Asymmetries in attributions of blame and praise, intent, and causality:

Free will, responsibility, and the side-effect effect

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Gilad Feldman designed Study 1. Prasad designed and wrote the pre-registration for follow-up Study 2. Gilad conducted data collection for both studies. Prasad and Adrien analyzed the data. Adrien and Prasad wrote the manuscript and edited revisions. Prasad, Adrien, and Gilad jointly finalized the manuscript for submission.

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Pre-registration peer review / verification			X
Data analysis peer review/verification	X	X	
Methodology	X	X	X
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Abstract

The Side-Effect Effect (SEE) is the phenomenon that negative side-effects elicit stronger attributions of intent and blame than intent and praise for positive side-effects. There are similar documented asymmetries showing stronger free will attributions to negative than to positive, and stronger associations between free will attributions and blame for negative outcomes than associations between free will attributions and praise for positive outcomes. Together, these are two well-known paradigms in experimental philosophy that have thus far mostly been studied separately. Given that they both examine similar domains regarding agency, intent, and responsibility, we aimed to integrate the two paradigms to examine possible joint effects and interactions. We used the classic SEE scenario with within and between designs, manipulated free will by contrasting deterministic versus indeterministic universes, and measured free will attributions. In two experiments (overall $N = 1520$), we found support for side-effect effects regarding attributions of intentionality and knowledge (Study 1: $d = 0.58$-1.77; Study 2: $d = 0.61$-1.75). We found a strong association between blame/praise and free will attributions, even when controlling for intent and knowledge. Finally, we found that when participants were asked to imagine a counterfactual and report praise or blame based on the experimental condition, blame was more strongly attributed to hypothetical harmful outcomes than praise to helpful outcomes. We found no consistent support for an interaction between the two paradigms, suggesting that they uniquely affect attributions. All materials, data, and code are available on: https://osf.io/z3g6d/

Keywords: free will, experimental philosophy, attributions, side-effect effect, blame, praise

Asymmetries in attributions of blame and praise, intent, and knowledge: Free will, responsibility, and the side-effect effect

In the last decade, there has been increasing interest in moral social cognition, examining how people perceive, interpret, and understand moral behavior. Experimental philosophy has brought philosophy into the lab, testing lay beliefs and folk psychology of abstract philosophical questions. This work has led to interesting observations revealing cognitive processes regarding the way that people think regarding philosophical domains such as intent, morality, and free will. In the present investigation, we set out to combine two of the most well-known paradigms in experimental philosophy – the classic side-effect effect (SEE) impacting attributions of intent, and the classic thought experiments regarding an (in)deterministic universe impacting attributions of free will and moral responsibility. Our goal was to investigate the interplay between the SEE and free will attribution paradigms.

Side-Effect Effect

SEE is the phenomenon that harmful outcomes of an action are perceived as more intentional than helpful outcomes, even when the agent had no particular desire to bring about these outcomes (Knobe, 2003). Studies of the phenomenon typically introduce participants to the following vignette (brackets describe the manipulation):

> The vice-president of a company went to the chairman of the board and said, ‘We are thinking of starting a new program. It will help us increase profits, but it will also [positive condition - **help**; negative condition - **harm**] the environment.’
>
> The chairman of the board answered, ‘I don't care at all about [positive condition - **helping**; negative condition- **harming**] the environment. I just want to make as much profit as I can. Let's start the new program.'
>
> They started the new program. Sure enough, the environment was [positive condition - **helped**; negative condition - **harmed**].

> Now consider a seemingly straightforward question:
> Did the chairman of the board [positive condition - **help**; negative condition - **harm**] the environment intentionally?

In the original experiment, 82% of participants in the negative outcome condition reported that the agent intentionally brought about the side-effect. In contrast, only 33% of participants in the positive outcome condition attributed intentionality to the agent described in the scenario.

People attributed more intentionality and blame to negative side-effects than intentionality and praise to positive side-effects, although the descriptions were identical, aside from the outcomes. Thus, SEE exemplifies a blame-praise judgments asymmetry (Hindriks, 2008) and its links to folk perceptions of intentionality (Malle & Knobe, 1997; Chandrashekar et al., 2022). The extant research has also reported SEE regarding attributions of knowledge (Beebe & Buckwalter, 2010; Beebe & Jensen, 2012). The SEE was proposed as an alternative account to the earlier view that the motivations and intent of the agent are the basis of the intentionality attributed to a behavior (Heider, 1958; Ohtsubo, 2007; Shultz & Wells, 1985). The SEE account proposed that outcomes influence the perceiver's reasoning about the intentionality of the described behavior.

Judgments of blame (vs. praise) are affected by multiple sources of information related to the outcome, including the agent's foreseeability of the outcome, the intent of the agent causing the harm, and counterfactuals about the agent's action (Cushman et al., 2008; Laurent et al., 2019). Much of the impetus in explaining the SEE has been focused on the intuitions of intentionality.

Since the first demonstration (Knobe, 2003), SEE of intentionality has been considered a fairly robust effect (Beebe & Buckwalter, 2010; Cova & Naar, 2012; Feltz, 2007; Guglielmo &

Malle, 2010; Klein et al., 2018; Laurent et al., 2019), and subsequently has been documented in other aspects such as causality (Tannenbaum et al., 2007), desire (Pettit & Knobe, 2009), and action versus in-action (Cushman et al., 2008). In addition, further work explaining the underlying cognitive processes that bring about asymmetry in the intuitions of ordinary subjects related to the SEE notes the role of emotions (Zucchelli et al., 2019) and individuals' personality differences (Cokely & Feltz, 2009).

Judgments of moral responsibility take into account several different aspects such as causality, intent, and counterfactuals about what could have been different (Malle, 2021). Blame serves the function of regulating behaviors of individuals in a society that promotes adherence to a set of moral standards (Monroe & Malle, 2019; Tetlock et al., 2010). Moreover, blame as an aspect of regulation extends to unintentional outcomes. For example, Monroe and Malle (2019) found that blame is constrained by the evidence that one's moral judgment is justified. Komatsu et al. (2021) found that robots are blamed more for inaction than humans when they fail to save lives because people think robots can prevent death better than humans. In other words, blame judgments also take into account the preventability, and the possibility that an agent could have taken steps to prevent an adverse outcome modulates the assessment of blame (Martin et al., 2019; Weiner, 1995).

On the other side, praise has often been overlooked. Indeed, while both are judgments regarding intentionality and causality, praise appears less sensitive to these features, and more in line with general features about an individual's stable, underlying character traits (Anderson et al., 2020). Blame seems to be more about the action, whereas praise seems to be more about the person who performed the action. This may explain why studies have documented blame and praise asymmetries in that they elicit very different attributions.

Linking free will and SEE: Free will and intent attributions to side-effects

Free will is often understood as a necessary condition for moral responsibility, because people perceive accountability as dependent on the person's capacity to have chosen to do otherwise (Monroe et al., 2014). In other words, that the agent has chosen their behavior freely, which may suggest stronger responsibility for his/her own actions. Empirical studies found support for the view that negative actions and outcomes were attributed stronger free will than positive ones, even for non-moral scenarios (Feldman et al., 2016; Fillon et al., 2021, Genschow & Vehlow, 2021). We therefore speculated that an agent in a situation involving a harmful outcome scenario is attributed more free will than an agent with a beneficial outcome, even when the outcome was a side-effect.

The side-effect effect paradigm has been used to demonstrate asymmetries in the attribution of intent and blame/praise to seemingly unintended side-effects. The attribution of intent is therefore not only one of the factors associated with the attribution of blame and praise, but, looking at the reverse causal chain, intent is affected by the attribution of blame, so that the need for blame and holding someone accountable leads to stronger attributions of intent (Monroe & Malle, 2019; Malle et al., 2022). Therefore, if even unintended harmful side-effects elicit higher intent, then it is possible that the "bad is freer than good" paradigm identified for free will attributions (Feldman et al., 2016) also extends to lesser chosen or "free" side-effects. That is, if the intentionality side-effect effect extends to free will attributions, then even if the protagonist (e.g., the chairman) only chooses to do something because of focusing on a different unrelated reason (e.g., to increase profits) and that this choice is driven by external pressures (e.g., the board and the shareholders), then with harmful outcomes (e.g., environment is harmed) the protagonist is still attributed as having more free will and the capacity for choice to do otherwise.

Further, examining intent and free will attributions together also helps make clearer the differences between them and their possible links in theories of blame and blame models. For example, in Malle et al. (2014)'s Theory of Blame they provided a "Path Model of Blame" with many different factors, including "intentionality" ("whether the agent brought about the event intentionally") and "capacity" ("whether the agent could have prevented the event"), yet missing the component of "free will" or "choice" (whether the agent could have chosen whether to prevent the event or not). Choice is loosely related to some of the other factors in the path model, such as "obligation" which serves as an external pressure limiting choice, yet goes far beyond that in capturing internal and external factors that may have restricted choice (Feldman, 2017). Studying intentionality and free will together by first using two experimental philosophy paradigms that focus on free will and intentionality, and then measuring both free will, intentionality, and blame attributions, can help shed light on 1) the associations between the three and 2) how each factor is affected by manipulations that impact free will and intentionality.

Linking free will and SEE: Manipulation of both agency and outcome valence

Experimental philosophy used thought experiments to provide additional insights regarding causality, determinism, and compatibilism (Feltz & Cova, 2014; Nahmias et al., 2007; Nichols & Knobe, 2007). We adapted this methodology to combine the thought experiments used to study SEE and free will. As the background context for the classic experimental philosophy SEE chairman scenario, we added the classic experimental philosophy manipulation of free will by describing the universe as either being deterministic or indeterministic.

The side-effect effect was initially demonstrated about intentionality: that when negative outcomes occur, to hold people accountable people judge other's behavior linked to that outcome to be an intended consequence of their action. Intentionality attributions are evaluations of whether an outcome of an associated action was planned. For example, when the protagonist has no foreknowledge of the negative outcome, then intentionality attributions are weaker (Laurent et al., 2019).

Free will attributions are focused on agency and choice: whether people are perceived to have had the choice to do otherwise, without internal or external constraints (Feldman, 2017).

While both attributions are associated with blame (Malle et al., 2014), they are conceptually and empirically different (Feldman et al., 2016, Philips & Knobe, 2009). One important difference is that free will is (mostly) the capacity for action regardless of constraints, both internal and external, and regardless of the outcome, whereas intentionality is a purely internal process, and focused on an association with an outcome. However, these nuanced differences in peoples' understanding of free will and intention have so far not been comprehensively examined in the literature (Feldman, 2017).

In the present investigation, we measured intention and free will attributions, and we manipulated SEE and free will environment to assess how intentionality and free will attributions covary, and how they might be differentiated when judging unintentional harm and help outcomes. We considered the control condition for the manipulation of free will universe as a replication of the side-effect effect.

Extension: Attributions of regret and moral responsibility

We also added an extension aiming to examine attributions of regret in the context of free will and SEE. Fillon et al. (2021) examined the relationship between agency and regret, and reported stronger regret attributed to exceptionality compared to regret, and with stronger regret attributed in an in-deterministic universe compared to deterministic universe, with no support for an interaction. Additionally, they reported that regret attributions were positively associated with free will and moral responsibility attributions (r = 0.20 – 0.42). Their findings overall suggested that when things go badly, a stronger sense of agency is related to feeling more responsible for the negative outcome and feeling stronger regret for it. Given that in the SEE there is a manipulation of outcome valence, we were interested whether: 1) we would be able to replicate the pattern of results for regret, and 2) whether this pattern of stronger responsibility would also translate to taking credit for positive outcomes, and whether that would be impacted by manipulation of agency.

The present investigation

We sought to combine two of the most well-known experimental philosophy paradigms, the side-effect effect and free will, and examine their joint effects and possible interactions. In doing so, we aimed to extend our understanding of both the SEE and free will attributions in several ways.

First, we tested for the SEE on the ratings of the attribution of free will, asking: Do people attribute higher free will to harmful side-effects than to beneficial side-effects of an action? Second, we tested associations between free will attributions and attributions of responsibility (both blame and praise). Third, we investigated whether manipulating free will universe impacts the SEE. Fourth, we examined whether the two manipulations of (in)determinism and valence are additive or interact to impact attributions of intent, free will, knowledge, regret, and moral responsibility.

Finally, we extended the typical SEE procedure. In the classic SEE paradigm participants read a scenario in which the protagonist is either blamed for harmful actions or praised for helpful actions. To strengthen the between-subject design to also include a within-subject design, within each outcome condition we had participants respond to both praise and blame for both the positive and the negative side-effects. For example, participants who read the SEE scenario that led to a helpful outcome rated both praise for the described positive outcome and blame in case the outcome was different and led to harm. We summarized our hypotheses in Table 1.

Overview, open science, pre-registrations, and disclosures

We conducted two experiments to test our predictions. Study 1 formed the initial exploratory investigation and was conducted together with another study (we, therefore, consider this to be an exploratory pre-test, see pre-registration of a combined with other research directions https://osf.io/embrp/). In Study 2, we pre-registered the specific predictions and ran a dedicated data collection with a larger sample (https://osf.io/4n5tk/). All materials, datasets, and analysis scripts are available on the OSF at https://osf.io/z3g6d/.

All studies, participants, measures, manipulations, and exclusions conducted for this investigation are reported, and data collection was completed before hypothesis testing. Tests were two-tailed, and α was set at .05.

Table 1

Summary of hypotheses, rationale, and findings in Studies 1 and 2

Context	**H#**	**Hypothesis**	**Rationale**	**Type**	**Study 1**	**Study 2**
Side-effect effect	1a	Blame attributions for harm > praise attributions for help	Classic side-effect effect.	Confirmatory replication	Supported *d* = 1.39 [1.14, 1.64]	Supported *d* = 1.50 [1.36, 1.63]
	1b	Intent attributions for harm > Intent attributions for help	Classic side-effect effect Blame requires intentionality and causality (Malle, 2014), which is not the case for praise (Anderson et al., 2020), thus we can expect the same pattern.	Confirmatory replication	Supported *d* = 1.52 [1.27, 1.77]	Supported *d* = 1.61 [1.48, 1.75]
	1c	Knowledge attributions for harm > Knowledge attributions for help	Beebe and Jensen (2012) found that knowledge is more attributed for harm than for help.	Confirmatory replication	Supported *d* = 0.81 [0.58, 1.04]	Supported *d* = 0.73 [0.61, 0.86]
	2	Free will attributions for harm > Free will attributions for help	Free will has a positive relationship with blame for harm (Feldman et al., 2016; Fillon et al., 2021; Genschow & Vehlow, 2021), but to our knowledge, no investigation was conducted regarding praise. Also, we can draw a direct link with the bad is freer than good (Feldman et al., 2016) concept.	Exploratory	Unsupported *d* = 0.12 [-0.10, 0.34]	Supported *d* = 0.18 [0.06, 0.30].

Context	H#	Hypothesis	Rationale	Type	Study 1	Study 2
Interaction with the Universe	3	The SEE effect on blame/praise, intention, and knowledge is weaker in the deterministic universe than in the indeterministic universe.	Based on the possibility that perceptions of agency, or free will, underlie the SEE.	Exploratory	Supported blame/praise d = -0.82 [-1.10, -0.53], intention d = -0.29 [-0.58, -0.02] and knowledge d = -0.32 [-0.60, -0.04]	Supported blame/praise d = -0.49 [-0.63, -0.34] intention d = -0.11 [-0.25, -0.04], and not supported knowledge d = -0.01 [-0.13, 0.16]
SEE at the individual level	4	Blame is more attributed than praise, regardless of the SEE outcome.	Bad is stronger than good (Baumeister et al., 2001). Otherwise, this is the first time, to our knowledge, that blame is assessed for a helpful outcome and praise for a harmful outcome.	Exploratory	Supported η^2_p = 0.41	Supported η^2_p = 0.38
Correlations	5a	Free will attributions differ from intent attributions – Free will attributions are weakly or not significantly correlated with intent attributions.	Based on Feldman (2017) Intent and free will are different in nature and are related by the necessity to blame someone.	Exploratory	Supported r = .15 [.04, .26]	Supported r = .08 [.02, .14]
	5b	Blame attributions are positively correlated to free will attributions.	Based on Malle (2014) and Feldman (2017), free will is a condition to blame and thus, should be positively correlated.	Confirmatory	Supported r = .54 [.46, .61]	Supported r= .50 [.46, .54]

Context	**H#**	**Hypothesis**	**Rationale**	**Type**	**Study 1**	**Study 2**
	5c	Blame attributions are positively associated with free will attributions, even after controlling for attributions of intent.	Figure 2 from Malle (2014) indicates that intent modulates the relationship between causality and blame, while Table 2 from Feldman (2017) suggests that intentionality is not of the same nature as free will and should not be a necessary condition for the relationship between blame and free will.	Exploratory	Supported $r = .33$	Supported $r = .50$ [.45, .54]
Regret (Study 2)	6	Regret attributions for a negative outcome to an agent in the indeterministic universe is higher in comparison to an agent in the deterministic universe.	There is an association between free will and responsibility/blame, we therefore expect that agents in an indeterministic universe will be rated as experiencing higher regret over negative outcomes in comparison to agents in a deterministic universe due to negative side-effect.	Exploratory	N/A	Unsupported $d = 0.07$ [-0.08, 0.21]

Note. The hypotheses are not clearly stated in the pre-registration of Study 1. We based this table on the hypotheses written in the pre-registration of study 2. Inconsistent findings across Studies 1 and 2 were marked by italics.

Study 1: Exploratory pre-test

Method

Joint data collection with another project

Our original hypotheses and measures were included as a part of a prior experiment testing another hypothesis by Feldman and Chandrashekar (2018). In Feldman and Chandrashekar's (2018) study, the core experimental manipulations were of a deterministic versus indeterministic universe, focusing on other key measures of interest, and the additional SEE scenarios were added for exploratory purposes (disclosures in their supplementary materials page 2 read: "The data collection included a second part with an experiment regarding the Knobe (2003) side-effect effect. That experiment is unrelated to the research questions in this manuscript and therefore not included or referenced.". Thus, the results presented in this paper are original, going beyond the findings reported in Feldman and Chandrashekar (2018).

Participants

A total of 427 US American participants were recruited from Amazon Mechanical Turk using CloudResearch (Litman et al., 2017). We employed the following CloudResearch options: Duplicate IP Block, and recruited participants with approval rate of 95% and above and who had more than 100 tasks approved. We first excluded 13 participants who indicated a low English proficiency or self-reported not being serious about filling in the survey. These exclusion criteria were not pre-registered for Study 1, yet we applied it to be consistent with the pre-registered criteria of Study 2. The exclusion criteria did not have much impact and did not change any of the conclusions of the study (differences in effect size were smaller than 0.1), and we provided the results without exclusions with our code. Second, we excluded responses from 101 participants assigned to an additional experimental condition not meant for this investigation[1]. Thus, responses from 312 participants were included in this analysis (M_{age} = 36.2, SD_{age} = 12.13; 179 females). See the supplementary materials for additional details and procedures related to the sample.

Procedure and design

We summarized the experimental design in Table 2 detailing all the manipulations.

We randomly assigned participants to one of six between-subject conditions in a 3 (universe: deterministic vs. indeterministic universe vs. control) by 2 (negative - harmed the environment vs. positive - helped the environment), first manipulating the presented hypothetical universe and then presenting the classic chairmen side-effect effect scenario as taking place in that universe. Manipulations and measures were first pretested in a sample of undergraduates from a university in Hong Kong.

Participants assigned to the deterministic universe and indeterministic universe conditions read a description of the assigned hypothetical universe, then answered comprehension questions and attributions about the described universe to further strengthen the understanding of the described universe. Participants in the universe control condition were not provided with a descriptions of a hypothetical universe. Next, participants were presented with one of the two side-effect effect scenarios. In the deterministic universe and indeterministic

[1] The additional experimental condition presented participants with an "uncertain" universe in which it was not clear whether people are an exception to determinism or not, described and used in Feldman and Chandrashekar (2018). We do not analyze or report this condition as it was not meant for the current investigation, as mirrored by the design of the follow-up Study 2. We also note that because of Feldman and Chandrashekar (2018) the indeterministic and deterministic conditions had several questions more than the control condition that were presented to participants before the side-effect effect scenario and questions.

universe conditions , the scenarios were described as taking part in the previously described hypothetical universe.

The hypothetical universe related descriptions were adjusted from Nichols and Knobe (2007), which contrasted a fully deterministic universe with a universe in which all is deterministic with the exception of humans. In the original study, the two universes were presented together, yet we adjusted the experimental paradigm to split the two descriptions into two different between-subject conditions. The deterministic and indeterministic universe conditions were presented as follows:

> *Deterministic universe:*
>
> Imagine a universe (Universe D) in which everything that happens is completely caused by whatever happened before it. This is true from the very beginning of the universe, so what happened in the beginning of the universe caused what happened next, and so on right up until the present. For example, one-day John decided to have French Fries at lunch. Like everything else, this decision was completely caused by what happened before it. So, if everything in this universe was exactly the same up until John made his decision, then it had to happen that John would decide to have French Fries.
>
> *Indeterministic universe:*
>
> Imagine a universe (Universe D) in which almost everything that happens is completely caused by whatever happened before it. The one exception is human decision making. For example, one-day John decided to have French Fries at lunch. Since a person's decision in this universe is not completely caused by what happened before it, even if everything in the universe was exactly the same up

until John made his decision, it did not have to happen that John would decide to have French Fries. He could have decided to have something different.

Following the manipulation of the universe, participants read a reminder of the hypothetical universe with the Knobe side-effect managerial scenario as if it was taking part in the hypothetical universe.

