Causation and norms of proper functioning: Counterfactuals are (still) relevant

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Abstract

Causal judgments are well-known to be sensitive to violations of moral and statistical norms. There is ongoing discussion as to whether these effects are both best explained through changes in the relevance of counterfactual possibilities, or if moral norm violations should be independently explained through a potential polysemy of the term ‘cause’. In support of the latter view, recent work has pointed out that moral norm violations affect judgments of agents, but not inanimate objects, and that their effects are moderated by agents’ knowledge states. We advance this debate by demonstrating that judgments of counterfactual relevance exhibit precisely the same patterns, and that judgments of inanimate objects are actually highly sensitive to whether the *object* violated a prescriptive norm by malfunctioning. The latter finding is difficult to account for through polysemy, but is predicted by changes in the relevance of counterfactual alternatives.

Keywords: causation; norms; counterfactuals; morality; teleology

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A central question in research on causal cognition concerns the role of norms. It is well-known that both statistical and moral norms influence judgments of actual causation (e.g., a judgment that some event, *e*, was the cause of some outcome, *o*) (Alicke, 2000; Gerstenberg, Goodman, Lagnado, & Tenenbaum, 2015; Hitchcock & Knobe, 2009; Kominsky, Phillips, Gerstenberg, Lagnado & Knobe, 2015). Specifically, people are more inclined to judge that *e* was the cause of *o* if *e* was either very unlikely to happen or morally prohibited. Despite the wide-spread agreement on the existence of the phenomenon, there has been little corresponding agreement on how these effects should be explained.

Most researchers take the impact of statistical norms to reveal part of the basic underlying processes that support causal reasoning (e.g., Gerstenberg et al., 2015; Icard, Kominsky & Knobe, under review; Samland & Waldmann, 2016). They differ, however, in whether they treat the impact of moral norms similarly, or argue that it arises from a fundamentally different set of processes.

On the one hand, researchers have argued that the impact of both statistical and moral norms is best explained by changes in the relevance of counterfactual possibilities. These accounts propose that when a norm violation occurs, it increases the relevance of counterfactual alternatives wherein the norm violations are replaced by norm-conforming events (e.g., Halpern & Hitchcock, 2015; Kominsky et al., 2015). In support of this account, recent work demonstrated that norm violations affect explicit assessments of counterfactual relevance in precisely the same way they affect causal judgments (Phillips, Luguri & Knobe, 2015).

On the other hand, other researchers have argued for separate explanations of the two effects. The most recent approach has suggested that the term ‘cause’ is polysemous: It can be

used to talk about whether an agent is morally responsible for an outcome, *or* it can be used to talk about whether some event causally contributed to an outcome (Samland & Waldmann, 2016). On this approach, the impact of violations of moral norms can be accounted for by arguing that participants are more likely to interpret the word ‘cause’ as being about moral responsibility in cases where moral norms have been violated.

Within this debate, Samland and Waldmann (2016) (S&W hereafter) reported two important new data points: First, the violation of moral norms selectively influences causal judgments about whether *agents* caused an outcome, but not causal judgments of whether *inanimate objects* used by the same agents caused the outcome. Second, factors that affect the moral responsibility of the norm violator (such as their knowledge states) also affect causal judgments (see also Samland, Josephs, Waldmann, & Rakoczy, 2015). S&W suggest that these findings are best accounted for by assuming that participants were interpreting the causal question to be about moral responsibility when asked about an agent, but about the non-moral causal contribution when asked about an object.

A question raised in S&W is whether these findings provide evidence against accounts that propose a unified explanation of the impact of norms by way of the relevance of counterfactual alternatives. To answer this question, we ask whether the effects uncovered by S&W also arise in participants’ assessments of which counterfactuals are relevant. One possibility is that because moral norms apply to agents but not inanimate objects, participants will regard counterfactual alternatives to what the agent did as relevant, but not alternatives to what the inanimate object did. This may help explain why moral norm violations influenced causal judgments of agents but not objects. Furthermore, changes to agents’ mental states may affect both the agent’s moral responsibility and similarly whether it is relevant to consider

counterfactual alternatives to their actions, which may help explain why changes to agents' mental states affect causal judgments. For example, intentionality affects causal judgments in double-prevention scenarios where counterfactual reasoning directly informs causal judgments (Lombrozo, 2010). To foreshadow our findings, we replicate S&W's results, and additionally find corresponding changes in which counterfactual alternatives participants regard as relevant, demonstrating that these effects are consistent with both accounts.

