Australian Government
Australian Radiation Protection and Nuclear Safety Agency

arpansa

A Review of the research into the effects of radiofrequency fields on animals and plants in the environment

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The Honey Bee says:

STOP5G

5th Generation Wireless Technology

Headline News

The harmful effects of electromagnetic fields (EMFs) on nature have been scientifically recognised.

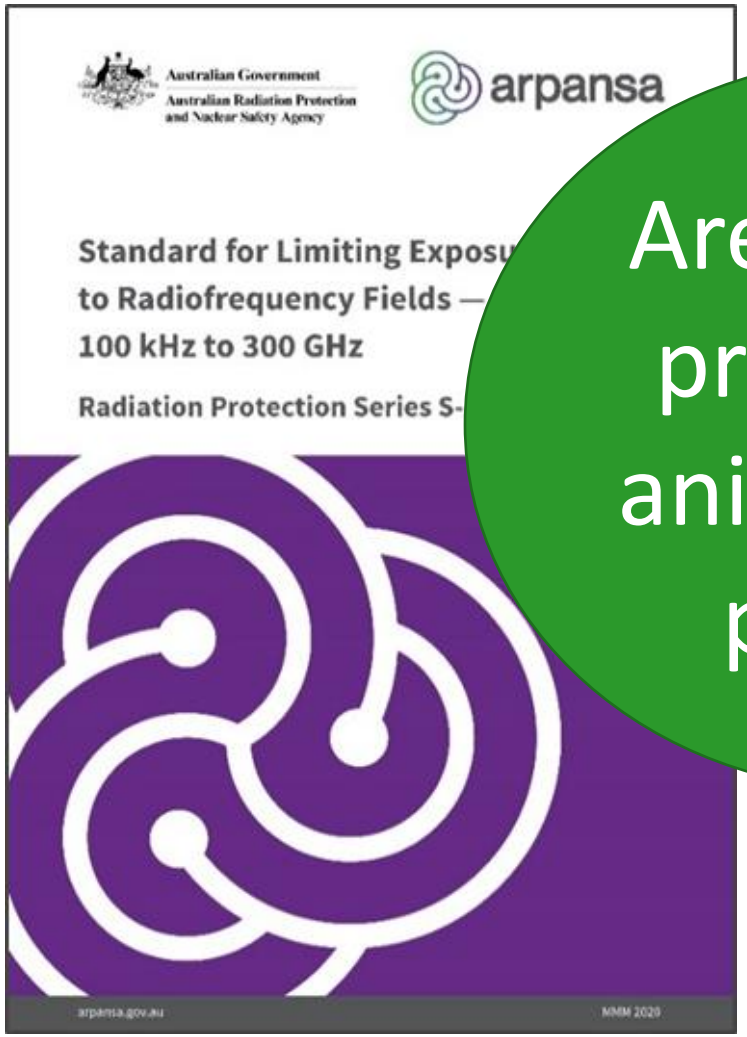
"Birds disappearing mysteriously. . . bees under threat.

Electromagnetic Fields A 'Credible Threat' To Wildlife

EMFSAFETYNETWORK.ORG

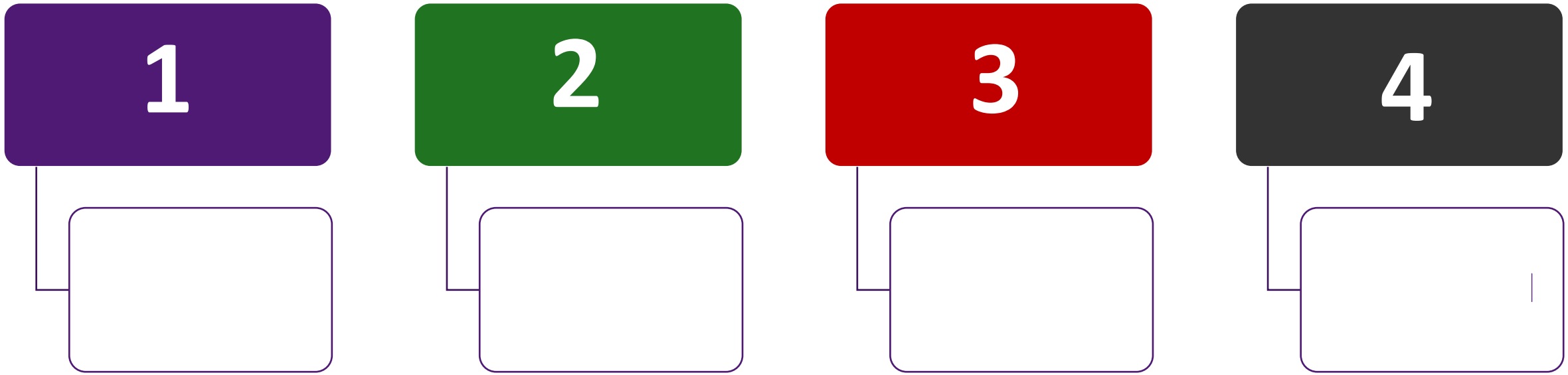
Does environmental exposure to radiofrequency fields have a negative impact on animals and plants?

We protect humans



Are we also protecting animals and plants?

We conducted a review of the evidence on the effects of RF on animals and plants



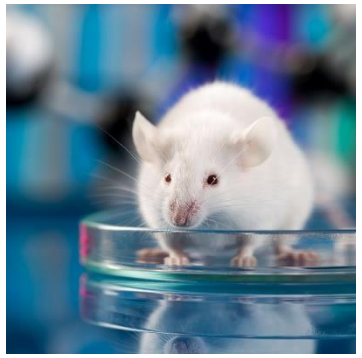
Question 1

What evidence is available?

We conducted a Systematic Map

Why not a systematic review?

How many studies are there?



We identified

24,432

We included

334

Animals

71%

Experimental

95%

Plants

29%

Observational

5%

Animals

	Birds	Fish	Insects	Mammals	Reptiles	Worms
Auditory system	0	0	0	1	0	0
Behaviour	10	3	34	4	1	1
Cellular effects	1	2	12	1	0	9
Development	39	3	19	1	3	4
Endocrine function	1	0	1	1	0	0
Genotoxicity	0	0	13	1	0	3
Hematology/Immunology	11	0	4	6	1	0
Mortality	10	0	12	0	2	1
Neurological effects	0	0	1	3	1	0
Ocular effects	0	0	0	1	0	0
Physiology	1	0	0	6	1	0
Population	5	0	4	0	0	0
Reception/Orientation	8	1	4	1	1	0
Reproduction	11	0	20	1	0	2

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Plants

	Aquatic plants	Fruits	Grain	Legumes	Vegetables	Trees and Shrubs
Biochemistry	1	2	10	9	2	4
Cellular effects	4	6	5	3	5	1
Genotoxicity	0	0	2	3	6	0
Germination/Growth	3	3	15	16	4	9
Physiology	0	0	5	1	1	2

Plants

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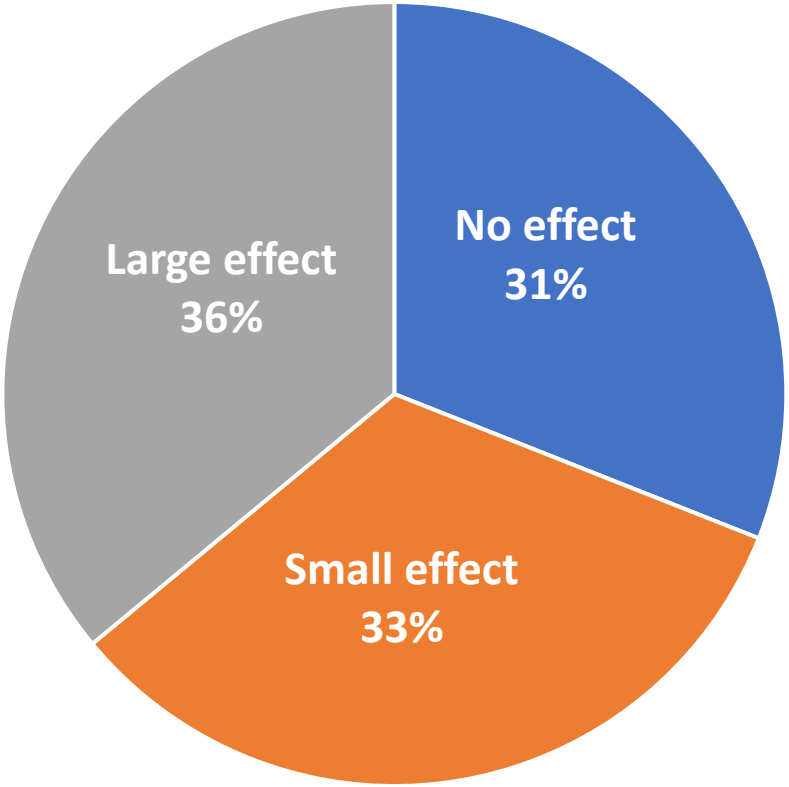
Question 2

Does the available evidence show a negative impact?

