Running head: ARGUMENT DILUTION

The Unintended Consequences of Argument Dilution in Direct to Consumer Drug Advertisements

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Direct to consumer (DTC) advertising of pharmaceutical drugs is often cited as the culprit for inflated patient demand for advertised drugs[1,2]. Alternate to this economic concern, we provide an evidenced based psychological account of another concern that warrants the re-examination of the merits of DTC advertising of prescription drugs. Across six experiments and a sample of 3,059 US participants, we find reliable evidence for the argument dilution effect. Specifically, when commercials list severe side-effects along with the most frequent, which includes both serious and minor, as required by the FDA, it dilutes consumers' judgements of the overall severity of side effects, compared to when only the serious side-effects are listed. Furthermore, consumers' reduced judgment of severity leads to greater attraction to those drugs. In regulating pharmaceutical advertisements, the FDA appear to have paradoxically dampened consumers' judgements of overall severity and risk, and increased the marketability of these drugs.

Unique to only the US and New Zealand, direct to consumer (DTC) advertising of pharmaceutical drugs is a $4.5 Billion a year industry[3]. The Food and Drug Administration (FDA), in promoting the interests of consumers (and patients), regulated and provided guidelines to pharmaceutical companies for both print and media advertising. The nexus of these guidelines stipulated a fair balance between benefits and risk information – the space allotted on print media and airtime on broadcast media, to side effects needed to sufficiently inform consumers of the various side-effects and precautions, in addition to the standard marketing of the drug's benefits. The ubiquitous 60 second television commercials, where significant portions of the latter part of the advertisement is devoted to a laundry list of side effects, owes its impetus to the FDA regulations of 1997/1999[4–6]. Although the medical community, the general populous, and media have expressed their annoyance and ridicule for these advertisements[1,2], we contend there exists a meaningful concern and downstream negative consequences of these regulated advertisements.

Specifically, despite FDA's well intentions to inform (vulnerable) consumers of the potential risk and side-effects of pharmaceutical drugs, these regulated advertisements, we contend, might have over the years produced the unintended outcome of dampening one's assessment of side-effects and in the process further promoted the benefits and attractiveness of the drug.

From the decision making literature we know that individuals are plagued by a series of biases[7], resulting in suboptimal decisions and outcomes. One of these established biases is the *argument dilution* effect[8,9]. When making predictions about a target, a person evaluates an array of information – both diagnostic and non-diagnostic to the evaluation. The dilution effect occurs whereby those who assess the mixed set of diagnostic and non-diagnostic information arrive at less extreme predictions in comparison to those who assessed only diagnostic information. That is, the non-diagnostic information – information of little value and consequence for outcome prediction – *dilutes* the value and importance of the diagnostic information in our prognostication. The dilution effect is evidenced in various social and non-social judgements, ranging from assessing intellectual ability[10], guilt of a suspect on trial[9], consumer brands[11] and lottery judgements[12].

The most robust psychological explanation is based on an averaging effect[13,]. In this model, each point of information is afforded a weighted score, whereby adding equal weights to non-relevant information as those assigned to relevant information, dilutes people's overall judgement. Further, this model has been shown to predict both social and non-social judgments[13,14]. We therefore contend the averaging effect and consequently the dilution of a category extends also to relevant but weak arguments, whereby a mixed set of information that contains both *strong* and *weak* relevant information dilutes people's overall judgement of the argument. Alternate to the extant work highlighting the cognitive and affective information that

produce information distortion in DTC advertisements[15,16], we contend the FDA in regulating DTC advertisements to list side-effects, that range from the serious – such as stroke, and thoughts of suicide – to those less serious, such as dry mouth and headache, have diluted consumers' judgements of overall severity of the drug's side-effects. Thus, the current practice of listing both severe and frequent but minor side-effects, paradoxically down-plays the risk factors in assessing the suitability of the drug, and in turn increases its attractiveness.

