Carl von Ossietzky
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Poisoned Babies, Shot Fathers, and Ruined Experiments

Experimental Evidence in Favor of the Compositionality Constraint of Actual Causation

Alexander Max Bauer, 20.07.2024

Roadmap

(1) A Tale of Three Papers

(2) Livengood and Sytsma (2020): "Actual Causation and Compositionality"

(3) Bauer and Romann (2022): "Answers at Gunpoint"

(4) Bauer and Kornmesser (2023): "Poisoned Babies, Shot Fathers, and Ruined Experiments"

(5) Takeaway Points

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A Tale of Three Papers

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Livengood and Sytsma (2020): "Actual Causation and Compositionality"

Compositionality Constraint of Actual Causation (CCAC): If c is an actual cause of e, then either c causes e directly, or every intermediary d by which c indirectly causes e is itself an actual effect of c and an actual cause of e. (Livengood and Sytsma 2020, p. 44)
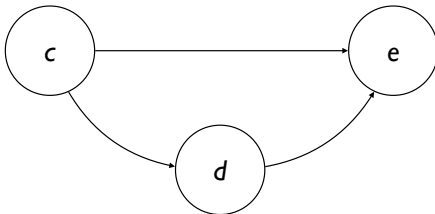
Livengood and Sytsma (2020): "Actual Causation and Compositionality"

Poisoned Cup Vignette: Amy wants to kill her daughter, Jessica, but she doesn't want to go to prison for murder. As such, Amy hatches a plan. She arranges for a babysitter, Courtney, to take care of Jessica while she is out of town on business. Before leaving, Amy laces one of Jessica's sippy cups with a deadly poison that is very difficult to detect. That evening, Courtney gives Jessica juice in the poisoned sippy cup. Jessica drinks the juice and dies two hours later. (Livengood and Sytsma 2020, p. 49)

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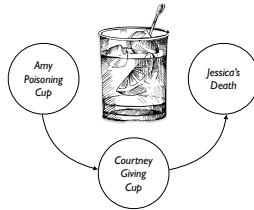
Livengood and Sytsma (2020): "Actual Causation and Compositionality"

Poisoned Cup Vignette

– $N = 34$

– (dis)agreement on 7-point scale

– 2 statements

    (A) "Amy caused Jessicas's death."
    (B) "Courtney caused Jessicas's death."
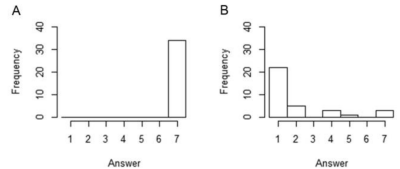
Figure 1. Histograms for study 1. *A*, Amy caused; *B*, Courtney caused.

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Livengood and Sytsma (2020): "Actual Causation and Compositionality"

Revolver Vignette: Trent has decided to kill his father, Brad. He aims his loaded revolver at Brad and pulls the trigger, releasing the hammer. The hammer strikes the cartridge, igniting the gun powder. The gun powder explodes, driving the bullet from the gun. The bullet hits Brad in the head. He dies instantly. (Livengood and Sytsma 2020, p. 59)

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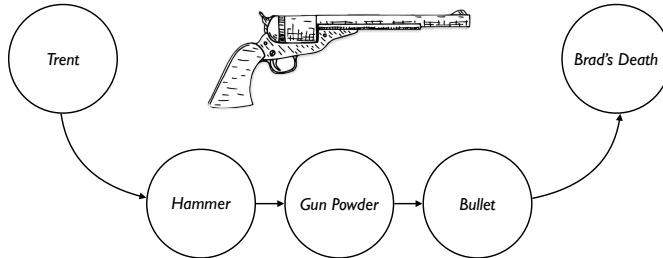
Livengood and Sytsma (2020): "Actual Causation and Compositionality"