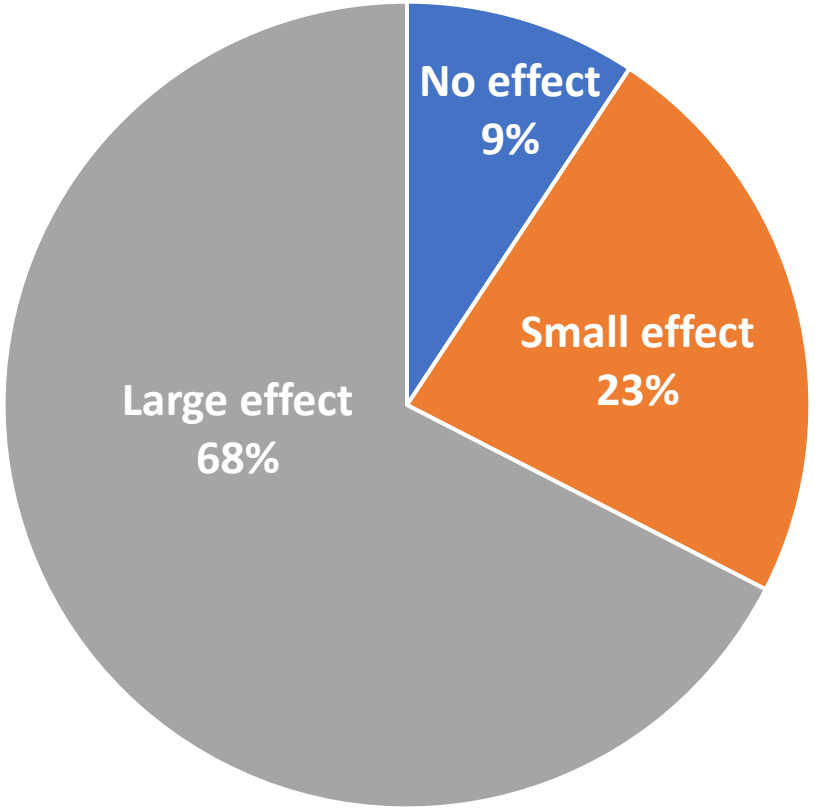
Analysis of effect size

- Is there an effect?
- Is there a small effect?
- Is there a large effect?