We conducted six experiments to test whether providing information of minor side effects along with major side effects reduces overall perception of severity of side effects associated with the drug. In doing so, our research makes three important contributions. First, extant work on argument dilution has centered on *irrelevant* (non-diagnostic) information towards the dilution of attribute judgment. We extend this by demonstrating that *relevant* diagnostic, but *weak* information also influences our calculus of argument strength. In addition, the dilution effect has primarily concentrated on positive information; we further the reach of the argument dilution effect by documenting it in the assessment of *negative* attributes. Finally, and most importantly, the applied results hold important policy implications in communicating risk to consumers of pharmaceutical drugs.

As an initial test of our hypothesis in Study 1, we recruited 804 US participants from an online national database. Participants listened to a real drug commercial of Cymbalta – a depression drug marketed DTC in the US – and judged the severity of its side effects. Half the participants listened to the entire 78 seconds of the audio commercial (*full audio condition*), whereas the other half listened to a slightly shorter 75 seconds version (*partial audio condition*), absent of three minor side-effects (stimulus material used for this and other studies is available at the open science framework link provided at the end of the article). This manipulation

constituted an omission of less than 4% of the advertisement's content. Following this, participants in both *full and partial audio conditions*, rated severity of the drug's side effects and its attractiveness.

As hypothesized, participants who heard the commercial in entirety, rated the drug as containing less severe side effects than participants who heard the three second shorter commercial with no mention of minor side effects ($F(1,802)=5.52$, $p=.019$, $d=.17$), suggesting that minor side effects diluted the perception of overall severity of side effects associated with Cymbalta (*Table 1 and 2*). We did not find a significant effect of our manipulation on drug attractiveness but an indirect effect of dilution was observed, such that as participants evaluated the side effects to be less severe, the drug was rated as more attractive in the full audio condition compared to the partial audio condition ($b=.06$, $p=.019$, *95%CI* [.01, .11]). As demonstrated in past work, an indirect effect is sufficient to demonstrate mediation, as lack of direct effect on the dependent variable can be an indication of other variables suppressing the effect of an independent variable[17,18]. Additionally, to rule out lack of attention as an alternate explanation for our results, we asked participants to recall all major side effects that were reported in the audio commercial. Participants correctly remembered more number of major side effects in the full audio condition than in the partial audio condition ($M_{Full} = 3.18$, $M_{Partial} = 2.78$, $F(1,802)=51.12$, $p<.001$).

If the psychological process of dilution is the underlying mechanism driving our results, then participants who recalled more number of side effects in the major side effects condition, should report the drug to be overall more severe compared to those who recalled less number of major side effects. Accordingly, we tested for an interaction effect of the manipulation and recall of major side effects on the drug's overall severity. Analysis revealed that the main effect of

condition on drug severity became marginal but was in the right direction ($F(1,800)=3.38$, $p=.095$), and there was a main effect of recall such that higher recall lead to greater drug severity ($F(1,800)=15.94$, $p<.001$). However, most importantly, a significant interaction between condition and recall was observed ($F(1,800)=7.03$, $p=.008$). Upon decomposing the interaction (see Figure 1), we find the slope for participants in the partial (major side effects only) condition was positive and significant ($b=.48$, $p<.001$) such that participants rated the drug to be more severe when they were able to recall more number of side effects compared to when they recalled fewer side effects. The slope for participants in the full (major and minor side effects) condition was not significant ($b=.05$, $p=.66$), implying that recalling more number of side effects did not increase ratings of drug severity as their evaluations were ostensibly diluted by the presence of minor side effects. This analysis provides initial evidence of argument dilution as the underlying process driving the effect and importantly strong evidence ruling out attention as an alternate explanation of our results as with better recall in the full advertisement condition, the presence of minor side effects significantly diluted participant's severity judgments. Finally, our results remain consistent when controlling for participant's symptoms for depression ($p=.021$) and perceptions of trade-off ($p=.063$). The results from Study 1 are important in documenting the presence of this phenomenon using a real-world DTC commercial with very minimal change in manipulation.