The managerial scenario was followed by a manipulation check regarding the outcome of the managerial decision—"what was the environmental outcome of the chairman's decision to start the new program?" (1 = *The environment was helped*; 2 = *The environment was harmed*; 3 = *The scenario does not say*).

Table 2

Studies 1 and 2: Experimental design

<table>
<tr>
<td>IV2: Side-effect outcome valence [2 Between]

IV1: Universe manipulation [3 Between]</td>
<td><u>IV2: Negative outcome:</u>
Harmed the environment

[In Universe D there is a company.]
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, but it will also harm the environment". The chairman of the board answered, "I don't care at all about harming the environment. I just want to make as much profit as I can. Let's start the new program." They started the new program. Sure enough, the environment was harmed.</td>
<td><u>IV2: Positive outcome:</u>
Helped the environment

[In Universe D there is a company.]
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, and it will also help the environment". The chairman of the board answered, "I don't care at all about helping the environment. I just want to make as much profit as I can. Let's start the new program". They started the new program. Sure enough, the environment was helped.</td>
</tr>
<tr>
<td><u>Control</u>:
[No description]

<u>Deterministic universe</u>:
Imagine a universe (Universe D) in which everything that happens is completely caused by whatever happened before it. This is true from the very beginning of the universe, so what happened in the beginning of the universe caused what happened next, and so on right up until the present. For example, one-day John decided to have French Fries at lunch. Like everything else, this decision was completely caused by what happened before it. So, if everything in this universe</td>
<td colspan="2"><u>Forced manipulation/comprehension check:</u>
“To make sure you understood the scenario - what was the environmental outcome of the chairman's decision to start the new program?”
The environment was helped / The environment was harmed / The scenario doesn't say

<u>Attributions</u> dependent variables:
All measures: 1 (Strongly Disagree) to 6 (Strongly Agree).

<u>Knowledge</u>
"[In Universe D,] the chairman knew the implications of the new program on the environment"
"[In Universe D,] the chairman understood the implications of the new program on the environment"

<u>Intent</u></td>
</tr>
</table>

was exactly the same up until John made his decision, then it had to happen that John would decide to have French Fries.	"[In Universe D,] the chairman intentions were to have such implications of the new program on the environment?" "[In Universe D,] did the chairman intentionally affect the environment?"
Indeterministic universe: Imagine a universe (Universe D) in which almost everything that happens is completely caused by whatever happened before it. The one exception is human decision making. For example, one-day John decided to have French Fries at lunch. Since a person's decision in this universe is not completely caused by what happened before it, even if everything in the universe was exactly the same up until John made his decision, it did not have to happen that John would decide to have French Fries. He could have decided to have something different.	Free will "[In Universe D,] the chairman was free to choose not to start the new program" (Reversed) "[In Universe D,] the chairman had to choose what he chose, and could not have chosen to do otherwise" Accountability: Praise attributions "[In Universe D,] the chairman should be applauded for his actions if they led to positive outcomes" Accountability: Blame attributions "[In Universe D,] the chairman should be criticized for his actions if they led to the environment being harmed" Regret/joy [Only in Study 2] "[In Universe D,] the chairman would regret his decision if he learned that his actions led to the environment being harmed."

Note. Participants in the universe control condition only answered the dependent variables and were not provided with a description of a universe.

Measures

We summarized the experimental design in Table 2 with all the measures used.

Participants evaluated the chairman's behavior on knowledge, intent, free will, and accountability (praise and blame), with all measures on a scale from 1 (*Strongly Disagree*) to 6 (*Strongly Agree*).

Knowledge attributions.

Two items measured the attributions of the extent to which the manager described in the scenario knew about and understood the possible implications of the decision - "In Universe D, the chairman knew the implications of the new program on the environment" and "In Universe D, the chairman understood the implications of the new program on the environment" (α = .87).

Intent attributions.

Two items measured attributions of intentionality, whether the manager intended for the program to have the outcome that it did—"In Universe D, the chairman intentions were to have such implications of the new program on the environment?"[2] and "In Universe D, did the chairman intentionally affect the environment?" (α = .81).

Free will attributions.

Two items measured attributions of free will, whether the manager had the freedom to choose otherwise—"In Universe D, the chairman was free to choose not to start the new program" and "In Universe D, the chairman had to choose what he chose, and could not have chosen to do otherwise" (reversed) (α = .87).

[2] A reviewer noted during peer review that the first intent measure was grammatically incorrect. We therefore conducted an analysis for each of the two variables, and found very similar results. Given the appropriate reliability of the two items, we concluded that the participants understood the first sentence as intended, despite the grammatical issues, and proceeded to report the results based on the aggregate. We recommend future research address this issue by rephrasing this specific item.

Accountability

In the classic SEE experiment, participants typically rated a single dependent variable varied according to the condition, meaning that in the harm condition participants measure measuring blame for the harmful event and praise for the helpful event, we measured blame and praise for both conditions.

Praise attributions.

Regardless of the assigned outcome condition, participants rated whether *positive* side-effects deserve *praise* - "In Universe D, the chairman should be applauded for his actions if they led to positive outcomes."

Blame attributions.

Regardless of the assigned outcome condition, participants rated whether *negative* side-effects deserve *blame* – "In Universe D, the chairman should be criticized for his actions if they led to the environment being harmed.".

Results

Data analysis

We initially pre-registered an analysis with "Two-way ANOVA with *t*-test contrasts for universe with harm/help" without indicating the type of t-test and overlooking the control condition. In our analyses, we used the Welch *t*-test instead of the Student *t*-test because it is more robust to violation of various statistical assumptions (Delacre et al., 2017). We also reported results based on the broader 3 (Experimental condition: Control, Deterministic universe, Indeterministic universe) × 2 (Outcome: Harm vs. Help) ANOVA. The results based on the pre-registered 2 × 2 ANOVA are provided in the supplementary materials (with the exclusion of the control condition, as pre-registered). We also ran an exploratory mixed ANOVA with 2 (measures, within: Blame vs. Praise) ×3 (universe, between: Control vs. Deterministic vs. Indeterministic) × 2 (outcome, between: Harm vs. Help).

We summarized the descriptive statistics of all dependent variables in six between-subjects experimental conditions in Table 3.

Manipulation checks

In the harm condition, one participant reported that the chairman helped the environment, and in the help condition, three participants reported that the chairman harmed the environment and three participants selected “the scenario does not say.” We also ran the analysis without these participants, and the results were similar without exclusions as for example, the main effect of SEE was d = 1.59, 95%CI [1.34, 1.85] for the sample with excluded participants, and d = 1.52 [1.27, 1.77] without the exclusions. Because we pre-registered the analysis of the entire sample and the results were similar, below we report results without exclusions.

Table 3

Study 1: Descriptive statistics grouped by experimental conditions

Experimental condition	**Outcome**	**Dimension**	**Mean**	**SD**
Control	Harm (n = 55)	Praise	2.49	1.60
		Blame	5.36	0.93
		Intention	4.52	1.14
		Free will	5.45	0.91
		Knowledge	5.67	0.55
	Help (n = 56)	Praise	3.07	1.52
		Blame	4.63	1.21
		Intention	2.40	1.16
		Free will	5.26	0.77
		Knowledge	4.88	0.89
Deterministic Universe	Harm (n = 55)	Praise	2.85	1.41
		Blame	3.96	1.57
		Intention	3.95	1.38
		Free will	2.84	1.71
		Knowledge	5.18	1.12
	Help (n = 51)	Praise	2.63	1.39
		Blame	3.45	1.35
		Intention	2.40	1.22
		Free will	2.49	1.49
		Knowledge	4.33	1.43
Indeterministic Universe	Harm (n = 48)	Praise	3.54	1.71
		Blame	5.44	0.77
		Intention	4.54	1.09
		Free will	5.33	1.06
		Knowledge	5.56	0.70
	Help (n = 47)	Praise	3.26	1.28
		Blame	4.36	1.39
		Intention	2.54	1.35
		Free will	5.12	0.84
		Knowledge	4.62	1.25

The side-effect effect

Replication of the original Praise and Blame effect

We found that blame for a potential negative outcome in the harm condition was higher than praise for a potential positive outcome in the help condition (H1a; $t(307.9) = 12.26$, $p < .001$, $g = 1.39$, *95% CI* [1.14, 1.64]). The results were similar for the intentionality (H1b; $t(309.8) = 13.42$, $p < .001$, $g = 1.52$ [1.26, 1.77]) and knowledge (H1c; $t(273.1) = 7.16$, $p < .001$, $g = 0.81$ [0.58, 1.04]). However, we found no support for differences in the free will attributions between the harm and help conditions (H2; $t(309.7) = 1.05$, $p = .294$, $g = 0.12$ [-0.10, 0.34]).

Extension: Differences between praise for positive outcomes and blame for negative outcomes regardless of the assigned outcome condition

Participants rated blame for negative outcomes and praise for positive outcomes, regardless of the outcomes in the scenario. As an exploratory extension, we conducted a 2 (measures, within: Blame vs. Praise) ×3 (universe, between: Control vs. Deterministic vs. Indeterministic) × 2 (outcome, between: Harm vs. Help) mixed ANOVA, summarized in Table 5. We found support for an interaction between the measure and the outcome (H4; $F(1, 306) = 13.81$, $p < .001$, $\eta^2_p = .04$). Praise attributed for a positive side-effect in the harmful outcome condition was similar to the praise attributed for a positive side-effect in the helpful outcome (respectively $M = 2.98$, $SD = 1.42$, $M = 2.94$, $SD = 1.62$) but blame attributed was higher for the negative side-effect in the harmful outcome condition than for a negative side-effect in the helpful outcome condition (respectively $M = 4.90$, $SD = 1.34$, $M = 4.16$, $SD = 1.40$).

Interaction: Indeterminism manipulation and the side-effect effect

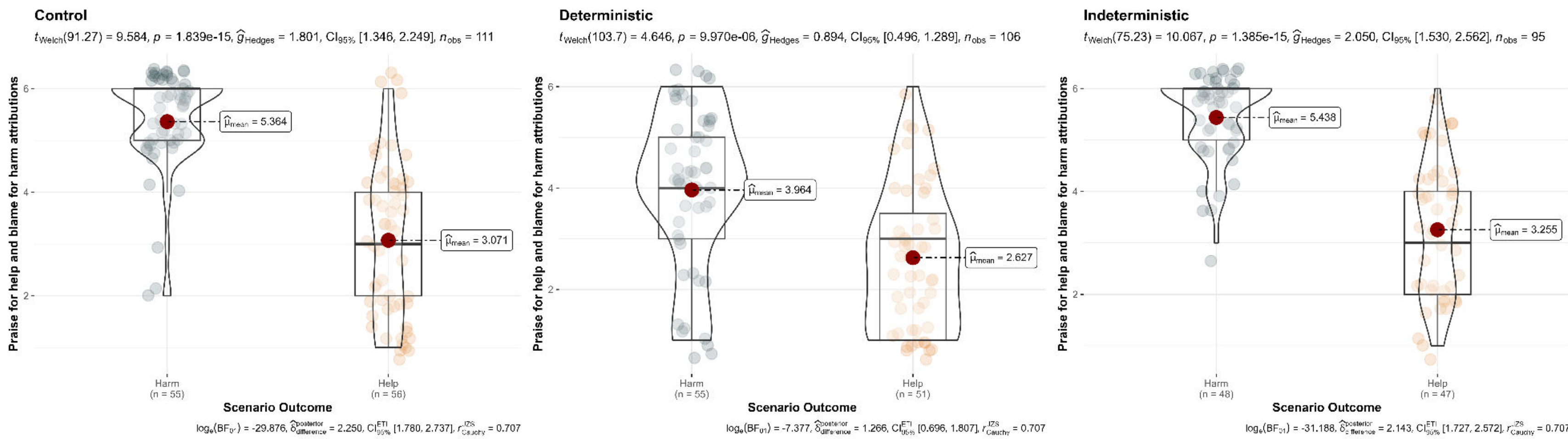
The SEE was found across all universe conditions (Figure 1). The effect was the strongest in the indeterministic universe (*g* = 2.05 [1.53, 2.56]) and the lowest in the deterministic universe (H3; *g* = 0.89 [0.50, 1.29]). The control condition seemed closer to the indeterministic universe condition (*g* = 1.80 [1.35, 2.25]).

The results were similar for the attributions of intention (Figure 2) and knowledge (Figure 3), with stronger effect sizes for the indeterministic and control universes than for the deterministic universe for both intent (indeterministic: *g* = 1.16 [1.15, 2.08]; control: *g* = 1.83 [1.38, 2.27]; deterministic: 1.17 [0.76, 1.58]) and knowledge (indeterministic: *g* = 0.92 [0.49, 1.35]; control: *g* = 1.06 [0.67, 1.47]; deterministic: *g* = 0.66 [0.26, 1.05]). We found no support for a difference between free will attributions (Figure 4) within the universes (indeterministic: *g* = 0.23 [-0.18, 0.62]; control: *g* = 0.22 [-0.15, 0.59]; deterministic: *g* = 0.22 [-0.16, 0.59]).

The results from the ANOVA (Table 4) indicated a main effect of the harmful/helpful outcome manipulation on all variables but free will attribution, a main effect of the type of universe manipulation on all variables but intentionality attribution, and an interaction effect only for the praise/blame attributions.

Figure 1

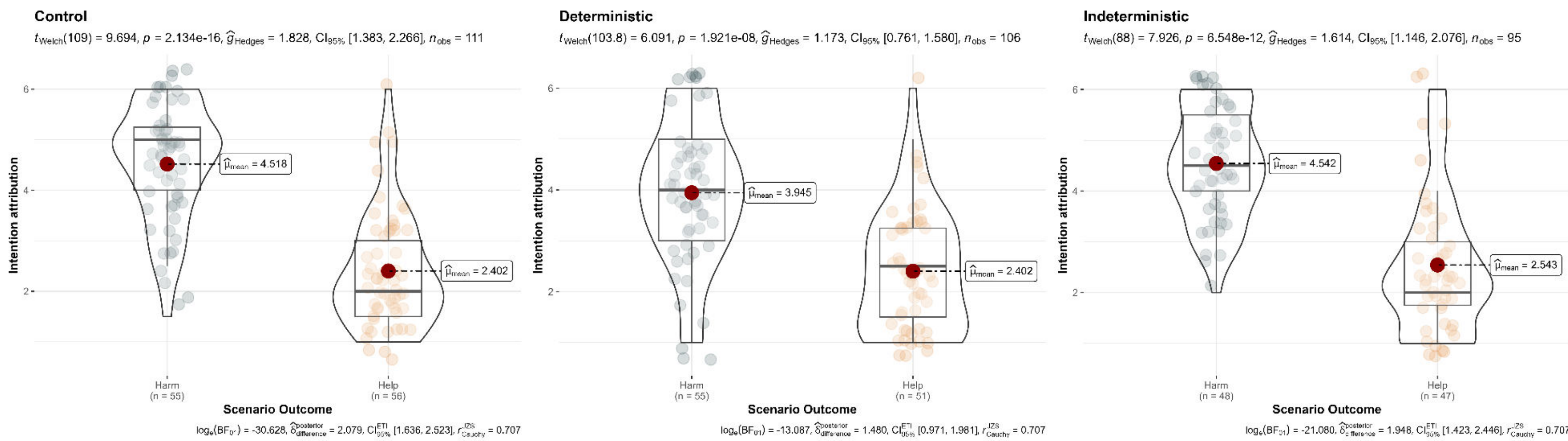
Study 1: Praise/blame attributions across universes (replication of side-effect effect)



*Note***.** Violin plots of the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure 2

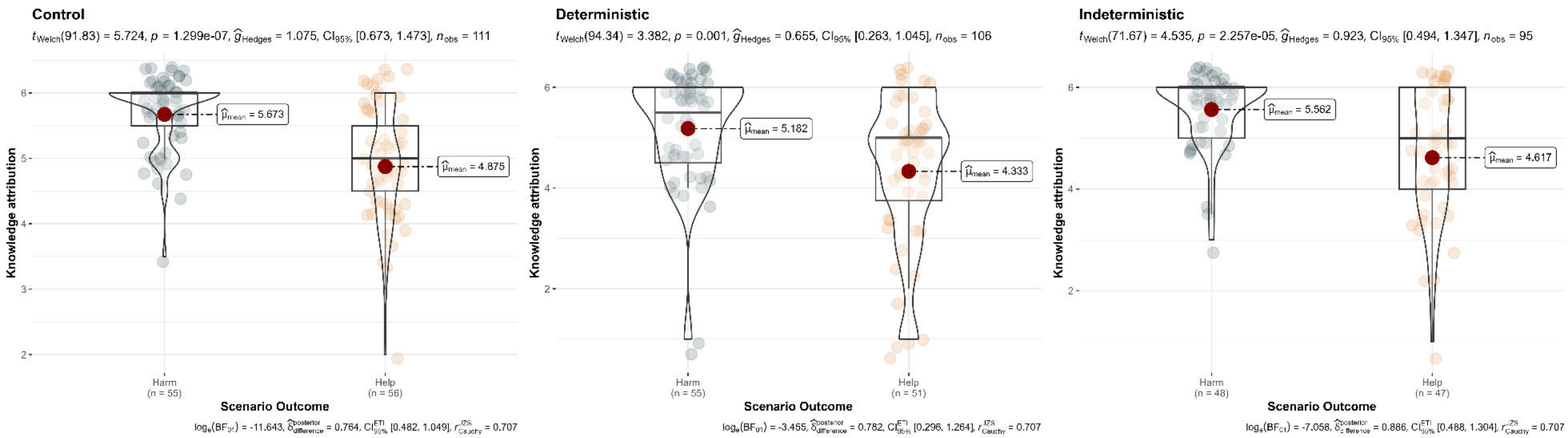
Study 1: Intent attributions across universes



Note. Violin plots of the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure 3

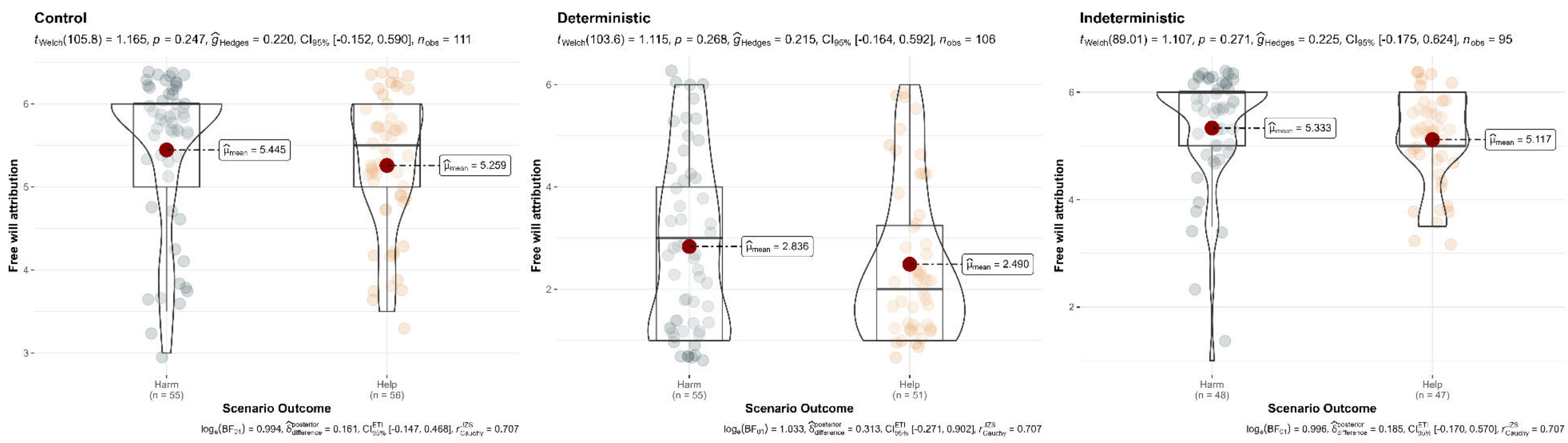
Study 1: Knowledge attributions across universes



Note. Violin plots of the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure 4

Study 1: Free will attributions across universe conditions



Note. Violin plots of the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Table 4

Study 1: Outcome and universe two-way ANOVA for attributions of blame/praise, intentionality, knowledge, and free will

	Praise for help and blame for harm attributions					**Intentionality attribution**					**Knowledge attribution**					**Free Will attribution**				
Factor	*F*	*df*	*MS*	*p*	η^2_p	*F*	*df*	*MS*	*p*	η^2_p	*F*	*df*	*MS*	*p*	η^2_p	*F*	*df*	*MS*	*p*	η^2_p
Outcome (Help vs Harm)	175.75	1	291.21	<.001	.04	182.80	1	276.22	<.001	.37	54.69	1	57.93	<.001	.15	3.44	1	4.84	.065	.01
Universe	20.58	2	34.10	<.001	.12	2.55	2	3.85	.080	.02	6.96	2	7.37	.001	.04	172.27	2	242.29	<.001	.53
Outcome × Universe	4.37	2	7.24	.013	.03	1.62	2	2.44	.201	.01	0.13	2	0.14	.874	.00	0.14	2	0.19	.873	.00

Note. Outcome and Universe are between subject variables. *df* = degree of freedom, *MS* = Mean square, $\eta^2 p$ = partial eta-squared.

Extension: Praise and blame within-subject regardless of assigned outcome

We tested the interaction between praise and blame at the individual level. We conducted a mixed ANOVA with 2 (measures, within: Blame vs. Praise) ×3 (universe, between: Control vs. Deterministic vs. Indeterministic) × 2 (outcome, between: Harm vs. Help). We summarized the results of the ANOVA in Table 5, plotted in Figure 5.