Animals

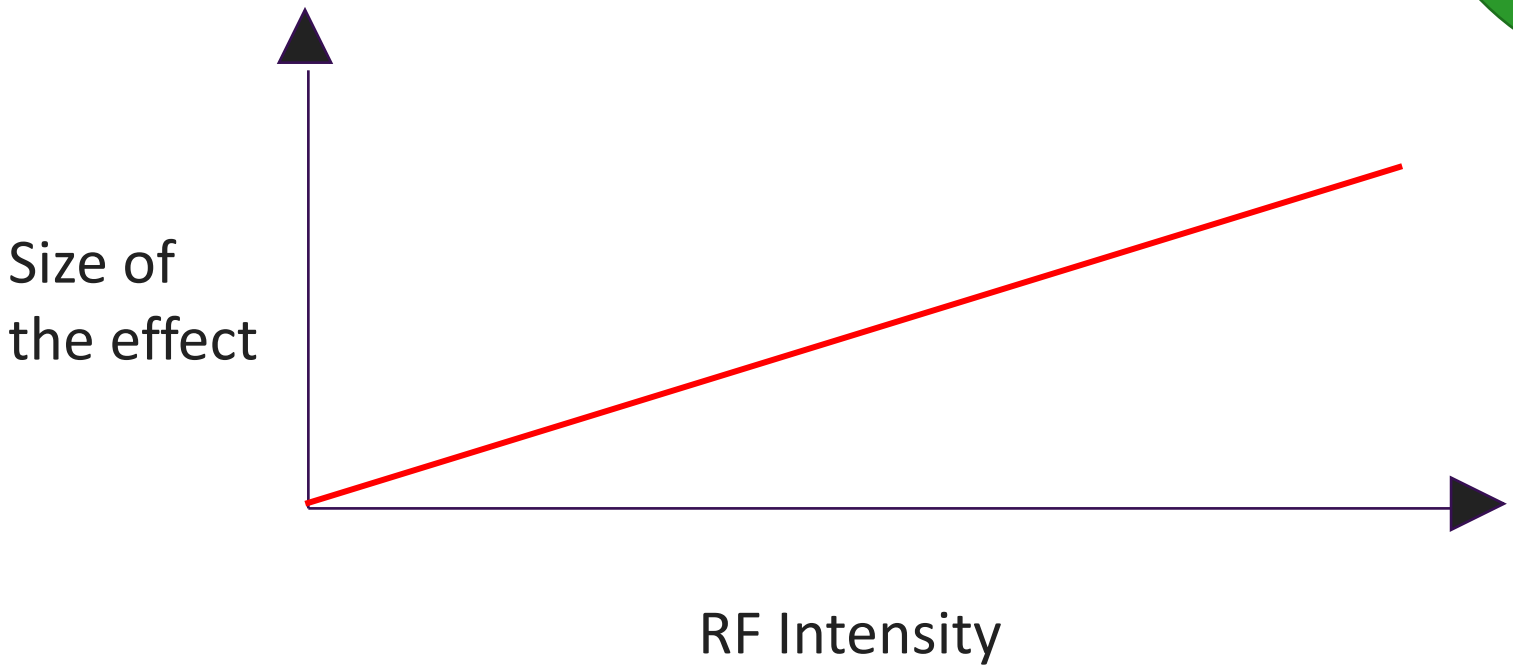


Plants

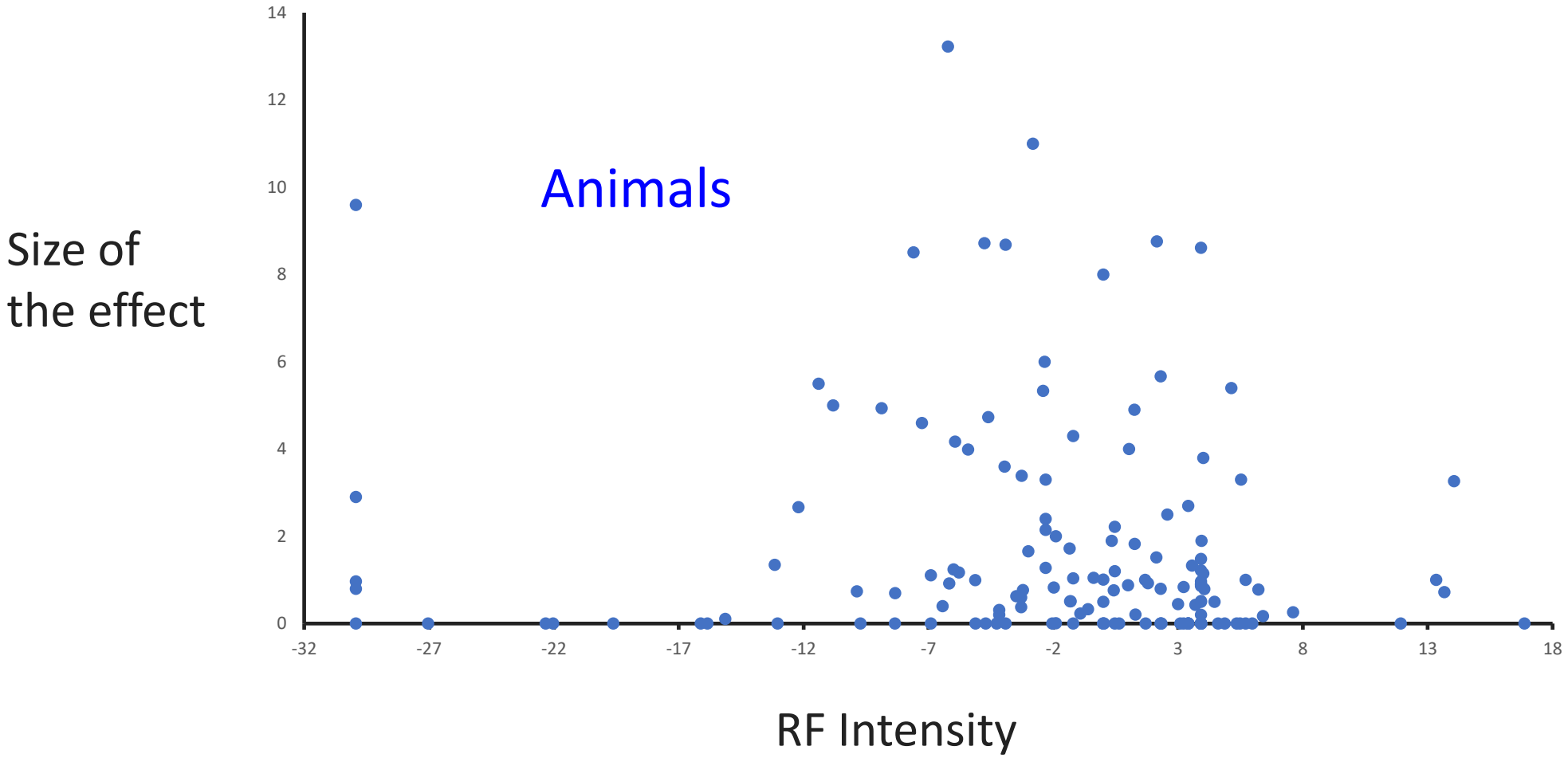


Does increasing the RF intensity increase the impact?

What we would expect for a true effect



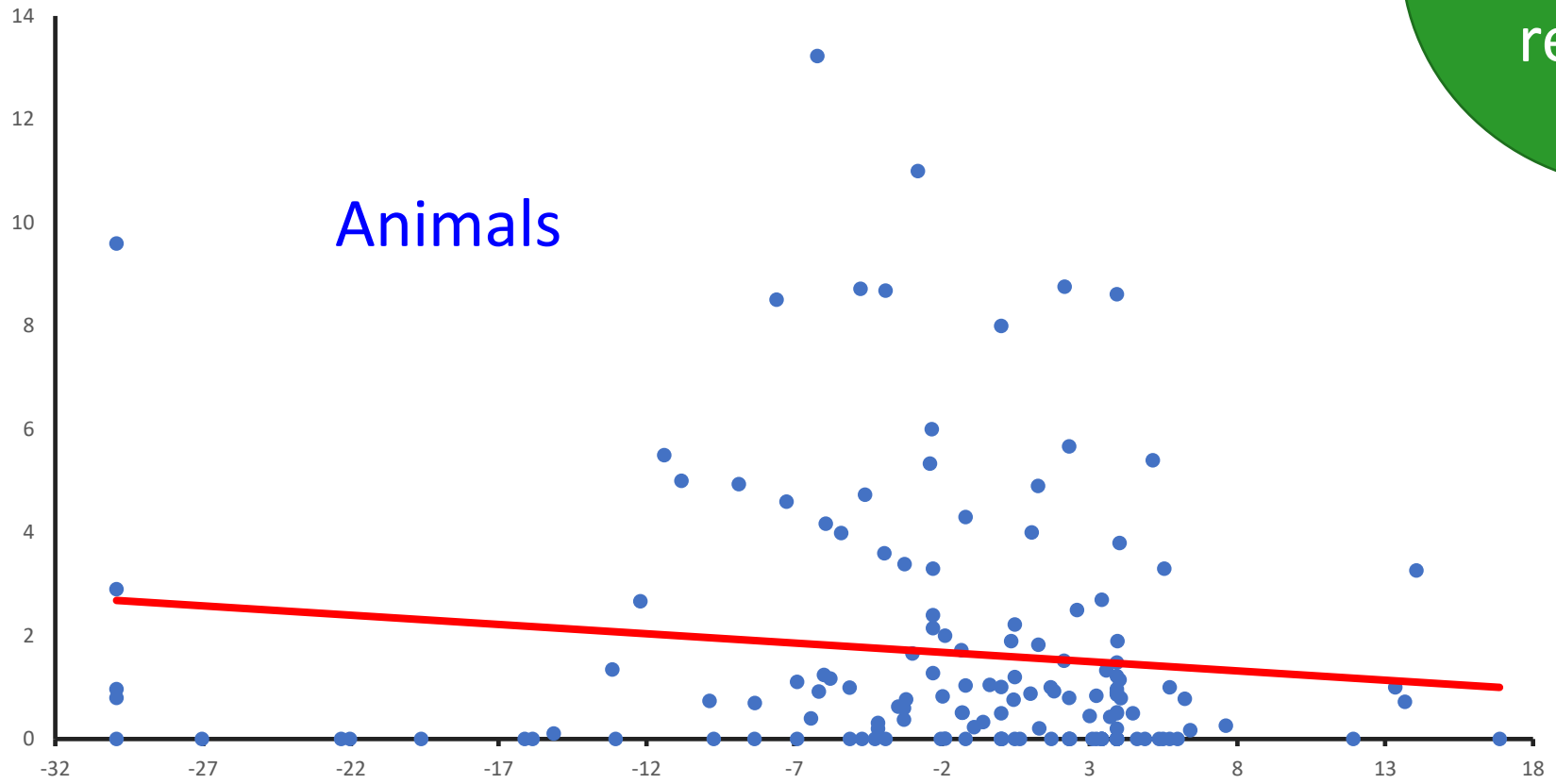
Does increasing the RF intensity increase the impact?