Revolver Vignette

– $N = 51$

– (dis)agreement on 7-point scale

– 4 statements

(A) "Trent caused Brad's death."
(B) "The hammer caused Brad's death."
(C) "The gun powder caused Brad's death."
(D) "The bullet caused Brad's death."
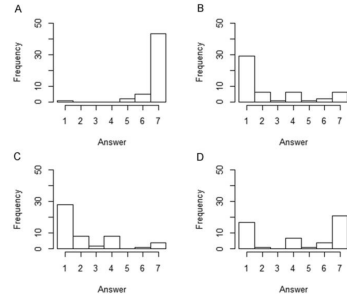
Figure 8. Histograms for study 8. *A*, Trent caused; *B*, hammer caused; *C*, powder caused; *D*, bullet caused.

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Livengood and Sytsma (2020): "Actual Causation and Compositionality"

GFCI Vignette: John is a scientist conducting a very important experiment on an unusual species of plant. His experiment requires growing his plants under a special light, which is plugged into an outlet with a ground fault circuit interrupter (GFCI) safety mechanism. The pipes running to John's laboratory were correctly manufactured and installed, and the system was protected from any changes in weather condition.

　　Despite there being nothing wrong with the pipes, one day a pipe burst in John's laboratory. Water ran into the outlet powering the special light. A properly functioning GFCI safety mechanism will break the circuit so that no power flows through its outlet if exposed to water in this way. And in fact, the GFCI safety mechanism did break the circuit. The special light turned off and the experiment was ruined. (Livengood and Sytsma 2020, p. 62)

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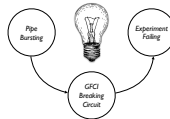
Livengood and Sytsma (2020): "Actual Causation and Compositionality"

GFCI Vignette

– $N = 163$

– (dis)agreement on 7-point scale

– 2 statements

   (A) "The pipe caused the experiment to be ruined."

   (B) "The GFCI caused the experiment to be ruined."
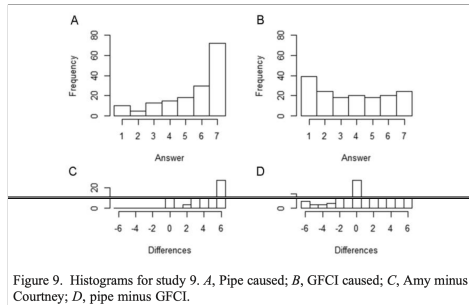
Figure 9. Histograms for study 9. *A*, Pipe caused; *B*, GFCI caused; *C*, Amy minus Courtney; *D*, pipe minus GFCI.

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Bauer and Romann (2022): "Answers at Gunpoint"

Events

8 different events

(A) "pulling the trigger"

(B) "releasing the hammer"

(C) "striking the cartridge"

(D) "igniting the gun powder"

(E) "the gun powder exploding"

(F) "driving the bullet from the gun"

(G) "the bullet hitting Brad in the head"

(H) "the death of Brad"

Bauer and Romann (2022): "Answers at Gunpoint"

Combinations of events

28 "X caused Y" statements, e. g.,

(A/B) "Pulling the trigger caused the release of the hammer."

(C/D) "Striking the cartridge caused the ignition of the gun powder."

(F/G) "The bullet being driven from the gun caused the bullet to hit Brad in the head."
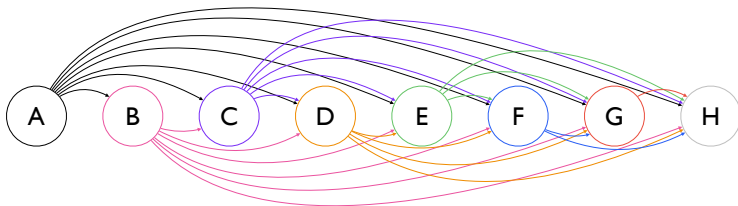
Bauer and Romann (2022): "Answers at Gunpoint"

(More or Less) Analogous Statements

(1) "Trent caused Brad's death."

(A/H) "Pulling the trigger caused the death of Brad."