In a second experiment, we investigate whether causal judgments of inanimate objects are sensitive to violations of prescriptive norms of proper functioning, even though they are not sensitive to violations of prescriptive moral norms. We find that they are, and that the changes in participants' causal judgments are mirrored by a corresponding change to their judgments of the relevance of counterfactual alternatives. This pattern is uniquely predicted by accounts that explain the impact of norms in terms of changes in the relevance of counterfactual alternatives.

Experiment 1

Methods.

Participants. 610 participants ($M_{age}=37.28$, $SD_{age}=12.14$; 338 females, 1 unreported) from Amazon Mechanical Turk participated for a modest monetary compensation. Participant recruitment was automated through TurkPrime (www.turkprime.com) to prevent repeat participation and limit recruitment to participants with a high approval rating.

Stimuli and procedure. This experiment was a modified version of S&W's Experiment 4 with an additional DV. The overall design was 4 (norm condition) x 3 (question) and administered fully between-subjects.

Participants read one of four vignettes (see supplemental materials). In all conditions, Tom owns a garden and has two gardeners, Alex and Benni, who each take care of 1/3 of the plants on their own, and jointly tend to the remaining 1/3. Additionally, Alex and Benni always use two fertilizers “A-X200®” and “B-Y33®”. Tom reads that fertilizers are good for plants, but using more than one kind of fertilizer could damage his plants, so Tom decides he wants both gardeners to use only fertilizer A-X200. In all cases, however, Alex applies fertilizer A-X200 and Benni applies fertilizer B-Y33, and the plants cared for by both of them are damaged.

The four conditions varied the reason that Benni used B-Y33. In the *Standard norm-violation condition*, Benni simply decides to use B-Y33; in the *Unintended norm-violation condition*, Benni believed he was applying A-X200, but accidentally applied B-Y33; in the *Ignorant norm-violation condition*, Tom neglects to tell Benni to use only A-X200, and he uses B-Y33 instead; and in the *Deceived norm-violation condition*, Alex deliberately lies to Benni about which fertilizer he is supposed to use to get him in trouble.

Additionally, the questions that participants answered varied. Participants were either asked questions that focused on the two agents (“Alex” and “Benni”), the two actions (“the application of fertilizer by Alex” and “the application of fertilizer by Benni”), or the two chemicals (“the application of chemical A-X200” and “the application of chemical B-Y33”). After reading the vignette, participants were first asked whether it was *relevant* to consider counterfactual alternatives to some aspect of the event (following Phillips et al., 2015). For example, in the Agent condition, participants were asked whether it was relevant to consider what Alex/(Benni) could have done differently.

Subsequently, as in S&W, participants were asked to judge who or what caused the plants to dry up (depending on the Question condition), and were allowed to choose one or both of the two options.

Following this question, participants received two check questions that tested their understanding of which chemicals were applied by which gardener, and which chemicals Tom wanted each gardener to use. Following S&W, they were also asked to estimate the proportion of the flowers that dried when (1) only fertilizer A-X200 was applied, (2) only fertilizer B-Y33 was applied, and (3) both were applied (see Supplemental Materials for replication).

Results.

We excluded participants who did not answer both of the check questions correctly, and analyzed the remaining 439 participants' judgments. We both qualitatively and quantitatively replicated the pattern of causal judgments observed in S&W. We graph this replication by comparing the average causal judgment for each of the two agents in each of the 12 conditions for both our data and S&W's data (Fig. 1a, see also Table S1 for more information on the replication of the key statistical tests reported in S&W).

To examine the effects of our manipulation on both causation and relevance judgments, we categorized participants' responses as assigning causal responsibility (or counterfactual relevance) to (1) only the norm-violating agent, (2) both agents, or (3) only the norm-conforming agent, and then subjected both kinds of judgments to a proportional odds logistic regression using the `probit` function in the `MASS` package in R. For causal judgments, we observed an effect of the norm-condition ($LRT=20.49$ [$df=3$], $p<.001$), an effect of question ($LRT=44.53$ [$df=2$], $p<.001$), and critically, a norm-condition x question interaction effect ($LRT=19.94$ [$df=6$], $p=.003$). For relevance judgments, we observed a highly similar pattern of results: an

effect of norm-condition ($LRT=13.93$ [$df=3$], $p=.003$), an effect of question ($LRT=73.34$ [$df=2$], $p<.001$), and a norm-condition x question interaction effect ($LRT=14.15$ [$df=6$], $p=.028$). The similarity of the pattern of these two judgments across the various conditions can be seen in Fig.

