

Laypersons' Beliefs and Intuitions About Free Will and Determinism: New Insights Linking the Social Psychology and Experimental Philosophy Paradigms

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Abstract

We linked between the social psychology and experimental philosophy paradigms for the study of folk intuitions and beliefs regarding the concept of free will to answer three questions: (1) What intuitions do people have about free will and determinism? (2) Do free will beliefs predict differences in free will and determinism intuitions? and (3) Is there more to free will and determinism than experiencing certainty or uncertainty about the nature of the universe? Overall, laypersons viewed the universe as allowing for human indeterminism, and they did so with certainty. Examining intuitions of prosociality, future orientation, learning, meaningfulness, human uniqueness, and well-being, ratings were highest in the indeterministic universe condition and lowest in the deterministic universe condition, both significantly different from the uncertain universe condition. Participants' free will beliefs had only weak impact on realism, happiness, and learning intuitions but did not reverse the general intuition favoring indeterminism and showed no impact on other intuitions.

Keywords

free will, experimental philosophy, belief in free will, intuitions

Introduction

How do people understand free will and determinism? How do people view a world with free will or a deterministic universe? In the last decade, experimental philosophers and social psychologists have made significant advances in the understanding of folk intuitions and lay beliefs regarding the concept of free will, offering new insights regarding this long debate and highly controversial topic. The two research streams, however, have been focusing on different research questions. Experimental philosophers have mainly focused on the question of how laypersons think about free will and whether they perceive free will and determinism as compatible or not. Social psychologists have focused their attention on exploring beliefs more broadly and have examined the consequences of free will and deterministic beliefs for cognition and behavior. There are also some differences in methodological approach. Experimental philosophers mainly examine their research questions using thought experiments by introducing participants to hypothetical scenarios and testing folk intuitions (Knobe et al., 2012; Nichols, 2011), while social psychologists mainly use scales to measure individual differences in the endorsement of free will and employ priming techniques to examine relationships with various behavioral factors (Baumeister & Monroe, 2014). The intersection of the two streams is promising, with

the potential of the two bodies of literature and methodologies to inform one another and give rise to new insights.

The present investigation aims at the intersection of the two views, by extending the classical experimental philosophy paradigm to incorporate recent developments in social psychology in several ways: (1) examining laypersons' free will and determinism intuitions for a wide array of factors found to be associated with free will beliefs (e.g., learning, happiness, prosociality, etc.), (2) examining the relationship between individual differences in free will beliefs and free will–related folk intuitions, and (3) exploring whether laypersons' free will and determinism intuitions are related to uncertainty regarding the nature of the universe. We discuss each of those extensions in detail, and report an empirical investigation.

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New Intuitions About Free Will and Determinism

A large body of research has consistently shown that in people's minds, the concept of free will is linked to moral responsibility based on the idea that free will is a prerequisite for holding people accountable for their behavior (Kant, 1788/1997). People view free actions as more accountable than actions that are not free (Stillman, Baumeister, & Mele, 2011), rate immoral actors as freer than moral actors (Feldman, Wong, & Baumeister, 2016; Phillips & Knobe, 2009), and report stronger beliefs in free will after being presented with immoral actors or actions (Clark et al., 2014; Shariff et al., 2014). Judgments of free will are associated with judgments of blame (Clark, Baumeister, & Ditto, 2017; Guglielmo, Monroe, & Malle, 2009; Malle, Guglielmo, & Monroe, 2014; Monroe, Dillon, & Malle, 2014), and disbelief in free will or the activation of the concept of determinism is associated with weaker moral attitudes (Carey & Paulhus, 2013) and less moral behavior (Vohs & Schooler, 2008).

The importance of the concept of free will is not limited to moral judgments. Studies have also shown that free will beliefs are associated with outcomes related to the pursuit of self-directed goals and coexistence with others in society. Supporting the sociofunctional role of free will (Baumeister, 2008a, 2008b; Baumeister & Monroe, 2014), the belief in free will has been associated with more prosocial and less aggressive behavior (Baumeister, Masicampo, & DeWall, 2009), more guilt over wrongdoings (Stillman & Baumeister, 2010), and more gratitude (Crescioni, Baumeister, Ainsworth, Ent, & Lambert, 2016; MacKenzie, Vohs, & Baumeister, 2014). In support of the self-promoting view of free will (Dennett, 2003), the belief in free will predicted higher autonomy and less conformity (Alquist, Ainsworth, & Baumeister, 2013) and better learning (Alquist, Ainsworth, Baumeister, Daly, & Stillman, 2015; Feldman, Chandrashekar, & Wong, 2016), which partly explain associations with positive outcomes such as higher job evaluations (Stillman et al., 2010), lower helplessness and higher self-efficacy (Baumeister & Brewer, 2012), higher perceived capacity and more positive attitudes toward decision-making (Feldman, Baumeister, & Wong, 2014), and a more future-oriented perspective (Seligman, Railton, Baumeister, & Sripada, 2013). Furthermore, the belief in free will also aids in providing believers with a deeper sense of meaning in their lives, stronger feelings of belongingness, and higher subjective feelings of well-being (Baumeister, Bauer, & Lloyd, 2010; Bergner & Ramon, 2013; Crescioni et al., 2016; Leotti, Iyengar, & Ochsner, 2010; Li, Wang, Zhao, Kong, & Li, 2016; Moynihan, Igou, & van Tilburg, 2017).