What we actually found

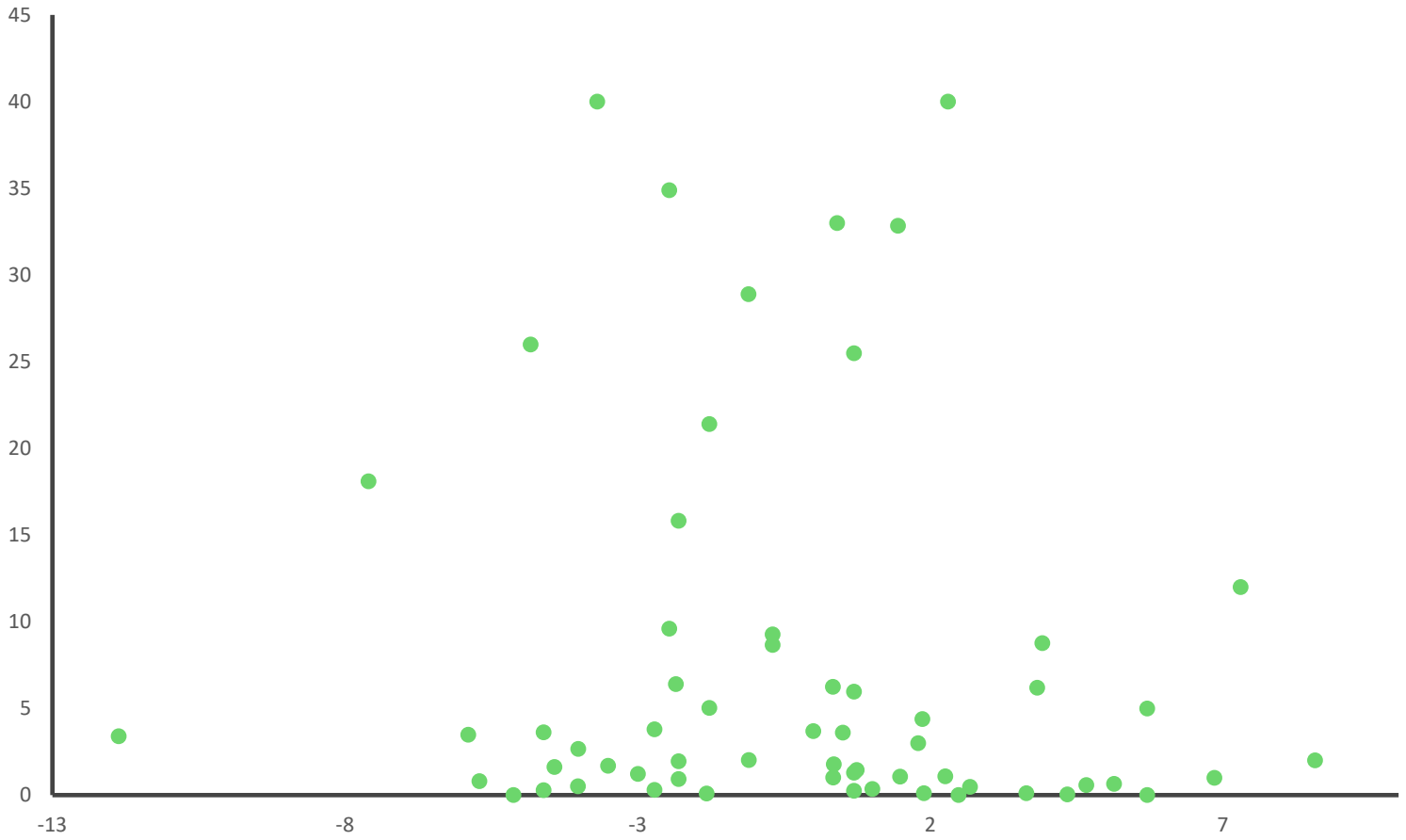
Clearly no dose-response

Size of the effect



What about for plants?

Size of the effect

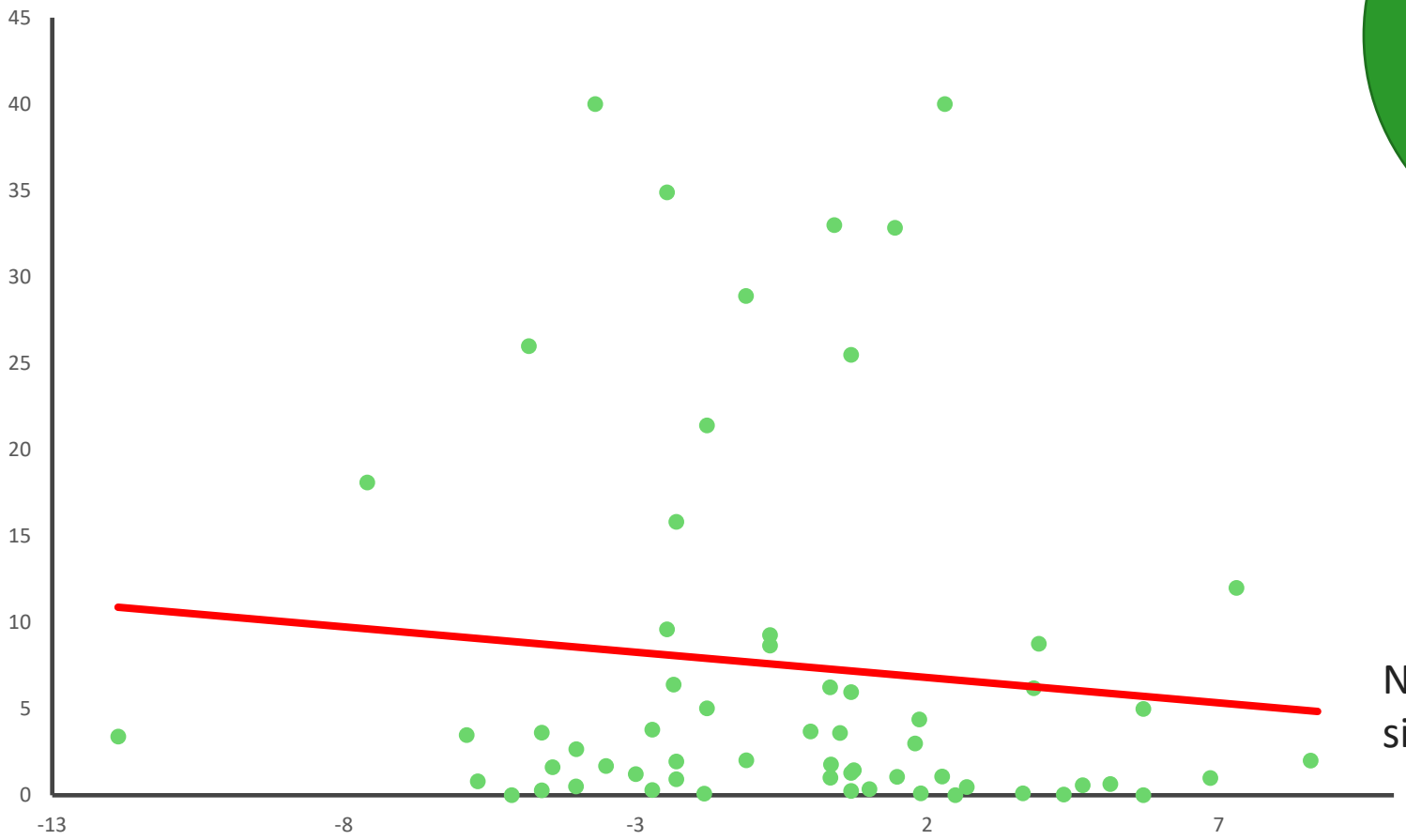


RF Intensity

What about for plants?

Again no dose-response

Size of the effect



RF Intensity

Not statistically significant

What about when animals and plants were exposed for longer?

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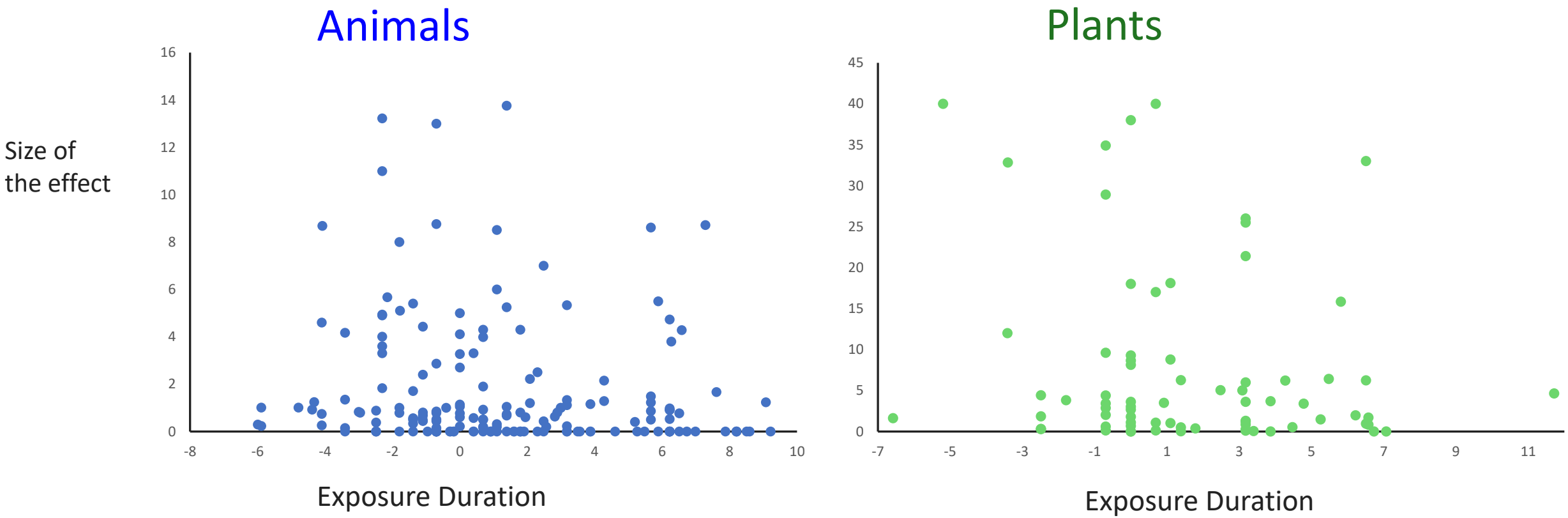

