar adjective pairs (Table 3). Affective (feeling-based) attitudes (Cronbach's Alpha = .90) and cognitive (belief-based) attitudes (Cronbach's Alpha = .89) were rated on seven-point scales that ranged from 1 = most negative to 7 = most positive.

Participants then reported the likelihood they would request Fluvent if visiting a doctor with flu symptoms. Responses were rated on a seven-point scale that ranged from 1 = extremely unlikely to 7 = extremely likely (Table 3).

Affective and cognitive attitudes were calculated as the mean of the three ratings on each measure. Scores for each of the dependent measures were subjected to one-way ANOVAs with p-value alpha < .05. Tukey's Honestly Significant Difference post-hoc tests (Tukey's HSD) were conducted to examine differences among the three conditions with p-value alpha < .05.[1]

We used regression modelling (PROCESS) to test whether feelings and beliefs mediated the relationship between image valence and behavioural intentions (Hayes 2013).

We included a "hypothesis awareness" check in the form of the open-ended question, "Briefly describe what you think the experimenters hope to show with this study."

Results

Participant characteristics are shown in Table 1. One-way ANOVAs testing the effect of image valence on participants' feelings, beliefs, and behavioural intentions towards Fluvent revealed statistically significant differences for measures of feeling ($F(2, 365) = 7.23$, $p < 01$, $\eta p^2 = .04$), belief ($F(2, 365) = 7.42$, $p < .01$, $\eta p^2 = .04$), and likelihood of request ($F(2, 365) = 4.26$, $p < .02$, $\eta p^2 = .02$).

Participants who saw Fluvent paired with positive images rated it significantly more favourably on the feeling measure (M = 4.83, SD = 1.05) than did those who saw Fluvent paired with negative images (M = 4.33, SD = 1.08, p < .01) (Figure 1). Those who saw Fluvent paired with neutral images (M = 4.65, SD = 0.99) rated it significantly more favourably than did those who saw negative images (M = 4.33, SD = 1.08, p < .05), but not less favourably than those who saw positive images (M = 4.83, SD = 1.05; p = .36).

Participants who saw Fluvent paired with positive images also rated it significantly more favourably on the belief measure (M = 5.45, SD = 0.88) than did those who saw Fluvent paired with negative images (M = 4.97, SD = 1.10, p < .01). Those who saw Fluvent paired with neutral images reported beliefs that, while intermediate between those who saw positive and negative images, did not differ significantly from either group (M = 5.19, SD = 0.95, ps > .09).

Participants in the positive condition were significantly more likely to request Fluvent from their doctor (M = 4.71, SD = 1.65) than were those in the negative condition (M = 4.08, SD = 1.70; p < .05). Request likelihood of participants who saw the neutral images (M = 4.43, SD = 1.73), while intermediate between those who saw negative and positive images, did not differ significantly from either (ps > .23).

An alternative way of conceptualising our findings on participants' intentions to request the drug from their doctor is to dichotomise responses so that scores above the midpoint of the scale (from 5 to 7) indicate likely requestors and scores at the midpoint and below (from 1 to 4) indicate unlikely requestors (Table 2).[2] From this perspective we found that positive imagery caused 18.1

[1] Although some measurement theorists consider Likert-type scales to be ordinal, there is evidence that Likert-type scales can be validly and reliably treated as interval scales, and can be analysed with parametric statistics (Labovitz 1967; Traylor 1983). Indeed, in experimental social psychology and behavioural economics, treating Likert-type scales as interval scales is common, accepted practice (Hofmann et al. 2010; Pleyers et al. 2007; Redelmeier and Kahneman 1996).

[2] The authors thank an anonymous reviewer for this suggestion.

Table 1 Participant characteristics by negative, neutral, or positive valence image condition*

Characteristics	Negative (n = 125)	Neutral (n = 124)	Positive (n = 124)	P Value
Age, mean (SD)	32.42 (10.54)	33.73 (11.59)	34.72 (13.25)	.31
Women, No. (%)	66 (52.8)	76 (61.8)	58 (47.2)	.07
College degree or higher, No. (%)	60 (48)	48 (39)	45 (36.6)	.16
English as first language, No. (%)	121 (96.8)	122 (99.2)	118 (95.9)	.26

*Two participants, one in the positive condition and one in the neutral condition, failed to report demographic information

per cent more people to request the drug compared to those who saw negative imagery, and 8.8 per cent more people compared to those who saw neutral imagery.