We found support for a main effect of praise and blame, as blame attributions were higher than praise attributions. Praise and blame attributions were higher in the indeterministic universe than in the deterministic, the control group was closer to the deterministic universe for praise, and closer to the indeterministic universe for blame, $F(2, 306) = 11.86$, $p < .001$, $\eta^2_p = .07$. For praise attributions, we found no support for differences across the universes and the harmful/helpful scenarios. For blame attributions, the harmful and helpful scenarios led to stronger attributions in the indeterministic and control universes than in the deterministic universe. Finally, we found no support for a 3-way interaction ($F(2, 306) = 2.02$, $p = .134$, $\eta^2_p = 0.002$).

Table 5

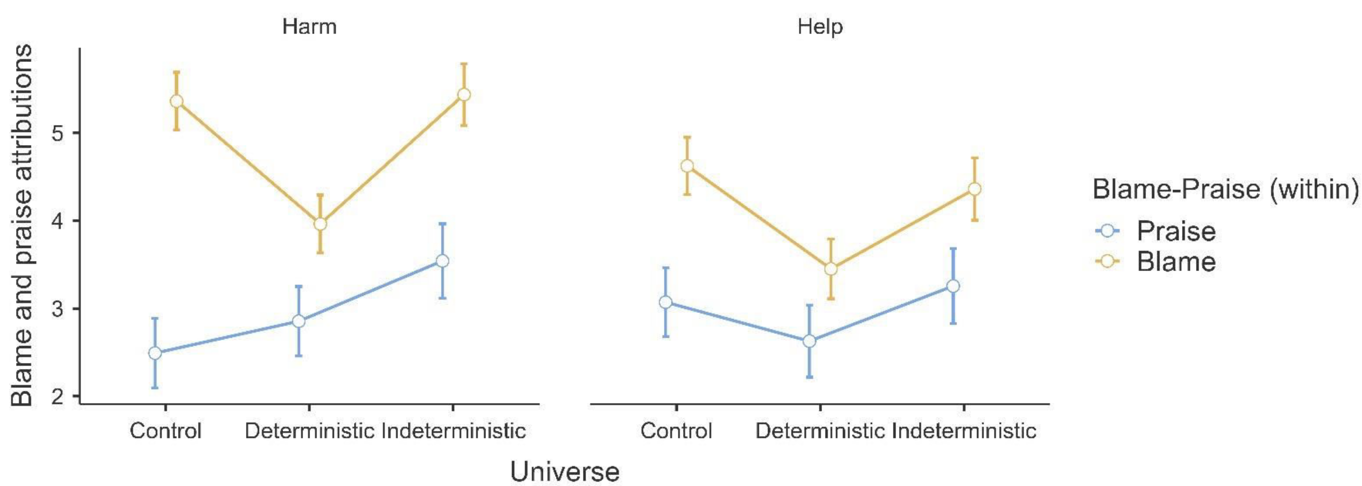
Study 1: Praise and blame attributions – 3 way mixed ANOVA testing the effects of measures, outcome, and universe

	Praise/Blame attributions				
Factor	*F*	*df*	MS	*p*	η^2_p
Measure (Blame vs. Praise)	211.09	1	377.92	<.001	.41
Measure × Outcome (Help vs. Harm)	13.81	1	24.72	<.001	.04
Measure × Universe	11.86	2	21.23	<.001	.07
Measure × Outcome × Universe	2.02	2	3.62	.134	.01

Note. Mixed ANOVA design: 2 (measures, within: Blame vs. Praise) ×3 (universe, between: Control vs. Deterministic vs. Indeterministic) × 2 (outcome, between: Harm vs. Help). *df* = degree of freedom, *MS* = Mean Square, η^2p = partial eta-squared.

Figure 5

Study 1: Estimated marginal means for praise/blame attributions – 3 way mixed ANOVA testing the effects of measures, outcome, and universe



Associations between free will and blame/praise attributions

We found support for a positive correlation between free will and blame attributions. For the control group, the correlation was $r(111) = .36$ [.18, .51], $p < .01$, and even stronger when considering the whole sample (H5b), $r(312) = .54$ [.46, .61], $p < .001$. The association held when we ran a partial correlation analysis controlling for the effect of intent and knowledge attributions (H5c; for the control group, $r(111) = .33$, $p < .001$; for the whole sample, $r(312) = .52$, $p < .001$).

We reported the correlations among other attributes in Table 6 (and Table S8 for the correlations by type of universe). Overall, free will attributions had a relatively weak positive correlation with attributions of intent (H5a; $r = .15$ [.04, .26]) and knowledge ($r = .14$ [.03, .24]), and there was a positive correlation between attributions of intent and knowledge ($r = .31$ [.21, .41]). For praise, we only found support for an association with intent ($r = .14$ [.03, .24], no support for a correlation found in the subsample of the control condition).

Table 6

Study 1: Means, standard deviations, and correlations across all conditions with confidence intervals

Variable	***M***	***SD***	**1**	**2**	**3**	**4**	**5**
1. Free will attributions	4.40	1.72	(.87)				
2. Intent attributions	3.40	1.55	.15** [.04, .26]	(.81)			
3. Knowledge attributions	5.05	1.13	.14* [.03, .24]	.35** [.25, .44]	(.87)		
4. Praise attributions	2.96	1.52	.11 [-.00, .22]	.14* [.03, .24]	-.02 [-.13, .09]	--	
5. Blame attributions	4.53	1.42	.54** [.46, .61]	.32** [.22, .42]	.31** [.21, .41]	.08 [-.04, .19]	--

Note. M and *SD* are used to represent mean and standard deviation, respectively. Correlation reported are Spearman correlations. Values in square brackets indicate 95% confidence intervals for each correlation. Alpha coefficients for scales measured with two or more items are on the diagonal cells. $N = 312$. The correlational table by type of universe can be found in Table S9.

Discussion

In Study 1, we replicated and extended the well-known findings of the perceived blame/praise asymmetry, intentionality and knowledge of side-effects (Knobe, 2003). Participants attributed more blame for the negative side-effect than praise for the positive side-effect, and more intentionality and knowledge for harm than for help. In line with our predictions, these differences were stronger when the incident was described to be occurring in an indeterministic universe than in a deterministic universe. However, we found no support for differences in free will attributions.

In exploratory extensions, we found that participants attributed more blame than praise for side-effects, regardless of the scenario, and more blame in the indeterministic universe than the deterministic universe, which was not the case for praise. We found that free will attributions were most strongly correlated with blame attributions, even after controlling for ratings of intentionality and knowledge.

Study 2: Confirmatory investigation

Study 2 was designed to test the robustness of the results noted in Study 1, with a dedicated pre-registration and using a larger well-powered sample. We also added a measure of regret. Based on a priori power analysis, we planned to recruit 1086 participants, with a statistical power of 0.95, an α set to .05, and an effect size of Cohen's $d = 0.20$. The smallest effect size of interest was based on Study 1, which compared free will attribution for a harmful outcome between the indeterministic and deterministic universes.

Method

Participants, procedures, and measures

A total of 1108 US American participants were recruited from Amazon Mechanical Turk using CloudResearch (Litman et al., 2017). We employed the following CloudResearch options: Duplicate IP Block, Block Suspicious Geocode Locations, and Verify Worker Country Location, and recruited participants with approval rate of 95% and above and with 1000-500000 approved tasks. After excluding 15 participants following the pre-registered exclusion criteria (see supplementary material for details), the final sample was 1093 (577 females; $M_{\text{age}} = 38.34$, $SD_{\text{age}} = 12.09$).

As in Study 1, we assigned participants randomly to one condition in a 3 (universe manipulation: Indeterministic, Deterministic, Control) × 2 (outcome: harm vs. help) between-subject design. The scenario descriptions and measures of free will, blame, intentionality, and knowledge attributions were exactly the same as the ones in Study 1, summarized in Table 2.

Added measure: Attributions of regret.

We added a measure of attributions of regret to the agent with one item on a 7-point scale (0 = *Strongly disagree*, 6 = *Strongly agree*). The item was "Do you agree with the following statement? - In Universe D, the chairman would regret his decision if he learned that his actions led to the environment being harmed."

Results

We summarized descriptive statistics in Table 7. The comprehension check showed that five participants thought the environment was helped in the harm condition, 16 participants thought the environment was harmed in the help condition, and 4 reported that the scenario did not indicate. Exclusions had little to no impact on the findings, for example, the difference between blame/praise was d = 1.69 [1.55, 1.83] for the pre-exclusion sample and d = 1.61 [1.48, 1.75] post-exclusion. Because we pre-registered the analysis of the entire sample and the results were similar, here we report results without any exclusions.

Table 7

Study 2: Descriptive statistics grouped by experimental conditions

Experimental condition	**Outcome**	**Dimension**	**Mean**	**SD**
Control	Harm (*n* = 185)	Praise	2.16	1.54
		Blame	5.47	0.92
		Intention	4.49	1.30
		Free will	5.48	0.88
		Knowledge	5.48	0.88
		Regret	2.09	1.39
	Help (*n* = 182)	Praise	3.13	1.33
		Blame	4.54	1.26
		Intention	2.38	1.21
		Free will	4.85	0.97
		Knowledge	4.68	1.22
		Regret	2.23	1.29
Deterministic Universe	Harm (*n* = 181)	Praise	3.08	1.63
		Blame	4.15	1.63
		Intention	4.22	1.41
		Free will	2.17	1.35
		Knowledge	5.42	0.82
		Regret	2.40	1.44
	Help (*n* = 178)	Praise	2.94	1.45
		Blame	3.49	1.60
		Intention	2.40	1.23
		Free will	2.03	1.18
		Knowledge	4.76	1.16
		Regret	2.17	1.27
Indeterministic Universe	Harm (*n* = 183)	Praise	3.50	1.83
		Blame	5.42	0.79
		Intention	4.52	1.15
		Free will	5.42	0.82
		Knowledge	5.48	0.69
		Regret	2.20	1.32
	Help (*n* = 184)	Praise	2.91	1.37
		Blame	4.53	1.49
		Intention	2.36	1.22
		Free will	5.20	1.01
		Knowledge	4.67	1.28
		Regret	2.20	1.23

The side-effect effect

Replication of the original Praise and Blame effect

We found that blame for negative side-effect in the harm condition was higher than praise for a positive side-effect in the help condition (H1a; $t(1088) = 24.75$, $p < .001$, $g = 1.50$ [1.36, 1.63]). We found similar results for the intentionality (H1b; $t(1088) = 26.65$, $p < .001$, $g = 1.61$ [1.48, 1.75]) and knowledge (H1c; $t(938.4) = 12.11$, $p < .001$, $g = 0.73$ [0.61, 0.86]) attributions. Contrary to study 1, we found a smaller difference in free will attributions between the harm and help conditions (H2; $t(1089) = 2.96$, $p = .003$, $g = 0.18$ [0.06, 0.30]). Finally, we found no support for a difference concerning our regret extension hypothesis (H6; $t(1091) = 0.34$, $p = .73$, $d = 0.02$ [-0.10, 0.14]).

Extension: Differences between praise and blame for both helpful and harmful side-effects

We measured how participants attributed blame to a negative side-effect of a helpful outcome, and praise to a negative side-effect of a harmful outcome. We conducted a mixed ANOVA with 2 (measures, within: Blame vs. Praise) ×3 (universe, between: Control vs. Deterministic vs. Indeterministic) × 2 (outcome, between: Harm vs. Help) reported in Table 9. We found support for an interaction between the measure and the outcome (H4; $F(1, 1087) = 55.8$, $p < .001$, $\eta^2_p = .05$). Praise attributed for a positive side-effect in the harmful outcome condition ($M = 2.91$, SD = 1.76) was similar to the praise attributed for a positive side-effect in the helpful outcome condition ($M = 2.99$, $SD = 1.38$), yet blame attributed to the negative side-effect in the harmful outcome condition was higher ($M = 5.02$, $SD = 1.32$) than in the helpful outcome condition ($M = 4.20$, $SD = 1.53$).

Interaction: Indeterminism manipulation and the side-effect effect

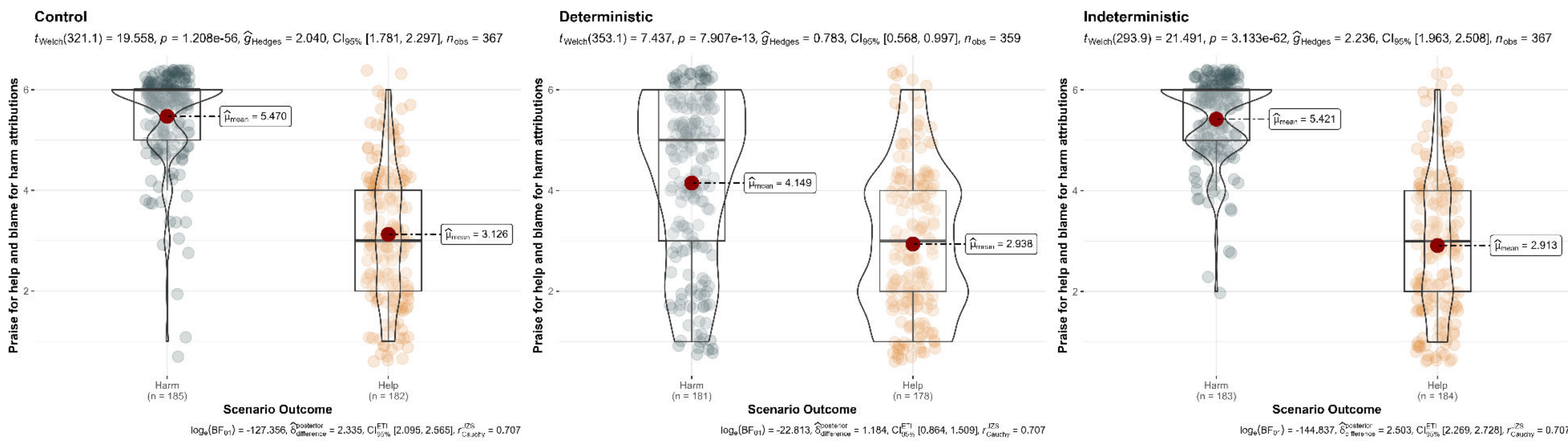
As in Study 1, the difference between blame and praise for side-effects was the highest in the indeterministic universe (H3; $g = 2.24$ [1.96, 2.51]), control in between ($g = 2.04$ [1.78, 2.30]) and the lowest in the deterministic universe ($g = 0.78$ [0.57, 1.00]), summarized in Figure 6.

We found similar results for the replication of the SEE, on the attributions of intention (Figure 7) and knowledge (Figure 8), with stronger effect sizes for the indeterministic and control universes than for the deterministic universe for both intent (indeterministic: $g = 1.81$ [1.57, 2.06]; control: $g = 1.67$ [1.43, 1.91]; deterministic: 1.37 [1.14, 1.60]) and knowledge (indeterministic: $g = 0.79$ [0.57, 1.00]; control: $g = 0.74$ [0.53, 0.96]; deterministic: $g = 0.66$ [0.45, 0.87]). There was support for differences between free will attributions (Figure 9) in the indeterministic and even stronger in the control universes, but no support in the deterministic universe (indeterministic: $g = 0.24$ [0.04, 0.45]; control: $g = 0.68$ [0.47, 0.89]; deterministic: $g = 0.12$ [-0.09, 0.32]). Finally, we found no support for an effect on regret attribution (all $g < 0.16$).

The results from the ANOVA (Table 8; Figure 10) indicated a main effect of the harmful/helpful scenarios on all variables, a main effect of the type of universe on praise/blame and free will attributions, and an interaction effect only for the praise/blame attributions (excepted regret attributions which were not affected by the scenario and universe for all conditions).

Figure 6

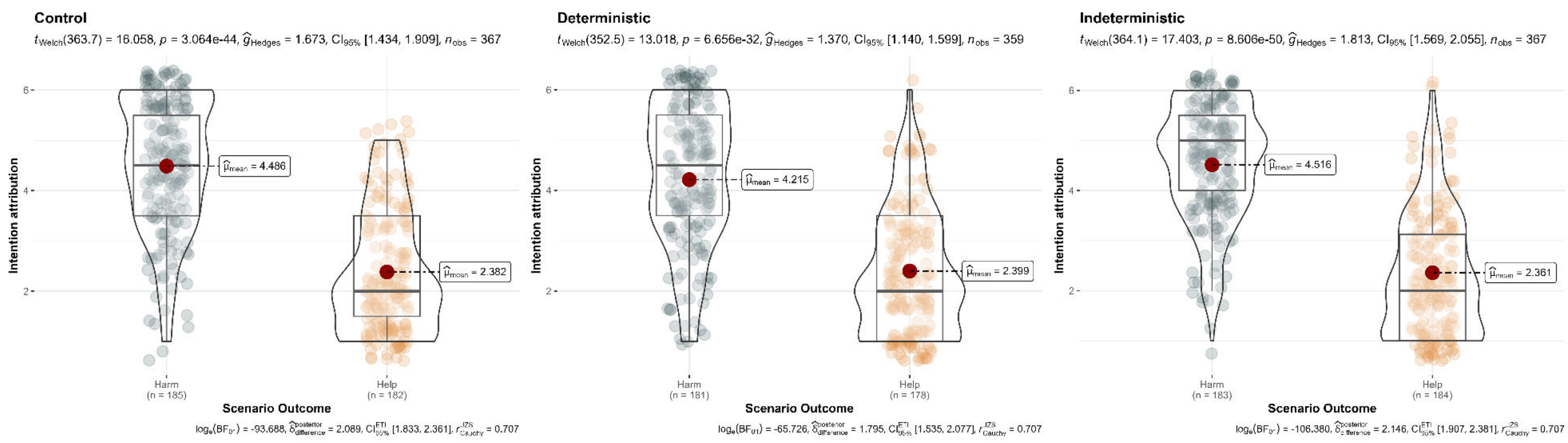
Study 2: Praise/blame attributions across universes (replication of side-effect effect)



*Note***.** A 3 (between subject; universe: control vs. deterministic vs. indeterministic) by 2 (between subject; outcome: harm vs. help) violin plots of praise/blame attributions. To mirror the classic side-effect effects, in this figure the dependent variable varies between the conditions, with blame attributions for the harm condition and praise attributions for the help condition.
Boxplots display the median, first, and third quartiles, and the red circle indicated the mean value.