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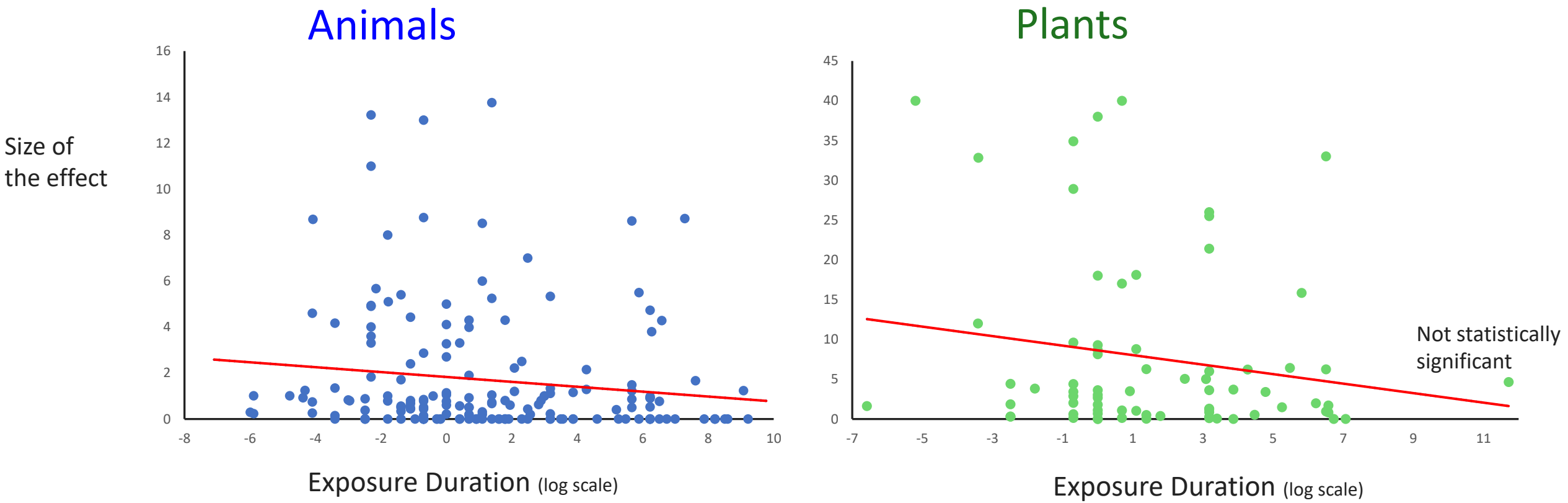


Question 3

Are the results valid?

Analysis of study quality

We assessed the quality of all the studies using five quality criteria on the methods used

Experimental studies

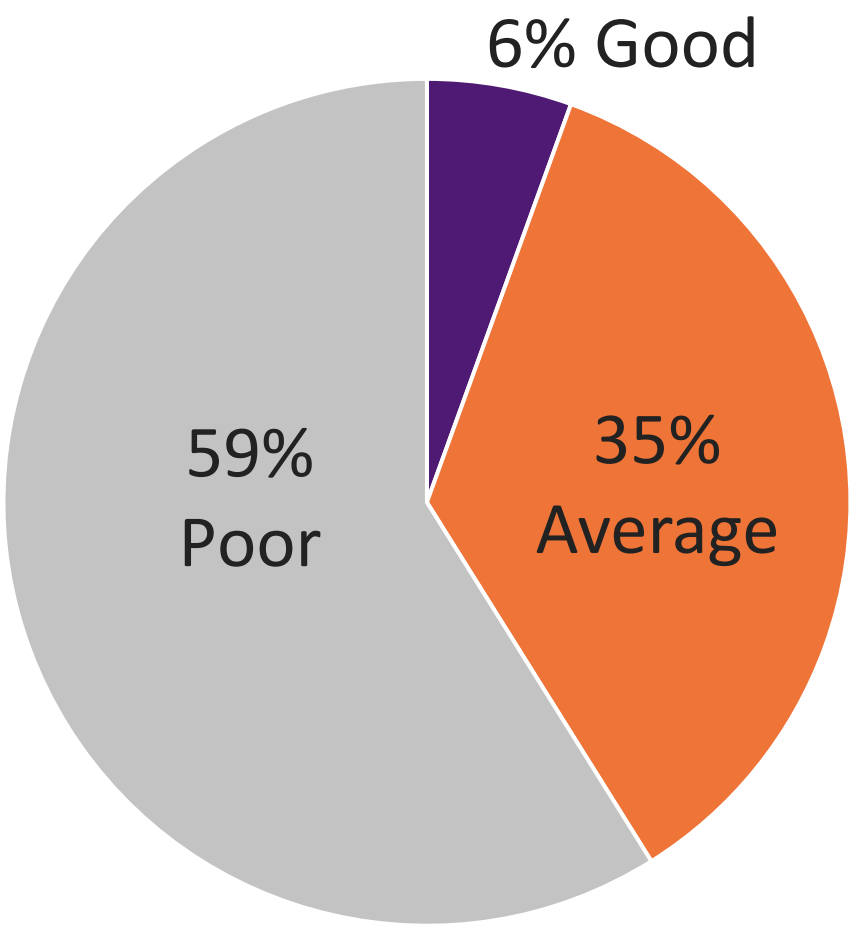
1. Adequate dosimetry
2. Use of negative controls
3. Use of positive controls
4. Blinding
5. Temperature control

Observational studies

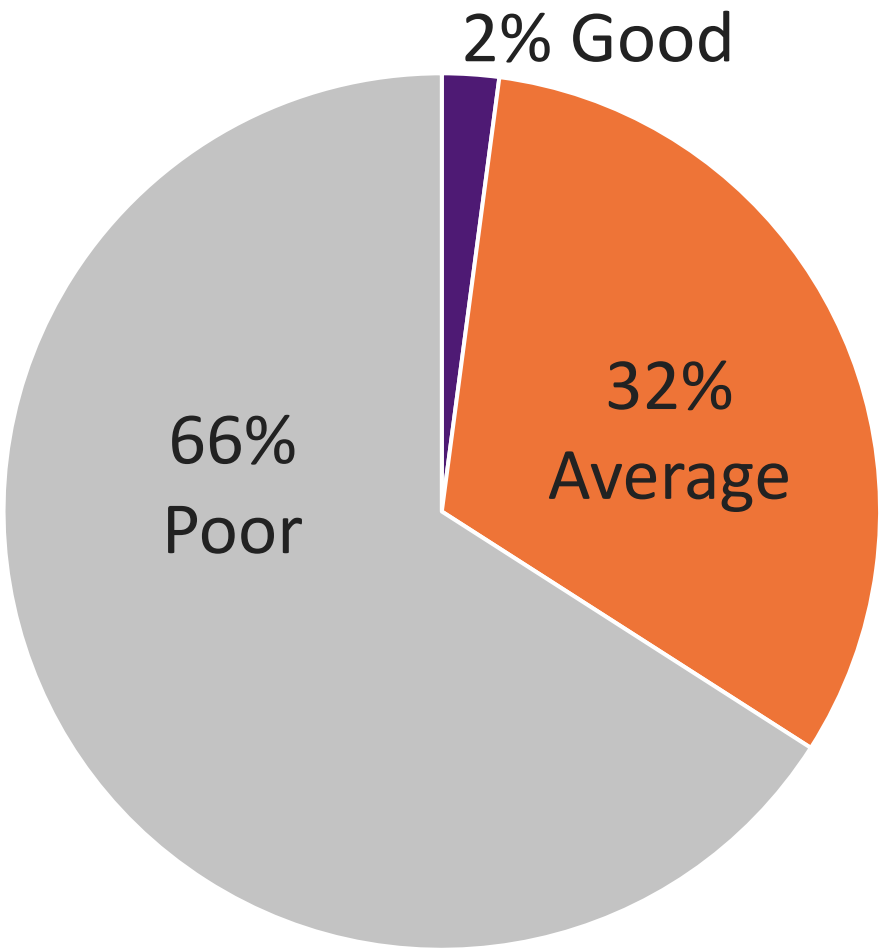
1. Exposure assessment
2. Comparison group
3. Consider other factors
4. Follow up
5. Outcome assessment