1b. At the level of each participants' responses, judgments of the causal responsibility were highly correlated with judgments of whether it was relevant to consider alternatives to the agents' actions. This was true both for judgment of the norm-violating agent/action/object, ($r=0.553$, $p<.001$), and for the norm-conforming agent/action/object ($r=0.406$, $p<.001$), and moreover, held whether participants were making judgments about agents ($r=0.651$, $p<.001$), actions ($r=0.262$, $p<.001$), or simply inanimate objects ($r=0.280$, $p<.001$).

Figure 1. Depiction of the relationship between participants' causal judgments in Study 1 and the previous causal results from S&W (a), and the mean relevance judgments (b). Judgments related to the norm-conforming agent are marked with a 'C'; Judgments related to the norm-violating agent are marked with a 'V'.

Experiment 2

Methods.

Participants. 403 participants ($M_{age}=34.96$, $SD_{age}=11.90$; 205 females, 1 unreported) from Amazon Mechanical Turk participated for a modest monetary compensation. Participant recruitment was again automated through TurkPrime.

Stimuli and procedure. This experiment used a 3 (Norm violation; norm-conforming vs. moral violation vs. malfunction) x 2 (Question: agent vs. object) design, administered fully between-subjects.

Participants read one of three vignettes involving a vending machine in an academic department (see supplemental materials). In every condition the machine had three levers (red, black, and white): two that produce pencils and one that produces an eraser but which frequently malfunctioned and also gave a broken pencil. There were also two agents: an administrative assistant, and Professor Smith (a recent hire who did not know about the malfunctioning lever). Prof. Smith always pulls the red lever, and the assistant always pulls the black lever, which later results in a problem for a student who needs a pencil to take a test but cannot get one.

In the norm-conforming condition, the red lever and black lever both produce pencils, and the white lever produces erasers (but also consistently malfunctions). Additionally, both administrators and faculty were allowed to take pencils from the machine. Both request pencils using the black and red levers, which both function appropriately. The moral violation condition was identical to the norm-conforming condition, except that the faculty are not allowed to get pencils from the machine (but administrative assistants are allowed), and this rule was known by Prof. Smith. Lastly, the malfunction condition was identical to the norm-conforming condition except that it was the red lever that produced erasers (and malfunctioned), and Prof. Smith wanted an eraser, so Prof. Smith pulled the red lever and got an eraser and a broken pencil.

Participants were then asked a relevance-of-counterfactual-alternatives question and a causal question in random order on separate pages. The relevance of alternatives question was worded and presented the same way as Experiment 1, and either focused on the agents (Prof. Smith, administrative assistant) or the objects (red lever, black lever). The causal question similarly asked either *who* caused the problem (agent condition) or *what* caused the problem (object condition), and participants could select one or both.

These were followed by three comprehension check questions and two additional manipulation-check questions. The comprehension questions ensured that participants understood the key facts about the levers, agents, and outcome of the scenario. Additionally, participants rated, on a 0-100 scale, how likely the malfunction was to occur, in order to verify that participants did not think the malfunction was a descriptive norm violation. Finally, participants rated their agreement with the statement “It was morally wrong for Prof. Smith to pull the red lever” on a 7-point Likert scale, with the expectation that ratings should be higher in the moral violation condition than the other two conditions, which should not differ from each other. The predictions for both manipulation-check questions were overwhelmingly confirmed (see Supplementary Materials).

Results.

We excluded participants who did not answer all three of the check questions correctly, and analyzed the remaining 258 participants’ judgments. To facilitate comparison of participants’ judgments, we computed a measure of participants’ preference for selecting the norm-violating event as a cause. Participants who selected *only* the norm-violating event as a cause were assigned a score of 1, participants who selected both or neither events as causes were assigned score of 0, and participants who selected *only* the norm-conforming event were

assigned a score of -1. We then analyzed participants' causal preference scores with a 2 (Causal Question: Agent vs. Object) x 3 (Norm condition: Immoral vs. Malfunction vs. Normal) proportional odds logistic regression, as in Study 1. This analysis revealed a main effect of Norm condition, ($LRT=71.49$ [$df=2$], $p<.001$), no main effect of Causal question ($LRT=0.045$ [$df=1$], $p=.832$), and critically a Norm condition x Causal question interaction effect ($LRT=31.42$ [$df=2$], $p<.001$).