Figure 7

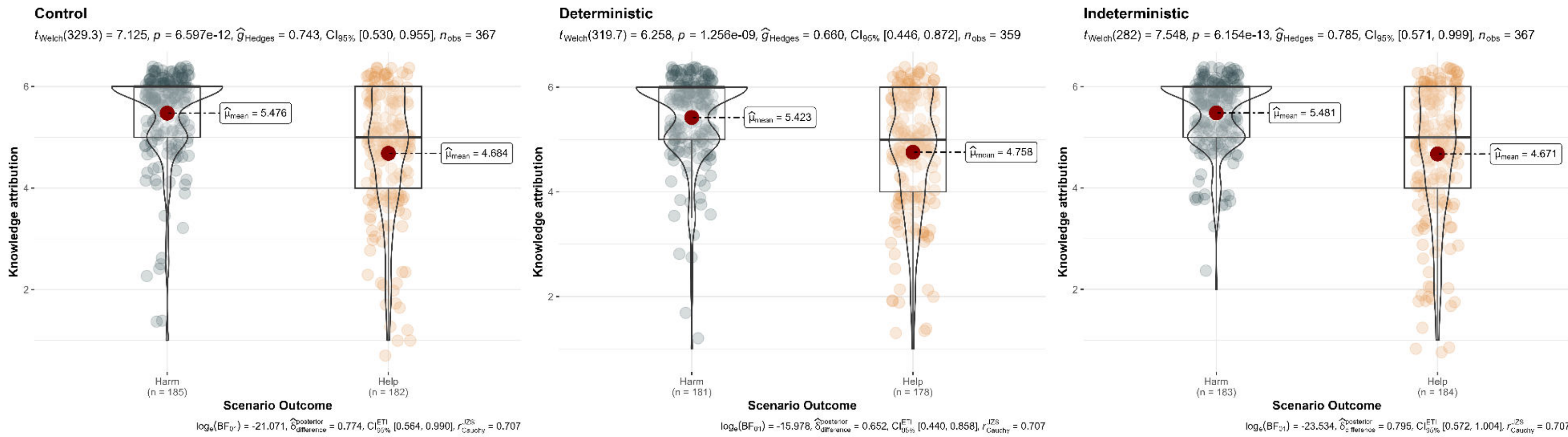
Study 2: Intentionality attributions across universe conditions



*Note***.** Violin plots of the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure 8

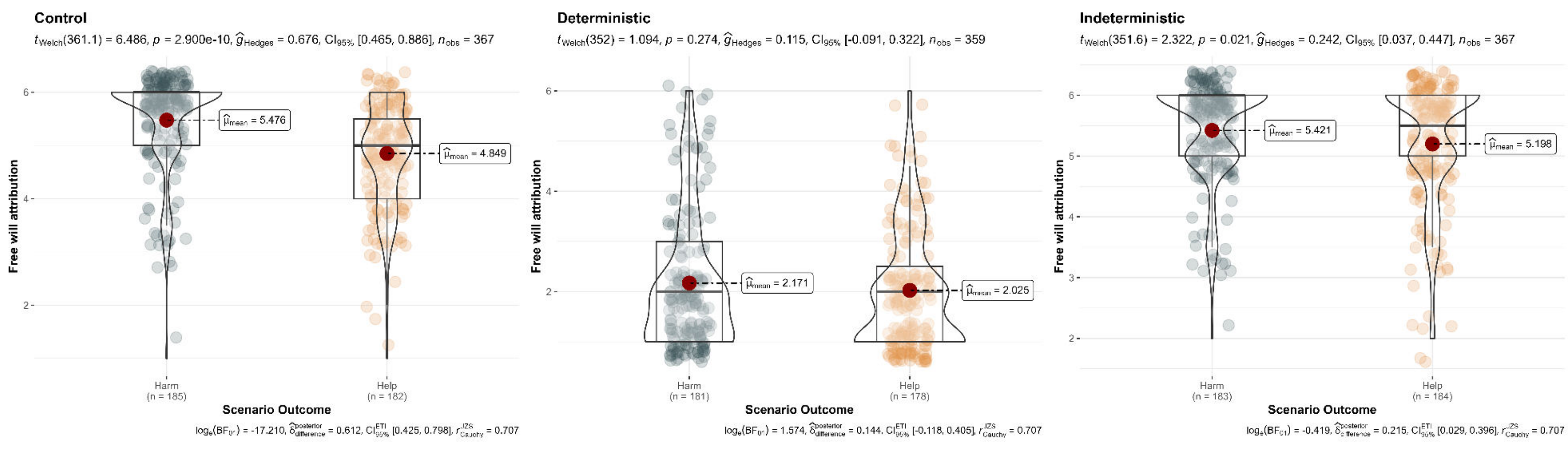
Study 2: Knowledge attributions across universe conditions



*Note***.** Violin plots of the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure 9

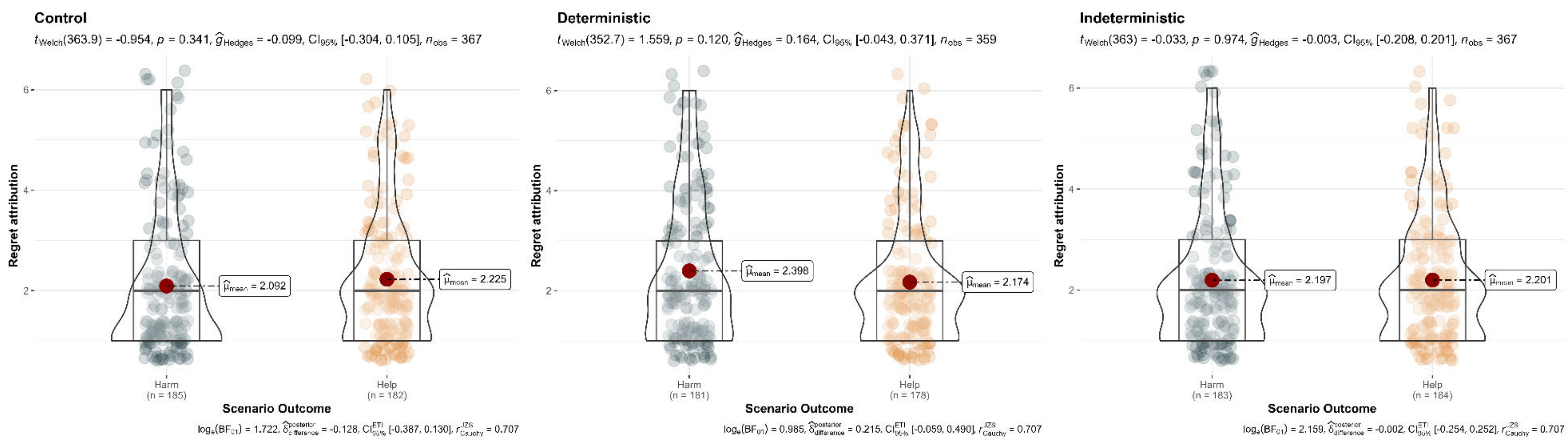
Study 2: Free will attributions across universe conditions



*Note***.** Violin plots of the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure 10

Study 2: Regret attributions across universe conditions



*Note***.** Violin plots of the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Extension: Praise and blame within-subject regardless of assigned outcome

We tested the interaction between praise and blame at the individual level. We conducted a mixed ANOVA with 2 (measures, within: Blame vs. Praise) × 3 (universe, between: Control vs. Deterministic vs. Indeterministic) × 2 (outcome, between: Harm vs. Help), and summarized the results in Table 9, plotted in Figure 11.

We found a main effect of praise-blame, as blame was attributed with more intensity than praise for side-effects of both outcomes, $F(1, 1087) = 744.1$, $MS = 1486.60$, $p < .001$. Praise was as likely attributed in the indeterministic universe than in the deterministic universe, the control group having a lower praise attribution than the other universes. On the other side, blame was higher in the indeterministic and control universes than in the deterministic universe. For the praise attribution, we found no support for a difference across the universes and the harmful/helpful scenarios. For the blame attribution, the harmful and helpful scenarios led to a stronger attribution in the indeterministic and control than in the deterministic universe. Finally, we found support for a 3-way interaction $F(2, 1087) = 17.2$, $p < .001$, $\eta^2_p = 0.03$.

Table 8

Study 2: Outcome and universe two-way ANOVA for attributions of blame/praise, intentionality, knowledge, free will, and regret

	Praise/Blame					**Intentionality**					**Knowledge**					**Free will**					**Regret**				
Factor	*F*	*df*	MS	*p*	η^2_p	*F*	*df*	MS	*p*	η^2_p	*F*	*df*	MS	*p*	η^2_p	*F*	*df*	MS	*p*	η^2p	*F*	*df*	MS	*p*	η^2_p
Outcome (Help vs Harm)	678.8	1	1115.75	< .001	.38	710.41	1	1120.76	<.001	.40	146.41	1	155.81	<.001	.12	27.43	1	30.06	<.001	0.025	0.13	1	0.22	.72	0.00
Universe	35.8	2	58.79	<.001	.06	1.28	2	4.04	.28	.002	0.19	2	0.02	.98	.001	1084.69	2	1188.65	<.001	0.667	0.87	2	1.54	.42	0.002
Outcome x Universe	27.4	2	45.09	< .001	.05	1.91	2	3.02	.148	.004	0.53	2	0.57	.586	.001	5.56	2	6.09	<.001	0.01	1.68	2	2.96	.19	0.003

Note. Outcome and universe are both between-subject manipulations. *df* = degree of freedom, *MS* = Mean Square, $\eta^2 p$ = partial eta-squared.

Table 9

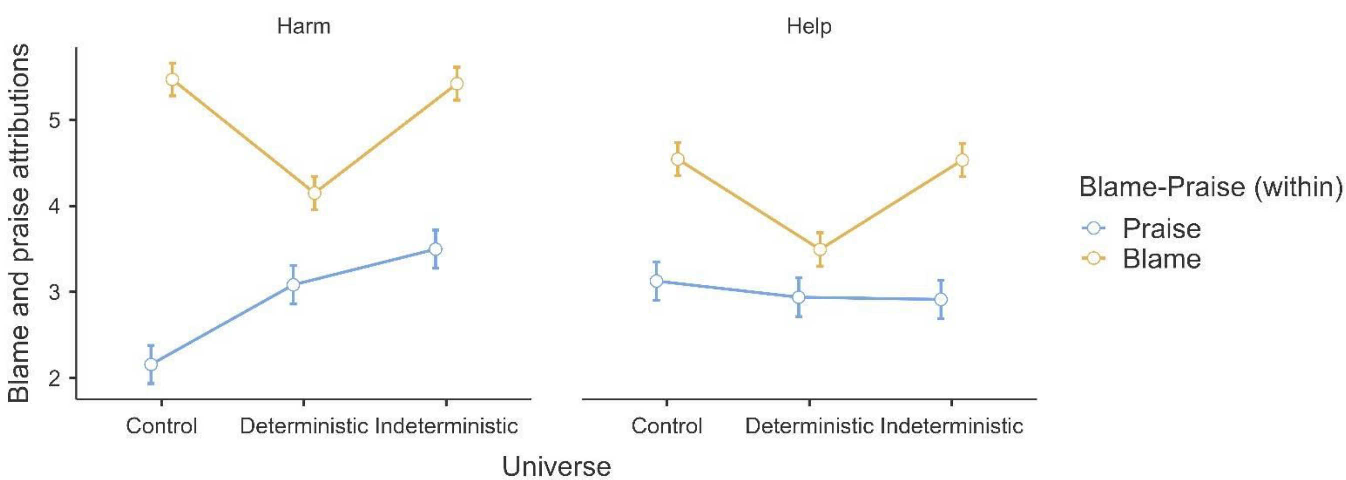
Study 2: Praise and blame attributions - Results of mixed ANOVA testing the effects of measures, outcome, and universe

	Praise/Blame attributions				
Factor	*F*	*df*	MS	*p*	η^2_p
Measure (Blame vs Praise)	744.1	1	1486.60	<.001	.13
Measure × Outcome (Help vs Harm)	55.8	1	111.47	<.001	.10
Measure × Universe	55.8	2	111.46	<.001	.20
Measure × Outcome × Universe	17.2	2	34.31	<.001	0.006

Note. Measures is a within-subject manipulation, outcome and universe are between-subject manipulation. *df* = degree of freedom, *MS* = Mean Square, $\eta^2 p$ = partial eta squared.

Figure 11

Study 2: Estimated marginal means for praise/blame attributions – 3 way mixed ANOVA testing the effects of measures, outcome, and universe



***Note*.** A 3 (between subject; universe: control vs. deterministic vs. indeterministic) by 2 (between subject; outcome: harm vs. help) by 2 (within subject; outcome: harm vs. help) plots of attributions. In this plot, praise and blame attributions are displayed separately.

Relationships between free will and blame attributions

We tested the associations between free will and blame attributions. As we hypothesized, we found strong support for a positive correlation between free will attribution and blame ratings: for the control group: $r(365) = .48$ [.40, .56], $p < .001$; for the whole sample (H5b), $r(1091) = .50$ [.46, .54], $p < .001$. The results held after controlling for the intent and knowledge attributions (for the control group: partial $r(363) = .44$ [.36, .52]; $p < .001$; for the whole sample (H5c), partial $r(1089) = .50$ [.45, .54]; $p < .001$). We reported the correlations among other attributes in Table 10 for the whole sample, and in Table S11 for the correlations per each of the universe conditions. Overall, free will attributions had a weaker positive correlation with attributions of intent (H5a; $r = .08$ [.02, .14]; $p < .01$), knowledge ($r =.10$ [.04, .15]; $p < .01$), and negative with regret ($r = -.07$ [-.13, -.01]; $p = .014$).

Table 10

Study 2 means, standard deviations, and correlations with confidence intervals

Variable	***M***	***SD***	**1**	**2**	**3**	**4**	**5**
1. Free will attribution	4.21	1.82	(.91)				
2. Intention attribution	3.40	1.61	.08** [.02, .14]	(.84)			
3. Knowledge attribution	5.08	1.10	.10** [.04, .15]	.29** [.23, .34]	(.90)		
4. Praise attribution	2.95	1.58	-.06 [-.12, .00]	.07* [.02, .13]	-.05 [-.11, .01]	--	
5. Blame attribution	4.61	1.49	.50** [.46, .54]	.27** [.22, .33]	.17** [.11, .23]	-.00 [-.06, .06]	--
6. Regret attribution	2.21	1.33	-.07* [-.13, -.01]	.16** [.11, .22]	.12** [.06, .18]	-.20** [-.26, -.14]	-.07* [-.12, -.01]

Note. M and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. Alpha coefficients for scales measured with two or more items are on the diagonal cells. The correlational table by type of universe can be found in Table S11.

Discussion

Study 2 results were largely consistent with the findings of Study 1. In line with our predictions, we found support for the side-effect effect in attributions of praise/blame, extended to outcome asymmetries regarding intent, knowledge, and to a smaller size, free will attributions. We also found support for blame, intent, knowledge, and free will attributions as being affected by (in)determinism. Finally, we found support for an interaction between (in)determinism and outcome for free will and praise/blame attributions, but not for intent and knowledge. We found no support for regret attributions effects. Finally, we found a higher magnitude of blame attribution than praise for the same participant, who attributed more blame in the indeterministic and control universes than the deterministic universe for both scenarios, and especially for harm, which was not the case for praise.

We note three takeaways from our findings. First, we found that side-effect effects are relatively consistent across contexts that vary on the possibility of free will. Attributions of blame/praise for side-effects, intent, and knowledge had a consistent and larger variation for harmful outcomes than for helpful outcomes. We also found main effect differences between blame and praise with blame attributions generally higher than praise attributions for side-effects, though this could be a psychometric artifact and so more work is needed to identify the nature of difference. Finally, free will attributions had a stronger link with blame than praise attribution, even after accounting for the perceived intentionality and knowledge attributed to the described agent.

General discussion

In two studies, we revisited and combined two classic paradigms in experimental philosophy – the side-effect effect and the impact of free will on moral accountability. We successfully replicated these classic effects, and further extended them by examining their joint effects and interactions, with several important insights. We summarized the results of the investigations in Table 1. Below, we will describe and interpret our results concerning the replication of the two main theories tested, the side-effect effect and the free will relationship with blame, before discussing the new findings linking the two theories in light of our extension regarding ascribing blame for negative side-effect of helpful outcome and praise for positive side-effects of harmful outcome.

Side-effect effect: Replication

Revisiting the SEE and examining the impact of outcome manipulation, we found that participants attributed higher intent, knowledge, and blame to harmful negative side-effects than helpful positive side-effects of an action. The results were consistent across the two samples.

In addition to the replication of the SEE on praise/blame, we replicated the asymmetry in the attributions of intent and knowledge. Our findings are in line with the extant literature on moral judgments (see Malle, 2021, for a review). For example, a recent theoretical assertion defined intentionality as follows: "people consider that an agent did X *intentionally* to the extent that X was causally dependent on how much the agent wanted X to happen (or not to happen)" (Quillien & German, 2021, p.1). We also replicated the findings from Beebe and Jensen (2012) that knowledge is also more attributed to a harmful than to a helpful side-effect, indicating that laypeople judge the knowledge of others (here, a chairman) based on the outcome of a decision, as they do for intention.

Free will manipulation and attributions

Type of universe and moral accountability: Replication

We tested whether the classic experimental philosophy of manipulating determinism in a described universe impacts evaluations of moral accountability. We found that the manipulation had a strong impact on the attributions made toward the chairman, regardless of whether the side-effect was positive or negative. Across both Studies 1 and 2, participants 1) made stronger attributions in the indeterministic universe than in the deterministic universe, 2) participants attributed more blame and praise in the indeterministic universe than the deterministic universe, and 3) the attributions of intention and knowledge were stronger in the indeterministic universe, but to a lower extent (the two lower bound for the effect sizes of intention attributions are close to zero, but significant).

Associations between free will and accountability attributions: Replication

Why and when do people blame others? We provided one possible answer by showing a link between blame and free will. In negative outcome situations, blame (Monroe et al., 2014) and free will (Feldman et al., 2016) are both about the capacity to choose, suggesting that blame is due to perceiving harm as a choice. Our results supported this view, as we found a positive and strong correlation between blame and free will attributions. We also found stronger blame attributions in the indeterministic universe than in the deterministic universe, which was the measure that displayed the highest variation between the universes in Study 2. The relationship held when being controlled for the other variables. Our correlational and experimental results are in line with some of the recent work on blame. For example, Genschow and Vehlow (2021) found that free will perception was related to not only the blame toward an offender but also toward the victim, meaning that the blame/free will relationship goes beyond the need for compensation. Put together, these findings indicated that the possibility of having free will to act is related to the blame we attribute to someone, but not the attribution of praise or regret.

The literature has remained unclear regarding how moral judgments are related to our lay assumptions regarding the universe. The current results show that the asymmetry between blame for the side-effects of harm/praise for the side-effects of help is stronger in the indeterministic world than in the deterministic world, but also that the "control" universe, in which nothing is said regarding the law of the universe the chairman is in has the same properties as the indeterministic universe. The results seem to indicate that laypersons tend to view the universe we are in as similar to the indeterministic universe described in the vignette, and that individuals seem to perceive indeterminism by default, or at least "laypersons viewed the universe as allowing for human indeterminism" (Feldman & Chandrashekar, 2018, p.539). We also found that the relationship between free will and intent is weak in both studies, which supports the idea that free will and intent are separate constructs, that free will is not a prerequisite for intention, and that attributions of free will and intent can lead to blame from a different path (Feldman, 2017).

Associations Between Free Will and the Side-effect-Effect

We examined the impact of valence of the outcomes in the classic SEE chairman scenario over free will attributions and found support for free will attribution asymmetries in Study 2, but less so in Study 1. In Study 2, free will attributions were higher for the harmful outcome than for the helpful outcome, though the effect was weaker than the effects of intention, knowledge, praise, and blame. However, we found no support for the asymmetry in Study 1. The inconsistent results across the two samples may be attributed to the smaller sample in Study 1.

Although a link might be made between the SEE and free will, the effect sizes are much smaller for the free will dimensions (attribution of free will and manipulation of the universes) than for the attributions of blame, intent, knowledge, or scenario manipulation. A very recent debate led to the conclusion that free will is attributed more on the basis of norm-violation accounts than because of intrinsic motivation (Monroe & Ysidron, 2021). In this article, researchers found that participants attributed the same amount of free will to a praiseworthy and blameworthy action. Another recent work has indicated that ignorance is a key factor in explaining attributions for an action (Kirfel & Phillips, 2023). People attributed more intentionality and free will to a norm-violating action when the agent was aware of the consequences of his act. This lack of awareness was left ambiguous in our scenarios, as we simply stated that the chairman "did not care" about the consequences) which might have led participants to not infer free will and intentionality as much as we intended, in the case the chairman was not aware of his actions. Furthermore, in both scenarios, the chairman could have been seen as acting in line with norms ascribed to chairmen (maximizing profits) for some participants, who would not attribute free will related to norm violation. On the other side, some participants might have seen a violation of norms related to the environmental protection (the chairman does not care for the environment), attributing more free will for violating this norm. These two arguments can explain the weaker attribution of free will for the difference between harm and blame than the other attributions. To further understand how free will attribution can vary based on a harmful or helpful outcome, researchers should consider manipulating the salience of the norm-violation related to a positive or negative non-intended outcome, but also the degree of awareness of the consequences of the actor's behavior.

Free will and regret associations

We found a strong association between free will and blame, and therefore expected that agents in an indeterministic universe would be attributed a stronger experience of regret over negative outcomes compared to agents in a deterministic universe. However, our results failed to find experimental support for this view. This result is surprising, as Fillon et al. (2021) found that regret related to free will across the universe conditions for the exceptionality bias. Still, in our study, the manipulation of the universe did not lead to a change in regret attributions. We did not find support for an association between regret and free will attributions, and we found no support for differences in regret across types of universes.

It is possible that our (in)determinism universe manipulations were not effective enough to influence attributions of regret. Alternatively, the descriptive part of the scenario related to the harmful or helpful outcomes might have driven the entire effect, where participants overlooked the universes when ascribing regret. Theoretically, one can only regret a decision if one can think about a better alternative. Thus, regret is only possible if there are alternative choices; in other words, if there is free will—a view supported by the work of Fillon and colleagues (2021). They manipulated the universes to find an interaction between the exceptionality effect and determinism on regret and found that only exceptionality affects regret. The authors indicated that it could be hard for participants to understand the deterministic universe, as laypeople believe that they have free will even in a deterministic universe, a view held by the majority of people called natural compatibilism (Nadelhoffer et al., 2020). Thus, it is possible that the manipulation of the universe might not be a good operationalization for choice representation, because it is hard for participants to represent the differences between the universes and their consequences. More work is needed to explore these directions.

Blame for Side-Effects is Stronger than Praise Regardless of the Outcome

Related to moral accountability, we found that attributions of blame for potential negative side-effects were stronger than attributions of praise for potential positive side-effects, regardless of the outcomes (harmful or helpful) described in the scenario. Based on the view that bad is stronger than good (Baumeister et al., 2001), we expected people to attribute stronger blame than praise for a potential side-effect. Our findings supported the prediction across both Study 1 (d = 1.39) and Study 2 (d = 1.50). Interestingly, Feldman et al. (2016) argued that "bad is freer than good." People attributed higher free will to negative than positive valence, regardless of morality or intent, for both self and others. We found similar though weaker results for side-effects. This finding strengthens the argument for a relationship between blame and free will attributions.

Limitations

One limitation lies in our manipulation of the free will universe, as it refers very broadly to the ability to choose without disentangling the constraints underlying the inability to choose. In the discussion regarding free will, there are context-dependent constraints (e.g., job role) and broader, more fundamental factors that restrict choice that are close to the philosophical debate on free will (e.g., determinism, higher power, genes, physics, etc.). While the free will universe manipulation is close to the philosophical debate and the manipulation impacted free will attributions, it is possible that free will attributions might also be related to the contextual aspects of choice. Finally, there is the possibility that the universe scenarios do not work as intended, as participants can have difficulties understanding the consequences of a deterministic universe. Future studies can expand on our findings to examine more specific constraints and how the effects we reported vary depending on the type of constraint or operationalization of the universe.

We also found an oversight in the two items measuring attribution of intention, which were not grammatically clear. We adapted the two items on the intention from Jamison and colleagues' (2020) study, which are not standardized and may have impacted one of the questions. However, the reliability coefficients were high for both studies. We conducted a 2x2 ANOVA on both items and noted that, even if the second item is higher than the first, they are affected the same way by the SEE and the type of universe. We added the results to OSF. We believe that despite the awkward phrasing, the two questions were similarly understood by the participants.

