Routledge
Taylor & Francis Group

Health Communication

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/hhth20

Commentary on "Do Vaping Prevention Messages Impact Adolescents and Young Adults? A Meta-Analysis of Experimental Studies"

Daniel J. O'Keefe

To cite this article: Daniel J. O'Keefe (2023) Commentary on "Do Vaping Prevention Messages Impact Adolescents and Young Adults? A Meta-Analysis of Experimental Studies", Health Communication, 38:8, 1723-1726, DOI: 10.1080/10410236.2023.2212467

To link to this article: https://doi.org/10.1080/10410236.2023.2212467

HEALTH COMMUNICATION
2023, VOL. 38, NO. 8, 1723–1726
https://doi.org/10.1080/10410236.2023.2212467

Routledge
Taylor & Francis Group

ARTICLE COMMENTARY

Commentary on "Do Vaping Prevention Messages Impact Adolescents and Young Adults? A Meta-Analysis of Experimental Studies"

Daniel J. O'Keefe

Department of Communication Studies, Northwestern University

ABSTRACT

Preventing vaping by adolescents and young adults is unquestionably an important goal. Ma et al.'s meta-analysis invites the conclusion that vaping prevention messages are effective. This commentary discusses two concerns about that conclusion and the affiliated meta-analysis: (1) None of the analyzed effect sizes describes the effectiveness of vaping prevention messages; the effect sizes describe the difference in effectiveness (the difference on an outcome variable) between the two conditions being compared. (2) As the two conditions being compared vary, so do the relevant conclusions––but the review combines different kinds of comparisons.

Preventing vaping by adolescents and young adults is unquestionably an important goal. Ma et al.'s (in press) meta-analysis invites the conclusion that vaping prevention messages are effective. This commentary discusses two concerns about that conclusion and the affiliated meta-analysis: (1) None of the analyzed effect sizes describes the effectiveness of vaping prevention messages; the effect sizes describe the difference in effectiveness (the difference on an outcome variable) between the two conditions being compared. (2) As the two conditions being compared vary, so do the relevant conclusions—but the review combines different kinds of comparisons.

What the effect sizes represent

It will be useful to begin by having a clear understanding of what effect sizes represent in message-effects experiments of the sort reviewed in the meta-analysis. It can be easy to think that the effect sizes analyzed represent the effects of vaping prevention messages, with larger effect sizes indicating larger message effects. This is a misunderstanding of the effect sizes.

The effect sizes describe the difference in effectiveness (the difference on an outcome variable) between the two conditions being compared, not the value of either condition on the outcome. An effect size favoring a vaping prevention message does not mean that the vaping prevention message was effective in any absolute sense—only that it was more effective than the condition against which it was compared.

To concretize that distinction, suppose there was a scale of absolute message persuasiveness ranging from zero (no persuasion) to 100, with a standard deviation of 10. And imagine two studies of persuasive messaging. Study 1 compared message A (with a persuasion score of 35) against message B (score of 30); the effect size (expressed as *d*, the standardized mean difference) is .5. Study 2 compared message C (score of 80) against message D (score of 78); the effect size (*d*) is .2. The messages in study 2 were much more effective than the messages in study 1, but the effect size was larger in study 1—because the effect size describes the *difference* between the conditions being compared, not the effectiveness of any single message. Confusion on this point is not uncommon (see O'Keefe, 2017, for examples and discussion).

So in the reported meta-analysis, no individual study speaks to the question of whether vaping prevention messages are effective in some abstract sense. Rather, each study examines the difference in effectiveness between the two conditions being compared. Correspondingly, positive meta-analytic mean effect sizes (favoring treatment over control) on outcomes of interest do not indicate that treatment messages are effective. Such mean effect sizes can indicate only the direction and size of the mean difference between the conditions being compared.

Variation in comparisons

As just discussed, the effect sizes reviewed in this meta-analysis describe the difference on an outcome variable between the two conditions being compared. Thus, the meaning of a given effect size—what the effect size describes—depends on which conditions are being compared.

As the conditions being compared vary, so does the meaning of the effect size (and the claim being addressed). For example, a study that compared an anti-vaping message against a no-message control condition would speak to the question of whether an anti-vaping message is more effective than saying nothing. But a study that compared a text-only anti-vaping message against a text-plus-visual anti-vaping message would speak to the question of the relative effectiveness of text-only anti-vaping messages and text-plus-visual anti-vaping messages. Because the comparisons differ in the two studies, the effect sizes from those two studies describe

CONTACT Daniel J. O'Keefe d-okeefe@northwestern.edu 999 Michigan Avenue, Apt. 1C, Evanston, IL 60202-1445, USA

different relationships and would not appropriately be averaged.