(2) "The hammer caused Brad's death."

(B/H) "Releasing the hammer caused the death of Brad."

(3) "The gun powder caused Brad's death."

(D/H) "Igniting the gun powder caused the death of Brad."

(E/H) "The explosion of the gun powder caused the death of Brad."

(4) "The bullet powder caused Brad's death."

(F/H) "The bullet being driven from the gun caused the death of Brad."

(G/H) "The bullet hitting Brad in the head caused the death of Brad."

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Bauer and Romann (2022): "Answers at Gunpoint"

Results

– $N = 52$

– (dis)agreement on 7-point scale

– 28 statements

– central tendency for no statement smaller than the "neutral" value 4
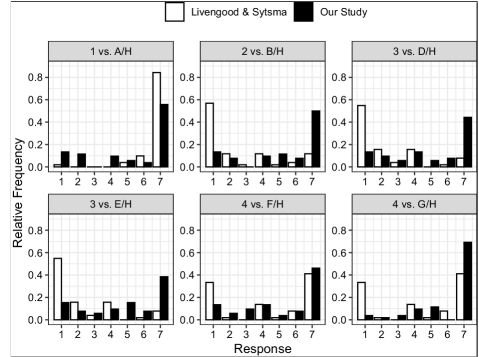
Bauer and Kornmesser (2023): "Poisoned Babies, Shot Fathers, and Ruined Experiments"

Causation–Responsibility Confusion: In "x caused y" statements, the verb "cause" is ambiguous and might be understood in moral terms (also see Samland and Waldmann 2014)

Intermediary–Ontology Confusion: Typically, events are the relata of causal chains, not agents or objects. Using agents or objects leads people to understand the verb "cause" in moral terms. (also see Samland and Waldmann 2016)

Cause-End Questioning: If, in "x caused y" statements, y is always the end point of a causal chain, this emphasises the end point. If the end point is of moral significane, this might lead subjects to view the statements in moral terms (also see Bauer and Romann 2022)

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Bauer and Kornmesser (2023): "Poisoned Babies, Shot Fathers, and Ruined Experiments"

Design

- $N \approx 60$ for each study (16 studies in total)

- (dis)agreement on 7-point scale

- vignettes from Livengood and Sytsma (2020)

    - poisoned cup vignette
    - revolver vignette
    - GFCI vignette

- studies for each vignette

    - replication
    - exclusion of IOC
    - exclusion of CRC
    - exclusion of CEQ
    - simultaneous exclusion of IOC, CRC, and CEQ

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Bauer and Kornmesser (2023): "Poisoned Babies, Shot Fathers, and Ruined Experiments"

Results

– successful replication (for all vignettes)

– excluding IOC led to less disagreement that intermediaries are causes (for poisoned cup and revolver vignette)

– excluding CRC led to agreement that intermediaries are causes (for poisoned cup and revolver vignette)

– excluding CEQ led to agreement that intermediaries are causes (for all vignettes)

– simultaneous exclusion of IOC, CRC, and CEQ led to agreement that intermediaries are causes (for all vignettes)

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Takeaway Points

Key Assumptions in Light of the Data

- if asked the right way, subjects can be prevented from confusing causation with responsibility

- subjects' intuitions are not in conflict with the Compositionality Constraint of Actual Causation (contrary to Livengood and Sytsma 2020)

- responsibility might not be (such a large) part of the concept of causation (contrary to proponents of the *responsibility view*)

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Data
https://github.com/alephmembeth/causality-revolver
https://github.com/alephmembeth/causality-compositionality
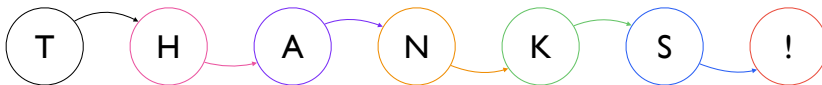
References

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Livengood, Jonathan, and Justin Sytsma (2020): "Actual Causation and Compositionality". *Philosophy of Science* 87 (1), 43–69.