We decomposed this interaction effect by separately analyzing participants' causal preference scores for each of the different conditions. When the relevant norm was moral and thus applied to the agent but not the object, participants tended to prefer the norm-violating agent as a cause, but did not similarly prefer the norm-violating object as a cause ($LRT=15.33$ [$df=1$], $p<.001$). When the relevant norm was functional, and thus the norm applied to the object but not the agent, this pattern was reversed: participants tended to prefer the norm-violating object as a cause, but did not similarly prefer the norm-violating agent as a cause ($LRT=12.36$ [$df=1$], $p<.001$). When there was no norm that applied to either the agent or the object, there was small and non-significant preference for the norm-conforming agent but not the object ($LRT=1.13$ [$df=1$], $p=.288$).

We next analyzed participants' judgments of the relevance of counterfactual alternatives in exactly the same way. Just as with participants' causal judgments, we observed a main effect of Norm condition, ($LRT=40.53$ [$df=2$], $p<.001$), no main effect of Relevance question ($LRT=0.10$ [$df=1$], $p=.747$), and critically a Norm condition x Relevance question interaction effect ($LRT=33.70$ [$df=2$], $p<.001$). We decomposed this interaction effect by separately analyzing participants' counterfactual preference scores for each of the different conditions. When a moral norm was salient, participants tended to prefer counterfactuals for the agent, but

not the object ($LRT=16.63$ [$df=1$], $p<.001$). When the relevant norm was functional, this pattern was reversed: participants preferred counterfactuals for the object, but not the agent ($LRT=11.20$ [$df=1$], $p<.001$). When there was no norm violation that applied to either the agent or the object, there was a small and significant preference for the norm-conforming agent, but not the object ($LRT=4.48$ [$df=1$], $p=.034$).

Figure 2. Average preference score for the norm-violating event in causal judgments (left plots) and counterfactual relevance judgments (right plots), as a function of which norms were relevant (split into panels). Grey bars depict responses to questions about agents; Red bars depict responses to questions about inanimate objects. Error bars depict +/- 1 SEM.

General Discussion

The results of these two experiments favor a counterfactual relevance account of the impact of norms on causal judgments. While Experiment 1 replicated S&W's finding that moral norm violations primarily affect casual judgments of intentional agents and not inanimate objects, Experiment 2 further found that violations of norms of proper functioning primarily affect

judgments of inanimate objects but not intentional agents. In both experiments, judgments of counterfactual relevance tracked the impact of different norm violations on causal judgments concerning both intentional agents and inanimate objects.

The extant literature on causal judgment now provides evidence for three distinct types of norms that all show similar effects: descriptive statistical norm violations (e.g., Kominsky et al., 2015), prescriptive moral norm violations (e.g. Hitchcock & Knobe, 2009), and prescriptive functional norm violations (demonstrated here). The demonstration of additional norms that have similar impact on causal judgments makes a parsimonious explanation increasingly desirable. To extend the polysemy account, for example, one would have to propose three independent explanations for the qualitatively similar effects of each of the three different kinds of norms. By contrast, an account that appeals to the relevance of counterfactual alternatives provides a unified explanation of these effects and specifically predicts that these different norms should have a qualitatively similar impact.

While the present work suggests that counterfactual relevance remains the most promising explanation for the role of norms in causal judgments, many aspects of the relationship between counterfactual representation and causal cognition remain poorly understood.

A critical insight which arises in both S&W and in the current studies is that norms have a highly specific effect on causal judgments: They preferentially affect causal judgments of the entities to which the norm applies and typically do not extend to other aspects of the same event. Across two studies, we additionally find that this pattern is replicated in participants' judgments of the relevance of counterfactual alternatives. Together, these findings suggest that, rather than

representing a counterfactual alternative to an event in its entirety, participants' causal and counterfactual cognition represents events more granularly.

How events are represented in causal and counterfactual cognition, and which aspects of an event are typically represented independently, are almost completely unexplored topics (e.g. Halpern & Hitchcock, 2015, explicitly acknowledge this issue). However, as emerging research makes clear, it will be difficult to make precise predictions about the impact of norms without a well worked-out theory of how events are represented. This remains a critical area for future work.