Against that background, it is instructive to examine closely the treatment-versus-control comparisons in the studies included in the meta-analytic review. As will be seen, different kinds of comparisons were combined—arising from variation both in control conditions and in treatment conditions.

Variation in control conditions

Pro-vaping messages as controls

Some of the included studies compared an anti-vaping message against a pro-vaping message (e.g., an advertisement for a brand of vaping equipment). For example, the message contrast extracted from Majmundar et al.'s (2020, p. 78) study was between an anti-vaping message ("an argument related to the possible harm of e-cigarette smoking") and a pro-vaping message ("an argument supporting possible benefits of e-cigarette smoking"). Comparing an anti-vaping message and a pro-vaping message speaks to the question of whether anti-vaping messages are more effective in discouraging vaping than are pro-vaping messages (unsurprisingly, they are).[1]

Anti-vaping messages as controls

Some of the included studies compared one anti-vaping message against another anti-vaping message. For example, Sontag et al. (2019) compared two vaping warning messages, a text-only version and a text-plus-pictorial version. Underwood and Yang (2018) compared various vaping fear appeals. Noar et al. (2020) compared different "e-cigarette prevention videos" (p. 2), as did Rohde et al. (2021, p. 1224). For a given comparison, one anti-vaping message was designated as the "treatment" message and the other anti-vaping message designated as the "control."[2]

Notice that the effect size from such a comparison does not speak to the question of whether vaping prevention messages have effects or are effective. After all, if both anti-vaping messages were highly effective but *equally* effective, the effect size would be zero; if the two messages were equally ineffective, the effect size would also be zero. A nonzero effect size would mean only that the two messages were not equally effective, but would not indicate anything about either message's absolute effectiveness.

No-advocacy-message conditions as controls

Some of the included studies compared a treatment message against a no-advocacy-message control condition, that is, a condition in which participants were not exposed to any vaping advocacy message. Lazard (2021) had a no-message control condition. England et al. (2021) had an irrelevant-message control condition (a public health message concerning sugary drinks).[3] Such studies speak to the question of whether a treatment message is more effective (in discouraging vaping) than not using a treatment message.

Summary: Variation in control conditions

The three different control conditions just described appear in studies in the meta-analytic dataset and so contribute to the reported overall mean effect sizes. But these three control conditions speak to substantively different research questions.

The comparison of a treatment message against a pro-vaping message addresses the question "Is a treatment message more effective in discouraging vaping than a pro-vaping message?" The comparison of one anti-vaping message against another anti-vaping message addresses the question "Is anti-vaping message A more effective in discouraging vaping than anti-vaping message B?" The comparison of a treatment message against a no-advocacy-message control condition addresses the question "Is a treatment message more effective in discouraging vaping than not having an advocacy message?"

And, correspondingly, the effect sizes computed from such comparisons have different meanings. One kind of effect size describes the difference in effectiveness between a treatment message and a pro-vaping message. Another kind of effect size describes the difference in effectiveness between two anti-vaping messages. A third kind of effect size describes the difference in effectiveness between a treatment message and a no-advocacy-message condition.

And because the different effect sizes describe different things, it does not make sense to average effect sizes across them. As a simple illustration, it could simultaneously be true that (a) treatment messages are more effective at discouraging vaping than are pro-vaping messages and (b) treatment messages are not more effective at discouraging vaping than saying nothing on the subject. In such a circumstance, a mean effect size computed across the two kinds of effect size would (ceteris paribus) favor the treatment message—which could lead unsuspecting readers to suppose that treatment messages are "effective" and so should be deployed, even though in fact treatment messages were not more effective than saying nothing.

Variation in treatment conditions

As just described, the effect sizes analyzed are based on a variety of control conditions. But those effect sizes are also based on a variety of treatment conditions.

As a place to start: Majmundar et al.'s (2020) study, mentioned above, actually had three message conditions: "exclusively positive, exclusively negative, and ambivalent (both positive and negative). The positive message consisted of an argument supporting possible benefits of e-cigarette smoking, the negative message, an argument related to the possible harm of e-cigarette smoking, and an ambivalent message with one argument for the benefit and one argument for harm of e-cigarette smoking" (Majmundar et al., 2020, p. 78). As discussed above, the message contrast extracted from this study was between the anti-vaping message (the negative message) and the pro-vaping message (the positive message).