The direct effect of image valence on behavioural intentions was significant (β = .25 [95 per cent CI, .12 - .38], t = 3.76, p < .001). However, feelings (.72 [95 per cent CI, .55 - .89], t = 8.41, p < .001) and beliefs (.51 [95 per cent CI, .33 - .69], t = 5.60, p < .001) simultaneously mediated the effect of image valence (.01 [95 per cent CI, −.15 - .17], t = .15, p > .87) on likelihood to request Fluvent (R^2 = .48).

We asked two research assistants who were blind to the experimental conditions to independently code responses to the hypothesis awareness check as either "aware" or "unaware." The coders showed 88 per cent agreement and disagreements were judged as either aware or unaware by the second author. This resulted in 33 of 375 (8.8 per cent) respondents identified as hypothesis aware.

To test whether demand artefacts or hypothesis awareness could have caused our findings we re-ran the critical ANOVAs excluding respondents who were coded as "hypothesis aware." The results for feeling (F(2, 337) = 7.61, p < .01, ηp2 = .04), belief (F(2, 337) = 7.78, p < .01, ηp2 = .04), and likelihood of request (F(2, 337) = 5.15, p < .01, ηp2 = .03) were, if anything, slightly stronger without the hypothesis aware respondents [Feeling: negative (M = 4.33, SD = 1.05), neutral (M = 4.61, SD = 0.95), positive (M = 4.86, SD = 1.07). Belief: negative (M = 4.95, SD = 1.12), neutral (M = 5.21, SD = 0.90), positive (M = 5.45, SD = 0.86). Request: negative (M = 4.06, SD = 1.63), neutral (M = 4.43, SD = 1.72), positive (M = 4.78, SD = 1.63)]. And for all three dependent variables post hoc tests (Tukey's HSD) revealed that only positive and negative conditions differed from each other; positive and negative never differed significantly from neutral.]

Discussion

Our study extends research on evaluative conditioning to the domain of pharmaceuticals. We showed that pairing a hypothetical prescription medicine with positive images produced more favourable feelings and beliefs towards the drug than did pairing with more negative images. Specifically, participants who saw the drug paired with positive images believed it to be safer, more effective, and more beneficial than did participants who saw the drug with negative images. Pairing with positive imagery also produced greater intention to request the drug from a physician should flu symptoms be experienced.

There are strong reasons to think that evaluative conditioning operates in DTCA. First, DTCA makes liberal use of images that are remarkably similar to those of positive valence in the IAPS. Take a 2010 ad for the cholesterol-lowering drug Lipitor (Pfizer 2010). It features a man by a picturesque lake, walking a dog through a verdant forest, and jumping from a jetty into sparkling waters. The Lipitor logo appears in most frames.

Table 2 Intention to request Fluvent from doctor by condition (dichotomised)

Intention to request fluvent	Negative	Neutral	Positive	Total
No	66 (52.8 %)	54 (43.5 %)	43 (34.7 %)	163 (43.7 %)
Yes	59 (47.2 %)	70 (56.5 %)	81 (65.3 %)	210 (56.3 %)
Total	125 (100 %)	124 (100 %)	124 (100 %)	373 (100 %)

Table 3 Dependent measures

Affective (feeling-based) attitude measure								
Choose the number on each scale that best describes your feelings about Fluvent								
sad	1	2	3	4	5	6	7	delighted
annoyed	1	2	3	4	5	6	7	happy
sorrow	1	2	3	4	5	6	7	joy
Cognitive (belief-based) attitude measure								
Choose the number on each scale that best describes your thoughts about Fluvent								
unsafe	1	2	3	4	5	6	7	safe
harmful	1	2	3	4	5	6	7	beneficial
ineffective	1	2	3	4	5	6	7	effective
Behavioural intention measure								
Imagine you have the flu and attend your doctor. How likely are you to request Fluvent?								
extremely unlikely	1	2	3	4	5	6	7	extremely likely

The highest valence image in the IAPS depicts three puppies perched on a wall (Lang et al. 2008). Other positive imagery includes beaches, natural scenery, and people playing in water. The Lipitor images are undoubtedly positive valence, and their juxtaposition with the Lipitor logo closely mirrors the pairings used in evaluative conditioning studies. It is reasonable, therefore, to conclude that positive conditioning will result. This conclusion is consistent with the findings of a recent review by Schachtman and colleagues (Schachtman et al. 2011).

The possibility of evaluative conditioning in DTCA raises worrying implications for the autonomy of viewers' medicine choices. It is a cornerstone of medical ethics and the law that patients should provide informed, autonomous consent to medical treatment (Skene and Smallwood 2002). Central to the epistemic requirements of autonomous consent is an accurate grasp of facts material to the decision. On a prominent judicial summary, material facts are those that "a reasonable person in the patient's position … would be likely to attach significance to" (*Rogers v. Whitaker*, 175 CLR 479, 1992, at 490). Facts about the safety and effectiveness of a prescription medicine lay strong claim to being material for someone considering its use.