Gave each study a QUALITY SCORE 0 - 5

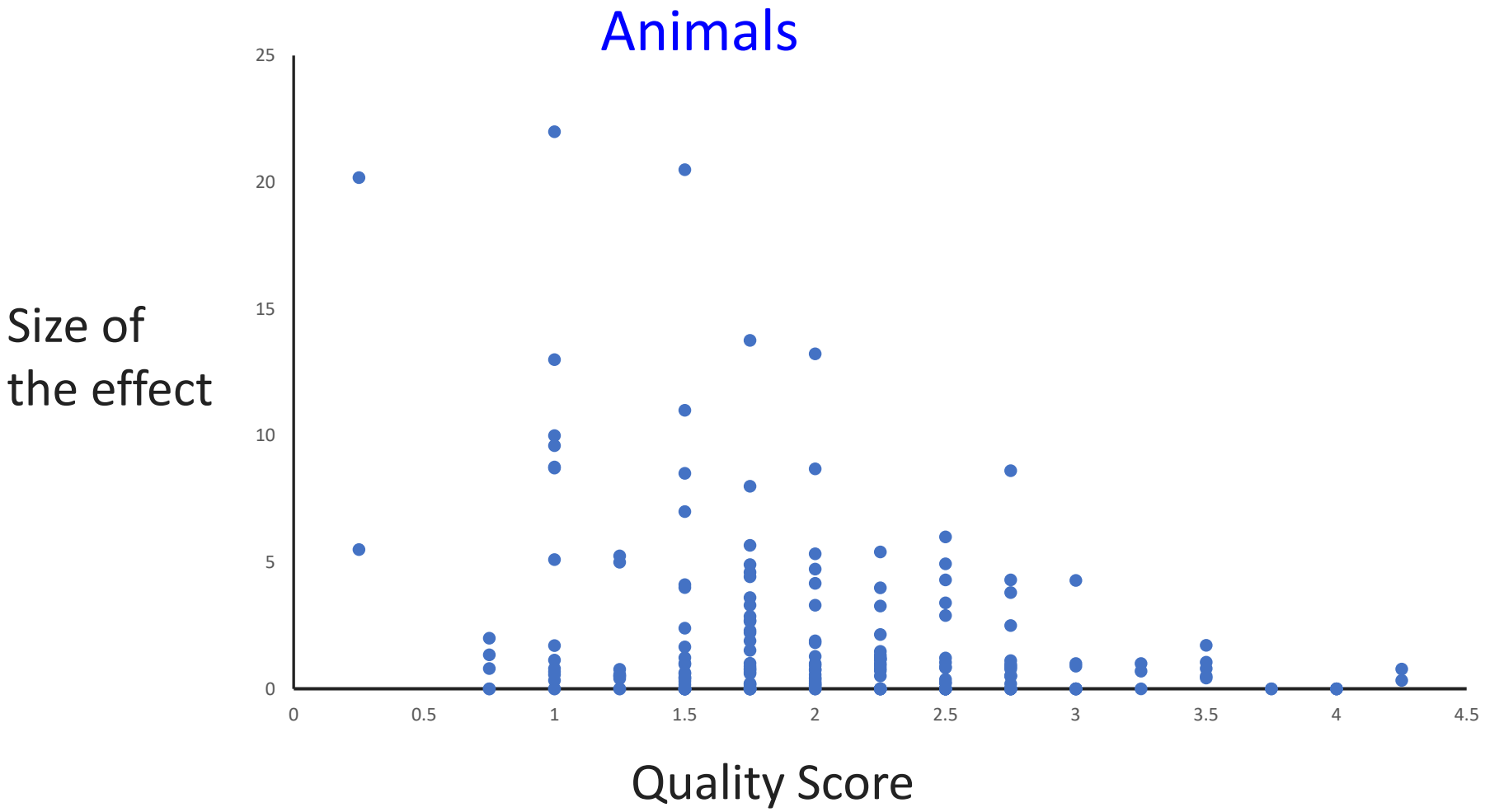
Animals



Plants



How is the quality of the studies related to what they found?