The message category of interest here is the "ambivalent message" condition, the message that contains both pro-vaping and anti-vaping information. It's not necessarily a concern that this kind of message was put aside when considering Majmundar et al.'s (2020) study; if the message contrast of meta-analytic interest is between an anti-vaping message and a pro-vaping message, then this ambivalent-message condition *should* be put aside.

But now consider a study that compares an advertisement for vaping equipment (a pro-vaping message) against the same advertisement accompanied by a health warning about the dangers of vaping. The latter message is a straightforward instance of an ambivalent message, that is, one containing both pro-vaping information (the vaping ad) and anti-vaping information (the health warning).

And indeed some of the messages that were classified as "treatment" messages were vaping-ads-with-health-warnings messages, that is, ambivalent messages. See, for example, the descriptions (in Supplemental Table S1 of Ma et al., in press) of the studies of Katz et al. (2020) and Mays et al. (2016, concerning condition comparison #2, "text warning on e-cigarette ad vs. e-cigarette print ad"). The point is: Some of the messages that were categorized as "treatment" messages were anti-vaping messages, but others were ambivalent messages.

The upshot: Variations in comparisons

So in the studies included in the meta-analysis, the "control" conditions varied: sometimes the control condition was a pro-vaping message, sometimes another anti-vaping message, and sometimes a no-advocacy-message condition. And the "treatment" conditions varied: sometimes the treatment was an anti-vaping message, sometimes an ambivalent message.

It's one thing to compare an anti-vaping message and a pro-vaping message. It's something different to compare an ambivalent message and a pro-vaping message. It's something different still to compare an anti-vaping message and a no-advocacy-message condition. And it's something different again to compare two anti-vaping messages.

But the reported meta-analysis is insensitive to such distinctions, and the result is that the set of message comparisons is a farrago. Subsets of these effect sizes—subsets in which all of the effect sizes are based on the same sort of comparison—are appropriately analyzed. But for the collection as a whole, the overall mean effect sizes are not meaningfully interpretable.

Any set of effect sizes can be meta-analyzed. An effect size from a study comparing the effects of a narrative message and a non-narrative message on immigration policy attitudes, an effect size from a study comparing the effects of a one-sided message and a two-sided message on immigration policy attitudes, an effect size from a study comparing the effects of a vivid message and a no-message control condition on immigration policy attitudes, and an effect size from a study comparing the effects on immigration policy attitudes of a message advocating a tighter immigration policy and a message advocating a looser immigration policy—it is possible to compute a meta-analytic mean effect size across those effect sizes, but that mean effect size is not meaningful.[4] The purpose of a meta-analysis is to synthesize results from "studies that have addressed the same research question" (Field & Gillett, 2010, p. 667). The effect sizes reviewed in this meta-analysis do not all address the same research question.

To come at this point in a different way: As discussed above, the effect sizes being analyzed do not describe the absolute effectiveness of treatment messages; the effect sizes describe the difference in effectiveness between the two conditions being compared. If one mistakenly thought that all these effect sizes describe the effectiveness simpliciter of treatment messages, then one might be inclined to lump them together and compute an overall mean effect—which then would (erroneously) be interpreted as indicating whether treatment messages were "effective." But the collected effect sizes describe differences on outcome variables (not the effectiveness of any one condition) between a variety of treatment conditions and a variety of control conditions, with that variety making the collection of effect sizes not meaningfully averaged.

Conclusion

Ma et al.'s (in press) meta-analysis invites the conclusion that vaping prevention messages are effective. But none of the analyzed effect sizes describes the effectiveness of vaping prevention messages, and the variety of experimental comparisons (arising from variation both in the treatment condition and in the control condition) is such as to make the reported overall mean effect sizes uninterpretable.

Notes

1. In Ma et al.'s (in press) Supplemental Table S1, the "control message" for five studies is described as a "pro-vape message." Taking that count at face value, it arguably undercounts the number of studies in which the control condition is a pro-vaping message. See note 3 concerning Andrews et al. (2019).
2. There does not appear to be an articulated principled basis for identifying which anti-vaping message went in which category. However, when two anti-vaping messages were compared, the more effective anti-vaping message seems generally to have been classified as the treatment message and the less effective anti-vaping message classified as the control.
3. Ma et al.'s (in press) Supplemental Table S1 describes the control message of Andrews et al.'s (2019) study as a "no vape message" condition, the same label used to describe England et al.'s (2021) irrelevant-message condition. This is not an accurate description. In Andrews et al.'s (2019) study, all participants saw an e-cigarette ad: "respondents were randomly assigned to one of nine experimental versions of an e-cigarette ad" (p. 794). The experimental comparison of central interest was between an e-cigarette ad with a warning and an e-cigarette ad with no warning; that is, the control condition was a pro-vaping message (an ad with no warning).
4. If these effect sizes are nonzero, then artful coding of the direction of effect (i.e., the sign of each effect size) can yield a mean effect size that is *either* positive *or* negative. See note 2.