Samland, Jana, and Michael Waldmann (2014): "Do Social Norms Influence Causal Inferences?" In: *Proceedings of the 36th Annual Meeting of the Cognitive Science Society*, edited by Paul Bello, Marcello Guarini, Marjorie McShane, and Brian Scassellati. Red Hook: Curran Associates, 1359–1364.

Samland, Jana, and Michael Waldmann (2016): "How Prescriptive Norms Influence Causal Inferences". *Cognition* 156, 164–176.

Pictures
https://vecteezy.com/membros/lyuda-vv876136

Poisoned Babies, Shot Fathers, and Ruined Experiments
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Bauer and Romann (2022): "Answers at Gunpoint"

Group A

Combination A/B: "Pulling the trigger caused the release of the hammer."
Combination A/C: "Pulling the trigger caused the hammer to strike the cartridge."
Combination A/D: "Pulling the trigger caused the ignition of the gun powder."
Combination A/E: "Pulling the trigger caused the explosion of the gun powder."
Combination A/F: "Pulling the trigger caused the bullet to be driven from the gun."
Combination A/G: "Pulling the trigger caused the bullet to hit Brad in the head."
Combination A/H: "Pulling the trigger caused the death of Brad."

Group B

Combination B/C: "Releasing the hammer caused the hammer to strike the cartridge."
Combination B/D: "Releasing the hammer caused the ignition of the gun powder."
Combination B/E: "Releasing the hammer caused the explosion of the gun powder."
Combination B/F: "Releasing the hammer caused the bullet to be driven from the gun."
Combination B/G: "Releasing the hammer caused the bullet to hit Brad in the head."
Combination B/H: "Releasing the hammer caused the death of Brad."

Group C

Combination C/D: "Striking the cartridge caused the ignition of the gun powder."
Combination C/E: "Striking the cartridge caused the explosion of the gun powder."
Combination C/F: "Striking the cartridge caused the bullet to be driven from the gun."
Combination C/G: "Striking the cartridge caused the bullet to hit Brad in the head."
Combination C/H: "Striking the cartridge caused the death of Brad."

Group D

Combination D/E: "Igniting the gun powder caused the explosion of the gun powder."
Combination D/F: "Igniting the gun powder caused the bullet to be driven from the gun."
Combination D/G: "Igniting the gun powder caused the bullet to hit Brad in the head."
Combination D/H: "Igniting the gun powder caused the death of Brad."

Group E

Combination E/F: "The explosion of the gun powder caused the bullet to be driven from the gun."
Combination E/G: "The explosion of the gun powder caused the bullet to hit Brad in the head."
Combination E/H: "The explosion of the gun powder caused the death of Brad."

Group F

Combination F/G: "The bullet being driven from the gun caused the bullet to hit Brad in the head."
Combination F/H: "The bullet being driven from the gun caused the death of Brad."

Group G

Combination G/H: "The bullet hitting Brad in the head caused the death of Brad."

Appendix A: Items

Poisoned Babies, Shot Fathers, and Ruined Experiments
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Bauer and Romann (2022): "Answers at Gunpoint"

