Big Suppla: Challenging the Common View of the Supplements and Herbs Industry Affects the Willingness to Try and Recommend Their Products

Nevena Mijatović* (iD), Jasmina Šljivić* (iD), Nemanja Tošić* (iD), Ljubica Conić* (iD), Marija Petrović (iD), Iris Žeželj (iD)
Psychology Department, Faculty of Philosophy, University of Belgrade, Belgrade, Serbia

Resorting to complementary/alternative medical (CAM) therapies can lead to bad health outcomes or interfere with officially recommended therapies. CAM use is, nevertheless, widespread and growing. This could be partially due to the perception of the CAM industry as powerless and non-profit oriented, in contrast to the pharmaceutical industry ("Big Pharma"). In reality, both industries are highly profitable and powerful; to highlight this similarity, science communicators coined the term "Big Suppla". Drawing from a sample of 242 participants upon all exclusions, we experimentally tested whether varying these attributes in presenting the industries impacts consumers' evaluation of the two categories of products (herbs and supplements) and their willingness to try and recommend them. We also tested whether the effect is moderated by conspiratorial thinking, and whether it is due to a change in trust. All hypotheses were pre-registered. As expected, participants who read the Big Suppla vignette decreased the endorsement of both supplements and herbs, whilst, against our hypotheses, there were no significant changes in endorsement in the contrasting "Baby Suppla" group. Conspiratorial thinking was related to more endorsement of CAM, but it did not moderate the experimental effects. We also did not observe the expected mediation by trust. Our most robust results corroborate the idea that challenging the myth of benevolence of the CAM industry makes people more critical in evaluating its products or considering their usage. They support the intuitions of science communicators who coined the term Big Suppla, and can help in tailoring public health messages.

Key words: complementary and alternative medicine, perception of power, questionable health behaviors, conspiracy theories

In an attempt to stay healthy, people take advice from official sources, but often simultaneously or alternatively, turn to less credible ones as well. Such advice can sometimes be downright dangerous. For example, chlorine dioxide, an industrial bleaching agent, is sold

worldwide as a "miracle mineral supplement/solution", supposedly curing HIV, malaria, autism, and a plethora of other diseases (Lynn & Davey, 2015). The global Covid-19 pandemic has raised a lot of questions regarding the best practices to stay safe. Even though there were official medical recommendations on how to behave (albeit not always consistent), people sometimes resorted to folk remedies or other pseudoscientific solutions; this preference became so widespread that the WHO created a special website for fact-checking some of the common alternative practices (WHO Coronavirus mythbusters, 2020). These included eating garlic, avoiding spicy food, taking mega doses of vitamins C and D regardless of baseline vitamin status, and even ingesting methanol to prevent or cure the disease (Forrest, 2020; Islam et al., 2020; Teovanović et al., 2021).

These kinds of "cures" fall under the category of complementary and alternative medicine (CAM; Kemppainen et al., 2017). The World Health Organization defines CAM as "a broad set of health care practices that are not part of that country's own traditional or conventional medicine and are not fully integrated into the dominant health care system" (WHO, 2019, p. 8). CAM practices are based on the premise that healing comes from integrating the mind, body and spirit (e.g., Bishop et al., 2007). This holistic view, as opposed to the biomedical approach, leads to the framing of healing under the popular New Age phrase of "boosting the immune system". Apart from the cited deadly examples of ingesting methanol or bleach, CAM can lead to other unfavorable health outcomes. Simultaneous usage of CAM products and prescribed biomedical therapy may lead to unforeseen interactions (Chan et al., 2012). Not only are there risks of using CAM and conventional therapies simultaneously, but research suggests that people who opt for using CAM treatments often stop using conventional treatments (e.g., Lim et al., 2010). On the other hand, when observed, the beneficial effects of CAM practices and products can typically be attributed to the placebo effect (Ernst, 2010).

The preference for CAM over the pharmaceutical industry might partially be driven by the widespread view of the pharmaceutical industry, often referred to as "Big Pharma", as powerful and profit oriented, leaving the CAM industry to be perceived as less powerful and not as profit oriented (Goldman, 2020). Big Pharma or Bad Pharma (Ingraham, 2010) earned this nickname because it is perceived to be in a merciless chase for profits. Pharmaceutical companies are advertising drugs and "selling sickness", as suggested by some, often in a very aggressive manner, by medicalizing some trivial conditions (Brezis, 2008).

While it is estimated that the profit margin of pharmaceutical companies in 2013 was very similar to the profit margin of banks (Deangelis, 2016), the alternative is not that different. The CAM industry is actually highly profitable. Data suggest that its market size value in 2020 was, if dietary supplements[1] are included, about 212 billion US dollars, and that by 2027 its market value will reach about 527 billion US dollars (Grand View Research, 2020a, 2020b). Data from 2007 show that U.S. citizens visit CAM providers about 300 million times each year and spend billions of dollars on these services (Nahin et al., 2009). In addition, while conventional medicine bases its practices on rigorous scientific efficacy examinations and has to prove its efficacy via clinical trials, CAM is usually not evidence-based and remains largely unregulated. Thus, it is

---

[1] In Grand View Research (2020b), dietary supplements are analyzed apart from CAM, but in other publications (e.g., Ventola, 2010) they are treated as one industry. In our research, dietary supplements are analyzed as a part of the CAM industry.

much easier and less costly to place a CAM product on the market than to place a pharmaceutical product (Wiesener et al., 2012). These facts are not widely known to the general public and might contribute to the CAM industry being more trusted in comparison to the pharmaceutical. To highlight the similarities between the two industries, science journalists have coined a nickname for CAM: "Big Suppla" (e.g., Hall, 2011). Not only do they not correspond to reality, perceptions of power and true "intentions" of the two industries could be related to different levels of trust attributed to them, which, in turn, could relate to consumer behavior: willingness to try and recommend their products.