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Supplementary Materials**Experiment 1**

Statistical comparison	S & W	Cause	Relevance
<u>Effect of question within each story condition</u>			
Standard violation	43.02***	30.18***	18.55***
Unintended violation	26.89***	20.78***	10.10*
Ignorant violation	48.80***	35.40***	52.06***
Deception violation	64.42***	73.64***	54.98***
<u>Effect of story within each question condition</u>			
Chemical/event	4.23 ^{ns}	4.36 ^{ns}	10.54 ^{ns}
Person/event	13.71*	6.16 ^{ns}	14.27*
Agent	79.72***	79.37***	62.80***
<u>Difference from standard violation for the agent question condition</u>			
Unintended violation	17.50***	26.43***	16.23***
Ignorant violation	42.46***	38.76***	34.22***
Deception violation	58.41***	53.99***	41.18***

Table 1. Comparison of key statistical tests in S&W and the same tests performed on participants' causal and relevance judgments in Experiment 1.

Materials***Background:***

Tom has a huge garden and loves flowers. Because he has less and less time for gardening lately, he employed two gardeners who take care of the plants on his 30 flower beds: Alex and Benni.

Both can independently decide on their working hours and arrange who cares for which flower beds. They decided that there will be some flower beds which only one of them will take care of and others that they will both take care of, but on alternate days.

Alex and Benni are very reliable and Tom is satisfied with their work. Nevertheless he wants to optimize the plant growth.

Since Tom has read in a magazine that plants grow better when they are fertilized, he decides to let Alex and Benni fertilize his plants. The magazine recommends the use of the chemicals **A X200®** or **B Y33®**, since both are especially effective.

However, Tom also read that it can damage plants when they are exposed to multiple different types of chemicals. Tom therefore decides that he only wants to use one fertilizer. He goes for **A X200®**.

Standard Norm Violation:

Tom instructs Alex and Benni to buy the chemical A X200® and to use only this fertilizer.

Alex volunteers for buying several bottles of this chemical for Benni and himself.

After a few weeks, Tom goes for a walk in his garden. **He realizes that some of his plants are much prettier and bigger than before. However, he also realizes that some of his plants have lost their beautiful color and are dried up.**

That makes Tom very sad and reflective. He wonders whether the drying of his plants might have something to do with the fertilization. He wants to investigate this matter and talks to Alex and Benni.

Alex tells him that he followed Tom's instructions and only bought and used the chemical **A X200®**.

However, Benni tells him that he had used the chemical **B Y33®** instead. He still had some bottles of this chemical in stock at home and wanted to use them up.

Since some flower beds were only fertilized by Alex or only fertilized by Benni, but others by both, Tom asks Alex and Benni to make a detailed plan about which of his 30 flower beds had been fertilized by whom in the last few weeks. Afterwards, he takes a closer look at the flower beds.

He realizes that the plants were bigger and more beautiful where only one single chemical had been used (i.e., only A X200® or only B Y33®).

They were dried up in the flower beds on which both A X200® and B Y33® were applied by the gardeners.

Unintended Norm Violation:

Tom instructs Alex and Benni to buy the chemical A X200® and to use only this fertilizer.

Alex volunteers for buying several bottles of this chemical for Benni and himself.

After a few weeks, Tom goes for a walk in his garden. **He realizes that some of his plants are much prettier and bigger than before. However, he also realizes that some of his plants have lost their beautiful color and are dried up.**

That makes Tom very sad and reflective. He wonders whether the drying of his plants might have something to do with the fertilization. He wants to investigate this matter and talks to Alex and Benni.

Alex tells him that he followed Tom's instruction: "I only bought and used the chemical A X200® which I had funneled into the blue can."

Benni suddenly is startled and says to Alex: "What? You funneled A X200® into the *blue* can? But you told me you had funneled it into the *green* can! That's why I always used the green can!"

Alex replies: "Did I? Then I am sorry!"

Tom remembers that he had filled B Y33® in a green can - long before he had read about the chemicals in his magazine. He had never used it. **So Benni must have accidentally, without knowing it, applied the chemical B Y33®, whereas only Alex applied A X200®.**

Since some flower beds were only fertilized by Alex or Benni, but others by both, Tom asks Alex and Benni to make a detailed plan about which of his 30 flower beds had been fertilized by whom in the last weeks. Afterwards, he takes a closer look at the flower beds.