Statement	Mean	Standard Error	95% Confidence Interval	Variance
A/B	5.89	0.26	[5.37, 6.40]	3.48
A/C	5.56	0.27	[5.02, 6.10]	3.74
A/D	5.33	0.28	[4.77, 5.88]	4.00
A/E	5.12	0.29	[4.54, 5.70]	4.34
A/F	5.19	0.28	[4.63, 5.75]	4.08
A/G	4.92	0.31	[4.31, 5.54]	4.86
A/H	5.17	0.33	[4.51, 5.83]	5.64
B/C	5.90	0.27	[5.37, 6.44]	3.70
B/D	5.67	0.25	[5.17, 6.18]	3.28
B/E	5.25	0.27	[4.71, 5.79]	3.80
B/F	5.17	0.28	[4.62, 5.73]	4.00
B/G	4.90	0.30	[4.31, 5.50]	4.56
B/H	5.21	0.31	[4.59, 5.84]	5.07
C/D	5.75	0.28	[5.18, 6.32]	4.19
C/E	5.54	0.26	[5.02, 6.05]	3.43
C/F	5.21	0.28	[4.65, 5.77]	4.01
C/G	4.69	0.32	[4.06, 5.32]	5.16
C/H	4.94	0.32	[4.29, 5.59]	5.47
D/E	5.94	0.27	[5.41, 6.48]	3.70
D/F	5.50	0.25	[5.07, 6.08]	3.27
D/G	4.94	0.30	[4.35, 5.53]	4.53
D/H	4.88	0.31	[4.24, 5.53]	5.32
E/F	5.92	0.26	[5.41, 6.44]	3.41
E/G	4.88	0.30	[4.28, 5.49]	4.70
E/H	4.79	0.31	[4.16, 5.42]	5.15
F/G	5.19	0.30	[4.59, 5.79]	4.63
F/H	4.96	0.32	[4.33, 5.60]	5.21
G/H	6	0.24	[5.53, 6.47]	2.86

Table 1: Summary of statements

Case	V	p
A/B	1079.00	< 0.001***
A/C	1058.50	< 0.001***
A/D	998.00	< 0.001***
A/E	842.00	0.001**
A/F	792.00	< 0.001***
A/G	872.00	0.004**
A/H	876.50	< 0.001***
B/C	1067.50	< 0.001***
B/D	978.50	< 0.001***
B/E	915.50	< 0.001***
B/F	794.00	< 0.001***
B/G	806.50	0.004**
B/H	869.00	0.001**
C/D	1152.50	< 0.001***
C/E	880.00	< 0.001***
C/F	891.50	< 0.001***
C/G	699.00	0.035*
C/H	697.50	0.005**
D/E	1134.00	< 0.001***
D/F	986.00	< 0.001***
D/G	905.00	0.004**
D/H	756.00	0.006**
E/F	1108.00	< 0.001***
E/G	722.50	0.007**
E/H	780.00	0.02*
F/G	849.00	< 0.001***
F/H	772.00	0.004**
G/H	1053.00	< 0.001***

Table 2: Two-tailed Wilcoxon signed-rank tests

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Bauer and Kornmesser (2023): "Poisoned Babies, Shot Fathers, and Ruined Experiments"

Study		Statement	N	M	95% CI	Versus Neutral Value			Versus Replication	
						z	p	r	z	p
Replication	(1)	"Gabi caused Nele's death."	71	6.859	[6.679, 7.039]	8.242	< 0.001***	1.166	—	—
	(2)	"Kathrin caused Nele's death."		2.000	[1.569, 2.431]	−5.952	< 0.001***	−0.842	—	—
IOC (1)	(1)	"Gabi's action of poisoning the sippy cup caused Nele's death."	67	6.522	[6.176, 6.868]	7.076	< 0.001***	0.865	1.918	0.055
	(2)	"Kathrin's action of giving Nele a poisoned sippy cup caused Nele's death."		3.447	[2.823, 4.072]	−1.424	0.155	−0.174	−3.587	< 0.001***
IOC (2)	(1)	"The action of poisoning the sippy cup caused Nele's death."	89	5.910	[5.514, 6.306]	6.648	< 0.001***	0.705	4.333	< 0.001***
	(2)	"The action of giving Nele juice with a poisoned sippy cup caused Nele's death."		4.640	[4.116, 5.164]	2.551	0.011	0.270	−6.441	< 0.001***
CRC	(1)	"Nele would not have died that evening if Gabi had not poisoned her sippy cup."	86	6.767	[6.618, 6.917]	8.783	< 0.001***	0.947	1.812	0.070
	(2)	"Nele would not have died that evening if Kathrin had not given her juice in a poisoned sippy cup."		5.953	[5.548, 6.359]	6.716	< 0.001***	0.724	−8.927	< 0.001***
CEQ	(1)	"Gabi's action of poisoning Nele's sippy cup caused Kathrin to give Kathrin Nele juice in a poisoned sippy cup."	61	6.180	[5.714, 6.649]	6.145	< 0.001***	0.787	2.812	0.005**
	(2)	"Kathrin's action of giving Nele juice in a poisoned sippy cup caused Nele to ingest poison."		5.115	[4.501, 5.728]	3.413	< 0.001***	0.437	−4.678	< 0.001***
	(3)	"Nele's action of ingesting poison caused her death."		4.279	[3.599, 4.958]	0.596	0.551	0.076	—	—
Combination	(1)	"Kathrin would not have given Nele juice in a poisoned sippy cup if Gabi had not poisoned Nele's sippy cup."	59	5.102	[4.421, 5.782]	2.969	0.003**	0.387	5.008	< 0.001***
	(2)	"Nele would not have ingested poison if Kathrin had not given her juice in a poisoned sippy cup."		6.169	[5.695, 6.644]	5.814	< 0.001***	0.757	−8.237	< 0.001***
	(3)	"Nele would not have died that evening if she had not ingested the poison."		6.458	[6.101, 6.814]	6.609	< 0.001***	0.860	—	—