But mere understanding of material facts does not pass muster on a credible autonomy standard. It is possible, for example, to understand *what* a physician states to be a drug side effect yet, for a variety of reasons, not believe *that* it is so (Faden et al. 1986). This concern has led theorists to propose that autonomous agents must not merely understand material facts, but believe them to be true (Faden et al. 1986). Only through belief will a material fact be accorded due weight in the ensuing deliberation about treatment.

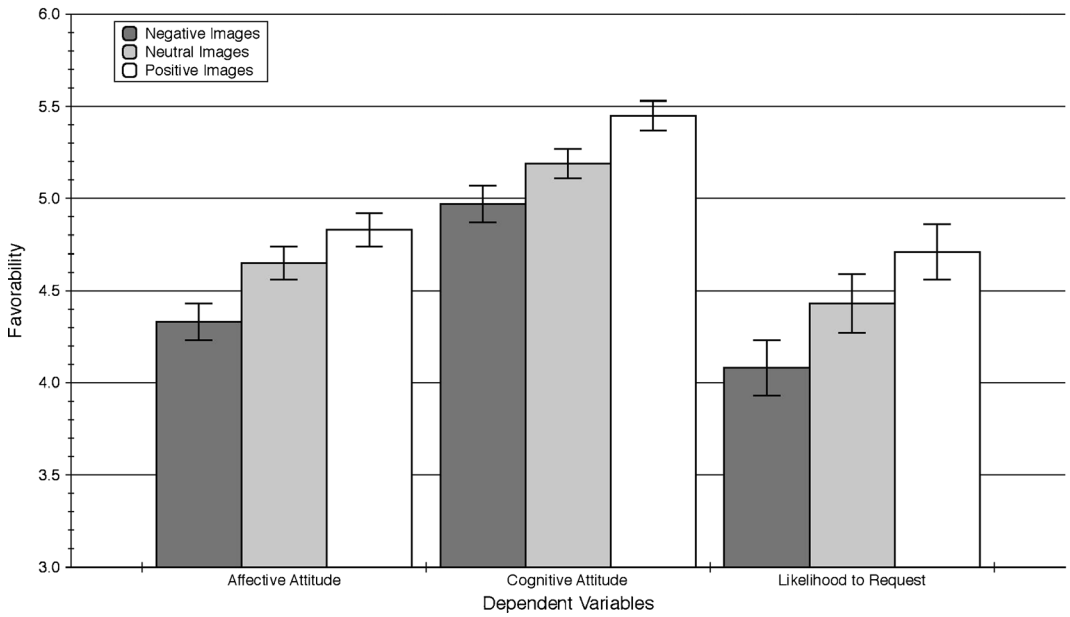

Figure 1 The effect of image valence on affective and cognitive attitudes towards and intention to request Fluvamivir (with standard error bars)

Epistemology recognises two standards of belief that might satisfy an autonomy requirement. True belief is an intuitively plausible benchmark. Yet true beliefs can arise through "epistemic luck," raising questions about their capacity to ground autonomy. A person with incipient dementia, for example, may believe a heart medicine to be a cardiac drug one day, and an antidepressant the next. Should consent be obtained on the "cardiac" day it would be a stretch to impute autonomous choice.

In contrast, a justified belief standard stresses adequate grounds for belief. To be justified, a belief must stem from a reliable belief-forming mechanism, one that heightens the chance the resulting belief will be true (Swinburne 2001). If a patient were, for example, to use an authoritative plain-language drug information sheet, then a range of beliefs about indications, contraindications, and side effects will likely withstand empirical scrutiny.

We suggest that evaluative conditioning is an unreliable belief-forming mechanism whose operation in DTCA is, therefore, likely to produce unjustified beliefs. When positive evaluative conditioning is produced by imagery, it is the affective valence of those images—how good they make the viewer feel—that is the primary determinant of beliefs that issue as part of the overall attitude shift. And positive affect can be generated by images that say nothing about the actual properties of a drug. For example, our study used pictures of cute animals and chocolate bars to produce favourable beliefs about the safety and effectiveness of a flu drug.

The corollary is that positive imagery in DTCA is antagonistic to the goal of viewers forming justified beliefs about the advertised drug. Should viewers suffer from the relevant condition, and deem facts about the drug to be material, evaluative conditioning threatens the autonomy of their subsequent drug choice. That choice occurs at least partly within the confines of the doctor−patient relationship, making evaluative conditioning in DTCA a legitimate focus of inquiry for medical ethics.