So far, however, the effects of pitting the two views of the CAM industry against one another (powerful, unregulated and profit oriented Big Suppla versus powerless, unnecessarily regulated and non-profit oriented "Baby Suppla") on the endorsement of CAM products have not been experimentally tested. In addition, populations that might be more prone to it and the mechanism behind it also remain unknown.

Conspiratorial Worldview and CAM Perception and Usage

People prone to conspiracies attribute significant social and political events to the actions of sinister powerful actors (e.g., Goertzel, 1994; Uscinski & Parent, 2014). In such a manner, Big Pharma, considering its perceived power, is often accused of both creating demand for certain drugs by restricting access to them and of creating addiction by encouraging their overuse (Singler, 2015). It is also believed that cures for some diseases are being withheld to make people buy more expensive, but less effective medications (Blaskiewicz, 2013), and that the industry hides the side-effects of widely recommended practices, such as

vaccination (Grimes, 2016). A current widely popular conspiracy theory, also rooted in this image of the pharmaceutical industry as powerful and profit-hungry, is that the pandemic is a plot by Big Pharma (Lynas, 2020; van Mulukom et al., in press). Given that people prone to conspiracy theories tend to perceive actors in high power positions as malevolent (Imhoff & Bruder, 2014), they attribute such motives to the pharmaceutical industry, but to a lesser extent to the CAM industry, which is typically perceived as powerless. This might be one of the reasons why scientific attempts to persuade the public to reconsider the usage of CAM can fail when addressed to people high on conspiracy mentality (Imhoff et al., 2018).

In a recent study, Lamberty & Imhoff (2018) examined the relationship between the perception of power and the evaluation of a drug using an experimental design. They manipulated whether an herbal drug was proposed for approval by "a pharmaceutical consortium" (high power condition) or "an interested group of affected patients" (low power condition); they also measured participants' general conspiracy proneness, i.e., conspiracy mentality. Conspiracy mentality was positively related to positive evaluations of CAM, and negatively to those of biomedical approaches. Moreover, those high on conspiracy mentality preferred the drug when it was proposed by low power agents instead of high-power ones, compared to those lower on conspiracy mentality.

The Present Study

In the present study, we experimentally tested the effects of presenting the CAM industry as powerful, profit-oriented, and unregulated (Big Suppla) versus as powerless, non-profit oriented and heavily regulated (Baby Suppla) on consumers' readiness to try, recom-

mend and positively evaluate CAM products. We tested whether people who endorsed a conspiratorial worldview also endorsed CAM products more and whether they were more sensitive to our experimental manipulation. Finally, we explored whether the degree to which people changed their trust towards the CAM industry upon reading the vignettes mediated this relationship.

We intended to partially conceptually replicate the study conducted by Lamberty and Imhoff (2018), but we extended and modified it in several important aspects. First, we focused on the CAM industry in general and the effects of challenging the widespread perception of it. We tried to convey its market position (powerful, profit-oriented, unregulated vs. powerless, non-profit-oriented, regulated) through vignettes providing facts of its profit margin, growth, societal influence and (lack of) regulatory burdens. Second, to obtain more statistical power and cancel out inter-subject variance, we used a within-subject (pretest-posttest) design. Third, our design included a control group to ensure there was no attitude change independent of experimental manipulation (e.g., carry-over effect).

Based on these research objectives and research design, we preregistered (link to the preregistration) the following hypotheses: participants' endorsement of CAM products (evaluation, willingness to try and recommend CAM products) will decrease after reading about Big Suppla and increase after reading about Baby Suppla (H1). Conspiratorial worldview will moderate the effect of the experimental manipulation on the endorsement of CAM products: people higher in conspiratorial worldview will endorse CAM products less after reading about Big Suppla, and more after reading about Baby Suppla in comparison to those lower in conspiratorial worldview (H2). Participants more prone to believe in conspiracy theories will initially endorse

CAM products more than those less prone to conspiracy theories (Lobato et al., 2014) (H3). Trust in the CAM industry will mediate the effect of the experimental manipulation on CAM endorsement so that the Big Suppla manipulation decreases trust, whilst the Baby Suppla increases trust (H4).

