

**Infographics on risks
associated with COVID-19 and
the willingness to get the
AstraZeneca vaccine**
two randomized online experiments

Read & presented by Martine Jansen, for the Reading Group
“Statistics Communication and (in)numeracy”

Article

Title - Infographics on risks associated with COVID-19 and the willingness to get the AstraZeneca vaccine: two randomized online experiments















Authors - Lisa Felgendreff, Regina Siegers, Leonie Otten and Cornelia Betsch

Published - BMC Public Health. 2024; 24: 529

DOI - <https://doi.org/10.1186%2Fs12889-024-18057-0>

Data, code etc - Yes! See <https://osf.io/82kp6/> 😊

OSF

Name ^ v	Modified ^ v
-  OSF Storage (Germany - Frankfurt)	
-  Data and analyses	
 analysis---AstraZeneca-vaccine_BMC-Public-Health.html	2024-02-04 09:14 PM
 analysis - AstraZeneca vaccine_BMC Public Health.Rmd	2024-02-04 09:14 PM
 rawdata_Study1.xlsx	2022-06-09 08:28 PM
 rawdata_Study2.xlsx	2024-01-23 03:46 PM
-  Material	
 Study 1 Experiment Materials.docx	2022-06-09 08:27 PM
 Study 2 Experiment Materials.docx	2022-06-09 08:27 PM
-  Preregistrations	
 Preregistration AstraZeneca_Study 1.pdf	2024-02-17 08:37 PM
 Preregistration AstraZeneca_Study 2.pdf	2024-02-17 08:37 PM
-  Supplement	
 Supplement.docx	2024-02-17 08:41 PM

Why this article?

It cites a familiar paper:

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33. Zikmund-Fisher BJ, Witteman HO, Dickson M, Fuhrel-Forbis A, Kahn VC, Exe NL, et al. Blocks, ovals, or people? Icon type affects risk perceptions and recall of pictographs. *Med Decis Mak.* 2014;34(4):443–53.

“There is still a debate about whether more concrete manikins or abstract icon types are best used to communicate risks and whether they differently affect risk perceptions. One study suggests that the correlation between actual and perceived risk is higher in more numerated and graphically literate persons viewing manikins instead of more abstract icons [33].”

Background

- Doubts about AstraZeneca vaccin regarding vaccine **efficacy**,
- Uncertainty about likelihood severe **side effects**
- Temporal suspension AstraZeneca vaccine in several European countries and associated news coverage had short-term negative impact on public's general **vaccination intention**
- Long-term impact on general intentions to get vaccinated was low

So paper about understanding of:

- Mechanisms risk perception and weighing of vaccine-specific and disease-associated risks in decision proces
- Effect of evidence-based information about benefits and harms that could have a debiasing role when communicating about vaccination and disease risks

Study I - Hypotheses

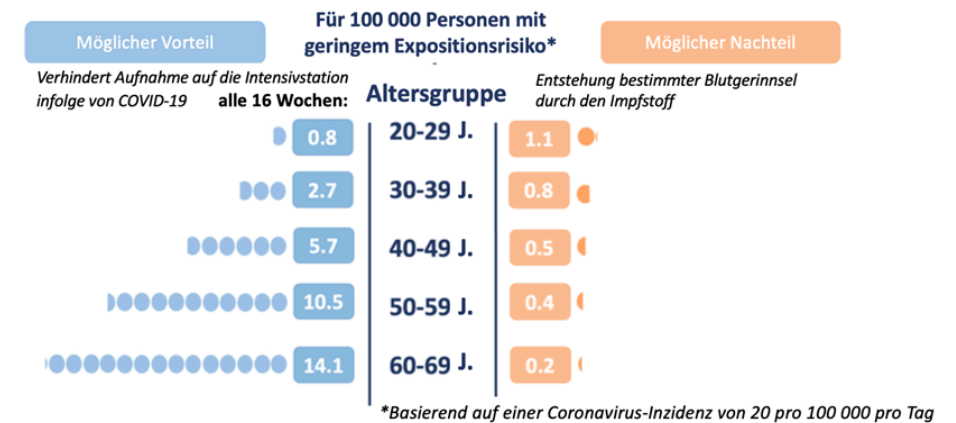
- H1: *evidence-based information hypothesis*
Compared to control (no infographic), **intention to get vaccinated** with AstraZeneca is **greater** when presenting **evidence-based info** about the comparative risk of severe COVID-19 vs. AstraZeneca's risk of specific blood clots
- H2: *pronounced benefit hypothesis*
Individuals who have received **info about the effect of vaccination at high-exposure** have a **higher vaccination intention** than individuals who have received information about low-exposure