To establish both the robustness of this effect and further increase the ecological validity of our research, in Studies 2a-c we replicated the effects using a different medium – print – and also varied the architecture of these print advertisements. According to the FDA guidelines, print advertisement apart from promoting the drug should also highlight its various side effects, but this information is generally buried with other information in smaller text and often in an

inconspicuous location within the advertisement. We reasoned that changing a couple of side effects within a torrent of information would provide a more conservative test of our hypotheses. Accordingly, in Study 2a, participants were shown an actual print advertisement for the drug Lunesta, designed to treat sleep disorder. Randomly assigned participants either read the complete set of 4 side effects (2 major and 2 minor) – *complete side effects condition* (*n*=200) – or a subset of 2 major side effects – *major side effects condition* (*n*=200). As hypothesized, a one-way ANOVA revealed that participants who read all 4 side effects evaluated the drug as containing less severe side effects than those who read just the 2 major side effects ($F(1,398)=6.43$, $p=.012$, $d=.25$, *Table 1*). Similar to Study 1, we did not observe direct effect on drug attractiveness but an indirect effect of dilution was observed, such that as participants evaluated the side effects to be lower in severity, the drug was rated more attractive in the complete side effects (both major and minor) condition compared to the major side effects only condition ($b=.10$, $p=.012$, *95%CI* [.02, .18]). Further, as expected and similar to Study 1, our results remain consistent when controlling for susceptibility to sleep disorder ($p=.012$) and tradeoff ($p=.053$).

In Study 2b, we presented participants with an alternate and further conservative presentation of the merits and side-effects of another actual prescription drug for depression, Abilify, via a Drug Facts Box. Drug Facts Box is a one page summary that includes benefits and harmful effects of a drug and shown to improve consumer decision-making when choosing prescription drugs[19,20]. Participants were randomly assigned to a complete (*n*=196) or major information condition (*n*=203). In the complete information condition participants read information of the benefits and both the major and minor side effects of the drug, whereas in the major side effects condition, information about minor side effects was removed from the Drug

Facts Box. Participants then responded to measures identical to Study 1 and 2a. A one-way ANOVA revealed significant difference across the two condition ($F(1,397)=13.90$, $p<.001$, $d=.37$), such that participants in the complete information condition rated the drug lower on severity ($M=5.33$, $SD=1.22$) compared to those in the major side effects only condition ($M=5.74$, $SD=.98$). Consistent with Study 1 and Study 2a, we also found indirect effect of the manipulation on drug attractiveness such that participants evaluated the drug as more attractive in the complete information condition compared to the major side effects only condition due to their lower judgment of the drug's severity of side effects ($b=.14$, $p<.001$, *95%CI* [.07,.22]).

In Study 2c, to further demonstrate the robustness of our effects, we employed another version of a drug commercial. Specifically, participants were presented with content for another actual direct to consumer drug, Concerta - prescribed to treat attention deficit hyperactive disorder. We formatted the advertisement such that information about the side effects was sandwiched in between statements highlighting the benefits and merits of the drug. This followed the architecture of the audio commercial (Study 1), where side effects were presented amongst its benefits, but unlike Study 1, the side effects were more precisely and squarely sandwiched between the merits of the drug. Similar to the other studies, participants were randomly assigned to a complete side effects ($n=225$) or major side effects only condition ($n=227$). Additionally, to rule out any potential measurement bias in participant's ratings of drug severity, in contrast to the previous studies, participants responded to an additional measure of drug severity – how safe it would be to consume that drug (reverse coded). In addition to being an extra measure, we also ensured the question was framed in a more positive direction focused on safety, rather than harm. Replicating our findings from before, a one way ANOVA revealed a significant effect ($F(1,450)=10.25$, $p=.002$, $d=.30$) such that participants judged the drug less severe in the

complete information condition (*M*=5.13, *SD*=1.16) compared to those in the major side effects only condition (*M*=5.47, *SD*=1.10). Bootstrap analysis revealed a significant indirect effect of our manipulation on drug attractiveness such that lower perception of drug's severity in the complete information condition as opposed to major side effects only condition made the drug appear more attractive (*b*=.14, *p*=.001, *95%CI* [.06,.23]). Our results also remained consistent when controlling for participant's susceptibility to the disease (*p*=.002) and their perceptions of trade-off (*p*=.003).