Method

Design

The study follows a pretest-posttest measurement design with a control group. In one experimental group we exposed participants to information framing the CAM industry as powerful, profit-oriented, and unregulated (the Big Suppla condition) and in the other experimental group we exposed participants to information framing the CAM industry as the opposite – powerless, non-profit oriented and regulated (the Baby Suppla condition). Finally, in the control group we exposed participants to neutral information about the CAM industry: the etymology (origin) of the words "supplements" and "alternative". We measured the respondents' endorsement of the CAM products before and after the experimental manipulation. General conspiratorial mindset and Belief in specific conspiracy theories served as moderators, whilst Trust in the CAM industry served as a mediator, also measured before and after.

The IRB at the Department of psychology, University of Belgrade, approved the research design (No 2021-50). All instruments, materials translated to English, and syntax for analyses are available at OSF.

Stimuli

Participants read all the manipulated information about the CAM industry in the form of vignettes. Vignettes for all three groups were

designed in Canva to resemble digital articles in real outlets. All three articles had a similar number of words: 219 (Big Suppla), 239 (Baby Suppla) and 227 (Control group).

Measurements

Endorsement of CAM Products

Endorsement of CAM products was assessed at two time points: before and after reading the vignette. We opted to assess the endorsement of (1) dietary supplements for boosting the immune system and (2) herbal products as two representatives of the larger group of CAM products. For each of the two categories, we asked the participants to firstly (a) evaluate these products, using four 7-point semantic differential scales (*efficient/inefficient, useful/useless, desirable/undesirable, healthy/unhealthy*). Further, we asked them to assess how likely they were to (b) try and (c) recommend these products on a 7-point scale ranging from 1 (*not willing at all*) to 7 (*absolutely willing*). We averaged all three dependent measures (evaluation, willingness to try and to recommend) for both dietary supplements and herbal products, into two main scores – endorsement of dietary supplements and endorsement of herbal products. We decided to treat the two groups of products separately, as the factor analysis (Appendix A) suggested that the evaluation of supplements and the evaluation of herbs form two distinct factors. Additionally, as per preregistration, we calculated three individual measures for each product group: (a) evaluation, willingness (b) to try and (c) to recommend CAM products, leading to a total of six separate measures.

Trust in the CAM Industry

For trust, we asked the participants to rate their trust in the herbs industry and the sup-

plements industry separately, before and after reading the vignette. Participants indicated their answers on a 7-point-Likert scale ranging from 1 (do *not trust it at all*) to 7 (*completely trust it*).

Belief in Conspiracy Theories

We assessed the participants' conspiratorial worldview via two measures. The conspiracy mentality questionnaire (CMQ, Bruder et al., 2013), adapted for Serbian by Milošević-Ðorđević et al. (2021), measures a general tendency towards conspiratorial beliefs and consists of 5 items, rated by the participants on a 11-point scale ranging from 1 (*strongly disagree*) to 11 (*strongly agree*). The Belief in Specific Conspiracy Theories Questionnaire (BSCTQ-14, Lukić et al., 2019) measures in turn belief in several specific conspiracy theories. The participants indicated their agreement with fourteen statements on a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Internal consistencies of $\alpha = .84$ and $\alpha = .94$, respectively, allowed us to average the responses for both scales. Both scales were administered in the pretest, before participants read the vignettes.

Sociodemographic

We collected information about gender (options: male, female, other), age and education level (total number of years of formal education).

Manipulation Check

After reading the vignette, participants rated the CAM industry on three 7-point semantic differential scales, ranging from 1 (*powerless; non-profitable; strictly regulated*) to 7 (*powerful; profitable; loosely regulated*). We calcu-

lated a composite score for the perception of the CAM industry by averaging the scores on the three semantic differential scales. Participants perceived the CAM industry in the Big Suppla condition (M_{big} = 5.78, 95% CI [5.61, 5.94]) as significantly more powerful, profit oriented and unregulated than in the control group (M_{cont} = 5.07, 95% CI [4.89, 5.25]), and participants in the control group perceived the CAM industry as significantly more powerful, profit oriented and unregulated than in the Baby Suppla condition (M_{baby} = 2.98, 95% CI [2.77, 3.18]). As per preregistration, to have not only relative but also absolute differences between experimental groups, we excluded the participants who scored on average below four in the Big Suppla experimental group, and on average above four in the Baby Suppla group. In addition, they had to score four or higher on two out of three scales in the Big Suppla group, and four or lower in the Baby Suppla group.

Attention Check

We asked the participants to answer two questions about the vignette they read to test whether they had read it attentively. We also included a third attention check item in the questionnaires ("Please select number 3"), to make sure they answered the questions attentively. We excluded the participants who failed two or more attention questions.

Sample

We collected the respondents via snowballing on social media. The link to the questionnaire was seeded in different Facebook groups and in the comments section of the news media posts related to COVID-19. A total of 365 participants finished the survey. Upon excluding the participants who failed the attention checks (N = 76), and/or manipulation checks

(N = 47), we ended up with a final sample of 242 participants. Women made up the majority of the sample (76%); the average age was 32.6 (11.79) and average years of education 14.2 (2.92). To ensure that this sample size was adequate for detecting the intended effects, we ran a post-hoc sensitivity analysis in GPower 3.0 (Faul et al., 2007), for a 2x3 within-between interaction, with α set at .05 and power at .80, and given an average correlation of .8 between our repeated measures, with our sample size of N = 242, we could reliably detect Cohen's d of 0.40.