Disclosure statement

No potential conflict of interest was reported by the author.

Funding

The author reported there is no funding associated with the work featured in this article.

ORCID

Daniel J. O'Keefe http://orcid.org/0000-0003-1594-8892

References

Andrews, J. C., Mays, D., Netemeyer, R. G., Burton, S., & Kees, J. (2019). Effects of e-cigarette health warnings and modified risk and claims on adolescent e-cigarette craving and susceptibility. *Nicotine & Tobacco Research*, *21*(6), 792–798. https://doi.org/10.1093/ntr/nty076

England, K. J., Edwards, A. L., Paulson, A. C., Libby, E. P., Harrell, P. T., & Mondejar, K. A. (2021). Rethink Vape: Development and evaluation of a risk communication campaign to prevent youth E-cigarette use. *Addictive Behaviors*, *113*, 106664. https://doi.org/10.1016/j.addbeh.2020.106664

Field, A. P., & Gillett, R. (2010). How to do a meta-analysis. *British Journal of Mathematical & Statistical Psychology*, *63*(3), 665–694. https://doi.org/10.1348/000711010X502733

Katz, S. J., Shi, W., Erkkinen, M., Lindgren, B., & Hatsukami, D. (2020). High school youth and e-cigarettes: The influence of modified risk statements and flavors on e-cigarette packaging. *American Journal of Health Behavior*, *44*(2), 130–145. https://doi.org/10.5993/AJHB.44.2.2

Lazard, A. J. (2021). Social media message designs to educate adolescents about e-cigarettes. *Journal of Adolescent Health*, *68*(1), 130–137. https://doi.org/10.1016/j.jadohealth.2020.05.030

Ma, H., Kieu, T.K. -T., Ribisl, K. M., & Noar, S. M. (in press). Do vaping prevention messages impact adolescents and young adults? A meta-analysis of experimental studies. *Health Communication*. https://doi.org/10.1080/10410236.2023.2185578

Majmundar, A., Cornelis, E., & Moran, M. B. (2020). Examining the vulnerability of ambivalent young adults to e-cigarette messages. *Health Marketing Quarterly*, *37*(1), 73–88. https://doi.org/10.1080/07359683.2019.1680119

Mays, D., Smith, C., Johnson, A. C., Tercyak, K. P., & Niaura, R. S. (2016). An experimental study of the effects of electronic cigarette warnings on young adult nonsmokers' perceptions and behavioral intentions. *Tobacco Induced Diseases*, *14*(1), 17. https://doi.org/10.1186/s12971-016-0083-x

Noar, S. M., Rohde, J. A., Prentice Dunn, H., Kresovich, A., Hall, M. G., & Brewer, N. T. (2020). Evaluating the actual and perceived effectiveness of e-cigarette prevention advertisements among adolescents. *Addictive Behaviors*, *109*, 106473. https://doi.org/10.1016/j.addbeh.2020.106473

O'Keefe, D. J. (2017). Misunderstandings of effect sizes in message effects research. *Communication Methods and Measures*, *11*(3), 210–219. https://doi.org/10.1080/19312458.2017.1343812

Rohde, J. A., Noar, S. M., Prentice Dunn, H., Kresovich, A., & Hall, M. G. (2021). Comparison of message and effects perceptions for *The Real Cost* e-cigarette prevention ads. *Health Communication*, *36*(10), 1222–1230. https://doi.org/10.1080/10410236.2020.1749353

Sontag, J., Manderski, M. T. B., Hammond, D., & Wackowski, O. A. (2019). US young adults' perceived effectiveness of draft pictorial e-cigarette warning labels. *Tobacco Control*, *28*(e1), e49–51. https://doi.org/10.1136/tobaccocontrol-2018-054802

Underwood, K. A., & Yang, J. Z. (2018, May). *Prior knowledge's differential effects on fear appeal outcomes* [Paper presentation]. International Communication Association Annual Conference, Prague, Czech Republic.