He realizes that the plants were bigger and more beautiful where only one single chemical had been used (i.e., only A X200® or only B Y33®).

They were dried up in the flower beds on which both A X200® and B Y33® were applied by the gardeners.

Ignorant norm violation:

When Tom meets Alex in the garden shortly afterwards, he instructs him to buy the chemical A X200® and to use only this fertilizer. He also explicitly instructs him to tell Benni to only use A X200®.

Alex volunteers to buy several bottles of this chemical for Benni and himself and to tell Benni about Tom's instruction.

After a few weeks, Tom goes for a walk in his garden. **He realizes that some of his plants are much prettier and bigger than before. However, he also realizes that some of his plants have lost their beautiful color and are dried up.**

That makes Tom very sad and reflective. He wonders whether the drying of his plants might have something to do with the fertilization. He wants to investigate this matter and talks to Alex and Benni.

Alex immediately starts apologizing: "I am sorry! I completely forgot to tell Benni about the rule! I bought and used the chemical **A X200®** but Benni must have used something else because he did not know about the new rule."

Benni tells Tom that Alex had not told him that they were only supposed to use A X200®. He explains: "I have used the fertilizer I previously used; it is called **B Y33®!**"

Tom remembers that he had filled B Y33® in a green can - long before he had read about the chemicals in his magazine. He had never used it. **So Benni must have accidentally, without knowing it, applied the chemical B Y33®, whereas only Alex applied A X200®.**

Since some flower beds were only fertilized by Alex or Benni, but others by both, Tom asks Alex and Benni to make a detailed plan about which of his 30 flower beds had been fertilized by whom in the last weeks. Afterwards, he takes a closer look at the flower beds.

He realizes that the plants were bigger and more beautiful where only one single chemical had been used (i.e., only A X200® or only B Y33®).

They were dried up in the flower beds on which both A X200® and B Y33® were applied by the gardeners.

Deceived Norm Violation:

When Tom meets Alex in the garden shortly afterwards, he instructs him to buy the chemical A X200® and to use only this fertilizer. He also explicitly instructs him to tell Benni to only use A X200®.

Alex volunteers to buy several bottles of this chemical for Benni and himself and to tell Benni about Tom's instruction.

After a few weeks, Tom goes for a walk in his garden. **He realizes that some of his plants are much prettier and bigger than before. However, he also realizes that some of his plants have lost their beautiful color and are dried up.**

That makes Tom very sad and reflective. He wonders whether the drying of his plants might have something to do with the fertilization. He wants to investigate this matter and talks to Alex and Benni.

After some interrogation, Alex finally confesses that he had told Benni that Tom wanted them to buy and use the chemical B Y33® instead of A X200®. He wanted Benni to use the wrong fertilizer and to get fired because he wanted to have more working hours to earn more money. He himself only used **A X200®**.

Benni tells Tom that Alex had told him that they were only supposed to use B Y33®. He therefore only used **B Y33®** without knowing that Tom actually intended both gardeners to use A X200®.

Since some flower beds were only fertilized by Alex or Benni, but others by both, Tom asks Alex and Benni to make a detailed plan about which of his 30 flower beds had been fertilized by whom in the last weeks. Afterwards, he takes a closer look at the flower beds.

He realizes that the plants were bigger and more beautiful where only one single chemical had been used (i.e., only A X200® or only B Y33®).

They were dried up in the flower beds on which both A X200® and B Y33® were applied by the gardeners.

Control Questions

Which chemical(s) were actually applied by each gardener? (you may select one, both, or neither for each gardener)

	Chemical A X200®	Chemical B Y33®
Alex	☐	☐
Benni	☐	☐

Which chemical(s) did Tom WANT each of the gardeners to use? (you may select one, both, or neither for each gardener)

	Chemical A X200®	Chemical B Y33®
Alex	☐	☐
Benni	☐	☐

Please estimate what percentage of the flowers dried up in each of the categories below (0% = none of the flowers dried up, 100% = all of the flowers dried up). We are looking for an estimate based on the story, you were not given exact numbers.