Analytical Strategy

To test the effect of the manipulation on participants' endorsement of CAM products (H1), we ran two Mixed ANOVAs, with the group (Big Suppla, Baby Suppla and control) as a between-subjects factor and the endorsement of each group of CAM products before and after reading the vignette as a within-subjects factor. To disentangle the interaction effects, we conducted post hoc analyses, and we report Holm's method adjusted p-values for a family of 15 comparisons. Additionally, we also ran the Mixed ANOVAs separately for each of the six dependent variables (evaluation of supplements, evaluation of herbs, willingness to try supplements, willingness to try herbs, willingness to recommend supplements, and willingness to recommend herbs). These analyses are reported in Appendix B at OSF. The analyses were conducted in JASP version 0.15.0.0. (JASP team, 2021).

To test H2 that conspiratorial worldview moderates the relationship between the manipulation and the endorsement of CAM products, we conducted four "Model 1" moderation analyses in the R Shiny application for R package "processR" (Keon-Woong, 2021). CAM endorsement was assessed as the pretest/posttest change in composite scores for

herbs and supplements. We first examined the relationship between the manipulation and the endorsement of herbal products with conspiracy mentality as a moderator and then with belief in specific conspiracy theories as a moderator separately. The same analyses were conducted with the endorsement of dietary supplements, leading to four separate moderation analyses. We excluded the control group from the analysis, given that our hypothesis focused on the experimental groups. We dummy-coded the experimental situations so that: 0 = Baby Suppla manipulation, 1 = Big Suppla manipulation.

To test our third hypothesis that those who are more prone to conspiratorial beliefs initially endorsed CAM products more, we examined the zero-order Pearson's correlations between the two measures of conspiratorial beliefs and the endorsement of herbs and supplements.

To test our final hypothesis, we first assessed whether the trust in the industry of dietary supplements and the trust in the industry of herbs changed after the treatment. We ran two univariate ANOVA analyses with the experimental group (Big Suppla, Baby Suppla, and control) as a between-subject factor. Dependent variables for change in trust in both industries were calculated as subtraction between posttest measures of trust and pretest measures of trust.

Results

Changes in the Endorsement of Supplements and Herbs as a Result of Experimental Manipulation

For dietary supplements, there was no significant main effect of the manipulation ($F(2,239) = 0.628$, $p = .535$), while we did observe a significant main effect of the pretest-posttest factor ($F(2,239) = 25.656$, $p <$ .001). Most importantly, this effect was qualified by a significant interaction ($F(2,239) = 8.113$, $p < .001$). There was an expected change in endorsement only in the Big Suppla group (Figure 1), such that participants endorsed supplements less after reading about the profit-oriented, powerful, and unregulated CAM industry ($M_{diff} = 0.472$, $SE = 0.070$, $t = 6.717$, $p_{holm} \leq .001$, $d = 0.387$). Contrary to our expectations, the endorsement for supplement did not increase in the Baby Suppla group ($M_{diff} = 0.088$, $SE = 0.088$, $t = 1.001$, $p_{holm} = 1.000$, $d = 0.004$) and there was no change in the control group, as expected ($M_{diff} = 0.124$, $SE = 0.075$, $t = 1.655$, $p_{holm} = 1.000$, $d = 0.093$).

We observed a similar pattern for the endorsement of herbs (Figure 2): there was no main effect of the manipulation ($F(2,239) = 2.525$, $p = .082$), while the pretest-posttest change in endorsement was significant ($F(2,239) = 26.337$, $p < .001$), as was the interaction ($F(2,239) = 5.606$, $p = .004$). As expected, we found a significant drop in the Big Suppla ($M_{diff} = 0.345$, $SE = 0.069$, $t = 5.034$, $p_{holm} \leq .001$, $d = 0.258$), but unexpectedly no increase in the Baby Suppla group ($M_{diff} = 0.005$, $SE = 0.085$, $t = 0.062$, $p_{holm} = 1.000$, $d = 0.004$) and a significant drop in the control group ($M_{diff} = 0.325$, $SE = 0.073$, $t = 4.442$, $p_{holm} \leq .001$, $d = 0.303$).

The analyses of individual dependent variables yielded similar results: we observed an effect of the Big Suppla manipulation on all dependent variables, with the exception of the evaluation of supplements.

Belief in Specific Conspiracy Theories and Conspiracy Mentality as Moderators of the Effect

To test our second hypothesis, we first ran a moderation analysis with belief in specific conspiracy theories as the moderator of the effect of the manipulation on change in
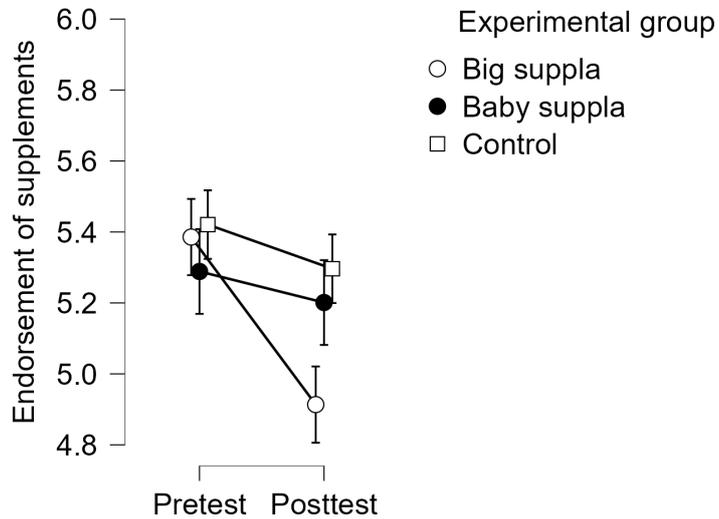
Note. Error bars represent 95% confidence intervals.