But it ought also to be a target for regulators. The FDA shows increasing willingness to research and regulate subtle persuasive elements in DTCA. For example, it prohibits signalling effects, where benefit information attains greater impact through display in a prominent headline, while risks are buried in small text (Food and Drug Administration 2009). It also warns against the use of distracting imagery while side effects are read in the voiceover (Food and Drug Administration 2009). Its Office of Prescription Drug Promotion is even conducting research into how DTCA impacts on implicit or unconscious viewer attitudes (Food and Drug Administration 2011). It is consistent with the thrust of this recent research that evaluative conditioning in DTCA falls within the FDA's purview.

A number of points may, however, be raised against the foregoing. First, from an empirical perspective why not remove any uncertainty by simply measuring evaluative conditioning in an actual commercial? The difficulty is both conceptual and methodological. Evaluative conditioning is, strictly, an attitude change from exposure to paired stimuli, one neutral and one valenced. Commercials utilise a myriad of persuasive content including imagery, music, voiceover tone, and propositional content, among others. As De Houwer notes, isolating the individual contribution of any specific valenced element in a real world commercial is exceedingly difficult (De Houwer 2009).

Perhaps, then, we underestimate the capacity of viewers to grasp and be persuaded by the propositional content of DTCA, vetted as it is for accuracy by the FDA? Indeed, drug information presented in simple "facts box" form can lessen the adverse influence on beliefs of other persuasive content in print DTCA (as well as counter potentially misleading statements about drug efficacy) (Schwartz et al. 2009). And viewers for whom the drug has strong personal relevance may be less vulnerable to attitude change through the emotional appeals of DTCA (Limbu et al. 2012). But there is also evidence that so-called "central route processing"—the rational assimilation of propositional content—is antagonised by distraction and cognitive load (Petty and Cacioppo 1986). It is plausible, therefore, that pain, distress, and an urgent desire for symptom relief may comprise a distraction that hinders rational processing. And the cognitive demands of weighing a range of treatment options also augur poorly for effective central route processing and, therefore, clear comprehension of propositional DTCA content.

What of the potential for DTCA to condition negative attitudes? It is an FDA requirement that side effects be detailed in a voiceover, and it is known that negative valence terms like *pain*, *fear* and *cancer* can induce negative attitudes (De Houwer et al. 1994). So it is possible that recitation of side effects could attenuate positive conditioning towards the drug. We concede this point. However, the issue is one of the reliability of beliefs. Side effects can also induce fear when read from a plain language information sheet. Yet, we rely on clearly articulated statements of efficacy to present a

balanced overview. Countering the negativity of adverse effects with irrelevant positive imagery is far less likely to engender a balanced and justified appraisal.

Our study is not without limitations. Given our use of a convenience sample, its representativeness of DTCA viewers may be questioned. It is noteworthy, however, that DTCA features drugs for conditions that affect adults of all ages and socioeconomic backgrounds, including asthma, hay fever, and depression. As a result the target demographic of DTCA is broad. In addition, the demographic measures in this study (see Table 1) and a wider survey of the characteristics of Mechanical Turk workers suggest our sample more closely approximates the U.S. population than do traditional undergraduate samples (Berinksy et al. 2012).

It is also possible that, because participants were aware they were in a study, they may have attended more closely to the experimental stimuli than they might to an actual advertisement. Should this lead to stronger recollection of the images paired with Fluvent—greater "contingency awareness"—it is possible that more pronounced conditioning could occur (Hofmann et al. 2010). Also, we measured self-reported behavioural intention, which may be an uncertain approximation of actual behaviour. Both limitations potentially impact on the ecological validity of our results.

Finally, the significance of the magnitude of our findings might be questioned. Those who viewed positive images reported more positive attitudes than those who viewed negative images by a margin of 0.5 for feelings, 0.48 for beliefs, and 0.63 for intentions to request, as measured on a seven-point scale. We accept this effect may appear small. But it is worth noting that partial eta squared effects of 0.04 (obtained for the feelings and beliefs measures) can be converted to the more familiar Cohen's d of 0.40. According to Cohen's effect size conventions, 0.8 is "large", 0.5 is "moderate" and 0.2 is "small," meaning d = 0.4 is closer to "moderate" than "small."

Moreover, on the dichotomised analysis of intention to request Fluvent (Table 2), positive imagery caused 18.1 per cent more people to request the drug compared to those who saw negative imagery, and 8.8 per cent more people compared to those who saw neutral imagery. Given that Americans watch nearly fifteen hours of prescription drug commercials each year (Brownfield et al. 2004), the high incidence of assent by doctors to patient drug requests (Kravitz et al. 2005), and the multi-billion dollar nature of the pharmaceutical industry, these figures suggest valenced imagery in DTCA contributes significantly to patterns of prescription drug use.