Regarding regret, we measured regret attribution as the possibility of experiencing regret for a decision if it led to the environment being harmed. Therefore, this measure was used for helpful and harmful outcomes, and assessed counterfactuals. To answer this question, participants have to think about the action, the possibility for this action to lead to a harmful situation, and then how the chairman should feel regarding these non-existent consequences. Understanding this process is not trivial and requires imagination to construct an answer, especially if the decision leads to helping the environment. Using descriptions might not be the best way to test the relationship between side-effects and regret attributions.

We tested if the chairman's knowledge about the program were associated with blame or praise for side-effects. We asked participants to state how well the chairman knew and understood the implications of his program on the environment. However, knowledge is only a proxy for attribution of responsibility – and causality. Stated differently, if the chairman knew about the side-effects of his acts, it does not automatically mean that he was responsible, or that he wanted to cause these side-effects. A new line of research regarding the relationship between knowledge and causality could draw on our results and ask participants if, by knowing about the side-effects and still choosing to implement the program, the chairman could be seen as responsible, and a cause for the side-effects of his harmful or helpful program.

Conclusion

In two experiments, we combined together two influential theories in experimental philosophy regarding blame: the side-effect effect and the relationship between blame and free will. We successfully replicated the side-effect effect, but also found support for the relationship between blame ascribed to side-effects and free will, with correlational evidence in both studies and the impact of a determinism manipulation of the description of the universe in Study 2. We then found that the relationship between blame and free will was stronger than attributions of intent or knowledge, suggesting that participants blame more freer actions not solely because these actions were intended. Finally, we tested for the first time if the side-effect effect could be seen regardless of the harmful and helpful outcome and found that blame was always attributed more than praise for potential side-effects. This finding is in line with the “bad is stronger than good” but also "bad is freer than good" hypotheses. Further work is needed to understand the causal relationships between the freeness to act, the attribution of accountability, and blame for unintended consequences of actions.

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Asymmetries in attributions of blame and praise, intent, and causality: Free will, responsibility, and the side-effect effect

Supplementary

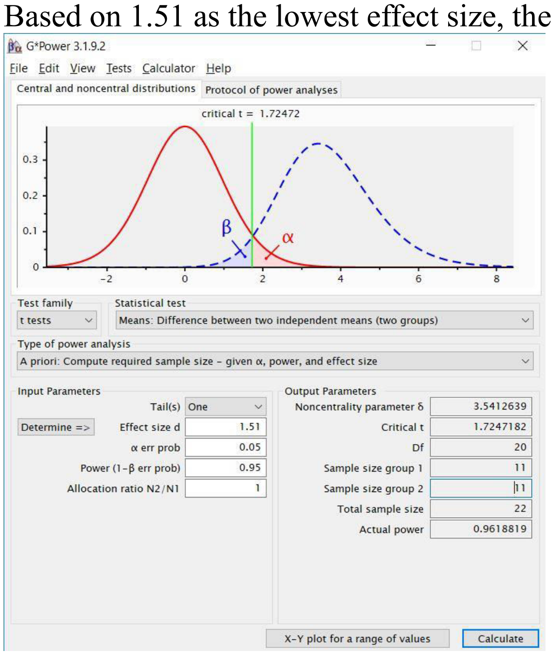
Power analyses

We conducted a power analysis before collecting the data for the Study 2. The power analysis was based on the results of Study 1. Our aim with Study 2 was to detect the weakest effect reported in Study 1 at .95 power (alpha =0.05). The largest required sample based on the power analyses is **1086**.

Details:

Power analyses
The largest required sample based on the power analyses is **1086**.
Intent side-effect effect
In study 1, the side-effect effect for different universes produced following effect sizes: Deterministic universe d = 1.51; indeterministic universe d = 1.61; control condition d = 1.84.

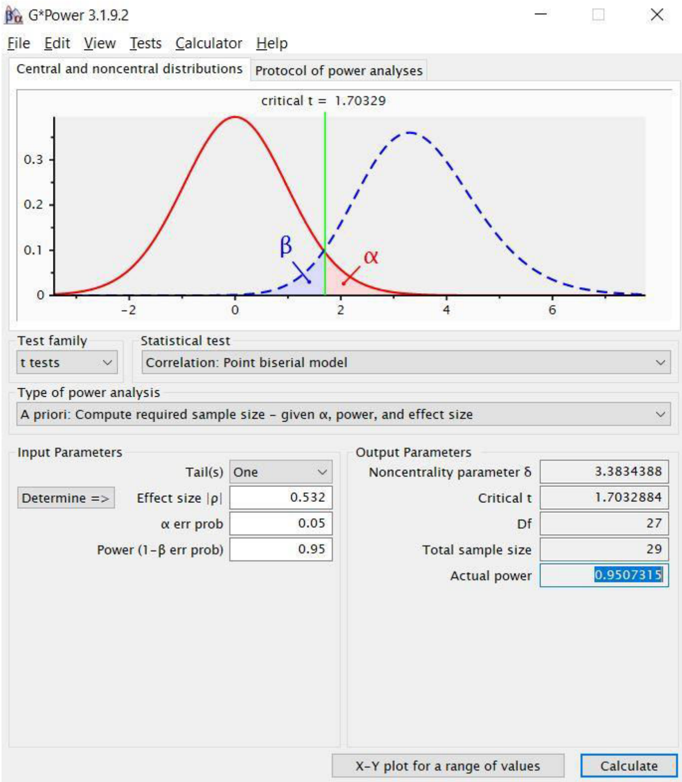
t tests - Means: Difference between two independent means (two groups)
Analysis: A priori: Compute required sample size
Input: Tail(s) = One
Effect size |ρ| = 1.51
α err prob = 0.05
Power (1-β err prob) = 0.95
Output: Noncentrality parameter δ = 3.5412639
Critical t = 1.7247182
Df = 20
Total sample size = 22
Actual power = 0.9618819
Based on 1.51 as the lowest effect size, the required sample is **22**.



Causality side-effect effect

In study 1, the side-effect effect of causality different universes produced following effect sizes: Deterministic universe d = 1.05; indeterministic universe d = 0.90; control condition d = 1.03.

t tests - Means: Difference between two independent means (two groups)
Analysis: A priori: Compute required sample size
Input: Tail(s) = One
Effect size |ρ| = 0.90
α err prob = 0.05
Power (1-β err prob) = 0.95
Output: Noncentrality parameter δ = 3.3674916
Critical t = 1.6735649
Df = 54
Total sample size = 56
Actual power = 0.9535206
Based on 1.51 as the lowest effect size, the required sample is **56**.
Free-will and blame association
In study 1, the correlation between free will attribution and blame we obtained the following Pearson correlation coefficient : r = .532. Using G*Power alpha = .05, two-tail (direction of hypothesis not determined) effect size r =.532 and power .95 we require a sample of **29.**
t tests - Correlation: Point biserial model
Analysis: A priori: Compute required sample size
Input: Tail(s) = Two
Effect size |ρ| = 0.532
α err prob = 0.05
Power (1-β err prob) = 0.95
Output: Noncentrality parameter δ = 3.3834388
Critical t = 1. 1.7032884
Df = 27
Total sample size = 29
Actual power = 0.9507315



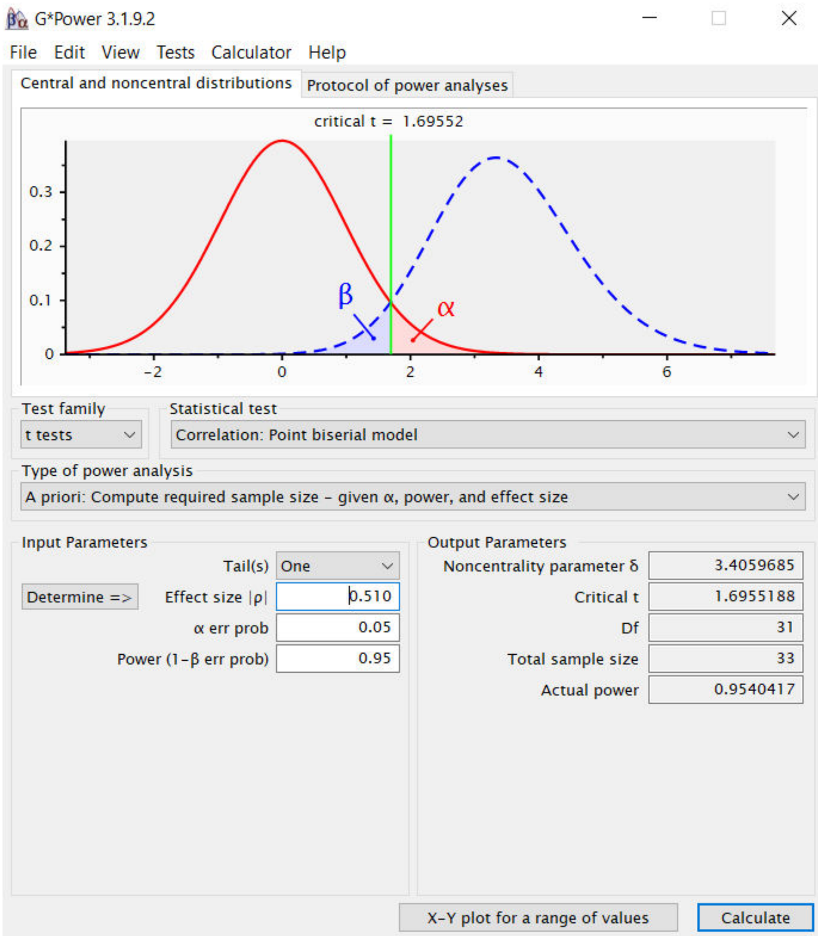
In study 1, the partial correlation between free will attribution and blame after controlling for intention and casualty we obtained the following Pearson correlation coefficient: r = .510
In study 1, the correlation between free will attribution and blame we obtained the following Pearson correlation coefficient: r = 510. Using G*Power alpha = .05, two-tail (direction of hypothesis not determined), r = 0.510 and power .95 we require a sample of **33.**

t tests - Correlation: Point biserial model

Analysis: A priori: Compute required sample size

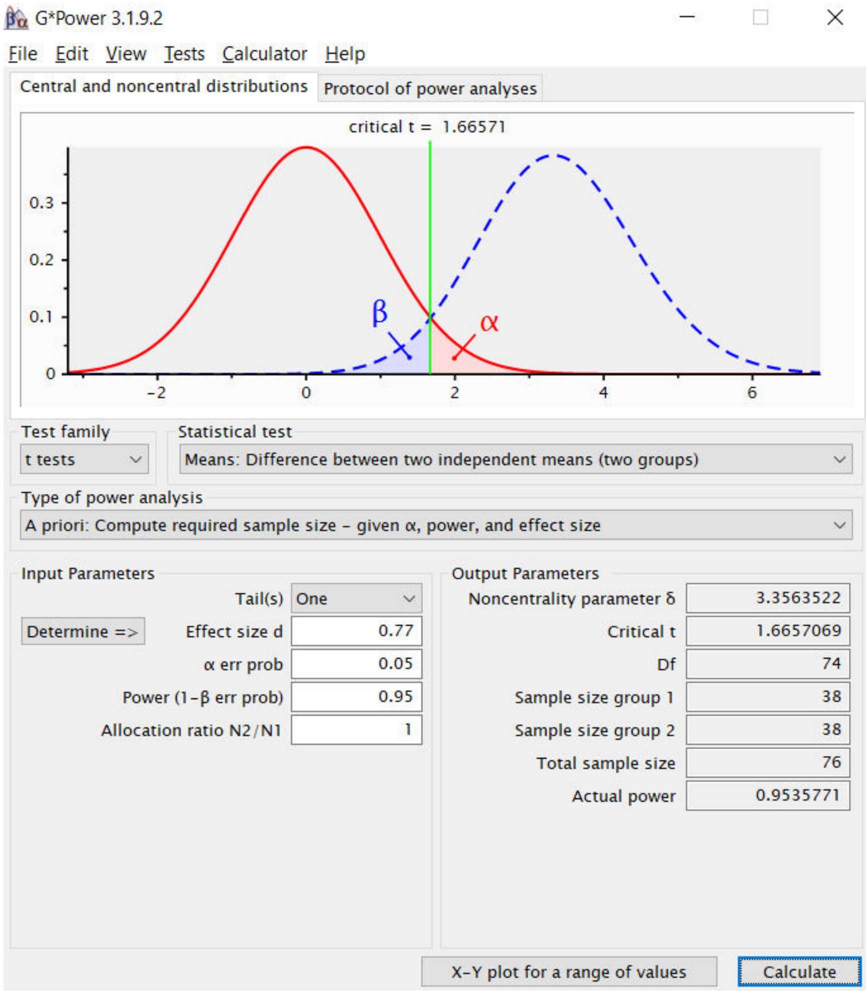
Input: Tail(s) = Two
Effect size |ρ| = 0.510
α err prob = 0.05
Power (1-β err prob) = 0.95

Output: Noncentrality parameter δ = 3.4059685
Critical t = 1.6955188
Df = 31
Total sample size = 33
Actual power = 0.9540417



In study 1, the independent t-test between blame and praise produced following effect size: d = 0.77

t tests - Means: Difference between two independent means (two groups)
Analysis: A priori: Compute required sample size
Input: Tail(s) = One
Effect size |ρ| = 0.7660409
α err prob = 0.05
Power (1-β err prob) = 0.95
Output: Noncentrality parameter δ = 3.3563522
Critical t = 1.6657069
Df = 74
Sample size group 1 = 38
Sample size group 2 = 38
Actual power = 0.9535771
Based on 0.77 as the effect size, the required sample is **76**.



In study 1, the independent t-test on attribution of blame for harmful outcome between indeterministic universe and deterministic universe produced following effect size: d = -1.125, with required sample of **36**.

Analysis: A priori: Compute required sample size

Input: Tail(s) = One

Effect size d = 1.125

α err prob = 0.05

Power (1-β err prob) = 0.95

Allocation ratio N2/N1 = 1

Output: Noncentrality parameter δ = 3.3750000

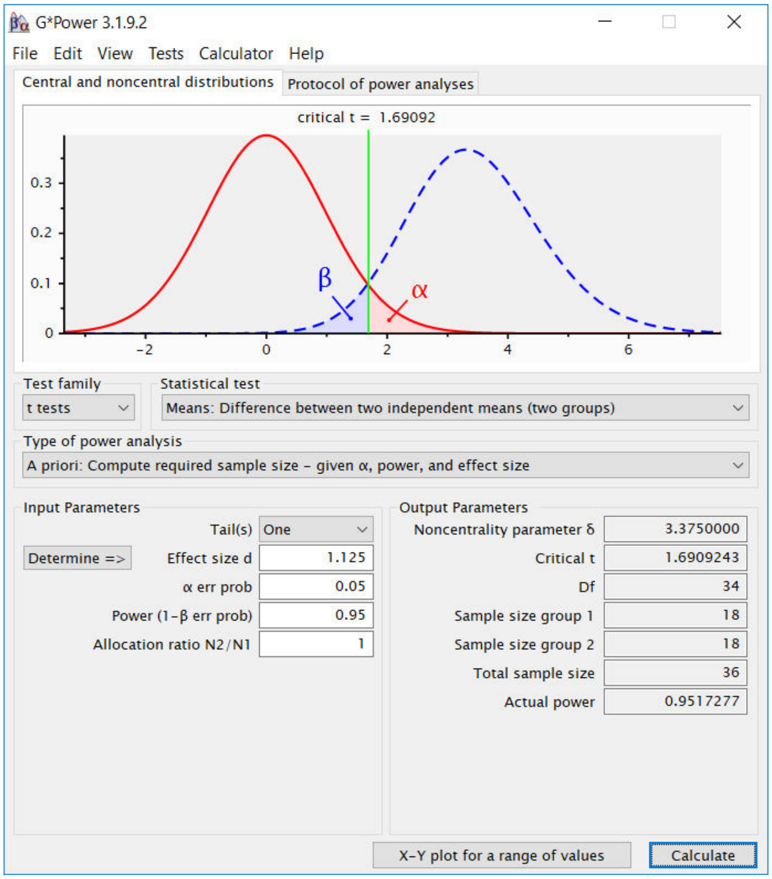
Critical t = 1.6909243

Df = 34

Sample size group 1 = 18

Sample size group 2 = 18

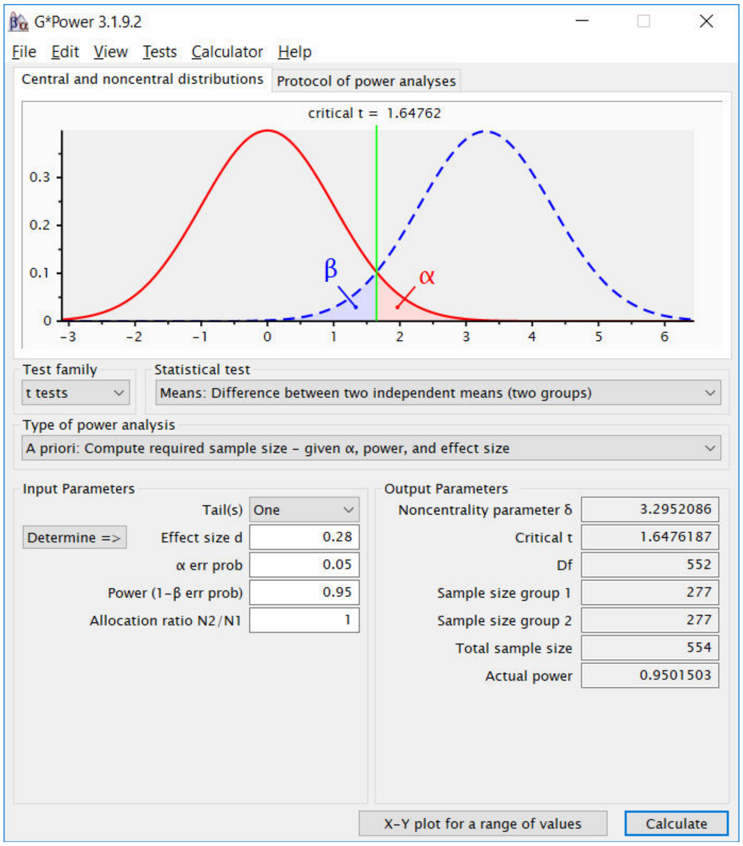
Total sample size = 36



Free-will and regret association

In a different project we measures free will and regret attributions and the correlational association between the two was r = .14, converted to Cohen's d is 0.28, which for power of 95% requires a sample size of **554**.

tests - Means: Difference between two independent means (two groups)
Analysis: A priori: Compute required sample size
Input: Tail(s) = One
Effect size d = 0.28
α err prob = 0.05
Power (1-β err prob) = 0.95
Allocation ratio N2/N1 = 1
Output: Noncentrality parameter δ = 3.2952086
Critical t = 1.6476187
Df = 552
Sample size group 1 = 277
Sample size group 2 = 277
Total sample size = 554



Bad is stronger than good

In study 1, the independent t-test comparing attribution of blame for negative outcome condition and attribution of praise for positive outcomes produced following effect size: d = 1.36, with required sample of **<u>26</u>**.

tests - Means: Difference between two independent means (two groups)