Figure 1 Interaction between manipulation and pretest-posttest measurement of supplements.
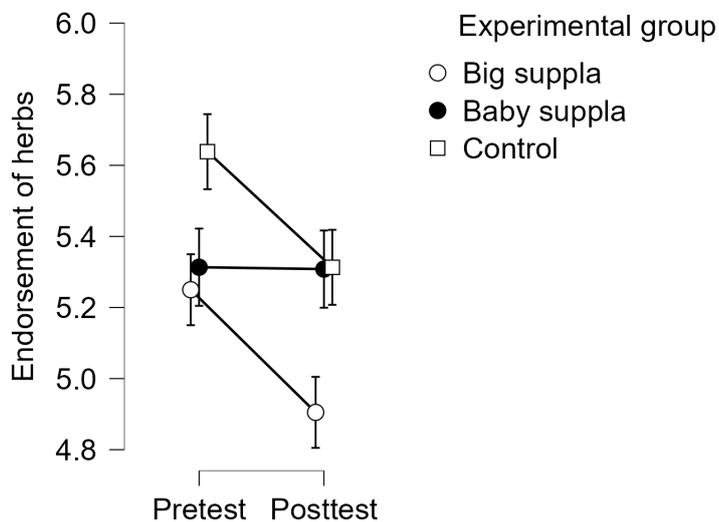
Note. Error bars represent 95% confidence intervals.

Figure 2 Interaction between manipulation and pretest-posttest measurement of herbs.

the endorsement of herbs. While the overall model was significant ($F(3,154) = 3.848$, $p = .011$, $R^2 = .05$), there was no significant moderation effect of belief in specific conspiracy theories ($\beta = 0.327$, $t = 1.291$, $p = .199$). The only predictor that significantly contributed to the model prediction was the main effect of the manipulation ($\beta = -0.523$; $t = -2.281$, $p = .024$), while belief in specific conspiracy theories alone ($\beta = -0.115$; $t = -0.920$, $p = .359$) did not contribute to the prediction of change in the endorsement of herbs. The same was true when we used the pretest-posttest change in the endorsement of supplements as the dependent variable – the model was significant ($F(3,154) = 4.509$, $p = .005$, $R^2 = .06$). However, while there was a significant main effect of the manipulation ($\beta = -0.544$; $t = -2.388$, $p = .018$), belief in specific conspiracy theories did not moderate this effect ($\beta = 0.345$; $t = 1.203$, $p = .231$). Belief in specific conspiracy theories did not contribute to the prediction of change in the endorsement of supplements on its own either ($\beta = -0.202$; $t = -1.633$, $p = .105$).

Secondly, we ran a moderation analysis with conspiracy mentality as a moderator of the effect of manipulation on change in the endorsement of herbs. While the overall model was significant ($F(3,154) = 3.393$, $p = .020$, $R^2 = .04$), there were no significant moderation effect of conspiracy mentality ($\beta = 0.047$, $t = 0.151$, $p = .880$), no significant main effect of the manipulation ($\beta = -0.291$; $t = -0.980$, $p = .329$), nor of conspiracy mentality alone ($\beta = -0.064$, $t = -0.485$, $p = .628$). The same was true when we used the pretest-posttest change in the endorsement of supplements as the dependent variable: the model was significant ($F(3,154) = 3.622$, $p = .015$, $R^2 = .05$), but there was neither a significant main effect of the manipulation ($\beta = -0.378$; $t = -1.277$, $p = .204$), nor did conspiracy mentality moderate this effect ($\beta = 0.133$; $t = 0.432$, $p = .667$). Conspiracy mentality did not contribute to

the prediction of change in the endorsement of supplements on its own either ($\beta = -0.054$; $t = -0.411$, $p = .682$).

The Role of Proneness to Conspiratorial Beliefs in Endorsement of CAM Products

In line with H3, people who were more prone to conspiratorial beliefs initially endorsed herbal products more. Correlations between the endorsement of herbal products and conspiracy mentality ($r = .20$, $p = .002$) and belief in specific conspiracy theories ($r = .24$, $p < .001$) were low but significant. However, the same was not true for the endorsement of supplements: the correlation was non-significant for both conspiracy mentality ($r = .01$, $p = .811$) and belief in specific conspiracy theories ($r = .08$, $p = .213$).