Together with the audio commercial in Study 1, the print advertisements of Study 2a, 2b and 2c, by utilizing different drugs, different architecture in presenting information, and different measures of severity ratings, we find strong and consistent support of dilution in DTC pharmaceutical commercials[1]. Furthermore, we ran a separate study where weak side-effects were presented before (primacy) or after (recency) the strong side-effects (M_{before}=5.62, M_{after}=5.72, F(1,198)=0.50, p=.48), thereby ruling out recency effect as an alternate account of our prior findings[21]. Thus, listing all frequent side effects, both major and minors, does not dampen the drug's attractiveness, but paradoxically increase it.

Having demonstrated the phenomenon using an audio commercial and replicated the effects with multiple print advertisements, in Study 3 we set out to further establish the robustness of this phenomenon by experimentally attenuating[22] the cognitive process of dilution (i.e., an averaging effect) – the psychological process we argue is the engine behind our observed set of results. If dilution is the result of averaging all side effects listed, it is plausible the process is dampened if participants can cognitively isolate major and minor side effects, by assigning greater emphasis/weight to major and less emphasis/weight to minor side effects when evaluating the overall severity of side effects. Accordingly, we added a third condition –

complete-major side effects emphasized condition, wherein all side effects were presented but major side effects were presented in bold 14 point red text and minor side effects presented in regular 12 point black text. Thus, drawing greater emphasis to major side effects should result in the mental separation and the assignment of greater weights to the major side effects when cognitively computing the overall severity of side effects.

A one-way ANOVA with severity of side effects as the dependent variable resulted in a significant main effect across the three experimental conditions ($F(2,601)=7.56$, $p<.001$). As predicted, there was no difference in means between the major side effect condition and the complete-major side effects emphasized condition ($t(401) = .11$, $p = .91$, *Table 1*). Consistent with Study 1 and Study 2a-c, participants in the complete side effects condition perceived the drug to be less severe in side-effects than those assigned to the major side effects condition ($t(398)=3.28$, $p=.001$), $d=.33$, *Table 1*). However, more importantly we also found that participants rated side effects to be significantly more severe in the complete-major side effects emphasized condition than in the complete side effects condition ($t(403)=3.20$, $p=.002$, $d=.32$, *Table 1*). Thus, by experimentally moderating the cognitive process of averaging, we further provide evidence of argument dilution as the psychological process, driving the varied assessment of severity. Finally, consistent with previous studies, we did not observe direct effect on drug attractiveness but controlling for complete side effects condition, a significant negative indirect effect was observed for major side effects condition ($b=-.11$, $p=.001$, *95%CI* [-.18, -.05]) and complete major side effects emphasized condition ($b=-.11$, $p=.002$, *95%CI* [-.17, -.04]) on drug attractiveness via severity perceptions. Specifically, as participants in the complete side effects condition rated the side effects to be lower in severity they found it to be more attractive compared to those participants in the major side effects condition and complete major side

effects emphasized condition. Finally, our results remain identical when controlling for symptoms of sleep disorder (p=.001) and trade-off (p=.001).

Thus, by experimentally moderating the psychological process we contend is driving the observed phenomenon, Study 3 replicates the findings of Study 1 and Studies 2a-c, and most importantly further extends our results by experimentally demonstrating the psychological process-underlying phenomenon of argument dilution effect. Furthermore, Study 3 provides an initial practical avenue through which dilution can be tempered in DTC advertising. Specifically, by listing both major and minor side effects, but nudging consumers' attention and weight allocated to the major side effects, consumers appear less susceptible to the argument dilution bias.

Finally, to empirically demonstrate the robustness of our effect we conducted a meta-analysis of the above five studies and also Study S1 in the supplementary information (N=2,855). Complete side effects emphasized condition in Study 3 was not included in the meta-analysis, as that was used to test the psychological process via moderation. However, the other two conditions were included in the meta-analysis. Using random effects analysis and found the effect to be significant with 95% confidence intervals not containing zero (d=.285, 95%*CI* [.203, .366]). Thus, paradoxically, listing both major and minor side effects appears to help the marketability of the drug.