Analysis: A priori: Compute required sample size

Input: Tail(s) = One

Effect size d = 1.361847

α err prob = 0.05

Power (1-β err prob) = 0.95

Allocation ratio N2/N1 = 1

Output: Noncentrality parameter δ = 3.4720422

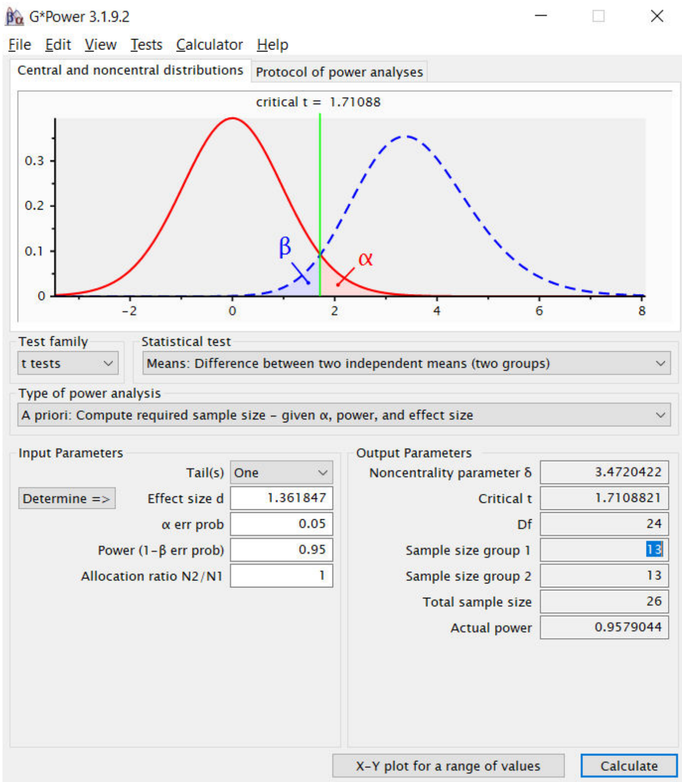
Critical t = 1.7108821

Df = 24

Sample size group 1 = 13

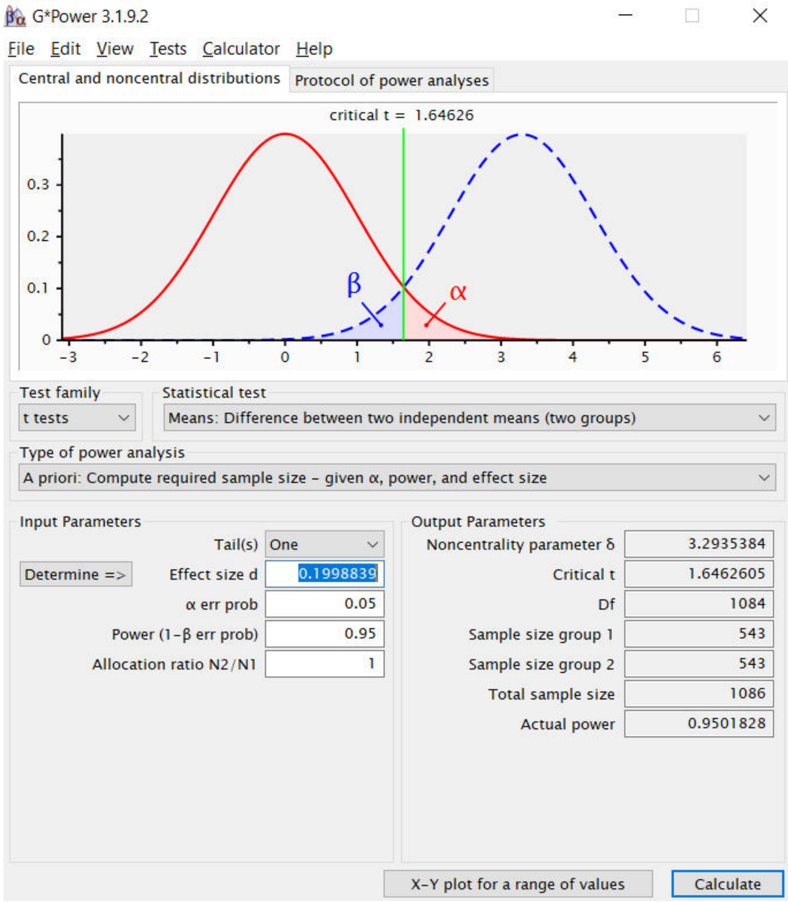
Sample size group 2 = 13

Total sample size = 26



Bad is free than good
In study 1, the independent t-test on attribution of free-will between harmful outcome between indeterministic universe and deterministic universe produced following effect size: d = 0.199, with required sample of **<u>1086</u>**.
tests - Means: Difference between two independent means (two groups)
Analysis: A priori: Compute required sample size
Input: Tail(s) = One
Effect size d = 0.1998839
α err prob = 0.05
Power (1-β err prob) = 0.95
Allocation ratio N2/N1 = 1
Output: Noncentrality parameter δ = 3.2935384
Critical t = 1.6462605
Df = 1084
Sample size group 1 = 543
Sample size group 2 = 543
Total sample size = 1086

Free will attributions with nuanced comparision
All universes Harm vs. Help; Cohen's d = 0.199; Required N= 1086 (shown above)
Deterministic universe - harm & help; Cohen's d = 0.201337; Required N= 1070
Indeterministic universe - harm & help; Cohen's d = 0.259705; Required N= 644
Unknown universe - harm & help; Cohen's d = 0.492977; Required N= 180
Control universe - harm & help; Cohen's d = 0.236293; Required N= 778


G*Power 3.1.9.2
File Edit View Tests Calculator Help
Central and noncentral distributions
Protocol of power analyses
critical t = 1.64626
β
α
Test family
t tests
Statistical test
Means: Difference between two independent means (two groups)
Type of power analysis
A priori: Compute required sample size – given α, power, and effect size
Input Parameters
Tail(s) One
Determine =>
Effect size d 0.1998839
α err prob 0.05
Power (1−β err prob) 0.95
Allocation ratio N2/N1 1
Output Parameters
Noncentrality parameter δ 3.2935384
Critical t 1.6462605
Df 1084
Sample size group 1 543
Sample size group 2 543
Total sample size 1086
Actual power 0.9501828
X–Y plot for a range of values
Calculate

Study 1

Important note

The analysis presented in Study 1 is based on the data collected in testing another set of published hypotheses by Feldman and Chandrashekar (2018). In Feldman and Chandrashekar's (2018) study, the key measures of interest were not the same as the one presented here, however, because the experimental manipulations were identical, we included the measures of interest in the Feldman and Chandrashekar (2018). The commonality between Feldman and Chandrashekar (2018) and Study 1 is the manipulation of the universe conditions. The study design of Feldman and Chandrashekar's (2018) included four between-subjects universe manipulations (i.e., "deterministic universe," "indeterministic universe," "uncertain universe," "Control condition").

For the present investigation, we only exclude the responses from the participants assigned to the uncertain universe (in which it is unclear to agents whether human behavior is determined or undetermined), as this manipulation is not relevant for the current set of theoretical predictions. As part of the experimental materials of Study 1 we document all the procedures, including that of the universe manipulations noted in the (Feldman and Chandrashekar (2018).

Table S1
Experimental Design of Study 1

Study 1 Participants were randomly assigned to 1 out of 8 different default and framing conditions and were required to confirm their choices accordingly. Experimental conditions varied in the structure of the question, i.e., the structure of the question (the DV) presented to the participants at the end of the health survey varied on framing and defaults.				
Independent Variable 1: Universe conditions	IV condition 1: Deterministic	IV condition 2: Indeterministic	IV condition 3: Control condition	IV condition 4: Uncertain universe
Independent Variable 1: Universe conditions	Outcome: Help		Outcome: Harm	
Dependent Variables	• Attributions of blame • Attributions of intentionality • Attributions of causality • Attributions of freewill • Attributions of praise			

Note. Responses recorded as part of "Uncertain universe" condition (which was integral part of Feldman and Chandrashekar, 2018) were not part of Study 1.

Materials of Study 1

'Determinism universe - harm the environment' condition

Imagine a universe (Universe D) in which everything that happens is completely caused by whatever happened before it. This is true from the very beginning of the universe, so what happened in the beginning of the universe caused what happened next, and so on right up until the present. For example, one-day John decided to have French Fries at lunch. Like everything else, this decision was completely caused by what happened before it. So, if everything in this universe was exactly the same up until John made his decision, then it had to happen that John would decide to have French Fries.

In Universe D there is a company.
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, but it will also harm the environment". The chairman of the board answered, "I don't care at all about harming the environment. I just want to make as much profit as I can. Let's start the new program." They started the new program. Sure enough, the environment was harmed.

'Determinism universe - help the environment' condition

Imagine a universe (Universe D) in which everything that happens is completely caused by whatever happened before it. This is true from the very beginning of the universe, so what happened in the beginning of the universe caused what happened next, and so on right up until the present. For example, one-day John decided to have French Fries at lunch. Like everything else, this decision was completely caused by what happened before it. So, if everything in this universe was exactly the same up until John made his decision, then it had to happen that John would decide to have French Fries.

In Universe D there is a company.
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, and it will also help the environment". The chairman of the board answered, "I don't care at all about helping the environment. I just want to make as much profit as I can. Let's start the new program". They started the new program. Sure enough, the environment was helped.

'Indeterministic universe - harm the environment' condition

Imagine a universe (Universe D) in which almost everything that happens is completely caused by whatever happened before it. The one exception is human decision making. For example, one-day John decided to have French Fries at lunch. Since a person's decision in this universe is not completely caused by what happened before it, even if everything in the universe was exactly the same up until John made his decision, it did not have to happen that John would decide to have French Fries. He could have decided to have something different.

In Universe D there is a company.
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, but it will also harm the environment". The chairman of the board answered, "I don't care at all about harming the environment. I just

want to make as much profit as I can. Let's start the new program." They started the new program. Sure enough, the environment was harmed.

'Indeterministic universe - help the environment' condition

Imagine a universe (Universe D) in which almost everything that happens is completely caused by whatever happened before it. The one exception is human decision making. For example, one-day John decided to have French Fries at lunch. Since a person's decision in this universe is not completely caused by what happened before it, even if everything in the universe was exactly the same up until John made his decision, it did not have to happen that John would decide to have French Fries. He could have decided to have something different.

In Universe D there is a company.
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, and it will also help the environment". The chairman of the board answered, "I don't care at all about helping the environment. I just want to make as much profit as I can. Let's start the new program". They started the new program. Sure enough, the environment was helped.

'Unknown universe - harm the environment' condition

Imagine a universe (Universe D) in which it is possible that everything that happens is completely caused by whatever happened before it. But in this universe, it is unclear whether human action follows this rule or if it is an exception to this rule.
For example, one-day John decided to have French Fries at lunch. In this universe, it is unclear whether John's decision in this universe was or was not completely caused by what happened before it. Assuming everything in the universe was exactly the same up until John made his decision, it is unclear whether or not John could have decided to not have French Fries, and whether he could have decided to have something different.

In Universe D there is a company.
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, but it will also harm the environment". The chairman of the board answered, "I don't care at all about harming the environment. I just want to make as much profit as I can. Let's start the new program." They started the new program. Sure enough, the environment was harmed.

'Unknown universe - help the environment' condition

Imagine a universe (Universe D) in which it is possible that everything that happens is completely caused by whatever happened before it. But in this universe, it is unclear whether human action follows this rule or if it is an exception to this rule.
For example, one-day John decided to have French Fries at lunch. In this universe, it is unclear whether John's decision in this universe was or was not completely caused by what happened before it. Assuming everything in the universe was exactly the same up until John made his decision, it is unclear whether or not John could have decided to not have French Fries, and whether he could have decided to have something different.

In Universe D there is a company.
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, and it will also help the environment". The chairman of the board answered, "I don't care at all about helping the environment. I just want to make as much profit as I can. Let's start the new program". They started the new program. Sure enough, the environment was helped.

'Control universe - harm the environment' condition

The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, but it will also harm the environment". The chairman of the board answered, "I don't care at all about harming the environment. I just want to make as much profit as I can. Let's start the new program." They started the new program. Sure enough, the environment was harmed.

'Control universe - help the environment'. condition

The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, and it will also help the environment". The chairman of the board answered, "I don't care at all about helping the environment. I just want to make as much profit as I can. Let's start the new program". They started the new program. Sure enough, the environment was helped.

Manipulation Check

To make sure you understood the scenario - what was the environmental outcome of the chairman's decision to start the new program?:
(a) The environment was helped.
(b) The environment was harmed.
(c) The scenario doesn't say.

Dependent variables

Attributions of intentionality

1. Do you agree with the following statement? - In Universe D, the chairman intentions were to have such implications of the new program on the environment?
2. Do you agree with the following statement? - In Universe D, did the chairman intentionally affect the environment?

Attributions of causality

1. Do you agree with the following statement? - In Universe D, the chairman knew the implications of the new program on the environment? (1 = strongly disagree; 6 = strongly agree)

2. Do you agree with the following statement? - In Universe D, the chairman understood the implications of the new program on the environment? (1 = strongly disagree; 6 = strongly agree)

Attributions of freewill

1. Do you agree with the following statement? - In Universe D, the chairman had to choose what he chose, and could not have chosen to do otherwise. (R) (1 = strongly disagree; 6 = strongly agree)
2. Do you agree with the following statement? - In Universe D, the chairman was free to choose not to start the new program. (1 = strongly disagree; 6 = strongly agree)

Attributions of blame

1. Do you agree with the following statement? - In Universe D, the chairman should be criticized for his actions if they led to negative outcomes. (1 = strongly disagree; 6 = strongly agree)

Attributions of praise

1. Do you agree with the following statement? - In Universe D, the chairman should be applauded for his actions if they led to positive outcomes. (1 = strongly disagree; 6 = strongly agree)

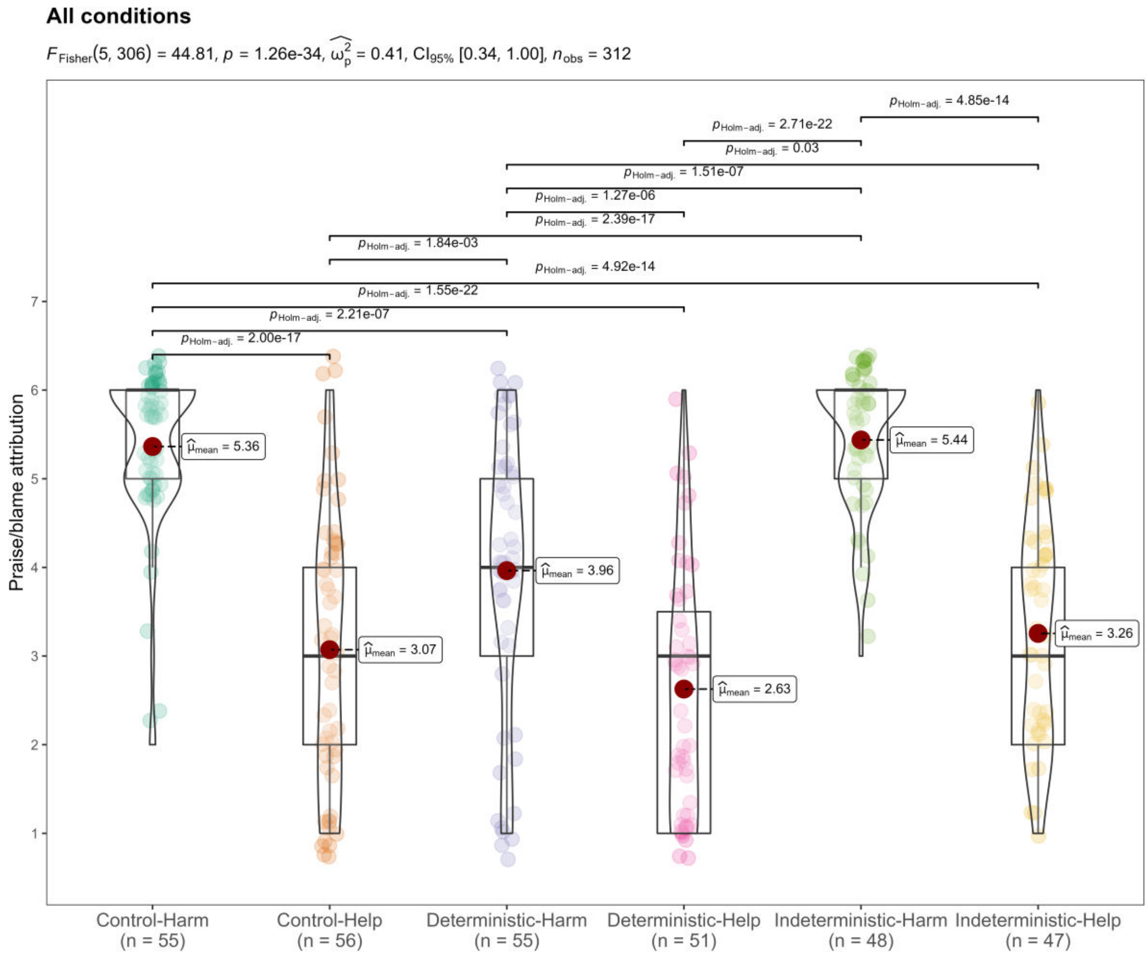
Table S2
Study 1: Results of 2x2 ANOVA testing the effects of type of outcome and type of universe on attributions of free will, Intentionality, and Causality.

	Praise/Blame attribution					Intentionality attribution					Causality attribution					Free Will				
Factor	*F*	*df*	MS	*p*	η^2p	*F*	*df*	MS	*p*	η^2p	*F*	*df*	MS	*p*	η^2p	*F*	*df*	MS	*p*	η^2p
Type of outcome (Help vs Harm)	91.77	1	154.93	<.001	0.32	97.25	1	157.07	<.001	0.33	29.95	1	40.28	<.001	0.13	2.21	1	3.96	.14	.01
Type of universe	32.75	1	55.29	<.001	0.14	4.21	1	6.79	.042	.02	4.11	1	5.52	.044	.02	183.34	1	328.58	<.001	.48
Type of outcome × Type of universe	5.31	1	8.96	.022	0.03	1.61	1	2.60	.206	0.01	0.09	1	0.12	.768	0.00	0.12	1	0.21	.73	.001

Note. df **= degree of freedom,** ***MS*** **= Mean Sum of Squares.**

Figure S1

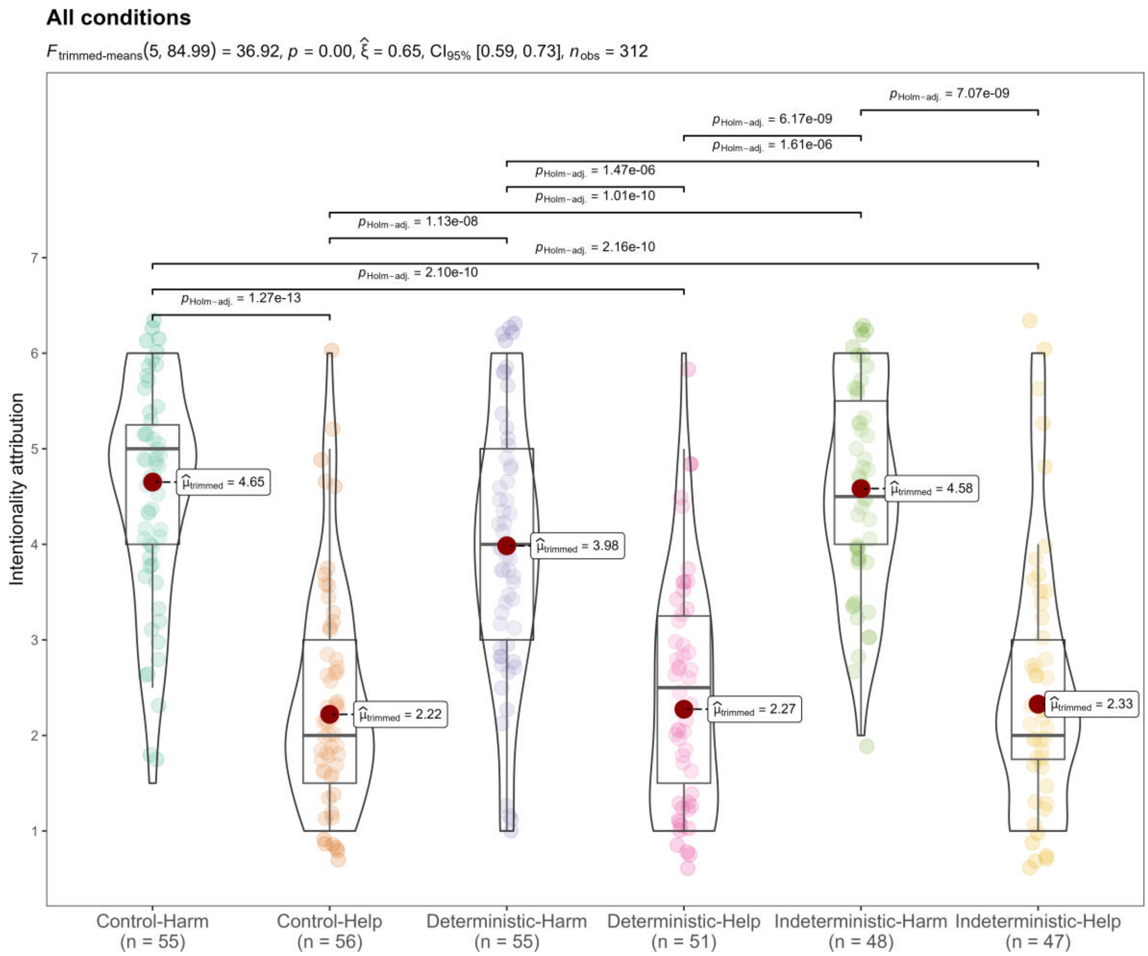
Study 1 Attribution of Praise/blame across all conditions



*Note***.** Violin plots displaying the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure S2

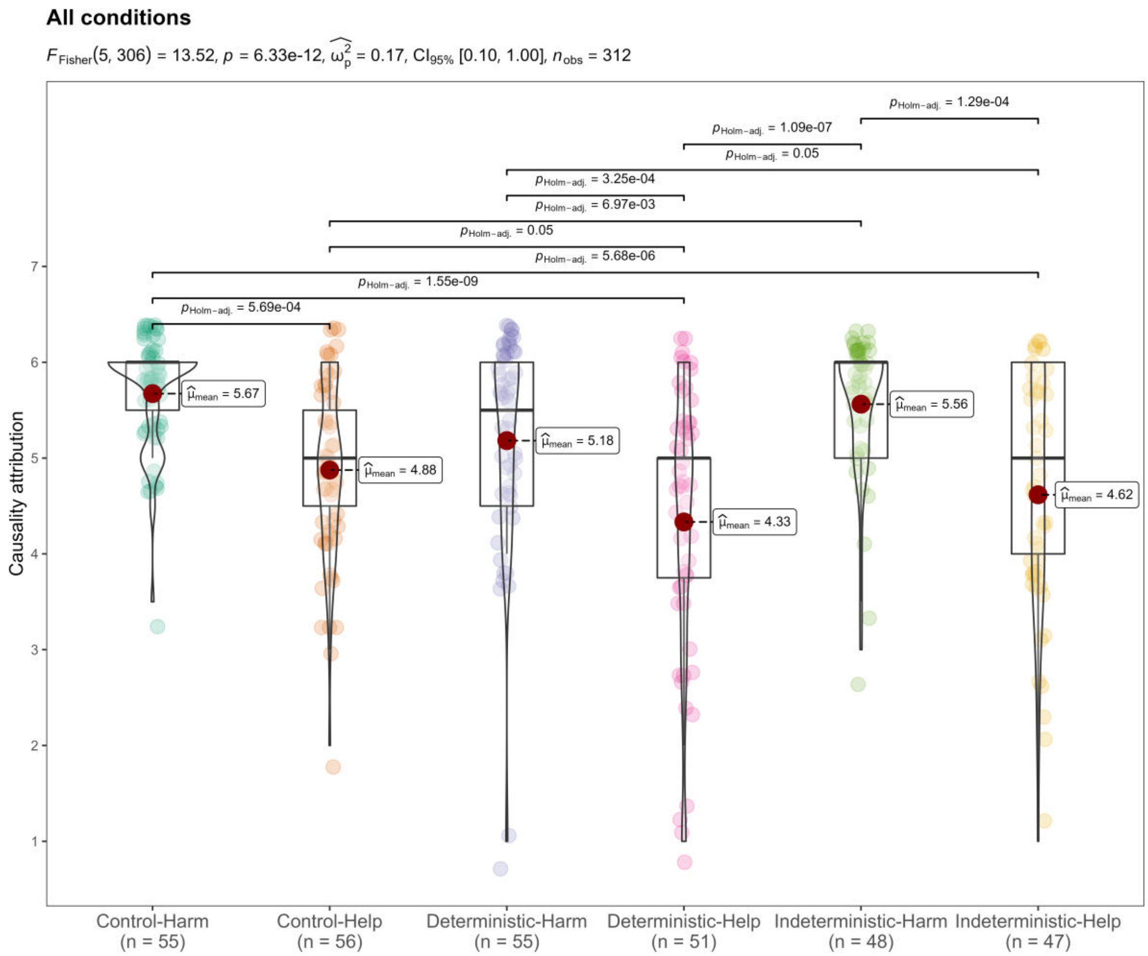
Study 1 Attribution of intentionality across all conditions