Table 1: Summary of statements for the poisoned cup vignette, reporting results of Wilcoxon signed-rank tests

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Bauer and Kornmesser (2023): "Poisoned Babies, Shot Fathers, and Ruined Experiments"

Study		Statement	N	M	95% CI	Versus Neutral Value			Versus Replication	
						z	p	r	z	p
Replication	(1)	"Leave caused Uwe's death."		6.603	[6.285, 6.922]	7.108	< 0.001***	0.896	—	—
	(2)	"The hammer caused Uwe's death."	63	3.000	[2.410, 3.590]	−3.288	< 0.001***	−0.414	—	—
	(3)	"The gunpowder caused Uwe's death."		2.984	[2.402, 3.566]	−3.391	< 0.001***	−0.427	—	—
	(4)	"The bullet caused Uwe's death."		5.048	[4.399, 5.696]	2.826	0.005**	0.356	—	—
IOC	(1)	"Leeve's action of shooting at Uwe caused Uwe's death."		5.648	[5.062, 6.234]	4.404	< 0.001***	0.599	3.367	< 0.001***
	(2)	"The release of the hammer caused Uwe's death."	54	3.667	[2.988, 4.346]	−0.921	0.357	−0.125	−1.754	0.0795
	(3)	"The explosion of the gunpowder caused Uwe's death."		3.593	[2.917, 4.269]	−1.230	0.219	−0.167	−1.563	0.1181
	(4)	"The bullet hitting Uwe caused Uwe's death."		6.241	[5.770, 6.712]	5.766	< 0.001***	0.785	−2.767	0.006**
CRC	(1)	"Uwe would not have died if Leeve had not shot at him."		6.480	[6.049, 6.911]	5.943	< 0.001***	0.841	0.410	0.6819
	(2)	"Uwe would not have died if the hammer had not been released."	50	6.120	[5.582, 6.658]	5.339	< 0.001***	0.755	−6.615	< 0.001***
	(3)	"Uwe would not have died if the gunpowder had not exploded."		5.720	[5.110, 6.330]	4.463	< 0.001***	0.631	−5.855	< 0.001***
	(4)	"Uwe would not have died if the bullet had not hit Uwe."		6.160	[5.633, 6.687]	5.165	< 0.001***	0.730	−2.505	0.012
CEQ	(1)	"Leeve's action of shooting at Uwe caused the release of the hammer."		4.962	[4.270, 5.654]	2.565	0.0103*	0.352	4.399	< 0.001***
	(2)	"The release of the hammer caused the explosion of the gunpowder."	53	5.830	[5.272, 6.389]	4.911	< 0.001***	0.675	−6.015	< 0.001***
	(3)	"The explosion of the gunpowder caused the bullet to hit Uwe."		5.056	[4.396, 5.717]	2.943	0.003**	0.404	−4.471	< 0.001***
	(4)	"The bullet hitting Uwe caused Uwe's death."		6.547	[6.170, 6.924]	6.376	< 0.001***	0.876	−3.748	< 0.001***
Combination	(1)	"The hammer would not have released if Leeve had not shot at Uwe."		6.380	[5.858, 6.702]	5.969	< 0.001***	0.820	1.682	0.0926
	(2)	"The gunpowder would not have exploded if the hammer had not released."	50	6.520	[6.194, 6.846]	6.232	< 0.001***	0.856	−7.377	< 0.001***
	(3)	"The bullet would not have hit Uwe if the gunpowder had not exploded."		6.120	[5.680, 6.560]	5.725	< 0.001***	0.786	−6.757	< 0.001***
	(4)	"Uwe would not have died if the bullet had not hit Uwe."		6.140	[5.670, 6.610]	5.593	< 0.001***	0.768	−2.294	0.0218

Table 2: Summary of statements for the revolver vignette, reporting results of Wilcoxon signed-rank tests

Slide 23
20.07.2024

Poisoned Babies, Shot Fathers, and Ruined Experiments
Alexander Max Bauer – University of Oldenburg, Faculty IV, Department of Philosophy

Bauer and Kornmesser (2023): "Poisoned Babies, Shot Fathers, and Ruined Experiments"

Study		Statement	N	M	95% CI	Versus Neutral Value			Versus Replication	
						z	p	r	z	p
Replication	(1)	"The pipe bursting caused the experiment to be ruined."	60	5.483	[4.902, 6.065]	4.369	< 0.001***	0.564	—	—
	(2)	"The GFCI breaking the circuit caused the experiment to be ruined."		4.117	[3.434, 4.799]	0.403	0.6871	0.052	—	—
IOC	(1)	"The pipe bursting caused the experiment to be ruined."	64	5.734	[5.236, 6.232]	5.310	< 0.001***	0.664	−0.556	0.5781
	(2)	"The breaking of the circuit by the GFCI caused the experiment to be ruined."		4.234	[3.596, 4.873]	0.658	0.511	0.082	−0.122	0.9028
CRC	(1)	"The experiment would not have been ruined if the pipe had not burst."	67	6.164	[5.771, 6.557]	6.484	< 0.001***	0.917	−1.760	0.0785
	(2)	"The experiment would not have been ruined if the GFCI had not broken the circuit."		3.358	[2.720, 3.996]	−1.794	0.0728	0.254	1.566	0.1173
CBQ	(1)	"The bursting of the pipe caused the GFCI to break the circuit."	64	6.094	[5.619, 6.568]	6.039	< 0.001***	0.755	−2.155	0.0312
	(2)	"The breaking of the circuit by the GFCI caused the special light to turn off."		6.250	[5.834, 6.665]	6.317	< 0.001***	0.790	−4.842	< 0.001***
	(3)	"The special light turning off caused the experiment to be ruined."		6.188	[5.785, 6.590]	6.628	< 0.001***	0.828	—	—
Combination	(1)	"The GFCI would not have broken the circuit if the pipe had not burst."		6.559	[6.220, 6.899]	6.780	< 0.001***	0.883	−3.391	< 0.001***
	(2)	"The special light would not have turned off if the GFCI had not broken the circuit."	59	6.186	[5.734, 6.639]	5.949	< 0.001***	0.775	−4.619	< 0.001***
	(3)	"The experiment would not have been ruined if the special light had not turned off."		5.915	[5.438, 6.393]	5.508	< 0.001***	0.717	—	—

Table 3: Summary of statements for the GFCI vignette, reporting results of Wilcoxon signed-rank tests

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