Overall, then, how ought the FDA to address our findings? A justified response would be to call for further research. Our single study requires replication. Further studies might also attempt evaluative conditioning towards medicines using positive valence sounds. The existence of a database of sounds with validated valences, the International Affective Digitized Sounds, facilitates this avenue of research (Bradley and Lang 2007). The issue of ecological validity might be addressed through research that mirrors the methodology of Smith and colleagues (Smith et al. 1998). They measured participants' overall affective ratings for a range of commercials and found that more positive scores predicted more favourable attitudes towards the product. As indicated earlier, however, this method does not identify the contribution to resulting attitudes of specific valenced content.

Should regulators ultimately conclude that valenced imagery in DTCA runs counter to the goal of accurate communication, how ought they to respond? One option is censorship, which raises twin issues of a benchmark for image valence and the labour-intensive nature of vetting DTCA imagery. Neither challenge is insurmountable. As outlined earlier, the IAPS is a validated repository containing valences for a wide range of images, including flowers, natural scenes, and people. Here then is a database that might ground a benchmark. Moreover, the task of vetting images is already one the FDA faces. As noted, the FDA proscribes imagery that distracts from risk information. Enforcing compliance with this guideline seems even more demanding than scrutiny of image valence. There is not, to our knowledge, any database that parses images on the basis of their capacity to distract.

A second option is to promote media literacy among DTCA viewers. The FDA already highlights media literacy through its program *Be Smart About Prescription Drug Advertising: A Guide for Consumers* (Food and Drug Administration 2012). The guide suggests ways consumers may use DTCA information to their advantage; for example, by triggering discussion about medicines with their doctor. It does not, however, instruct on how to disambiguate potentially misleading information. Indeed, empirical studies give cause for circumspection that media literacy could be an antidote to evaluative conditioning.

Sweldens and colleagues used valenced imagery to condition positive attitudes towards Belgian beers

(Sweldens et al. 2010). In an attempt to mitigate conditioning, they advised one group that the images contained no useful information about beer, and not to rely on them when rating attitudes. This manipulation is termed "persuasion knowledge priming." The result was only a limited reduction in positive conditioning. They also had participants "revalue" positive valence images—for example, a water skier—by labelling the image with negative epithets such as "arsonist" and "murderer." A variation on this kind of revaluation is conceivable with DTCA. Viewers could, for example, be instructed to focus on the list of side effects as positive images are displayed. Again, however, the cited study found this technique yielded only a limited reduction in positive conditioning. Also, as noted earlier, justified beliefs are unlikely to result by striving to balance evaluative conditioning with negative terms.

Conclusion

Non-propositional advertising content may lead viewers to hold beliefs that are inconsistent with the explicit claims made in DTCA. While those explicit claims are subject to strict regulation, non-propositional content—including valenced imagery—is subject to minimal scrutiny. The FDA's Office of Prescription Drug Promotion states its mission is "To protect the public health by assuring prescription drug information is truthful, balanced and accurately communicated" (Food and Drug Administration 2015). To that end, it is increasingly concerned with subtle persuasive techniques deployed in DTCA. Our study suggests evaluative conditioning in DTCA poses a threat to accurate communication of drug properties, and to the autonomy with which viewers make choices about medicines. On both counts, evaluative conditioning should figure prominently in the research and regulatory endeavours of the FDA. Unless such action is taken, the FDA's public health goals may ultimately be ceded to the pecuniary interests of pharmaceutical manufacturers.

Appendix 1

The fifteen statements included in the voiceover were:

1. Fluvent (Fluvamivir) is a new flu medication that may become available in your region
2. Each year between 5 and 20 per cent of the population experience the flu
3. The flu causes fever, cough, sore throat, and aches
4. Flu affects people of all ages
5. Flu poses highest risk for infants, those over 65, and those with chronic medical conditions
6. The flu is spread when an infected person coughs and droplets are inhaled by others
7. Vaccination is the most effective means of prevention
8. In addition, drugs are available that can prevent flu
9. Drugs can also treat flu once symptoms start
10. Fluvent is a new generation medication with a unique antiviral action
11. Initial research suggests it is more effective than existing flu drugs
12. As an alternative to vaccination Fluvent may be beneficial in reducing days off work
13. Fluvent may also lower the burden on healthcare facilities during flu epidemics
14. Fluvent carries some risk of side effects
15. Side effects include nausea, headache, diarrhoea, and rash

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