*Note***.** Violin plots displaying the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure S3

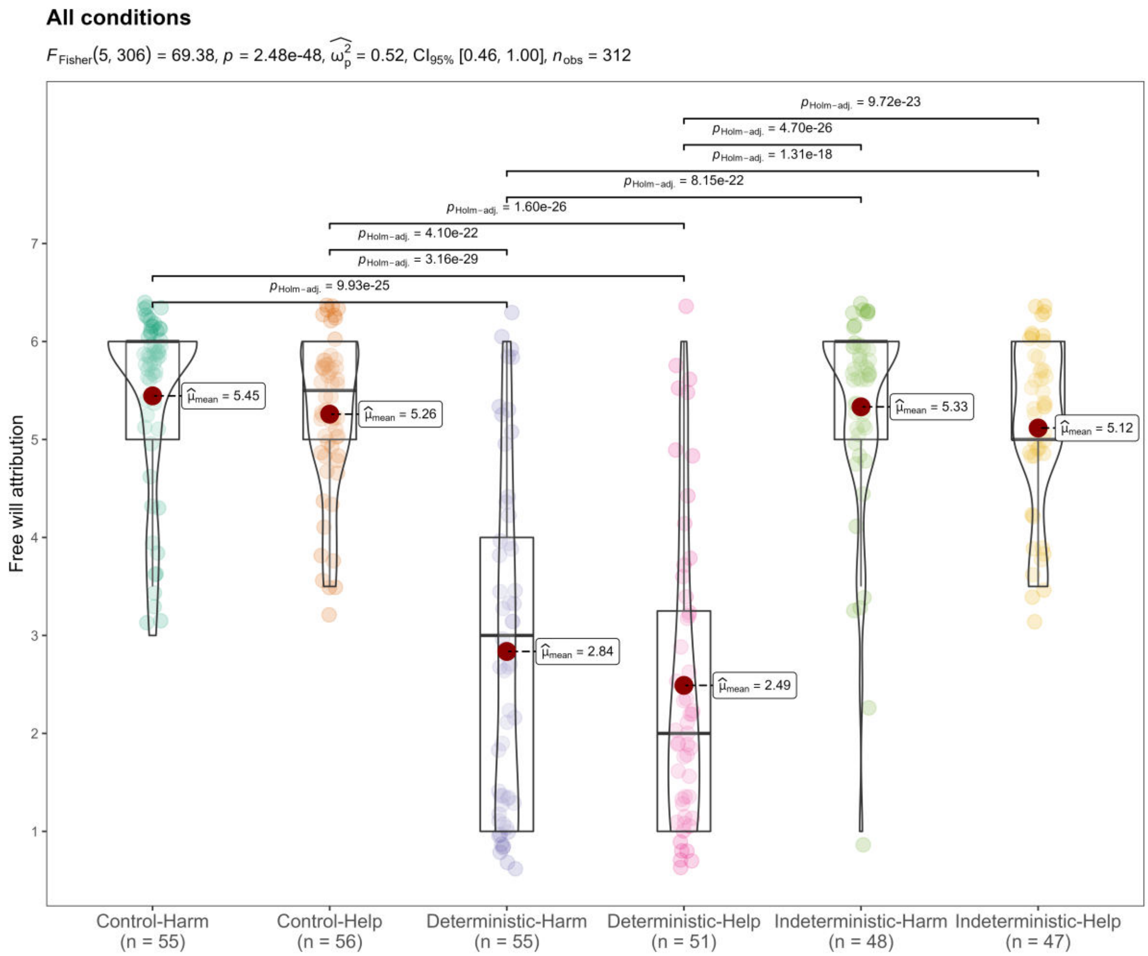
Study 1 Attribution of causality across all conditions



*Note***.** Violin plots displaying the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure S4

Study 1 Attribution of free will across all conditions



*Note***.** Violin plots displaying the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Study 2

Table S3

Experimental Design of Study 2

<table>
<tr><td colspan="4">Study 2

Participants were randomly assigned to 1 out of 6 different default and framing conditions and were required to confirm their choices accordingly. Experimental conditions varied in the structure of the question, i.e., the structure of the question (the DV) presented to the participants at the end of the health survey varied on framing and defaults.</td></tr>
<tr><td>Independent Variable 1: Universe conditions</td><td>IV condition 1: Deterministic</td><td>IV condition 2: Indeterministic</td><td>IV condition 3: Control condition</td></tr>
<tr><td>Independent Variable 1: Universe conditions</td><td colspan="2">Outcome: Help</td><td>Outcome: Harm</td></tr>
<tr><td>Dependent Variables</td><td colspan="3">• Attributions of blame
• Attributions of intentionality
• Attributions of causality
• Attributions of freewill
• Attributions of praise
• Attributions of regret</td></tr>
</table>

Materials of Study 2

'Determinism universe - harm the environment' condition

Imagine a universe (Universe D) in which everything that happens is completely caused by whatever happened before it. This is true from the very beginning of the universe, so what happened in the beginning of the universe caused what happened next, and so on right up until the present. For example, one-day John decided to have French Fries at lunch. Like everything else, this decision was completely caused by what happened before it. So, if everything in this universe was exactly the same up until John made his decision, then it had to happen that John would decide to have French Fries.

In Universe D there is a company.

The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, but it will also harm the environment". The chairman of the board answered, "I don't care at all about harming the environment. I just want to make as much profit as I can. Let's start the new program." They started the new program. Sure enough, the environment was harmed.

'Determinism universe - help the environment' condition

Imagine a universe (Universe D) in which everything that happens is completely caused by whatever happened before it. This is true from the very beginning of the universe, so what happened in the beginning of the universe caused what happened next, and so on right up until the present. For example, one-day John decided to have French Fries at lunch. Like everything else, this decision was completely caused by what happened before it. So, if everything in this universe was exactly the same up until John made his decision, then it had to happen that John would decide to have French Fries.
In Universe D there is a company.
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, and it will also help the environment". The chairman of the board answered, "I don't care at all about helping the environment. I just want to make as much profit as I can. Let's start the new program". They started the new program. Sure enough, the environment was helped.

'Indeterministic universe - harm the environment' condition

Imagine a universe (Universe D) in which almost everything that happens is completely caused by whatever happened before it. The one exception is human decision making. For example, one-day John decided to have French Fries at lunch. Since a person's decision in this universe is not completely caused by what happened before it, even if everything in the universe was exactly the same up until John made his decision, it did not have to happen that John would decide to have French Fries. He could have decided to have something different.
In Universe D there is a company.
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, but it will also harm the environment". The chairman of the board answered, "I don't care at all about harming the environment. I just want to make as much profit as I can. Let's start the new program." They started the new program. Sure enough, the environment was harmed.

'Indeterministic universe - help the environment' condition

Imagine a universe (Universe D) in which almost everything that happens is completely caused by whatever happened before it. The one exception is human decision making. For example, one-day John decided to have French Fries at lunch. Since a person's decision in this universe is not completely caused by what happened before it, even if everything in the universe was exactly the same up until John made his decision, it did not have to happen that John would decide to have French Fries. He could have decided to have something different.
In Universe D there is a company.
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, and it will also help the environment". The chairman of the board answered, "I don't care at all about helping the environment. I just want to make as much profit as I can. Let's start the new program". They started the new program. Sure enough, the environment was helped.

'Control universe - harm the environment' condition

The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, but it will also harm the environment".

The chairman of the board answered, "I don't care at all about harming the environment. I just want to make as much profit as I can. Let's start the new program." They started the new program. Sure enough, the environment was harmed.
'Control universe - help the environment'. condition
The vice-president of this company went to the chairman of the board and said, "We are thinking of starting a new program. It will help us increase profits, and it will also help the environment". The chairman of the board answered, "I don't care at all about helping the environment. I just want to make as much profit as I can. Let's start the new program". They started the new program. Sure enough, the environment was helped.

Manipulation Check

To make sure you understood the scenario - what was the environmental outcome of the chairman's decision to start the new program?:
(a) The environment was helped.
(b) The environment was harmed.
(c) The scenario doesn't say.

Dependent variables

Attributions of intentionality

1. Do you agree with the following statement? - In Universe D, the chairman intentions were to have such implications of the new program on the environment?
2. Do you agree with the following statement? - In Universe D, did the chairman intentionally affect the environment?

Attributions of causality

1. Do you agree with the following statement? - In Universe D, the chairman knew the implications of the new program on the environment? (1 = strongly disagree; 6 = strongly agree)
2. Do you agree with the following statement? - In Universe D, the chairman understood the implications of the new program on the environment? (1 = strongly disagree; 6 = strongly agree)

Attributions of freewill

1. Do you agree with the following statement? - In Universe D, the chairman had to choose what he chose, and could not have chosen to do otherwise. (R) (1 = strongly disagree; 6 = strongly agree)
2. Do you agree with the following statement? - In Universe D, the chairman was free to choose not to start the new program. (1 = strongly disagree; 6 = strongly agree)

Attributions of blame

1. Do you agree with the following statement? - In Universe D, the chairman should be criticized for his actions if they led to negative outcomes. (1 = strongly disagree; 6 = strongly agree)

<u>Attributions of praise</u>

1. Do you agree with the following statement? - In Universe D, the chairman should be applauded for his actions if they led to positive outcomes. (1 = strongly disagree; 6 = strongly agree)

<u>Attributions of regret</u>

1. Do you agree with the following statement? - In Universe D, the chairman would regret his decision if he learned that his actions led to the environment being harmed. (1 = strongly disagree; 6 = strongly agree)

Additional results

Table S4

Descriptive statistics grouped by experimental conditions

Study	Condition	Dimension	n	Mean	SD	Median	Skew	Kurtosis
Study 1	Control	Praise	111	2.78	1.58	2.00	0.44	-1.08
		Blame	111	4.99	1.14	5.00	-1.3	1.3
		Intention	111	3.45	1.56	3.50	0.08	-1.29
		Freewill	111	5.35	0.84	5.50	-1.18	0.24
		Causality	111	5.27	0.84	5.50	-1.1	1.04
	Deterministic Universe	Praise	106	2.75	1.39	3.00	0.27	-1.07
		Blame	106	3.72	1.48	4.00	-0.31	-0.75
		Intention	106	3.2	1.52	3.00	0.18	-0.9
		Freewill	106	2.67	1.61	2.00	0.64	-0.82
		Causality	106	4.77	1.34	5.00	-1.29	1.26
	Indeterministic Universe	Praise	95	3.4	1.51	4.00	-0.07	-1.14
		Blame	95	4.91	1.24	5.00	-1.39	1.65
		Intention	95	3.55	1.58	3.50	0.02	-1.14
		Freewill	95	5.23	0.96	5.50	-1.58	3.04
		Causality	95	5.09	1.11	5.50	-1.23	1.07
Study 2	Control	Praise	367	2.64	1.52	2.00	0.58	-0.76
		Blame	367	5.01	1.19	5.00	-1.31	1.20
		Intention	367	3.44	1.64	3.50	0.05	-1.23
		Freewill	367	5.16	0.98	5.50	-1.23	1.31
		Causality	367	5.08	1.13	5.00	-1.50	2.10
		Regret	367	2.16	1.34	2.00	1.24	0.80
	Deterministic Universe	Praise	359	3.01	1.54	3.00	0.31	-0.99
		Blame	359	3.82	1.65	4.00	-0.29	-1.16
		Intention	359	3.31	1.60	3.50	0.13	-1.15
		Freewill	359	2.10	1.27	2.00	1.21	0.76
		Causality	359	5.09	1.06	5.00	-1.38	1.87
		Regret	359	2.29	1.36	2.00	1.08	0.32
	Indeterministic Universe	Praise	367	3.20	1.64	3.00	0.16	-1.19
		Blame	367	4.98	1.27	5.00	-1.41	1.42
		Intention	367	3.44	1.60	3.50	-0.02	-1.21
		Freewill	367	5.31	0.92	6.00	-1.43	1.61
		Causality	367	5.07	1.10	5.00	-1.45	1.96
		Regret	367	2.20	1.27	2.00	1.18	0.85

Table S5

Study 1 Descriptive statistics grouped by experimental conditions And outcome of the scenario

Experimental condition	Outcome	Dimension	*n*	Mean	SD	Median	Skew	Kurtosis
Control	Harm	Praise	55	2.49	1.60	2.00	0.74	-0.90
		Blame	55	5.36	0.93	6.00	-1.98	4.27
		Intention	55	4.52	1.14	5.00	-0.63	-0.36
		Freewill	55	5.45	0.91	6.00	-1.44	0.68
		Causality	55	5.67	0.55	6.00	-1.70	2.83
	Help	Praise	56	3.07	1.52	3.00	0.18	-1.03
		Blame	56	4.63	1.21	5.00	-0.89	0.30
		Intention	56	2.40	1.16	2.00	1.03	0.70
		Freewill	56	5.26	0.77	5.50	-0.88	-0.25
		Causality	56	4.88	0.89	5.00	-0.63	0.42
Deterministic Universe	Harm	Praise	55	2.85	1.41	3.00	0.10	-1.30
		Blame	55	3.96	1.57	4.00	-0.56	-0.67
		Intention	55	3.95	1.38	4.00	-0.32	-0.43
		Freewill	55	2.84	1.71	3.00	0.43	-1.13
		Causality	55	5.18	1.12	5.50	-1.92	4.52
	Help	Praise	51	2.63	1.39	3.00	0.45	-0.80
		Blame	51	3.45	1.35	4.00	-0.11	-0.70
		Intention	51	2.40	1.22	2.50	0.69	-0.08
		Freewill	51	2.49	1.49	2.00	0.87	-0.43
		Causality	51	4.33	1.43	5.00	-0.87	-0.02
Indeterministic Universe	Harm	Praise	48	3.54	1.71	4.00	-0.21	-1.34
		Blame	48	5.44	0.77	6.00	-1.17	0.57
		Intention	48	4.54	1.09	4.50	-0.17	-0.94
		Freewill	48	5.33	1.06	6.00	-2.07	4.63
		Causality	48	5.56	0.70	6.00	-1.84	3.23
	Help	Praise	47	3.26	1.28	3.00	0.02	-1.09
		Blame	47	4.36	1.39	5.00	-0.98	0.14
		Intention	47	2.54	1.35	2.00	0.94	0.23
		Freewill	47	5.12	0.84	5.00	-0.72	-0.62
		Causality	47	4.62	1.25	5.00	-0.63	-0.14

Table S6

Study 2 Descriptive statistics grouped by experimental conditions And outcome of the scenario

Experimental condition	Outcome	Dimension	*n*	Mean	SD	Median	Skew	Kurtosis
Control	Help	Praise	185	2.16	1.54	1.00	1.22	0.29
		Blame	185	5.47	0.92	6.00	-2.30	6.24
		Intention	185	4.49	1.30	4.50	-0.62	-0.31
		Freewill	185	5.48	0.88	6.00	-1.98	3.99
		Causality	185	5.48	0.88	6.00	-2.46	7.56
		Regret	185	2.09	1.39	2.00	1.33	0.95
	Harm	Praise	182	3.13	1.33	3.00	0.17	-0.70
		Blame	182	4.54	1.26	5.00	-0.82	0.00
		Intention	182	2.38	1.21	2.00	0.63	-0.69
		Freewill	182	4.85	0.97	5.00	-0.86	0.74
		Causality	182	4.68	1.22	5.00	-1.02	0.62
		Regret	182	2.23	1.29	2.00	1.14	0.62
Deterministic Universe	Help	Praise	181	3.08	1.63	3.00	0.24	-1.17
		Blame	181	4.15	1.63	5.00	-0.52	-0.99
		Intention	181	4.22	1.41	4.50	-0.49	-0.60
		Freewill	181	2.17	1.35	2.00	1.22	0.59
		Causality	181	5.42	0.82	6.00	-2.06	5.84
		Regret	181	2.40	1.44	2.00	0.95	-0.01
	Harm	Praise	178	2.94	1.45	3.00	0.35	-0.81
		Blame	178	3.49	1.60	4.00	-0.11	-1.20
		Intention	178	2.40	1.23	2.00	0.69	-0.32
		Freewill	178	2.03	1.18	2.00	1.12	0.64
		Causality	178	4.76	1.16	5.00	-0.93	0.51
		Regret	178	2.17	1.27	2.00	1.19	0.65
Indeterministic Universe	Help	Praise	183	3.50	1.83	4.00	-0.12	-1.46
		Blame	183	5.42	0.79	6.00	-1.55	2.86
		Intention	183	4.52	1.15	5.00	-0.63	-0.17
		Freewill	183	5.42	0.82	6.00	-1.52	1.96
		Causality	183	5.48	0.69	6.00	-1.56	3.20
		Regret	183	2.20	1.32	2.00	1.25	0.88
	Harm	Praise	184	2.91	1.37	3.00	0.35	-0.67
		Blame	184	4.53	1.49	5.00	-0.89	-0.25
		Intention	184	2.36	1.22	2.00	0.73	-0.14
		Freewill	184	5.20	1.01	5.50	-1.28	1.03
		Causality	184	4.67	1.28	5.00	-0.95	0.30
		Regret	184	2.20	1.23	2.00	1.08	0.72

Table S7

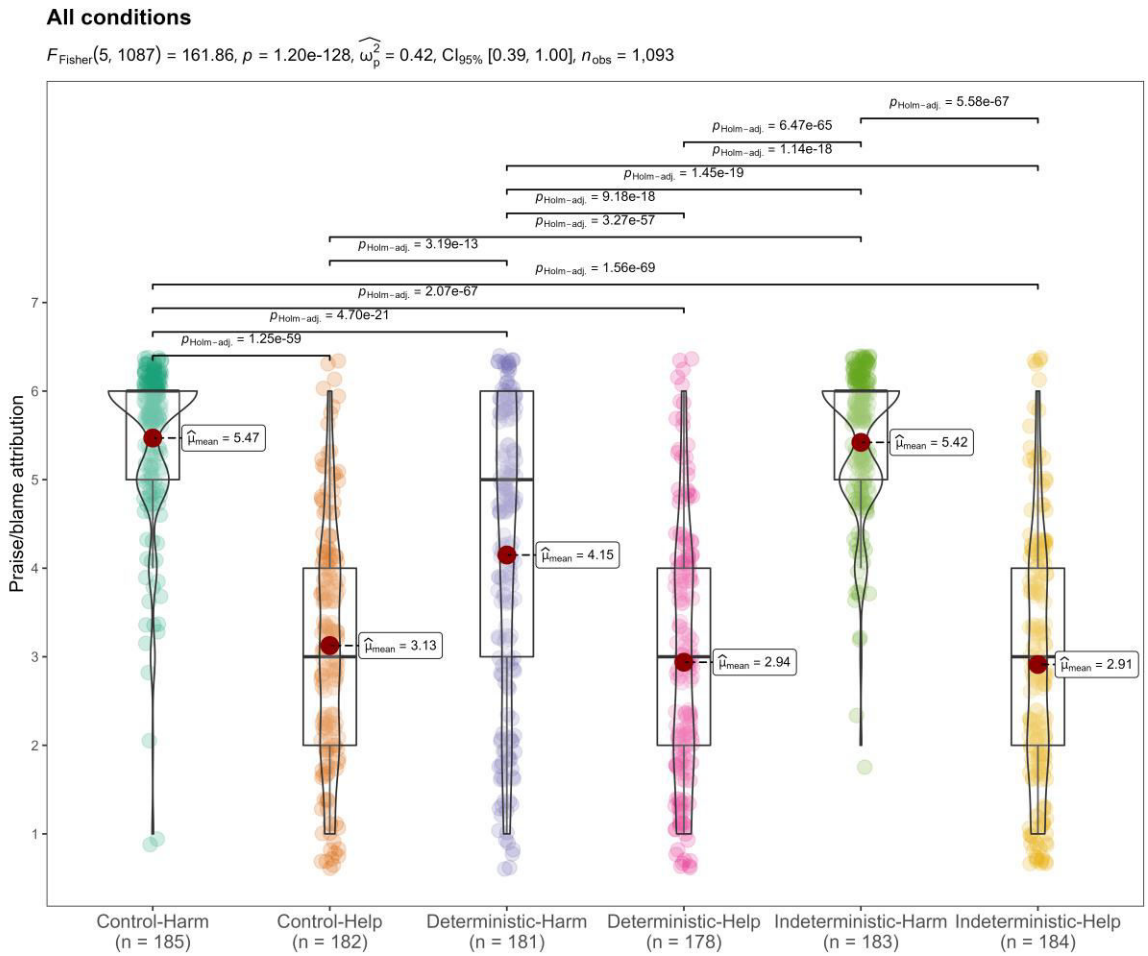
Study 2 full results of 2x2 ANOVA testing the effects of type of outcome and type of universe on attributions of free will, intentionality, and causality.