Study I - Participants & conditions

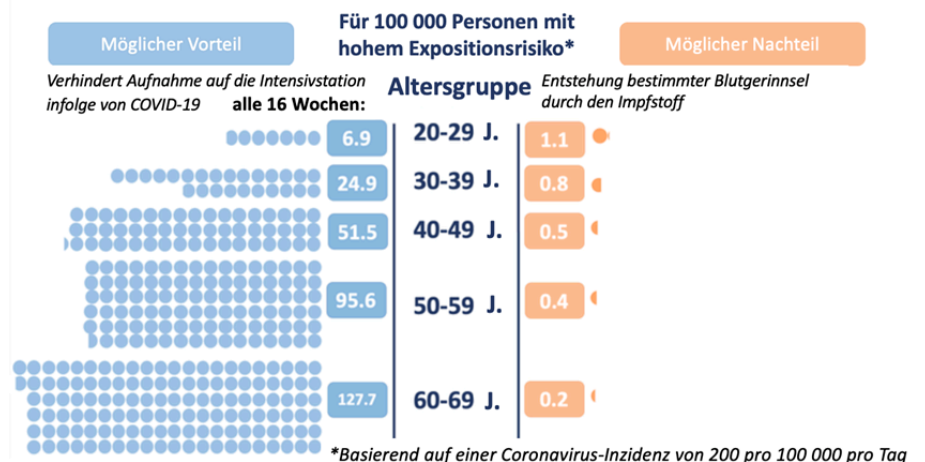
Participants: N = 842,
age-stratified to one of three experimental
conditions:

- 1. no infographic (control)
- 2. infographic low exposure risk
- 3. infographic high exposure risk

Abwägung der potenziellen Vorteile und Nachteile des COVID-19 Impfstoffs von Astra-Zeneca



Abwägung der potenziellen Vorteile und Nachteile des COVID-19 Impfstoffs von Astra-Zeneca



Study I - Results H1 and H2

Study I - Results Exploratory analyses

Table 1 Linear regression for intention to get vaccinated with the AstraZeneca vaccine (Study 1)

Predictors	DV: Intention to get vaccinated with the AstraZeneca vaccine				
	B	95% CI for B	β	95% CI for β	p
(Intercept)	1.62	0.89 – 2.34	-0.01	-0.16 – 0.14	< 0.001
Infographic with low exposure risk (control)	-0.01	-0.38 – 0.36	-0.00	-0.16 – 0.15	0.959
Infographic with high exposure risk (control)	-0.09	-0.45 – 0.28	-0.04	-0.19 – 0.12	0.646
Perceived risk of COVID-19	0.32	0.24 – 0.41	0.25	0.19 – 0.32	< 0.001
Perceived risk of getting vaccinated with the AstraZeneca vaccine	-0.09	-0.16 – -0.01	-0.08	-0.14 – -0.01	0.019
Age (years)	0.02	0.01 – 0.03	0.13	0.06 – 0.19	< 0.001
Gender (female)	-1.02	-1.32 – -0.72	-0.42	-0.55 – -0.30	< 0.001
University entrance qualification (no UEQ)	0.69	0.38 – 1.00	0.29	0.16 – 0.41	< 0.001
One shot of COVID-19 vaccine received (none)	1.14	0.74 – 1.54	0.47	0.31 – 0.64	< 0.001
N	824				
R ² / R ² adjusted	0.204 / 0.196				

The *p*-values in bold are statistically significant at *p* < 0.05

DV Dependent variable, CI Confidence interval

- Intention vacc with AZ different from general willingness
- Perceived risk vacc with AZ in control higher than Infographics condition
- No difference between high and low condition in the perceived risk vacc

Study II - Hypotheses

- H1: *risk-intention hypothesis*

Intention vacc with AZ higher in case of:

- greater perceived probability and/or severity of becoming infected
- lower perceived probability and/or severity blood clots

Exploration influence of socio-demographic variables, vaccine confidence, the tendency of benefit-risk weighing, and the preference of alternative COVID-19 vaccines on the intention to vaccinate

- H2: *illustration hypothesis*

Perceived **probability of blood** clots due to the AstraZeneca vaccine would be **lower** in conditions **with icons** illustrating the respective frequencies

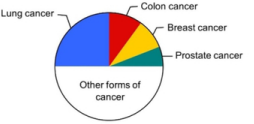
Effect of infographic design (**manikins or circles**) on perceived probabilities, also taking participants' numeracy and graph literacy into account

Study II - Participants & Conditions

Study II - Graph literacy

- Objective graph literacy: The Short Graph Literacy scale
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6470031/>

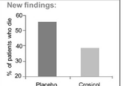
Item 1
Here is some information about different forms of cancer:
Percentage of people that die from different forms of cancer



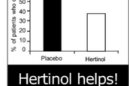
Approximately what percentage of people who die from cancer die from colon cancer, breast cancer, and prostate cancer taken together? ___ %

Item 2
In a magazine you see two advertisements, one on page 5 and another on page 12. Each is for a different drug for treating heart disease, and each includes a graph showing the effectiveness of the drug compared to a placebo (sugar pill).

