Reply to Betsch et al.: Highlighting risks of diseases shifts vaccine attitudes

Betsch et al. (1) argue that our intervention failed to affect "true" vaccine skeptics' attitudes, and that the findings of our paper (2) actually support the use of an intervention aimed at dispelling myths linking measles, mumps, and rubella (MMR) vaccines and autism.

Our paper (2) focuses on analyses of 315 participants who completed the required two sessions. This sample was split into terciles based on a scale that measured pretest vaccination attitudes, allowing for comparisons between participants with different pretest attitudes while retaining adequate statistical power for comparisons between conditions. Betsch et al. (1) performed an alternative set of analyses of our data, arbitrarily defining a cut-off for "true" vaccine skeptics that included just 21 participants split across three conditions. This sample size is far too small to achieve adequate statistical power, yielding a null result that is both unsurprising and uninformative.

Based on their procedure for dividing participants into groups, Betsch et al. (1) also claim that the autism correction condition was an effective intervention for a group they term "fence-sitters," but they provide no inferential statistics to support this claim. Using their selection criteria, vaccine attitude-change scores did not differ reliably between the autism correction condition ($M = 0.276$) and the control condition ($M = 0.185$), $t(80) = 0.81$, $P = 0.42$. In contrast, the disease risk condition ($M = 0.475$) led to markedly higher change scores compared with the control, $t(78) = 2.68$, $P = 0.01$.

Following standard practice in psychological measurement (3), we developed an attitude scale based on multiple items. Responses to the five items in our vaccine scale composed a reliable scale ($\alpha = 0.84$), and together these items were correlated with self-reported vaccine behaviors. Analyzing individual scale items, as Betsch et al. (1) recommend, results in a loss of power and necessitates that many more comparisons be made, increasing the chance of type 1 errors.

Even setting this concern aside, the disease risk intervention produced the largest attitude change for the item "I plan to vaccinate my children" ($M = 0.21$). This change was significantly larger than the change observed in the control condition ($M = -0.018$) [$t(212) = 2.78$, $P = 0.006$] and the change observed in the autism correction condition ($M = 0.049$), $t(203) = 1.97$, $P = 0.049$. The autism correction condition was not significantly different from the control condition, $t(209) = 0.83$, $P = 0.41$.

More detailed analyses of the persuasive impact of various interventions are certainly warranted, as are studies examining how different facets of vaccine attitudes might shape vaccine decisions, but larger-scale studies will be required to answer such questions.

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1 Betsch C, Korn L, Holtmann C (2015) Don't try to convert the antivaccinators, instead target the fence-sitters. *Proc Natl Acad Sci USA*, 10.1073/pnas.1516350112.

2 Horne Z, Powell D, Hummel JE, Holyoak KJ (2015) Countering antivaccination attitudes. *Proc Natl Acad Sci USA* 112(33):10321–10324.

3 Nunnaly J (1978) *Psychometric Theory* (McGraw-Hill, New York).

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The authors declare no conflict of interest.

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