Change in Trust in the CAM Industry as a Mediator

We did not observe significant interactions of the between-subject factor (Big Suppla, Baby Suppla and control) and change in trust of either the supplements industry ($F(2,239) = 0.562$, $p = .571$, $d = 0.08$); or herbal products industry ($F(2,239) = 1.630$, $p = .198$, $d = 0.22$). Thus, there was no conceptual justification to proceed with the mediation analysis.

Discussion

By portraying the CAM industry as profitable and powerful, we managed to make participants less likely to try, recommend and positively evaluate its products; portraying it as non-profit oriented and powerless, however, did not have the expected effects. This asymmetry might have been due to the fact that respondents did not find the Baby Suppla manipulation credible enough: more than half did not pass the manipulation check. In

addition, among those who did, the average assessment of CAM was closer to the maximum in the Big Suppla group than to the minimum in the Baby Suppla group (average 6 versus average 3 on a scale 1-7). The lack of effect could also partially be due to the ceiling effect on the endorsement of supplements and herbs, which was a priori high, leaving less room for the Baby Suppla manipulation effect. It is quite clear, on the other hand, that there was room for change in the opposite direction which left the respondents with a more realistic image of the industry and, importantly, translates to less willingness to try and recommend the products.

We also replicated previous findings (Lamberty & Imhoff, 2018; Lobato et al., 2014) that those more prone to conspiratorial beliefs seem to endorse CAM products more. This was true for herbs, but not for supplements, suggesting that herbs might be more closely associated with the CAM industry and thus a better representative of it. This finding fits into a broader framework of relationship between epistemologically suspect (irrational) beliefs and questionable health practices, be it non-adhering to recommended practices or resorting to non-evidence-based ones (Čavojová & Ersoy, 2020; Oliver & Wood, 2014; Teovanović et al., 2020).

Considering the nature of our manipulation, we expected that people more prone to conspiratorial beliefs would be more susceptible to it, especially to revising their CAM endorsement after the Big Suppla message. We based this assumption on the fact that the core of the manipulation refers to hidden power and intentions of the industry – that should be easier to incorporate into a conspiratorial worldview. We did not find a moderation effect, and at this time we can only offer a post hoc explanation of this lack of effect: it could be that more conspiratorial participants were not sensitive to the figures

in the vignettes as they were attributed to the official sources.

When it comes to the mechanism through which the manipulation affects the endorsement of the CAM products, we pre-registered an exploratory mediation via decrease/increase in trust. This was based on the idea that learning about the "real face" of the industry should signal its trustworthiness. We did not, however, observe such an effect, although we did find the main effect of the "Big Suppla" manipulation on the products' endorsement, as discussed previously.

Limitations and Future Research

Our results suggest that attitudes towards different products and representatives of the industry are not uniform. We chose dietary supplements and herbal products as two most popular product categories (Grand view research, 2020a) to represent the industry; they might not be its most typical representatives. In addition, although we did not directly measure it, there are indications that herbal products were perceived as more typical of the industry in comparison to dietary supplements. In fact, dietary supplements are sometimes not even included in CAM products lists as they tend to be sold in pharmacies and are often prescribed by doctors (e.g., Ventola, 2010). However, we argue that the lack of evidence for their health benefits and their overuse justifies our initial choice. For example, during the pandemic in 2020, people took excessive doses of supplements as a self-prescribed disease treatment (Michienzi & Badowski, 2020) or an immune system booster (Adams et al., 2020). As the message exhibited differential effects for two groups of products, communication might require more targeted tailoring for specific practices.

We expected trust to be a mediator of the main effect but did not observe it in the data.

Different candidates for the mechanism could be further explored. They could relate to the perception of industry or its products – e.g., perceived malevolence/benevolence of the industry or perceived effectiveness of the products.

Also, future studies could include both "Suppla" and "Pharma" manipulation in a single design and measure endorsement of CAM practices and adherence to official medical recommendations (e.g., vaccination). That could allow direct comparison of the effects of power manipulation for two industries that should initially be perceived differently in these terms and provide fine grained data about the relation between the two types of questionable health practices. Future researchers could also test the expected moderation by conspiratorial worldview, as it might prove to be more efficient for the Big/Baby Pharma manipulation.

Policy Implications

Our most robust finding – the effect of the Big Suppla manipulation – could help tailor public health messages. It suggests that, for example, a long-term campaign focused on highlighting the nature of the CAM industry and market could discourage the public from consumption of their products. However, the end goal is not to target this industry, but to lead to more informed consumers' decisions. To this end, the Big Suppla campaign would need to be complemented with evidence-based information about the specific products, and in the best scenario, with a widespread effort to increase health literacy.

Conclusion

We showed that challenging the myth of benevolence related to the CAM industry makes consumers more critical in evaluating its products or considering their usage, thus providing first evidence that the intuitions of science communicators who coined the term Big Suppla were correct. Having in mind how widespread CAM products and practices are, on one hand, and the lack of evidence that proves their effectiveness, on the other, the results of this study are important in terms of changing people's perception of the CAM industry (specifically herbs and dietary supplements industries), as well as the endorsement of its products and practices. The attempt to intervene in the opposite direction did not have the expected effect, suggesting that the consumers are not ready to give more credit to the industry. Whether more conspiratorial consumers tend to respond differently to this type of manipulation compared to less conspiratorial still needs to be explored. Taken together, our findings offer insight on how to tackle the overuse of these products and create a more realistic perception of the industry, which should lead to positive health outcomes.