Crosicol helps!

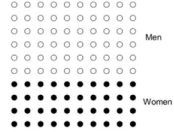


Hertinol helps!



Compared to the placebo, which treatment leads to a larger decrease in the percentage of patients who die?
Crosicol - Hertinol - They are equal - Can't say

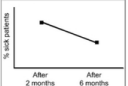
Item 3
The following figure shows the number of men and women among patients with disease X. The total number of circles is 100.



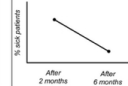
How many more men than women are there among 100 patients with disease X? ___ Men

Item 4
In the newspaper you see two advertisements, one on page 15 and another on page 17. Each is for a different treatment of psoriasis, and each includes a graph showing the effectiveness of the treatment over time.

Apsoriatin



NOPSORIAN



Which of the treatments contributes to a larger decrease in the percentage of sick patients?
Apsoriatin - Nopsorian - They are equal - Can't say

- For exploratory analyses: divided into low and high by a median split

Study II - Numeracy

- Subjective numeracy: SNS-3, The Subjective Numeracy Scale
 - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4592371/>
 - 1. How good are you at working with fractions? (“Not good at all, 1” to “Extremely Good, 6”)
 - 2. How good are you at figuring out how much a shirt will cost if it is 25% off? (“Not good at all, 1” to “Extremely Good, 6”)
 - 3. How often do you find numerical information to be useful? (“Never, 1” to “Very Often, 6”)
- Also divided into low and high by a median split
<http://sannejwillems.nl/communication-reading-group/>

Study II - Results - Regarding icons 1/3

Table S.12

Results of a 2 x 2 ANOVA with perceived probability of blood clotting due to the AstraZeneca vaccine as dependent variable when excluding participants who failed the comprehension check on the first attempt (N = 785)

Predictor	Sum of squares	df	Mean square	F	p	η_p^2
Exposure risk (low vs. high)						
Infographic design (Numbers vs. Circle vs. Manikin)	1.30	1	1.29	0.41	0.52	< .01
Helmert contrast	3.20	2	1.60	0.51	0.60	< .01
Contrast 1: Numbers vs. Icons	3.10	1	3.12	0.99	0.32	
Contrast 2: Circle vs. Manikin	0.10	1	0.08	0.03	0.87	
Exposure risk*	3.50	2	1.76	0.55	0.58	< .01
Infographic design						
Exposure risk* Contrast 1	0.90	1	0.86	0.27	0.60	
Exposure risk* Contrast 2	2.70	1	2.65	0.84	0.36	
Residuals	2108.10	666	3.27			

Study II - Results - Regarding icons 2/3

Table S.13

Results of a 2 x 3 x 2 ANOVA with perceived probability of blood clotting due to the AstraZeneca vaccine as dependent variable and graph literacy as explorative factor when excluding participants who failed the comprehension check on the first attempt (N = 785)

Predictor	Sum of squares	df	Mean square	F	p	η_p^2
Exposure risk (low vs. high)	1.30	1	1.29	0.41	0.52	< .01
Infographic design (Numbers vs. Circle vs. Manikin)	3.20	2	1.60	0.51	0.60	< .01
Graph literacy (low vs. high)	14.20	1	14.25	4.51	0.03	< .01
Exposure risk* Infographic design	2.70	2	1.37	0.43	0.65	< .01
Infographic design* Graph literacy	0.30	1	0.32	0.10	0.75	< .01
Exposure risk* Infographic design* Graph literacy	7.10	2	3.55	1.13	0.33	< .01
Exposure risk* Infographic design* Graph literacy	3.70	2	1.86	0.59	0.56	< .01
Residuals	2083.50	660	3.16			

Study II - Results - Regarding icons 3/3

- Visualizing info with icons (circles or manikins) instead of table did not change perceived probability of blood clots or COVID-19 infection when compared to seeing numbers only
- Could be due to the infographic's design
- *Perceived risk did not vary between the conditions with more concrete manikin and more abstract circle icons, even when considering numeracy and graph literacy*
- Cognitive skills directly influenced the risk perception, regardless of infographic. Participants with lower subjective numeracy and a lower graph literacy perceived higher probability of getting blood clots from the AstraZeneca vaccine. In line with previous research: experiencing difficulties in interpreting numerical and graphical information often leads to increased risk perception

Code

- 😊 it was there, and data too
- 😊 it is in R
- 😊 ran instantly
- 😞 no codebook (→ message to self)
- 😞 lots of nested ifelses