Recently, the American Medical Association's House of Delegates called for a ban on DTC advertising in the US[23], citing these advertisements produce an inflated demand for drugs. In addition to the theoretical contribution of demonstrating the psychological process of dilution among negatively valenced arguments, importantly we provide, an evidenced based psychologically grounded account of a more serious concern that warrants the re-examination of

the merits of DTC advertising of prescription drugs. Specifically, across a sample of 3,059 US participants, the target audience for these commercials, we find strong support for the psychological dilution of severity in judgments of side effects, when both major and minor side-effects are presented. Further, because of these diluted severity judgements, drug advertisements containing all side-effects are judged to be more attractive. More broadly, this raises an ethical dilemma - a conflict between what could be viewed as a moral imperative to provide complete information to the patient versus a form of paternalism that attempts to influence the patient's decisions in a manner that makes them better off [24]. The choice architecture employed in Study 3, which affords consumers the ability to compartmentalize and assign appropriate weights to major vs. minor side effects, presents one possible avenue by which pharmaceutical companies and regulators may look to attenuate the argument dilution effect, while maintaining transparency. Whichever nudge is implemented to combat this bias, it is clear our results underscore the unintended consequences of current advertisements, and the need for the FDA to reassess the prescriptive policy requirement for pharmaceuticals companies to list the full range of side effects in DTC drug commercials.

Methods

Ethics Statement. The ethics approval for this project was provided by London Business School as per the school's guidelines. In line with ethical guidelines, all participants provided informed consent before taking the studies.

Study 1. *Participants.* Eight hundred and four participants from the Unites States - the target audience of DTC advertisements - were recruited through Amazon Mechanical Turk (AMT) (M_{age}=35.72; 48.26% female; response rate 87.7%). Given the subtle manipulation, we collected

a large sample (≈400 per cell) to detect smaller effects while ensuring we minimized the probability of Type-1 error.

Design and Procedure. Participants were instructed to listen and judge the severity of side effects of an actual drug commercial for Cymbalta – a depression drug marketed DTC in the US. Participants were randomly assigned to either a full 78-seconds condition (*full audio condition*) – where they listened to the complete advertisement for Cymbalta, or to a partial 75-seconds condition (*partial audio condition*), that did not include the mention of three minor side effects (nausea, dry mouth and constipation). This manipulation constituted an omission of less than 4% of the advertisement's content. Following this, participants in both *full and partial audio conditions*, rated severity of the drug's side effects by answering two questions – *how serious/harmful are Cymbalta's side effects* – on a Likert scale, from 1 (definitely not serious/harmful) to 7 (definitely serious/harmful). Participants also judged attractiveness of the drug on a 7 point Likert scale by answering: 1) *if you were in the market for a depression drug, how likely would you purchase Cymbalta*, 2) *how effective would Cymbalta be in curing depression* and by answering 3) *at what percentage price, above or below, the average market price of other depression drugs should Cymbalta be priced*, on a slider scale ranging from -50 to +50. The composite was created by combining z scores for the three measures (α=.70).

We controlled for participants suffering from depression or similar symptoms, as these participants could be motivated to ignore or downplay the severity of the drug's side effects. Participants thus responded to one item measure on a 7-point scale – "*Please indicate how often you suffer from depression or symptoms similar to depression*". Furthermore, we also wanted to control for participant's prior beliefs around trade-off between greater effectiveness and increased severity of side effects. Tradeoff was measured with the item: "*FDA's GmbH medical*

index provides effectiveness rating of the drug on a 0 to 100 scale, with 100 being most effective. If a drug is ranked as 100 percent effective on this index, what would be your estimate of the extent to which this drug would have serious side-effects". It is important to note that although increased side-effects with dose-related increases in efficacy (benefits) can sometimes occur for a specific medicine, in many cases there is no clear link between likelihood of benefit and harm.

Study 2a. *Participants*. Four hundred US participants, the typical audience for DTC advertisements, were recruited using AMT (M_{age}=35.69; 45.75% female; response rate 93.7%). As print advertisements are lower on media richness[25], we felt a smaller sample size would suffice, but still recruited a large enough sample (≈200 per cell) to avoid any possibility of Type-1 error. Study 1 participants were excluded from partaking in Study 2a.

Design and Procedure. Participants were shown an actual print advertisement for the drug Lunesta, designed to treat sleep disorder (see Figure S1 and Figure S2 in the Supplemental Materials available online for the drug ad). Randomly assigned participants either read the complete set of 4 side effects (2 major and 2 minor) – *complete side effects condition* (n=200) – or a subset of 2 major side effects – *major side effects condition* (n=200). The 2 major side effects were uncontrollable shaking of a body part and mental problems with attention. The 2 minor side effects included in the complete side effects condition were dry mouth and headache. Participants then rated the severity of side effects and attractiveness of Lunesta, similar to Study 1. Participants also rated their perceptions of tradeoff and their own susceptibility to sleep disorder, using the identical items from Study 1.

Study 2b. *Participants*. Similar to Study 2a, we set out to recruit approximately 200 participants per cell. Our final sample consisted of 399 participants from AMT (M_{age}=38.48; 55.64% female;

response rate 92.58%). Participants from prior studies were excluded from partaking in this study.

Design and Procedure. Participants were shown a Drug Facts Box for the drug Abilify, manufactured to treat depression. The Drug Facts Box employed was identical to the one used and prescribed by Schwartz and Woloshin[19]. Randomly assigned participants either read the complete information about the drug– *complete side effects condition* (*n*=196) – or the complete information excluding few minor side effects – *major side effects condition* (*n*=203). Participants then rated the severity and attractiveness of Abilify, similar to the above studies.

Study 2c. *Participants*. Given the similar medium of print to studies 2a and 2b, we once again aimed to recruit approximately 200 participants per cell. Our final sample consisted of 452 participants from AMT (M_{age}=37.63; 56.42% female; response rate 90.6%). As before, participants who took part in prior similar studies were excluded from partaking in this study.

Design and Procedure. Participants were presented with the text from an advertisement for the Attention Deficit Hyperactive Disorder (ADHD) drug – Concerta –, whose side effects were sandwiched in between the benefits and merits of the drug. This manipulation squarely mirrored the architecture employed by several drug commercials where both the beginning and conclusion of the advertisement is devoted to highlighting various strengths or benefits associated with the drug with the side effects inserted in between. Randomly assigned participants either read the complete side effects of the drug including both major and minor– *complete side effects condition* (*n*=225) – or all major side effects barring the minor side effects – *major side effects condition* (*n*=227). Participants then rated the severity and attractiveness of Abilify, similar to the above studies. In previous studies drug severity was measured using items evaluating the seriousness, harm or risk associated with the drug. However, in this study we included an

additional item employing a different frame. Specifically, participants responded to the item "how safe would it be to consume Concerta" (α=.81). Finally, participants reported if they were suffering from ADHD and their perceptions of trade-off.

Study 3. *Participants*. Consistent with our rationale for sample size and similar to Studies 2a-c using a text based stimuli, we recruited roughly 200 US participants per cell (*N*= 604; M_{age}=34.97; 45.70% female; response rate 92.4%). As before, participants who took part in prior similar studies were excluded from partaking in this study.