Acknowledgements

Authors' ORCIDs
Nevena Mijatović
https://orcid.org/0000-0002-3741-7999
Jasmina Šljivić
https://orcid.org/0000-0001-6189-3998
Nemanja Tošić
https://orcid.org/0000-0002-7062-2695
Ljubica Conić
https://orcid.org/0000-0002-9677-0995
Marija Petrović
https://orcid.org/0000-0001-6422-3957
Iris Žeželj
https://orcid.org/0000-0002-9527-1406

References

Adams, K. K., Baker, W. L., & Sobieraj, D. M. (2020). Myth busters: Dietary supplements and COVID-19. *Annals of Pharmacotherapy, 54(*8*),* 820–826. https://doi.org/10.1177/1060028020928052

Bishop, F. L., Yardley, L., & Lewith, G. T. (2007). A systematic review of beliefs involved in the use of complementary and alternative medicine. *Journal of Health Psychology, 12*(6), 851–867. https://doi.org/10.1177/1359105307082447

Blaskiewicz, R. (2013). The Big Pharma conspiracy theory. *Medical Writing*, *22*(4), 259–261. https://doi.org/10.1179/2047480613z.000000000142

Brezis, M. (2008). Big Pharma and health care: Unsolvable conflict of interests between private enterprise and public health. *Israel Journal of Psychiatry and Related Sciences*, *45*(2), 83–94.

Bruder, M., Haffke, P., Neave, N., Nouripanah, N., & Imhoff, R. (2013). Measuring individual differences in generic beliefs in conspiracy theories across cultures: Conspiracy Mentality Questionnaire. *Frontiers in Psychology, 4*, 225. https://doi.org/10.3389/fpsyg.2013.00225

Chan, K., Zhang, H. W., & Lin, Z. X. (2012). 48—Treatments used in complementary and alternative medicine. In J. K. Aronson (Ed.), *Side Effects of Drugs Annual* (Vol. 34, pp. 769–783). Elsevier. https://doi.org/10.1016/B978-0-444-59499-0.00048-9

Čavojová, V., & Ersoy, S. (2020). The role of scientific reasoning and religious beliefs in use of complementary and alternative medicine. *Journal of Public Health, 42(3),* 239–248.

Deangelis, C. D. (2016). Big Pharma profits and the public loses*. The Milbank Quarterly, 94(*1*), 30–33.* https://doi.org/10.1111/1468-0009.12171

Ernst, E. (2010). Homeopathy: What does the "best" evidence tell us? *The Medical Journal of Australia,* 192, 458–460. https://doi.org/10.5694/j.1326-5377.2010.tb03585.x

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39(2),* 175–191. https://doi.org/10.3758/BF03193146

Forrest, A. (2020, April 28). Coronavirus: 700 dead in Iran after drinking toxic methanol alcohol to 'cure Covid-19'. *The Independent*. https://www.independent.co.uk/news/world/middle-east/coronavirus-iran-deaths-toxic-methanol-alcohol-fake-news-rumours-a9487801.html

Goertzel, T. (1994). Belief in conspiracy theories. *Political Psychology*, *15*(4), 731–742. https://doi.org/10.2307/3791630

Goldman, L. (2020), *Give ME a choice: Perceptions of freedom and the anti-vax movement in Maine.* https://digitalcommons.colby.edu/honorstheses/1008

Grand view Research. (2020a, March). *Complementary and alternative medicine market report, 2020-2027*. www.grandviewresearch.com/industry-analysis/complementary-alternative-medicine-market

Grand view Research. (2020b, February). *Dietary supplements market report, 2027*. https://www.grandviewresearch.com/industry-analysis/dietary-supplements-market

Grimes, D. (2016). On the viability of conspiratorial beliefs. *PLOS ONE*, *11*(1). https://doi.org/10.1371/journal.pone.0147905

Hall, H. (2011, February). *When dietary supplements are used as medicines.* https://getbetterhealth.com/when-dietary-supplements-are-used-as-medicines/

Imhoff, R., & Bruder, M. (2014). Speaking (un-) truth to power: Conspiracy mentality as a generalized political attitude. *European Journal of Personality, 28(*1*)*, 25–43. https://doi.org/10.1002/per.1930

Imhoff, R., Lamberty, P., & Klein, O. (2018). Using power as a negative cue: How conspiracy mentality affects epistemic trust in sources of historical knowledge. *Personality and Social Psychology Bulletin*, *44*(9), 1364–1379. https://doi.org/10.1177/0146167218768779

Ingraham, P. (2010, September). *Big Suppla*. https://www.paulingraham.com/big-suppla.html

Islam, M. S., Sarkar, T., Khan, S. H., Mostofa Kamal, A.-H., Hasan, S. M. M., Kabir, A., Yeasmin, D., Islam, M. A., Amin Chowdhury, K. I., Anwar, K. S., Chughtai, A. A., & Seale, H. (2020). COVID-19–related infodemic and its impact on public health: A global social media analysis. *The American Journal of Tropical Medicine and Hygiene*, *103*(4), 1621–1629. https://doi.org/10.4269/ajtmh.20-0812

JASP team. (2021). JASP (Version 0.15.0.0) [Computer software].