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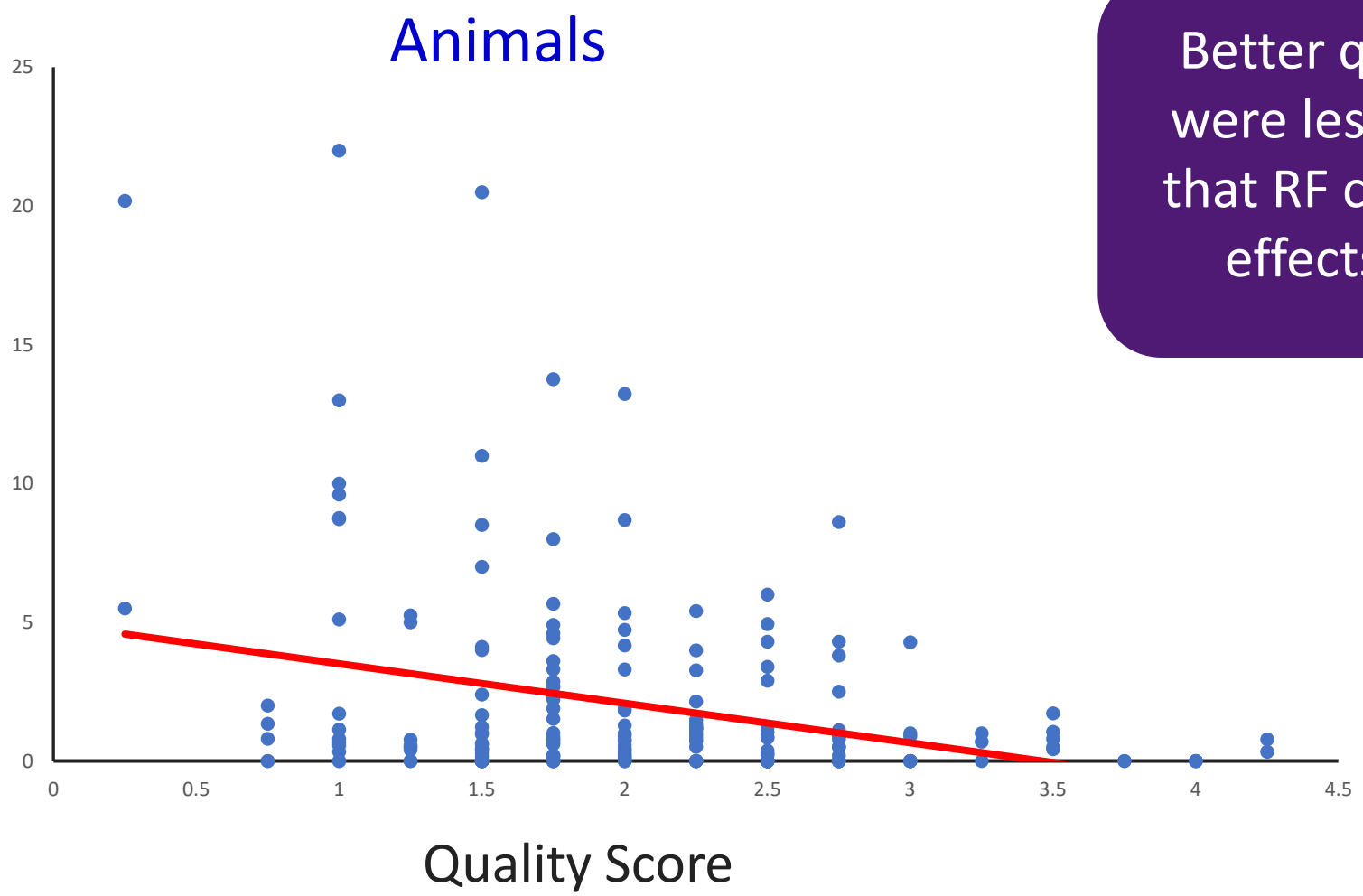
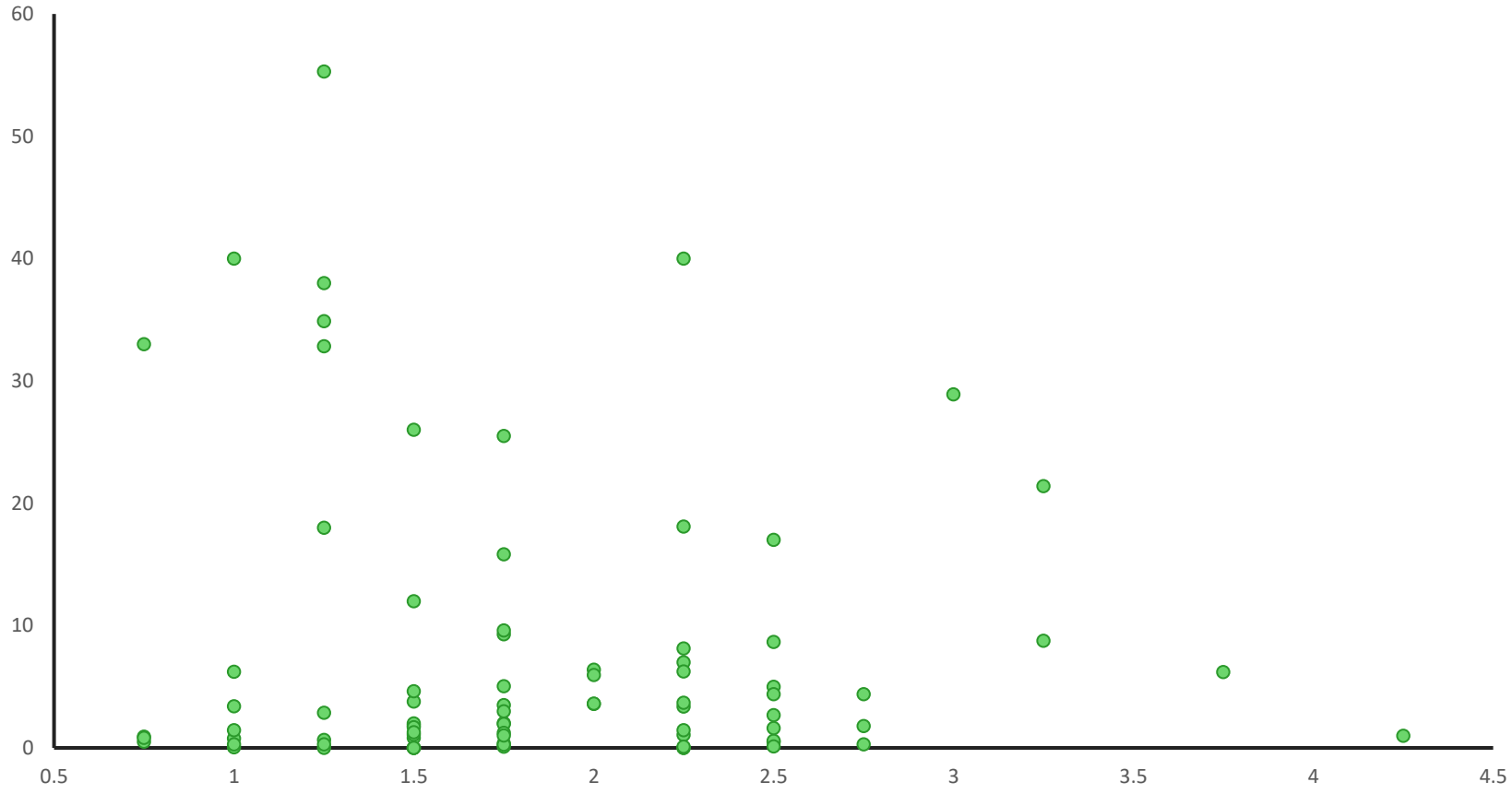


Better quality studies were less likely to find that RF causes adverse effects in animals

What about for plants?

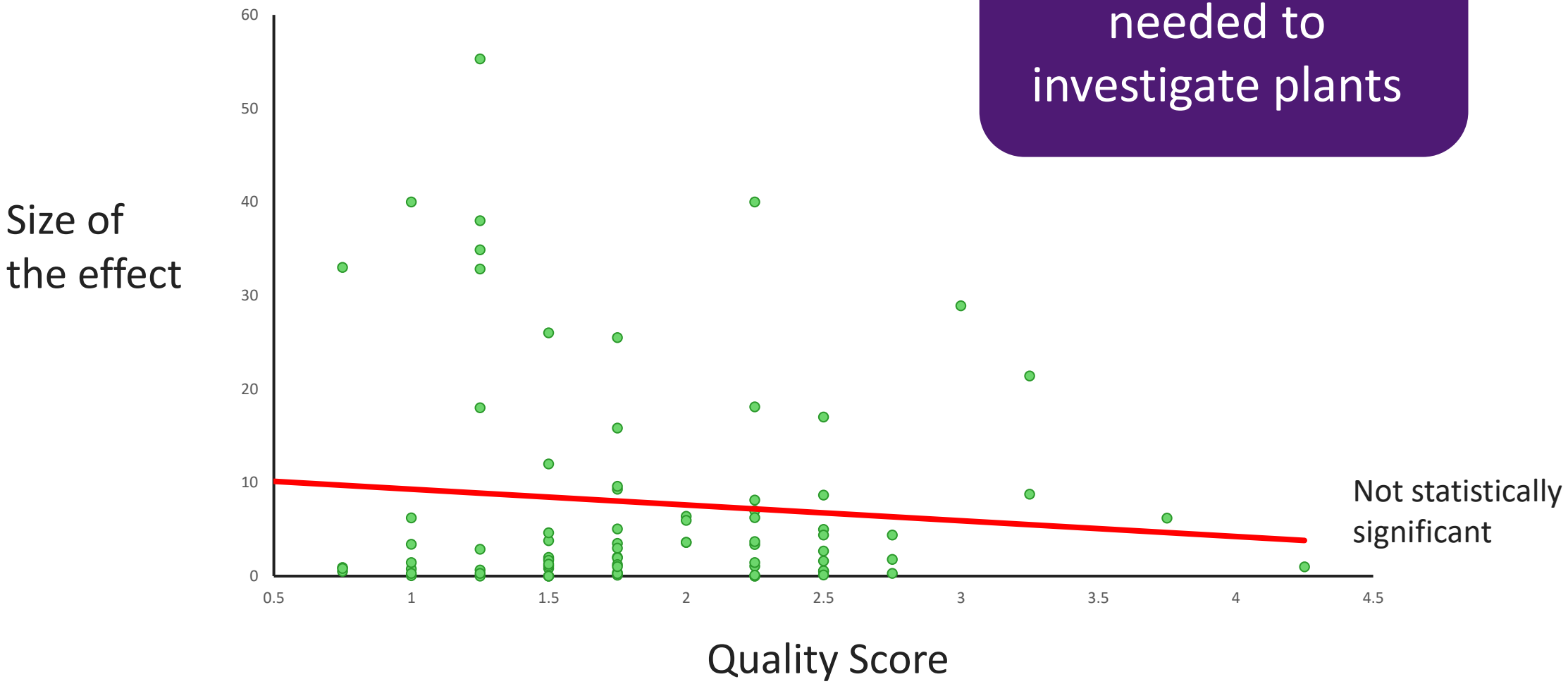
Size of the effect



Quality Score

What about for plants?

More studies are needed to investigate plants



To summarise

Variable results

Based on our “crude” analysis

No substantiated evidence that animals and plants are affected from RF exposure in the environment

Question 4

Where to from here?

Evidence clusters and gaps

Animals: Clusters where a systematic review could be performed now

	Birds	Fish	Insects	Mammals	Reptiles	Worms
Auditory system	0	0	0	1	0	0
Behaviour	10	3	34	4	1	1
Cellular effects	1	2	12	1	0	9
Development	39	3	19	1	3	4
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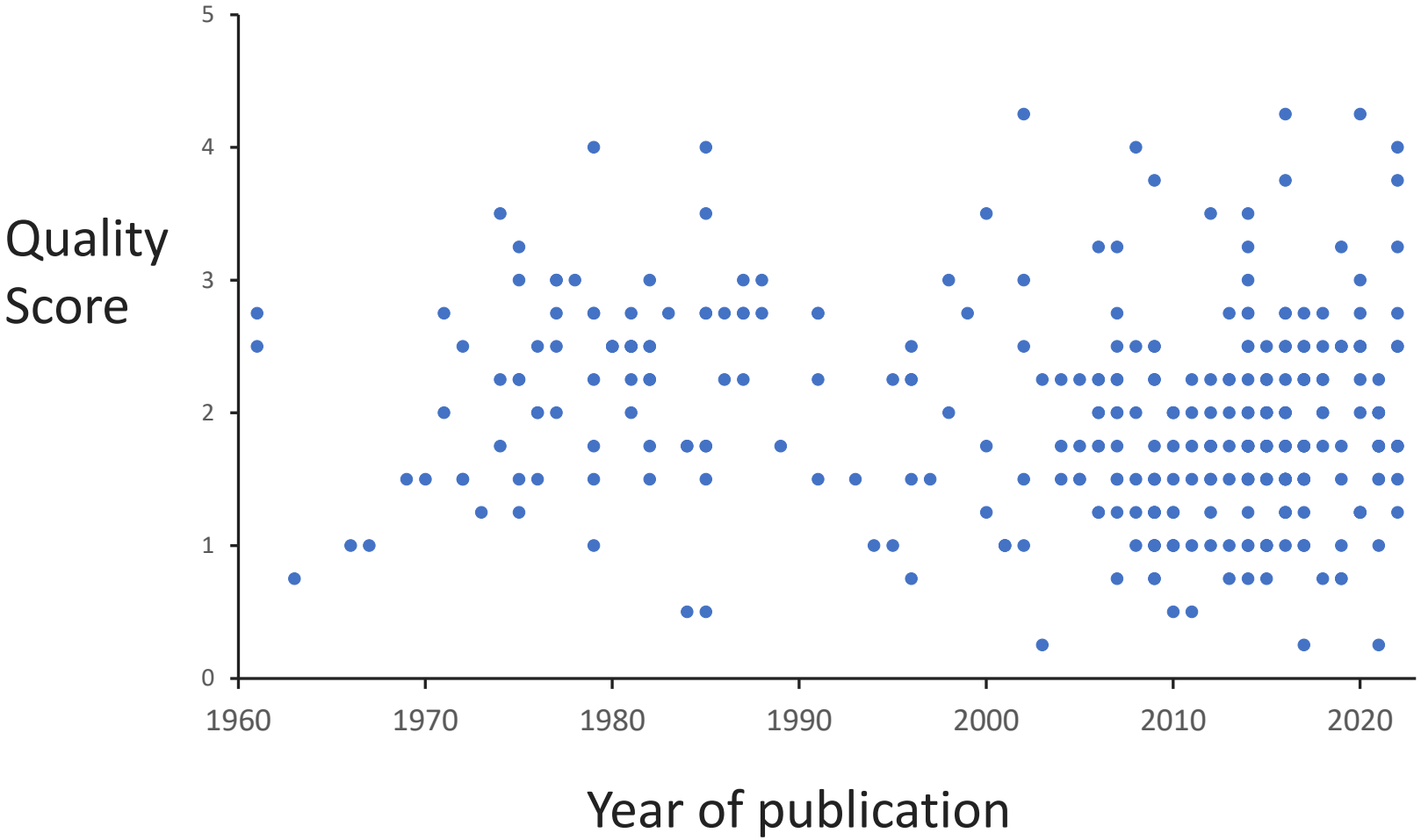
We clearly need more research

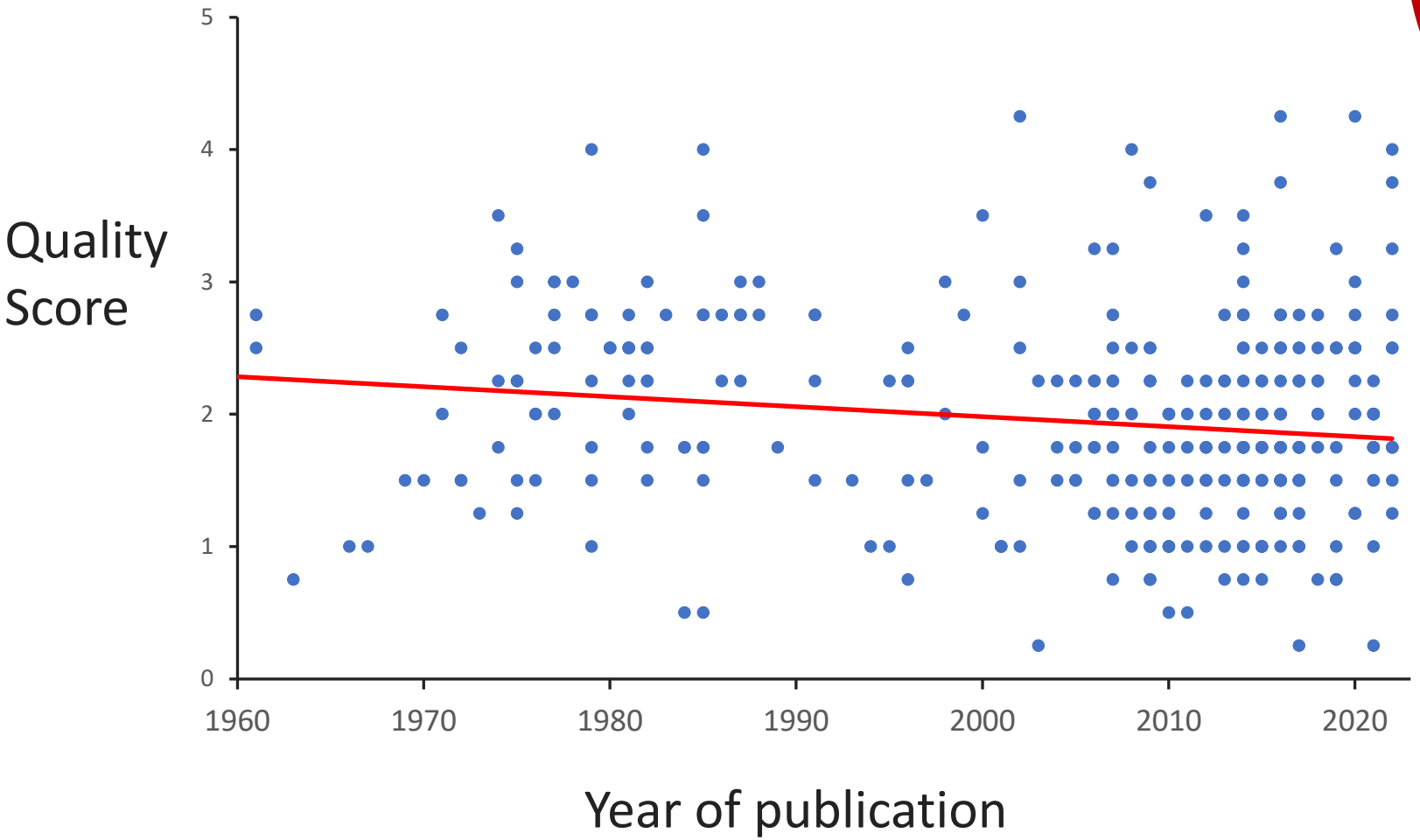
But we need more than just MORE PUBLICATIONS!!!

We also analysed the quality of studies over the years



We also analysed the quality of studies over the years

The quality of the studies has been steadily getting worst



We need better quality studies!!!

Experimental studies

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3. Use of positive controls
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5. Temperature control

Observational studies

1. Exposure assessment
2. Comparison group
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Collaborators

Chris Brzozek

Rohan Mate

Chhavi Bhatt

Sarah Loughran

Andrew Wood

Thank you

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