- Plants that were ONLY fertilized with chemical A X200® (0 – 100)
- Plants that were ONLY fertilized with chemical B Y33® (0 – 100)
- Plants that were fertilized with BOTH chemicals (0 – 100)

Primary Dependent Variables

Causation:

Agent Condition

Who caused the plants to be dried out? (select one or more)

- ☐ Alex
- ☐ Benni

Action Condition

What caused the plants to be dried out? (select one or more)

- ☐ The fertilization by Alex
- ☐ The fertilization by Benni

Object Condition

What caused the plants to be dried out? (select one or more)

- The application of chemical A X200®
- The application of chemical B Y33®

Counterfactual Relevance:*Agent Condition*

Now suppose that some people are discussing the fact that the flowers dried up and wondering how things could have been different. In thinking about who could have acted differently, please tell us whether it would be relevant or irrelevant to focus on the following people:

	Relevant	Irrelevant
Alex	☐	☐
Benni	☐	☐

Action Condition

Now suppose that some people are discussing the fact that the flowers dried up and wondering how things could have been different. In thinking about what could have happened differently, please tell us whether it would be relevant or irrelevant to focus on the following things:

	Relevant	Irrelevant
The fertilization by Alex	☐	☐
The fertilization by Benni	☐	☐

Object Condition

Now suppose that some people are discussing the fact that the flowers dried up and wondering how things could have been different. In thinking about what could have happened differently, please tell us whether it would be relevant or irrelevant to focus on the following things:

	Relevant	Irrelevant
The application of chemical A X200®	☐	☐
The application of chemical B Y33®	☐	☐

Probability Estimates We did not observe an effect of condition on participants' estimates of the percentage of flowers that dried, this was true of estimates when only A X200® was applied, $F(3,435) = 0.06$, $p = 0.981$, when only B Y33® was applied, $F(3,435) = 0.09$, $p = 0.966$, and when both were applied, $F(3,435) = 0.64$, $p = 0.588$. This pattern precisely replicates the one observed in S&W.

Experiment 2*No Norm Violation*

A philosophy department at a small university bought a vending machine to dispense and keep track of office supplies. Currently, the machine has pencils, which you can get by pulling a black lever or a red lever, and erasers, which you can get from the machine by pulling a white lever.

The white lever on the vending machine frequently malfunctions. When pulled, it produces both an eraser and a pencil, but breaks the pencil in the process.

Pencils are often needed by students who are taking tests, but there are usually plenty of pencils and erasers in the vending machine, so both the administrative assistants and the professors are allowed to take pencils and erasers from the machine.

Professor Smith was recently hired at the department. He was told that he is allowed to take pencils and erasers from the vending machine. However, he was not told that the white lever almost always malfunctions.

One morning, Professor Smith and an administrative assistant both go to the vending machine and pull a lever at the same time. The administrative assistant wanted a pencil, so he pulled the black lever. Professor Smith also wanted a pencil and so he pulled the red lever. Both levers worked like they were supposed to, and they both got a pencil from the vending machine.

These were the last two pencils in the vending machine.

Not long after, a student desperately needs a pencil for a test, but when she goes to the vending machine, there are no more pencils. This leads to a serious problem.

Moral Norm Violation

A philosophy department at a small university bought a vending machine to dispense and keep track of office supplies. Currently, the machine has pencils, which you can get by pulling a black lever or a red lever, and erasers, which you can get from the machine by pulling a white lever.

The white lever on the vending machine frequently malfunctions. When pulled, it produces both an eraser and a pencil, but breaks the pencil in the process.

Pencils are often needed by students who are taking tests, so to make sure there are always enough pencils, the philosophy professors are told to buy their own pencils and not take them from the vending machine. Only the administrative assistants are allowed to take pencils from the vending machine. There are plenty of erasers though, so both administrative assistants and professors are allowed to take erasers from the machine.

Professor Smith was recently hired at the department. He was told that he was not allowed to take pencils from the vending machine, but that he was allowed to take erasers. However, he was not told that the white lever almost always malfunctions.

One morning, Professor Smith and an administrative assistant both go to the vending machine and pull a lever at the same time. The administrative assistant wanted a pencil, so he pulled the black lever. Professor Smith also wanted a pencil and so he pulled the red lever. Both levers worked like they were supposed to, and they both got a pencil from the vending machine.

These were the last two pencils in the vending machine.

Not long after, a student desperately needs a pencil for a test, but when she goes to the vending machine, there are no more pencils. This leads to a serious problem.

Functional Norm Violation

A philosophy department at a small university bought a vending machine to dispense and keep track of office supplies. Currently, the machine has pencils, which you can get by pulling a black lever or a white lever, and erasers, which you can get from the machine by pulling a red lever.

The red lever on the vending machine almost always malfunctions. When pulled, it produces both an eraser and a pencil, but breaks the pencil in the process.

Pencils are often needed by students who are taking tests, but there are usually plenty of pencils and erasers in the vending machine, so both the administrative assistants and the professors are allowed to take pencils and erasers from the machine.

Professor Smith was recently hired at the department. He was told that he is allowed to take pencils and erasers from the vending machine. However, he was not told that the red lever almost always malfunctions.

One morning, Professor Smith and an administrative assistant both go to the vending machine and pull a lever at the same time. The administrative assistant wanted a pencil, so he pulled the black lever. Professor Smith wanted an eraser and so he pulled the red lever. The black lever worked like it was supposed to and the administrative assistant got a pencil. However, the red lever malfunctioned, and the professor got an eraser and a completely broken pencil.

These were the last two pencils in the vending machine.

Not long after, a student desperately needs a pencil for a test, but when she goes to the vending machine, there are no more pencils. This leads to a serious problem.

Control Questions

What are each of the levers **supposed** to deliver?

	Pencil	Eraser
Red lever	☐	☐
Black lever	☐	☐

What did each person actually receive from the vending machine after they pulled the lever?

(Check all boxes that apply.)

	Pencils	Erasers
Professor Smith	☐	☐
The administrative assistant	☐	☐

According to the department's rules, which office supplies was each person allowed to take from the vending machine? (Check all boxes that apply.)

	Pencils	Erasers
Professor Smith	☐	☐
The administrative assistant	☐	☐

Manipulation Check Questions

One of the levers could be used to get erasers. How likely was this lever to malfunction?

Please indicate your answer using the scale below (with 0 meaning maximally unlikely and 100 meaning maximally likely)

[Scale from 0 – 100]

Please tell us whether you agree or disagree with this statement about Professor Smith:

It was morally wrong for Professor Smith to pull the red lever.

[Scale from 1 ('Strongly agree') to 7 ('Strongly disagree') with a midpoint of 4 ('Neither agree nor disagree')]

Primary Dependent Variables

Causation:

Agent Condition

Who caused the problem? (select one or more)

- ☐ The administrative assistant
- ☐ Professor Smith

Object Condition

What caused the problem? (select one or more)

- ☐ The black lever
- ☐ The red lever

Counterfactual Relevance***Agent Condition***

Now suppose that some people are discussing the problem the student had and wondering how things could have been different. In thinking about who could have acted differently, please tell us whether it would be relevant or irrelevant to focus on the following people:

	Relevant	Irrelevant
The administrative assistant	☐	☐
Professor Smith	☐	☐

Object Condition

Now suppose that some people are discussing the problem the student had and were wondering how things could have been different. In thinking about what could have happened differently, please tell us whether it would be relevant or irrelevant to focus on the following things:

	Relevant	Irrelevant
The black lever	☐	☐
The red lever	☐	☐

Results of Manipulation Check Questions***Moral check***

Participants in the Moral Norm Violation condition much more strongly agreed that it was immoral for Professor Smith to pull the red lever ($M = 3.69$, $SD = 1.71$), than participants in the No Norm Violation condition ($M = 5.88$, $SD = 1.31$), $t(247.01) = -11.57$, $p < .001$, $d = 1.43$, or

the Functional Norm Violation condition ($M = 5.81$, $SD = 1.52$), $t(277) = -10.95$, $p < .001$, $d = 1.31$. The No Norm Violation and Functional Norm Violation conditions did not differ significantly from one another, $t(266) = 0.41$, $p = .685$, $d = 0.04$.

Probability Check

Participants in all three conditions estimated the probability that the lever that gave erasers would malfunction to be significantly above 50%, and thus not a descriptive norm violation. Most critically, this was observed in the Functional Norm Violation condition ($M = 85.32$, $SD = 21.39$), $t(130) = 18.90$, $p < .001$. It was additionally observed in the Moral Norm Violation condition ($M = 72.21$, $SD = 22.63$), $t(126) = 11.06$, $p < .001$, and the No Norm Violation condition ($M = 75.19$, $SD = 22.86$), $t(114) = 11.82$, $p < .001$.