	Praise/Blame attribution					**Intentionality attribution**					**Causality attribution**					**Free Will attribution**				
Factor	*F*	*df*	*MS*	*p*	η^2p	*F*	*df*	*MS*	*p*	η^2p	*F*	*df*	*MS*	*p*	η^2p	*F*	*df*	*MS*	*p*	η
Type of outcome (Help vs Harm)	346.2	1	627.37	<.001	0.32	453.64	1	715.60	<.001	0.39	95.44	1	98.56	<.001	0.12	5.06	1	6.16	.03	0.
Type of universe	38.9	1	70.48	<.001	.05	2.00	1	3.15	.16	.003	0.04	1	0.04	.85	0.00	1537.25	1	1871.40	<.001	0
Type of outcome x Type of universe	42.1	1	76.29	<.001	0.06	3.29	1	5.19	.070	0.005	0.93	1	0.96	.34	0.001	0.22	1	0.27	.64	0

Note. df = degree of freedom, *MS* = Mean Sum of Squares.

Figure S5

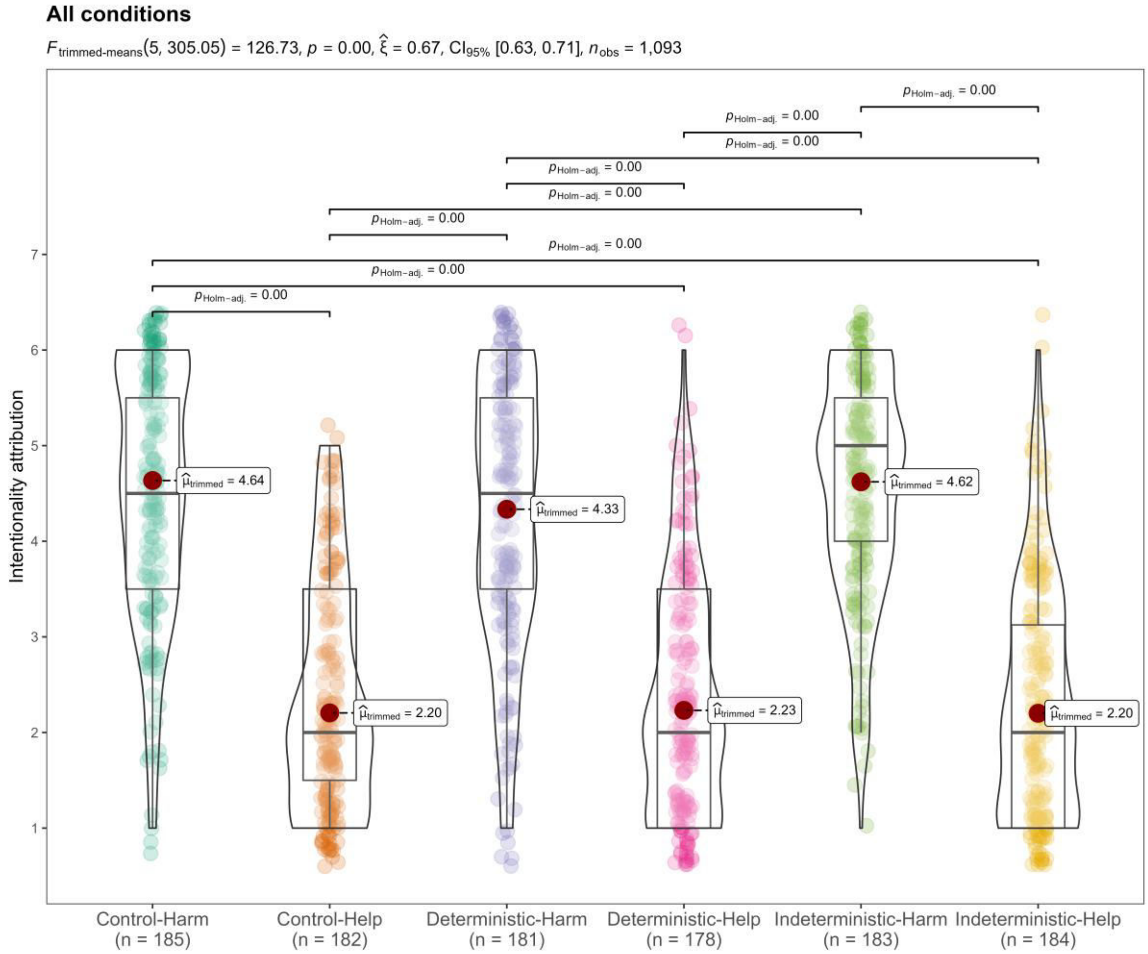
Study 2 Attribution of Praise/Blame across all conditions



*Note***.** Violin plots displaying the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure S6

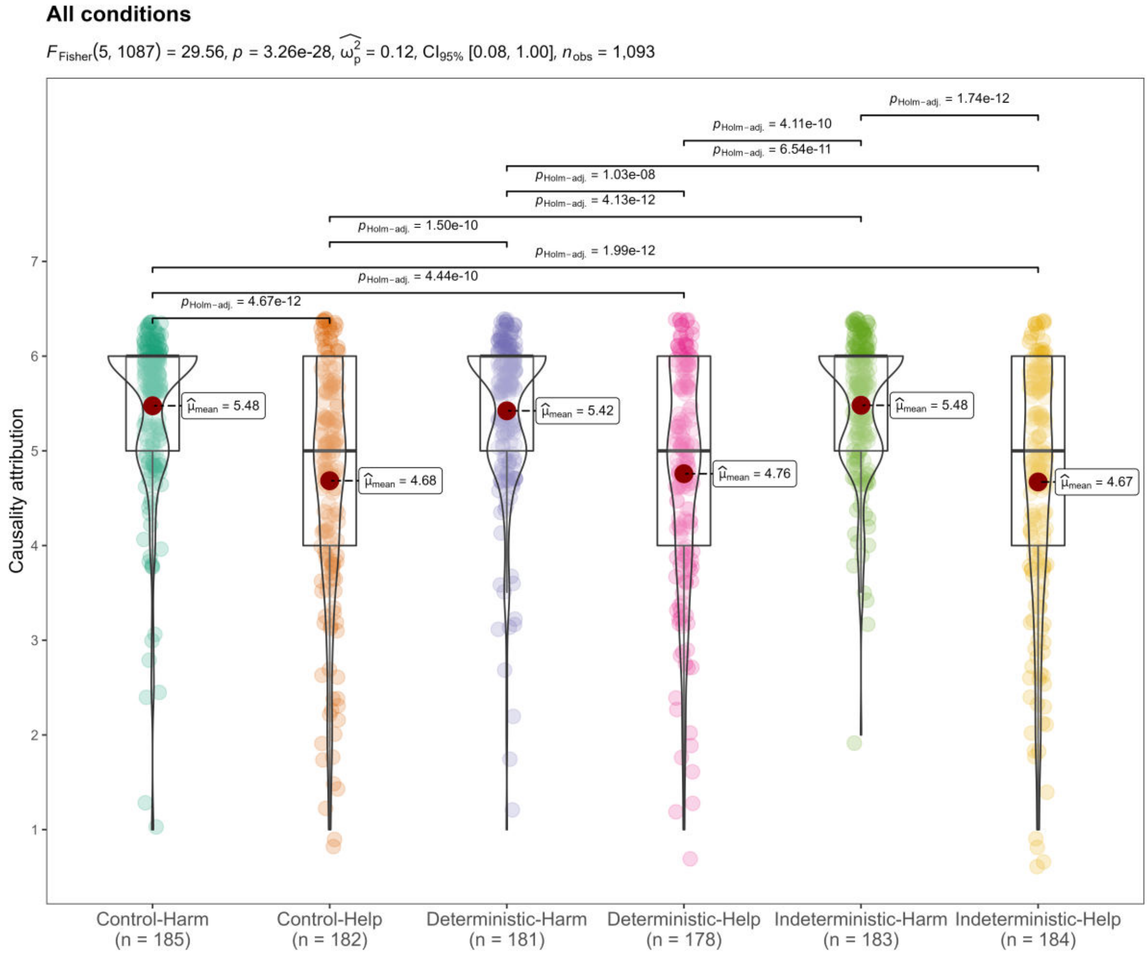
Study 2 Attribution of intentionality across all conditions



*Note***.** Violin plots displaying the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure S7

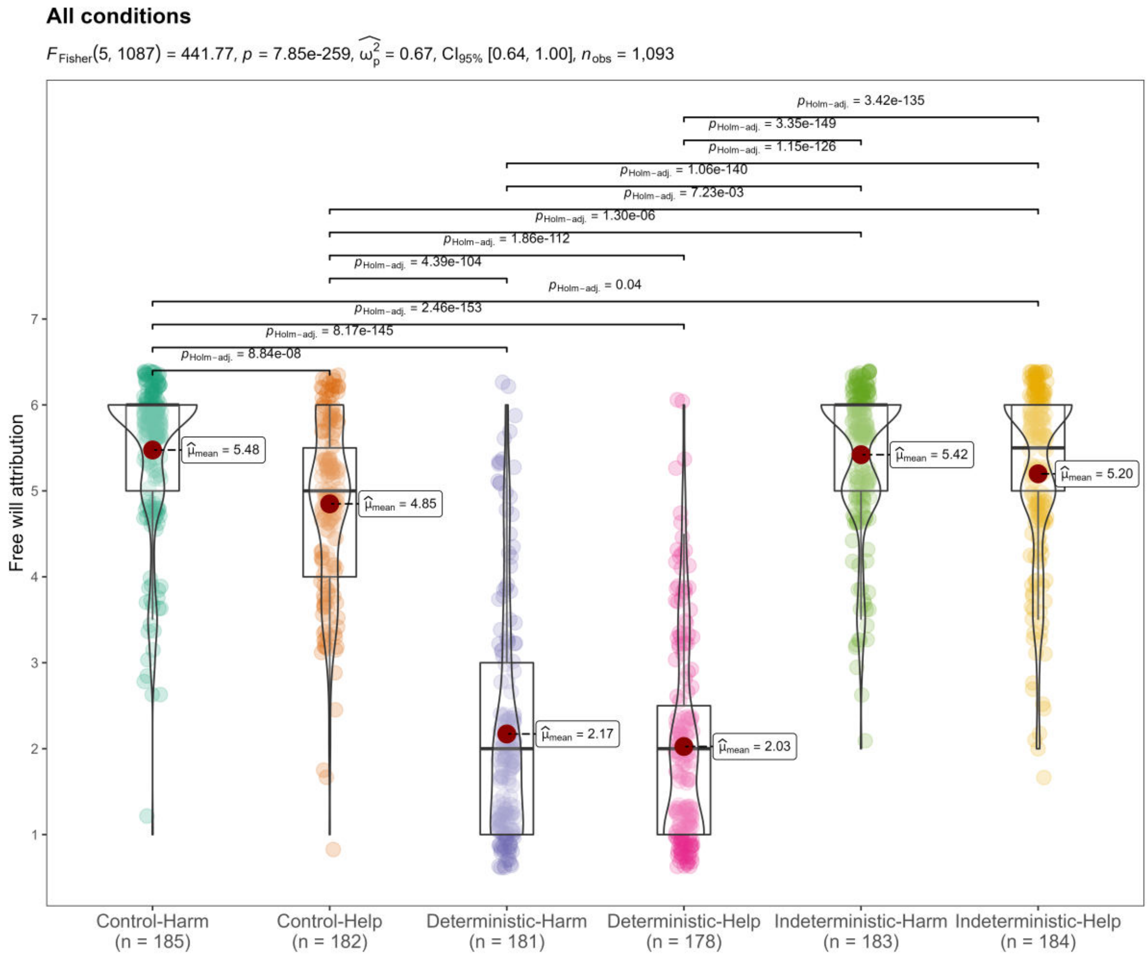
Study 2 Attribution of causality across all conditions



*Note***.** Violin plots displaying the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure S8

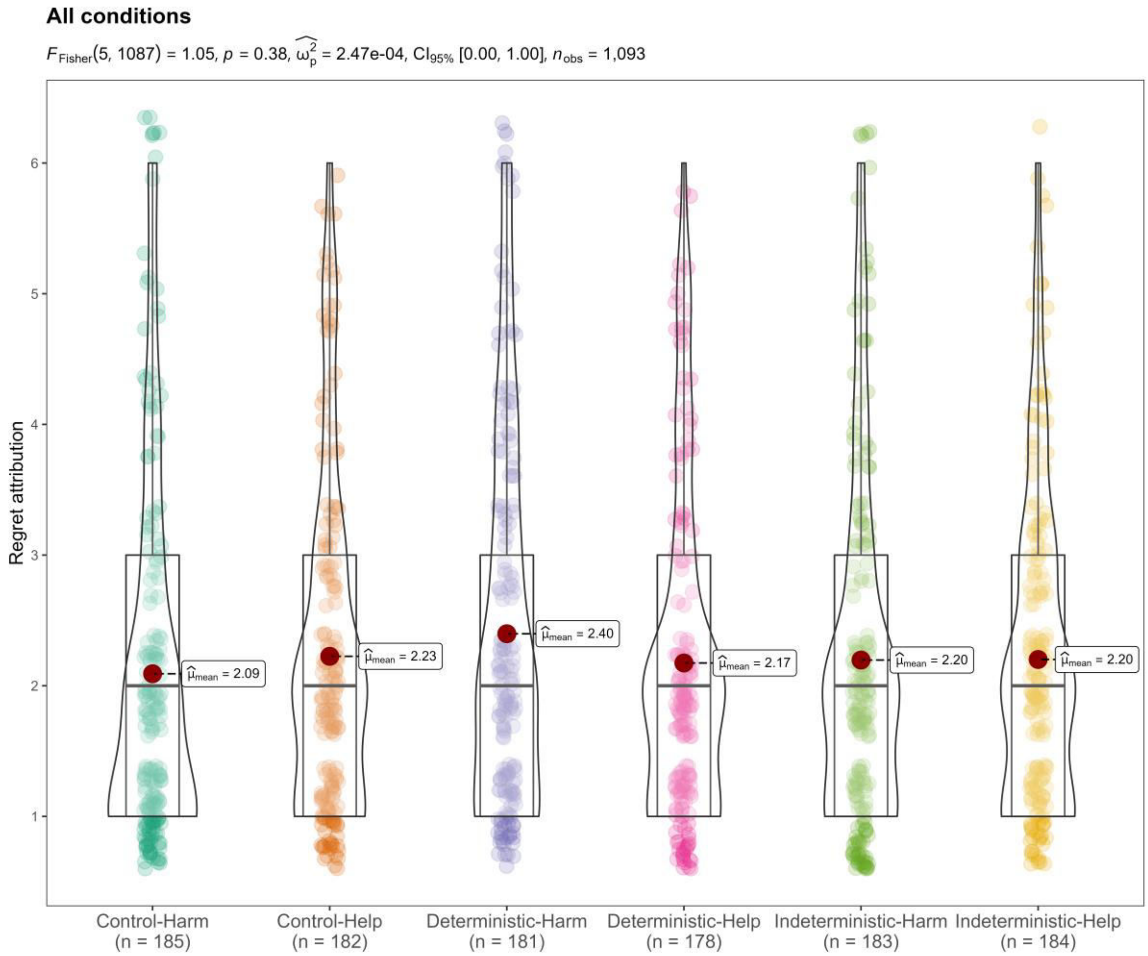
Study 2 Attribution of free will across all conditions



*Note***.** Violin plots displaying the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Figure S9

Study 2 Attribution of regret across all conditions



*Note***.** Violin plots displaying the distribution of responses, boxplots displaying the median, first, and third quartiles, and the red circle identifying the mean value.

Table S8

Study 1 correlations across all conditions

Type of universe	Variable	*M*	*SD*	1	2	3	4
Control (No universe, *n* =) 111)	1. Free will attributions	5.35	0.84				
	2. Intent attributions	3.43	1.55	.07 [-.12, .25]			
	3. Causality attributions	5.29	0.78	.24* [.06, .41]	.43** [.26, .57]		
	4. Praise attributions	2.82	1.58	-.08 [-.26, .11]	-.03 [-.22, .16]	-.07 [-.25, .12]	
	5. Blame attributions	5.03	1.10	.36** [.19, .50]	.36** [.19, .51]	.36** [.18, .51]	-.07 [-.25, .12]
Deterministic universe (*n* = 106)	1. Free will attributions	2.65	1.61				
	2. Intent attributions	3.20	1.52	.22* [.03, .39]			
	3. Causality attributions	4.78	1.35	-.19* [-.37, -.00]	.32** [.14, .48]		
	4. Praise attributions	2.75	1.40	.19* [.00, .37]	.31** [.13, .47]	-.02 [-.21, .17]	
	5. Blame attributions	3.73	1.48	.47** [.31, .61]	.27** [.09, .44]	.04 [-.15, .23]	.27** [.08, .44]
Indeterministic universe (*n* = 95)	1. Free will attributions	5.26	0.94				
	2. Intent attributions	3.55	1.60	.06 [-.14, .26]			
	3. Causality attributions	5.10	1.11	.30** [.10, .47]	.31** [.12, .48]		
	4. Praise attributions	3.39	1.52	.00 [-.20, .20]	.14 [-.07, .33]	-.00 [-.20, .20]	
	5. Blame attributions	4.91	1.25	.23* [.02, .41]	.32** [.13, .49]	.55** [.39, .67]	-.11 [-.31, .09]

Table S9
Study 2 correlations across all conditions

Type of universe	Variable	*M*	*SD*	1	2	3	4
Control (No universe , *n* =) 358)	1. Free will attributions	5.16	0.98				
	2. Intent attributions	3.44	1.64	.12*			
				[.02, .22]			
	3. Causality attributions	5.08	1.13	.34**	.33**		
				[.25, .43]	[.24, .42]		
	4. Praise attributions	2.64	1.52	-.28**	-.19**	-.24**	
				[-.38, -.18]	[-.29, -.09]	[-.33, -.14]	
	5. Blame attributions	5.01	1.19	.47**	.26**	.27**	-.32**
				[.39, .55]	[.16, .35]	[.17, .36]	[-.41, -.22]
Deterministic universe (*n* = 355)	1. Free will attributions	2.09	1.27				
	2. Intent attributions	3.31	1.61	.17**			
				[.07, .27]			
	3. Causality attributions	5.11	1.05	-.13*	.24**		
				[-.23, -.02]	[.14, .34]		
	4. Praise attributions	3.00	1.55	.09	.19**	.02	
				[-.02, .19]	[.09, .29]	[-.08, .13]	
	5. Blame attributions	3.83	1.66	.37**	.36**	.08	.19**
				[.28, .46]	[.27, .45]	[-.02, .19]	[.09, .29]
Indeterministic universe (*n* = 355)	1. Free will attributions	5.36	0.87				
	2. Intent attributions	3.41	1.61	-.01			
				[-.12, .09]			
	3. Causality attributions	5.11	1.09	.36**	.31**		
				[.26, .44]	[.21, .40]		
	4. Praise attributions	3.17	1.64	-.03	.20**	.07	
				[-.13, .08]	[.09, .29]	[-.03, .18]	
	5. Blame attributions	5.00	1.27	.24**	.24**	.22**	.10
				[.14, .34]	[.14, .34]	[.11, .31]	[-.00, .20]

Table S10

Study 1: Results of 3 x 2 ANOVA testing the effects of outcome and universe on attributions intentionality (combined dv, split dvs)

	Intentionality attribution (two items combined)				**Intentionality attribution (item 1)**				**Knowledge attribution (item 1)**			
Factor	*F*	*df*	*p*	η^2_p	*F*	*df*	*p*	η^2_p	*F*	*df*	*p*	η^2_p
Outcome (Help vs Harm)	182.80	1	<.001	.37	125.83	1	<.001	.29	154.89	1	<.001	.34
Universe	2.55	2	.080	.02	1.13	2	.324	.01	2.97	2	.053	.02
Outcome × Universe	1.62	2	.201	.01	0.47	2	.628	.00	2.35	2	.097	.02

***Note.* Outcome and Universe are between subject variables. *df* = degree of freedom, η^2p = partial eta-squared.**

Table S11

Study 2: Results of 3 x 2 ANOVA testing the effects of outcome and universe on attributions intentionality (combined dv, split dvs)

	Intentionality attribution (two items combined)				Intentionality attribution (item 2)				Knowledge attribution (item 2)			
Factor	*F*	*df*	*p*	η^2_p	*F*	*df*	*p*	η^2_p	*F*	*df*	*p*	η^2_p
Outcome (Help vs Harm)	182.80	1	<.001	.37	480.64	1	<.001	.31	647.58	1	<.001	.37
Universe	2.55	2	.080	.02	0.25	2	.778	.00	3.19	2	.041	.01
Outcome × Universe	1.62	2	.201	.01	1.50	2	.223	.00	1.80	2	.165	.00

***Note.* Outcome and Universe are between subject variables. *df* = degree of freedom, $\eta^2 p$ = partial eta-squared.**

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