Design and Procedure. To strip away the extraneous information typically found in actual drug commercials that may crowd out viewer's attention to side effects, Study 3 only provided participants with information about side effects. Participants read about a hypothetical drug, Xylopinol, which treats sleep disorder. This was a 3-condition between-subject design, whereby participants were randomly assigned to a *major*, or a *complete* or a *complete –major side effect emphasized* condition. In the *major side effects condition*, they were informed of only four major side effects of a hypothetical drug, Xylopinol, designed to aid insomnia, whereas in the *complete side effects condition*, they were alerted to both four major and two minor side effects. In the *complete major side effects emphasized* condition, participants read about both major and minor side effects, with major side effects more emphasized compared to the minor ones. Participants read that several pharmaceutical companies were actively working to develop drugs that could be effective in treating these sleep disorders. Following this, participants were either informed of the four major side effects (memory loss, depression, severe liver issues and suicidal thoughts), both the four major and two minor side effects (headache and dry mouth) or the complete side effects emphasized condition. Specifically, they read:

One such company, Astrazin Pharmaceutical Ltd., has developed a drug, Xylopinol that treats sleep disorders. US Food and Drug Administration (FDA) has found the drug to be effective and have approved the drug for sale in the United States.

However, as is the case with most drugs, Xylopinol may result in some unwanted side effects such as memory loss, depression, severe liver issues and suicidal thoughts (, headache and dry mouth).

After reading the scenario, all participants responded to a set of questions identical to Studies 2a and 2b aimed at assessing severity of side effects and drug attractiveness. Identical to Study 1 and Studies 2a-c, participants also rated their perception of quality, prior belief of tradeoff and their own susceptibility to sleep disorder.

Statistical Analysis. All analyses were performed using the statistical software Stata. Data across conditions were analyzed using a one-way analysis of variance with post hoc analysis of means. Testing of indirect effect was carried out using bootstrap procedure with 5000 iterations. Significance was assumed for *p* values less than .05.

Data availability. The authors declare that all data supporting the findings, study protocols and stimulus materials are available at https://osf.io/yw47v/.

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Competing Interests. The authors declare no competing interests.

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Table 1: Descriptive summary of results with means and standard deviation in parentheses.

	Study 1		**Study 2a**		**Study 2b**		**Study 2c**		**Study 3**		
	Full audio	*Partial audio*	*Complete side effects*	*Major side effects*	*Complete side effects*	*Major side effects*	*Complete side effects*	*Major side effects*	*Complete side effects*	*Major side effects*	*Complete-major side effects emphasized*
N	398	406	200	200	196	203	225	227	201	199	204
Severity of side effects	5.43 (1.08)	5.62 (1.15)	4.09 (1.27)	4.41 (1.27)	5.33 (1.22)	5.74 (.98)	5.13 (1.16)	5.47 (1.10)	5.52 (1.12)	5.85 (.88)	5.84 (.88)

Note. Each cell in the row denoted by severity of side effects represents mean value followed by standard deviation in parentheses.

Table 2: Separate one way ANOVA analysis for each of the four different items measuring overall drug severity across complete and major side effects condition. Effects are significant and consistent for each of the item across all five studies

	How serious are drug's side effects			**How harmful are drug's side effects**			**How would you assess the overall risk factor of using this drug?**			**How safe would it be to consume this drug?**		
	Complete side effects	Major side effects	Probability (difference in means)	Complete side effects	Major side effects	Probability (difference in means)	Complete side effects	Major side effects	Probability (difference in means)	Complete side effects	Major side effects	Probability (difference in means)
Study 1	5.49 (1.12)	5.66 (1.18)	0.039	5.37 (1.15)	5.57 (1.22)	0.016						
Study 2a	4.25 (1.38)	4.59 (1.36)	0.012				3.92 (1.34)	4.22 (1.34)	0.025			
Study 2b	5.43 (1.27)	5.89 (1.01)	0.0001				5.23 (1.33)	5.60 (1.13)	0.003			
Study 2c	5.67 (1.29)	6.05 (1.06)	0.001				5.19 (1.34)	5.50 (1.30)	0.013	3.47 (1.5)	3.14 (1.46)	0.019
Study 3	5.75 (1.16)	6.11 (.87)	0.001				5.29 (1.24)	5.60 (1.06)	0.001			

Note. Each cell (except ones under the probability column) denotes mean values followed by standard deviation in parentheses.

Figure 1: The interaction effect of the two audio conditions and participants' recall of major side effects on drug's overall severity (N=804). Slope for only partial audio condition is significant ($p<.05$).