Kemppainen, L. M., Kemppainen, T. T., Reippainen, J. A., Salmenniemi, S. T., & Vuolanto, P. H. (2017). Use of complementary and alternative medicine in Europe: Health-related and sociodemographic determinants. *Scandinavian Journal of Public Health, 46*(4), 448–455. https://doi.org/10.1177/1403494817733869

Keon-Woong, M. (2021). processR: Implementation of the 'PROCESS' Macro. R package version 0.2.6. https://CRAN.R-project.org/package=processR

Lamberty, P., & Imhoff, R. (2018). Powerful Pharma and its marginalized alternatives? *Social Psychology*, *49*(5), 255–270. https://doi.org/10.1027/1864-9335/a000347

Lim, A., Cranswick, N., & South, M. (2010). Adverse events associated with the use of complementary and alternative medicine in children. *Archives of Disease in Childhood, 96(*3*)*, 297–300. http://dx.doi.org/10.1136/adc.2010.183152

Lobato, E., Mendoza, J., Sims, V., & Chin, M. (2014). Examining the relationship between conspiracy theories, paranormal beliefs, and pseudoscience acceptance among a university population. *Applied Cognitive Psychology*, *28*(5), 617–625. https://doi.org/10.1002/acp.3042

Lukić, P., Žeželj, I., & Stanković, B. (2019). How (ir)rational is it to believe in contradictory conspiracy theories?. *Europe's Journal of Psychology, 15*(1), 94–107. https://doi.org/10.5964/ejop.v15i1.1690

Lynas, M. (2020). *COVID – Top 10 current conspiracy theories*. Retrieved from https://allianceforscience.cornell.edu/blog/2020/04/covid-top-10-current-conspiracy-theories/

Lynn, G., & Davey, E. (2015, June 11). 'Miracle autism cure' seller exposed by BBC investigation. *BBC.* https://www.bbc.com/news/uk-england-london-33079776

Michienzi, S. M., & Badowski, M. E. (2020). Can vitamins and/or supplements provide hope against coronavirus?. *Drugs in Context, 9,* 1–29. https://dx.doi.org/10.7573%2Fdic.2020-5-7

Milošević-Đorđević, J., Žeželj, I., & Đurić, Ž. (2021). Beyond general political attitudes: Conspiracy mentality as a global belief system predicts endorsement of international and local conspiracy theories. *Journal of Social and Political Psychology, 9*(1), 144–158. https://doi.org/10.5964/jspp.5609

Nahin, R. L., Barnes, P. M., Stussman, B. J., & Bloom, B. (2009). Costs of complementary and alternative medicine (CAM) and frequency of visits to CAM practitioners: United States, 2007. *National Health Statistics Reports*, *18*.

Oliver, J. E., & Wood, T. J. (2014). Conspiracy theories and the paranoid style(s) of mass opinion. *American Journal of Political Science*, *58*(4), 952–966. https://doi.org/10.1111/ajps.12084

Singler, B. (2015). Big Bad Pharma. *Nova Religio*, *19*(2), 17–29. https://doi.org/10.1525/nr.2015.19.2.17

Teovanović, P., Lukić, P., Zupan, Z., Lazić, A., Ninković, M., & Žeželj, I. (2020). Irrational beliefs differentially predict adherence to guidelines and pseudoscientific practices during the COVID-19 pandemic. *Applied Cognitive Psychology, 35*(2), 486–496. https://doi.org/10.1002/acp.3770

Uscinski, J. E., & Parent, J. M. (2014). *American conspiracy theories*. Oxford University Press.

van Mulukom, V., Pummerer, L., Alper, S., Bai, H., Čavojová, V., Farias, J. E. M., Kay, C. S., Lazarević, L. B., Lobato, E. J. C., Marinthe, G., Pavela Banai, I., Šrol, J., & Žeželj, I. (in press). Antecedents and consequences of COVID-19 conspiracy beliefs: A systematic review. Manuscript accepted for publication in *Social Science and Medicine.*

Ventola, C. L. (2010). Current issues regarding complementary and alternative medicine (CAM) in the United States: part 1: The widespread use of CAM and the need for better-informed health care professionals to provide patient counseling. *Pharmacy and Therapeutics, 35*(8), 461–468.

Wiesener, S., Falkenberg, T., Hegyi, G., Hök, J., di Sarsina, P. R., & Fønnebø, V. (2012). Legal status and regulation of complementary and alternative medicine in Europe. *Complementary Medicine Research, 19*(Suppl. 2), 29–36. https://doi.org/10.1159/000343125

World Health Organization. (2019). *WHO global report on traditional and complementary medicine 2019*. World Health Organization. https://apps.who.int/iris/handle/10665/312342

World Health Organization. (2020). *Coronavirus disease (COVID-19) advice for the public: Mythbusters*. Retrieved from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters