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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)
(3) Bauer and Romann (2022)
(4) Bauer and Kornmesser (2023)
(5) Takeaway Points

1 A Tale of Three Papers

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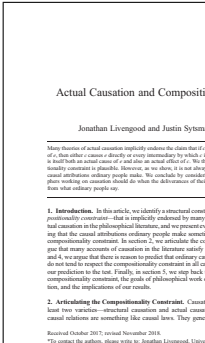

Actual Causation and Compositionality

Jonathan Livengood and Justin Sytsma*†

Many theories of actual causation implicitly endorse the claim that if c is an actual cause of e, then either c causes e directly or every intermediary by which c indirectly causes e is itself both an actual cause of e and also an actual effect of c. We think this compositionality constraint is plausible. However, as we show, it is not always satisfied by the causal attributions ordinary people make. We conclude by considering what philosophers working on causation should do when the deliverances of their theories diverge from what ordinary people say.

1. Introduction. In this article, we identify a structural constraint—the *compositionality constraint*—that is implicitly endorsed by many accounts of actual causation in the philosophical literature. Then we present evidence suggesting that the causal attributions ordinary people make sometimes violate the compositionality constraint. In section 2, we articulate the constraint and argue that many accounts of causation in the literature satisfy it. In sections 3 and 4, we argue that there is reason to predict that ordinary causal attributions do not tend to respect the compositionality constraint in all cases, and we put our prediction to the test. Finally, in section 5, we step back to reflect on the compositionality constraint, the goals of philosophical work on actual causation, and the implications of our results.

2. Articulating the Compositionality Constraint. Causation comes in at least two varieties—structural causation and actual causation. Structural causal relations are something like causal laws. They generate patterns of

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†We would like to thank audience members at Victoria University of Wellington, Iowa State University, and the 2016 Buffalo Experimental Philosophy Conference, who gave us feedback on earlier stages of this research. And we would like to thank several anonymous reviewers for their contributions.

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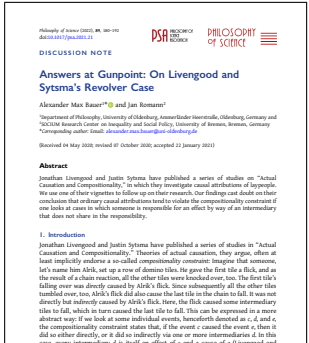

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DISCUSSION NOTE

Answers at Gunpoint: On Livengood and Sytsma's Revolver Case

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Abstract

Jonathan Livengood and Justin Sytsma have published a series of studies on "Actual Causation and Compositionality," in which they investigate causal attributions of laypeople. We use one of their vignettes to follow up on their research. Our findings cast doubt on their conclusion that ordinary causal attributions tend to violate the compositionality constraint if one looks at cases in which someone is responsible for an effect by way of an intermediary that does not share in the responsibility.

1. Introduction

Jonathan Livengood and Justin Sytsma have published a series of studies in "Actual Causation and Compositionality." Theories of actual causation, they argue, often at least implicitly endorse a so-called *compositionality constraint*: Imagine that someone, let's name him Alrik, set up a row of domino tiles. He gave the first tile a flick, and as the result of a chain reaction, all the other tiles were knocked over, too. The first tile's falling over was directly caused by Alrik's flick. Since subsequently all the other tiles tumbled over, too, Alrik's flick did also cause the last tile in the chain to fall. It was not directly but *indirectly* caused by Alrik's flick. Here, the flick caused some intermediary tiles to fall, which in turn caused the last tile to fall. This can be expressed in a more abstract way: If we look at some individual events, henceforth denoted as c, d, and e, the compositionality constraint states that, if the event c caused the event e, then it did so either directly, or it did so indirectly via one or more intermediaries d. In this case, every intermediary d is itself an effect of c and a cause of e (Livengood and Sytsma 2020, 44).

This compositionality constraint intuitively seems to be a reasonable desideratum for any adequate theory of actual causation. However, whether it is indeed correct, Livengood and Sytsma argue, is a different kettle of fish. Arguably, it is not enough to solely rely on the intuitions of a single philosopher or of a small, relatively

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ARTICLE

Poisoned Babies, Shot Fathers, and Ruined Experiments: Experimental Evidence in Favor of the Compositionality Constraint of Actual Causation

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Abstract

Livengood and Sytsma (2020) challenge the *compositionality constraint of actual causation* (CCAC), according to which each intermediary of a causal chain is an effect of its predecessor and a cause of its successor link. In several studies, they find support for their hypothesis that the CCAC is not in accordance with the ordinary causal attributions of laypeople. We argue that there are three interrelated problems in their studies' design that we call the *causality-responsibility confusion* (CRC), the *intermediary-ontology confusion* (IOC), and the *cause-end questioning* (CEQ). Avoiding the CRC, the IOC, and the CEQ leads to strong empirical support for the CCAC.

1 Introduction

Livengood and Sytsma (2020) (hereafter L&S 2020) challenge the *compositionality constraint of actual causation* (CCAC) that is implicitly entailed by many philosophical accounts of actual causation (e.g., Reichenbach 1956; Salmon 1994; Dowe 1995; Ehring 1997; Lewis 1973, 1986; for a brief summary, see L&S 2020, 43–47). They illustrate the CCAC by a chain of dominoes. There are two ways a person could cause the last domino in a chain to fall: First, they could cause it directly by flicking the last domino of the chain. Second, they could cause it indirectly by flicking, for example, the first domino of the chain. It then falls against the second domino, which falls against the third domino, and so on, until the last domino of the chain finally falls, too. According to the CCAC, the person causes the last domino to fall in both cases. However, if they do it indirectly, then there must be a number of *intermediaries*—the falling of one domino against the next one—such that

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2 Livengood and Sytsma (2020)

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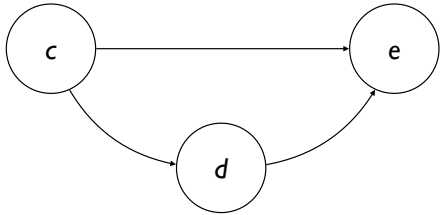
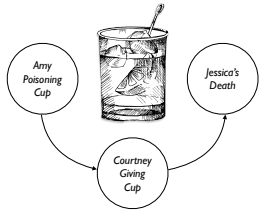
Compositionality Constraint of Actual Causation (CCAC): If *c* is an actual cause of *e*, then either *c* causes *e* directly, or every intermediary *d* by which *c* indirectly causes *e* is itself an actual effect of *c* and an actual cause of *e*. (Livengood and Sytsma 2020, p. 44)



2 Livengood and Sytsma (2020)

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)



2 Livengood and Sytsma (2020)

Poisoned Cup Results

- $N = 34$
- (dis)agreement on 7-point scale
- 2 statements
  (A) "Amy caused Jessicas's death."
  (B) "Courtney caused Jessicas's death."

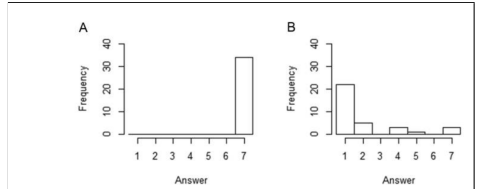
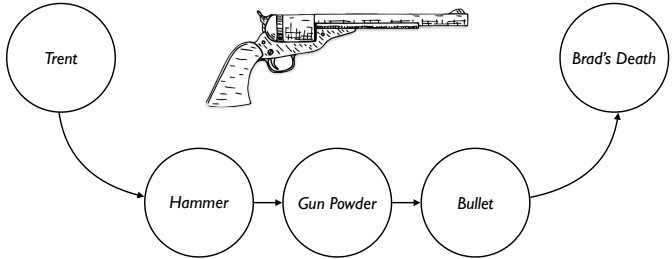


Figure 1. Histograms for study 1. *A*, Amy caused; *B*, Courtney caused.

2 Livengood and Sytsma (2020)

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)



2 Livengood and Sytsma (2020)

Revolver Results

- $N = 51$
- (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."

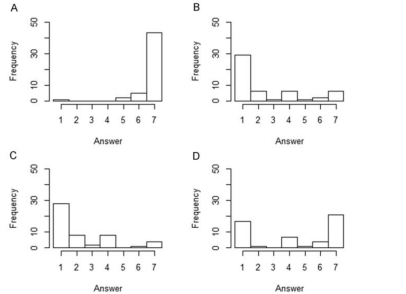


Figure 8. Histograms for study 8. *A*, Trent caused; *B*, hammer caused; *C*, powder caused; *D*, bullet caused.

2 Livengood and Sytsma (2020)

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)

2 Livengood and Sytsma (2020)

GFCI Results

- $N = 163$
- (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."

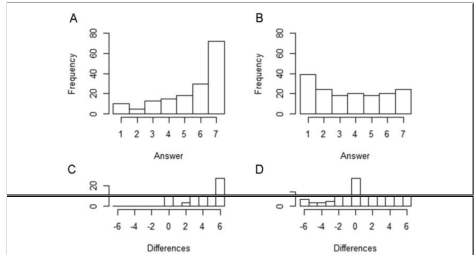
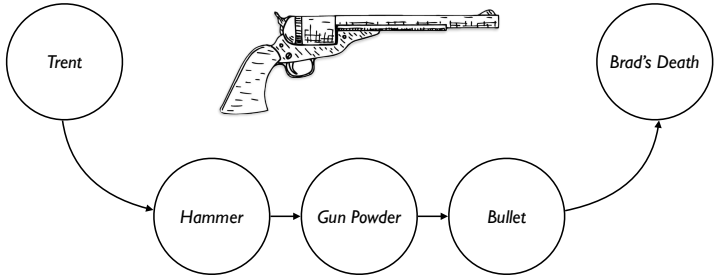


Figure 9. Histograms for study 9. *A*, Pipe caused; *B*, GFCI caused; *C*, Amy minus Courtney; *D*, pipe minus GFCI.

3 Bauer and Romann (2022)

3 Bauer and Romann (2022)

Structure of Revolver Vignette



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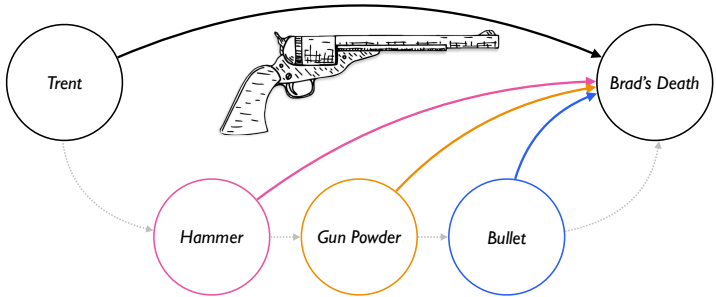
Questions of Revolver Vignette



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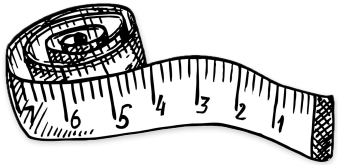
Events

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”



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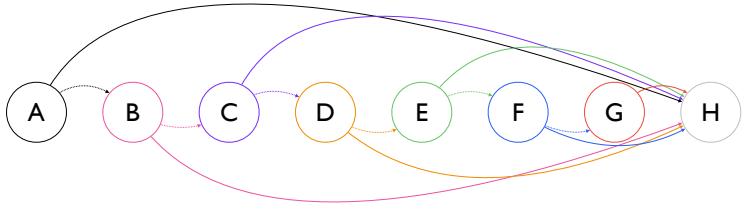
Chain

3 Bauer and Romann (2022)

Original Kind of Questions



3 Bauer and Romann (2022)

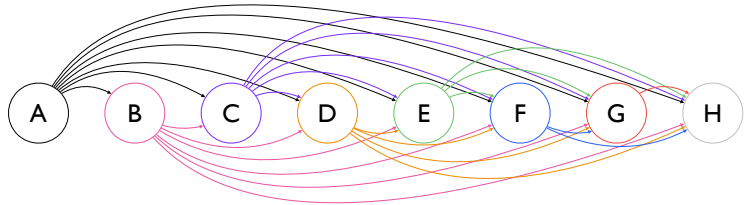
Combinations of Events

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."



3 Bauer and Romann (2022)

(More or Less) Analogous Statements to Livengood and Sytsma (2020)

(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."

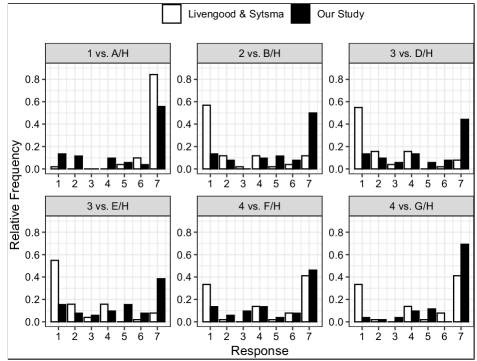
(F/H) "The bullet being driven from the gun caused the death of Brad."

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

3 Bauer and Romann (2022)

Results

- $N = 52$
- (dis)agreement on 7-point scale
- 28 statements
- central tendency for no statement smaller than the "neutral" value 4



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

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

Cause-End Questioning (CEQ): 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 also might lead subjects to view the statements in moral terms (also see Bauer and Romann 2022)

4 Bauer and Kornmesser (2023)

Design

- vignettes from Livengood and Sytsma (2020)
  - Poisoned Cup Vignette
  - Revolver Vignette
  - GFCI Vignette
- (dis)agreement on 7-point scale
- studies for each vignette
  - replication
  - exclusion of IOC
  - exclusion of CRC
  - exclusion of CEQ
  - simultaneous exclusion of IOC, CRC, and CEQ
- $N \approx 60$ for each study (16 studies in total)

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Example Revolver

Table 2. Summary of Statements for the Revolver Vignette

Study		Statement	*N*	*M*
Replication	(1)	"Leeve caused Uwe's death."		6.603
	(2)	"The hammer caused Uwe's death."	63	3.000
	(3)	"The gunpowder caused Uwe's death."		2.984
	(4)	"The bullet caused Uwe's death."		5.048
IOC	(1)	"Leeve's action of shooting at Uwe caused Uwe's death."		5.648
	(2)	"The release of the hammer caused Uwe's death."	54	3.667
	(3)	"The explosion of the gunpowder caused Uwe's death."		3.593
	(4)	"The bullet hitting Uwe caused Uwe's death."		6.241
CRC	(1)	"Uwe would not have died if Leeve had not shot at him."		6.480
	(2)	"Uwe would not have died if the hammer had not been released."	50	6.120
	(3)	"Uwe would not have died if the gunpowder had not exploded."		5.720
	(4)	"Uwe would not have died if the bullet had not hit Uwe."		6.160
CEQ	(1)	"Leeve's action of shooting at Uwe caused the release of the hammer."		4.962
	(2)	"The release of the hammer caused the explosion of the gunpowder."	53	5.830
	(3)	"The explosion of the gunpowder caused the bullet to hit Uwe."		5.056
	(4)	"The bullet hitting Uwe caused Uwe's death."		6.547

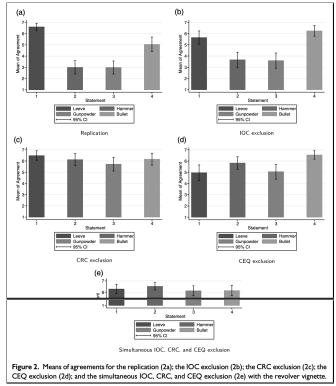


Figure 2. Means of agreements for the replication (2a); the IOC exclusion (2b); the CRC exclusion (2c); the CEQ exclusion (2d); and the simultaneous IOC, CRC, and CEQ exclusion (2e) with the revolver vignette.

4 Bauer and Kornmesser (2023)

Results

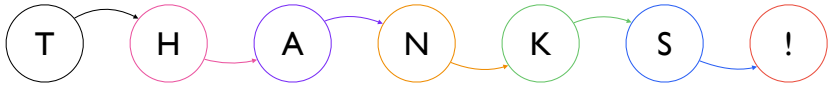
- successful replication (for all vignettes)
- excluding IOC led to less disagreement that intermediaries are causes (for poisoned cup and revolver vignette)
- excluding CRC led to agreement that intermediaries are causes (for poisoned cup and revolver vignette)
- excluding CEQ led to agreement that intermediaries are causes (for all vignettes)
- simultaneous exclusion of IOC, CRC, and CEQ led to agreement that intermediaries are causes (for all vignettes)

5 Takeaway Points

5 Takeaway Points

Key Assumptions in Light of the Data

- when questioning people, we must be very careful not only in choosing our words but also in choosing our sets of questions
- subjects' intuitions seem not to be in conflict with the Compositionality Constraint of Actual Causation (contrary to Livengood and Sytsma 2020)
- if asked the right way, subjects might be prevented from confusing causation with responsibility
- responsibility might not be (such a large) part of the concept of causation (contrary to proponents of the *responsibility view*)



Data

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

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Pictures

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Additional Slides

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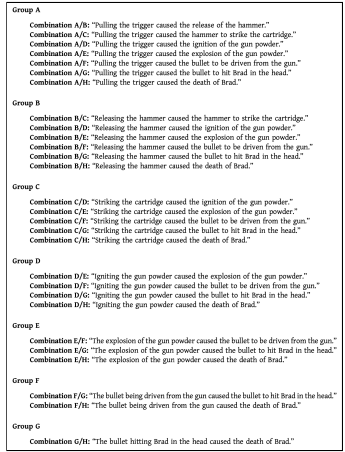

Group A

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

3 Bauer and Romann (2022)

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]	3.79
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]	3.78
D/F	5.58	0.25	[5.07, 6.08]	3.27
D/G	4.94	0.30	[4.35, 5.53]	4.53
D/H	4.88	0.32	[4.24, 5.53]	5.32
E/F	5.93	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]	3.86

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

4 Bauer and Kornmesser (2023)

Study		Statement	N	M	95% CI	Versus Neutral Value z	Versus Neutral Value p	Versus Neutral Value r	Versus Replication z	Versus Replication 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 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	−6.678	< 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

4 Bauer and Kornmesser (2023)

Study		Statement	N	M	95% CI	Versus Neutral Value z	Versus Neutral Value p	Versus Neutral Value r	Versus Replication z	Versus Replication p
Replication	(1)	"Leeve 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."		6.280	[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

4 Bauer and Kornmesser (2023)

						Versus Neutral Value			Versus Replication	
Study		Statement	*N*	*M*	95% CI	*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
CEQ	(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