These findings broaden our understanding of the functional role of the belief in free will as encompassing a comprehensive view of humans as unique animals, proactive and future-oriented agents, capable of change, learning, and improvement (Baumeister & Monroe, 2014; Feldman, 2017). Experimental philosophers have traditionally focused on intuitions of compatibilism, morality, causality, intent, deliberation, and meaning (Feltz & Cova, 2014; Nahmias, Coates, & Kvaran, 2007), with

more recent extensions to psychological factors previously associated with free will beliefs (Bear & Knobe, 2016) as well as examining links with choice, decision-making, and reasoning (Feldman et al., 2014; Monroe & Malle, 2010; Rose & Nichols, 2013). Yet, many of the associations found in social psychology about free will beliefs have not yet been explored in experimental philosophy regarding free will intuitions. This raises our first research question of whether the observed links between the belief in free will and outcomes would also be reflected in laypersons' intuitions about free will and determinism. Specifically, whether laypersons would show a cognitive association between indeterministic free-will and learning, meaning, prosociality, future orientation, and well-being.

Belief in Free Will and Free Will Intuitions

Free will intuitions are affected by both situational cues and stable individual differences (Cokely & Feltz, 2009; Cushman & Mele, 2008; Feltz, Cokely, & Nadelhoffer, 2009; Nichols & Ulatowski, 2007). Feltz and Cokely (2008) have shown that laypersons' attributions of moral responsibility are affected by personality traits, such that those high in extroversion intuitively associated agents with higher free will in a hypothetical deterministic universe. The reasoning was that extroverts care more about social dynamics and therefore emphasize human freedom and responsibility to facilitate social functioning (Feltz & Cokely, 2009; Nadelhoffer, Kvaran, & Nahmias, 2009; Schulz, Cokely, & Feltz, 2011). These findings followed other individual differences found in attributions of intentionality (Cushman & Mele, 2008) and the Knobe (2003) effect in which people attribute higher intent to a bad side effect (secondary outcome) than to a positive side effect (Feltz & Cokely, 2007, 2008).

Individual differences related to free will are especially relevant to free will intuitions. While the link between beliefs and intuitions regarding free will may seem straightforward, as far as we know there has been no attempt to test the relationship between the two. Although beliefs are sometimes confused with perceptions, intuitions, or attitudes, there are important conceptual differences (Feldman, 2017). Broadly, beliefs are an endorsement of whether certain statements are true or accurate (e.g., I have free will), whereas intuitions involve judgments (e.g., free will is associated with good/bad, and/or it makes me feel positive/negative) or an evaluation of a situation or an object (e.g., this situation or hypothetical universe would allow me to choose more/less freely/morally). Importantly, beliefs are generally considered stable and cross-situational, while intuitions are more context-specific. This leads to our second research question of whether free will beliefs predict differences in free will related intuitions.

In connection with our first research question, an investigation of the intersection of beliefs and intuitions would provide another much-needed methodological bridge between the experimental philosophy and the social psychology paradigms.

Uncertainty About Free Will and Determinism

The studies following classic experimental philosophy paradigm looking at free will typically present participants with two types of hypothetical universes—a fully deterministic universe in which all life including human behavior is determined, and a universe in which human behavior is an exception and is not fully determined (Nichols, 2011; Nichols & Knobe, 2007). In these studies, participants are asked to judge which of the two universes better represents reality (realism) and then asked to rate attributions of moral responsibility under a specific universe (usually the deterministic universe, to assess compatibilism). In the majority of the studies that have employed this paradigm, most of the participants (over 90%) typically indicated the indeterminist universe as more likely representative of reality (and still embrace moral responsibility in a deterministic world, which is often interpreted as compatibilism). However, it was noted that framing of different aspects in the described hypothetical universes may affect people's perceptions of realism (e.g., Feltz et al., 2009; Feltz & Cova, 2014; Roskies & Nichols, 2008).

One of the challenges in capturing people's intuitions regarding the concepts of free will and determinism lies in the concept of uncertainty. A fully deterministic universe is a universe where there is no room for uncertainty. An indeterministic universe is a universe that allows for uncertainty (Lau, Hiemisch, & Baumeister, 2015) and incompatibilists' free will has been associated with unpredictability (e.g., Brembs, 2011; Feldman, Wong, et al., 2016; Paulhus & Carey, 2011; Pronin & Kugler, 2010) and linked with the unexpected in alternative realities of what else could happen or could have happened (e.g., counterfactuals; Alquist et al., 2015; Seto, Hicks, Davis, & Smallman, 2015). It is possible that the findings in experimental philosophy showing participants rating the indeterministic universe as more realistic indeed reflect people's strong intuitions against or disbelief in determinism (Sarkissian et al., 2010). Yet, it might instead reflect the participants' uncertainty about the fundamental laws governing the universe, since our current scientific understanding does not allow for a complete mapping of all deterministic causes or for proof of free will or lack of determinism.

Examining uncertainty is about more than merely the need for a control condition in the classic experimental philosophy paradigm. Comparing uncertainty to indeterministic free will and determinism would allow us to verify that laypersons indeed have an intuition for indeterministic free will rather than expressing uncertainty regarding the existence of determinism or free will, as well as to potentially provide us with a clearer understanding of the differentiation that people make between indeterministic free will and uncertainty about the world.

The Present Investigation

We constructed an empirical investigation that targets the three discussed extensions: (1) testing new intuitions for concepts

previously associated with free will beliefs, (2) examining the relationship between free will beliefs and intuitions regarding free will and determinism, and (3) comparing intuitions of free will and determinism to intuitions resulting from uncertainty.

Experiment

We preregistered the experiment on March 9, 2016, 15:03 Coordinated Universal Time (UTC) on the Open Science Framework and data collection was launched later that day. Power analyses and all materials used in this experiment are available in the Online Supplementary Materials. Data set and code were shared on the Open Science Framework (<https://osf.io/j4k9z/>).

Participants and Procedures

A total of 346 American Amazon Mechanical Turk participants ($M_{\text{age}} = 35.51$, $SD_{\text{age}} = 11.65$; 181 female) were recruited online using TurkPrime.com (Litman, Robinson, & Abberbock, 2016). Participants were randomly assigned to one of the three between-subject conditions (deterministic universe, indeterministic universe, or an uncertain universe). All participants answered a scale measuring free will beliefs, read a scenario of the assigned condition's hypothetical universe, and responded to questions evaluating intuitions.

Using the classic experimental philosophy paradigm, the scenario described a hypothetical universe, with the two original conditions for a fully deterministic universe and a universe which allows for human indeterminism (regarded as free will under the incompatibilist view of free will as incompatible with a fully deterministic universe). The original studies (Nichols, 2011; Nichols & Knobe, 2007; Sarkissian et al., 2010) showed both universes to the participants and asked to choose between the two or to make judgments about only one of those. We adjusted this paradigm to a between-subject design in which participants were only presented with one hypothetical universe to address potential contrasting effects.

The deterministic and indeterministic universes were described 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.

Going beyond the two original descriptions, we sought to address the third extension discussed in the introduction and assess uncertainty. We therefore added a condition of an uncertain universe, in which it is unclear to agents whether human behavior is determined or undetermined:

Uncertain universe: 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.

Following the scenarios, participants completed a manipulation check (see the Online Supplementary Materials) and answered attribution questions.

Measures

Belief in free will. To assess the interaction between folk beliefs and folk intuitions, we collected beliefs in free will. The belief in free will was measured using the 9-item Personal Agency and Free Will subscales of the Free Will and Determinism Scale (Rakos, Laurene, Skala, & Slane, 2008). Participants were asked to indicate their agreement with statements related to believing in the existence of free will, such as "I have free will" and "I am in charge of my actions even when my life's circumstances are difficult" (1 = *strongly disagree*, 7 = *strongly agree*; $\alpha = .93$).

Intuitions. We supplemented the realism and moral responsibility intuitions used in the original experimental paradigm with questions about intuitions of happiness, learning, meaningfulness, human uniqueness, prosociality, and future orientation.

Realism. Two items measured the extent to which the hypothetical universe was perceived as similar to the real universe we live in—"How similar is Universe D to our own real universe?" (0 = *not at all like our universe*, 5 = *exactly like our universe*) and "To what extent does Universe D follow the same laws of nature as our own real universe?" (0 =

Table 1. Means and SDs for All Conditions.

Universe Intuitions	Deterministic		Indeterministic		Uncertain	
	M	SD	M	SD	M	SD
Realism	1.80	1.51	3.45	1.25	2.87	1.47
Happiness	2.14	1.41	3.69	1.06	3.24	1.18
Learning	2.51	1.49	4.00	1.09	3.55	1.28
Meaningfulness	2.27	1.24	3.58	0.83	2.94	1.04
Uniqueness	2.45	1.43	3.39	1.03	2.70	0.98
Prosociality	2.05	1.29	2.60	0.97	2.46	1.13
Future orientation	1.04	1.45	2.82	1.73	2.11	1.62
Moral responsibility	2.35	1.69	3.77	0.97	3.13	1.32

Note. Indeterministic universe: $n = 108$, deterministic universe: $n = 111$, and uncertain universe: $n = 112$; scales are between 0 and 5. M = mean; SD = standard deviation.

completely different laws of nature, 5 = *exactly the same laws of nature*; $\alpha = .97$).

Happiness. Two items measured intuitions related to the possibility of happiness in the hypothetical universe—"How happy do you think you can be if you were living in Universe D?" (0 = *not at all happy*, 5 = *the happiest possible*) and "In Universe D, to what extent is happiness possible?" (0 = *happiness not at all possible*, 5 = *happiness very possible*; $\alpha = .85$).

Learning. Two items measured intuitions related to the possibility of individual learning in the described universe—"In Universe D, to what extent is learning possible?" (0 = *learning not at all possible*, 5 = *learning very possible*) and "In Universe D, does learning something mean anything?" (0 = *learning something is meaningless*, 5 = *learning something is very meaningful*; $\alpha = .87$).

Meaningfulness. Four items measured intuitions related to the meaningfulness of individuals' actions in the hypothetical universe—"How meaningful do you think life would be for people living in Universe D?" (0 = *without any meaning*, 5 = *very meaningful*), "How purposeful (filled with purpose) do you think life would be for people living in Universe D?" (0 = *without any purpose*, 5 = *very purposeful*), "In Universe D, human action is more meaningful (has unique meaning) than that of other animals," and "In Universe D, human action is more purposeful (has a sense of purpose) than that of other animals" (0 = *strongly disagree*, 5 = *strongly agree*; $\alpha = .80$).

Uniqueness. Three items measured the extent to which human behavior is perceived as unique—"In Universe D, humans are just like any other object in the universe" (reversed), "In Universe D, humans operate under different natural laws than all other objects," and "In Universe D, humans possess unique attributes that make them different from all other elements of nature" (0 = *strongly disagree*, 5 = *strongly agree*; $\alpha = .73$).

Prosociality. Two items measured perceptions of human behavior in the hypothetical universe as either self-centered or prosocial. Items included "In your opinion, would people living in

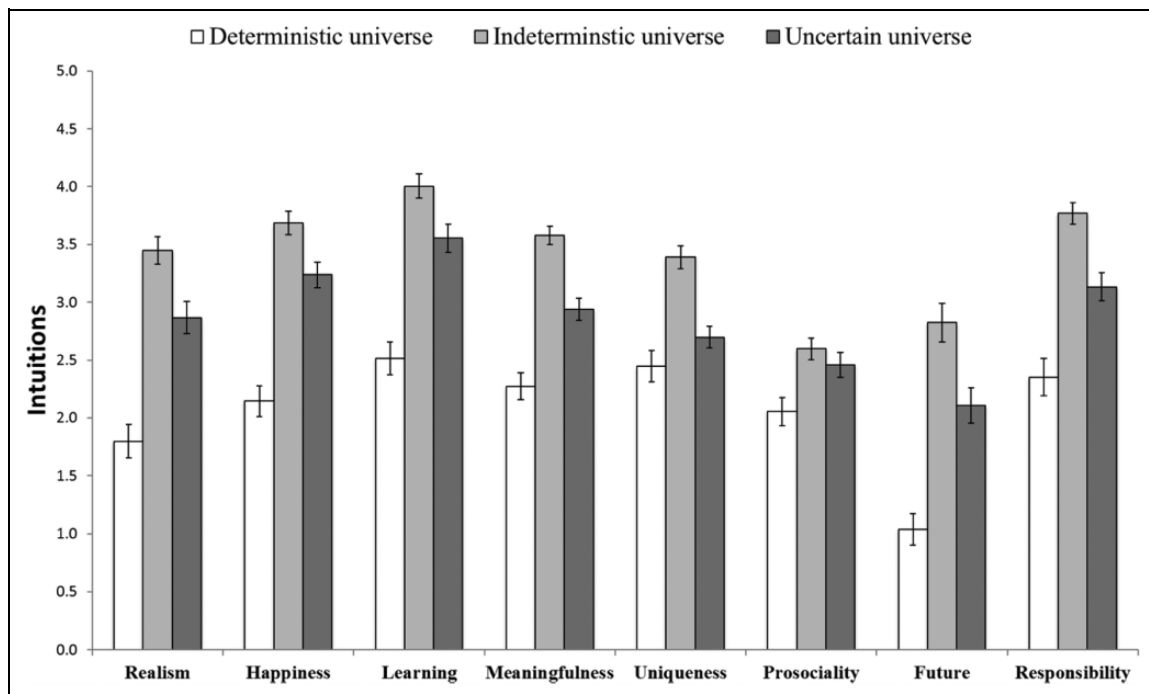


Figure 1. Plot of intuitions for the three conditions—deterministic versus indeterministic versus uncertain universe. Scales are between 0 and 5. Error bars indicate ± 1 Standard Error Mean (SEM).

Universe D be more prosocial or more self-centered?” (0 = *extremely self-centered*, 5 = *extremely prosocial*) and “In your opinion, would people living in Universe D prefer to promote their own goals or social goals?” (0 = *only own goals*, 5 = *only social goals*; $\alpha = .84$).

Future orientation. A single item measured whether past or future was perceived as more important in the hypothetical universe—“In Universe D, which would be more important—past or the future?” (0 = *past would be more important*, 5 = *future would be more important*).

Moral responsibility. Two items measured intuitions of moral responsibility in the hypothetical universe—“Should people living in Universe D be held morally responsible for their negative actions?” (0 = *people should not be held accountable for their actions*, 5 = *people should definitely be held responsible for their actions*) and “If someone living in Universe D committed a crime, this person should pay for the crime committed” (0 = *strongly disagree*, 5 = *strongly agree*; $\alpha = .91$).

Results

The means and standard deviations of all dependent variables for each condition are detailed in Table 1 and plotted in Figure 1, and the overall means and standard deviations for the entire sample and the correlations between the dependent variables and scale reliabilities are detailed in Table 2. An analysis of variance showed that all dependent variables were affected by the experimental manipulation describing different

hypothetical universes, and the results are detailed in Table 3 (all $F > 6.75$, $p \leq .001$; $.22 \geq \eta_p^2 \geq .04$).

We ran a set of independent sample t tests contrasting the different experimental conditions, summarized in Table 4. We found that participants in the deterministic universe condition rated all intuitions as lower than the participants in the indeterministic universe (all $p < .001$, from $d = .48$ for prosociality to $d = 1.24$ for happiness and meaningfulness). There were no significant differences between the deterministic and the uncertain conditions in uniqueness ($p = .132$, $d = .20$) and no significant differences between the indeterministic and the uncertain conditions in prosociality ($p = .320$, $d = .13$), but in all other intuitions, participants in the uncertain universe rated intuitions as lower than participants in the indeterministic universe condition ($p < .01$ and $d = .38$ to $d = .69$) and higher than the deterministic universe (all with $p < .001$, and from $d = .33$ for learning to $d = .84$ for uniqueness).

We proceeded to examine whether individual differences in the endorsement of the belief in free will would predict differences in intuitions for the deterministic and indeterministic universes. The analyses of covariance of the interaction between the deterministic versus the indeterministic experimental conditions and the belief in free will for all intuitions are summarized in Table 5. There was a main effect positive relationship between belief in free will and intuitions of realism and uniqueness, with a significant interaction on intuitions of realism, happiness, and learning. The interactions are plotted in Figure 2. On these three significant intuitions interactions, the differences in intuitions between the indeterministic and deterministic universes were higher for those high on the belief in free will

Table 2. Means, SDs, α s, and Correlations Between Intuitions.

Intuitions	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8
1. Realism	2.70	1.57	(.97)							
2. Happiness	3.02	1.38	.73	(.85)						
3. Learning	3.35	1.44	.64	.78	(.87)					
4. Meaningfulness	2.92	1.17	.57	.69	.69	(.80)				
5. Uniqueness	2.84	1.23	.15	.19**	.20	.55	(.73)			
6. Prosociality	2.37	1.16	.26	.31	.29	.31	.08 ^{ns}	(.84)		
7. Future orientation	1.98	1.76	.51	.50	.44	.49	.17**	.24	(—)	
8. Moral responsibility	3.08	1.48	.52	.57	.59	.58	.33	.17**	.42	(.91)

Note. $N = 331$. α s for all measures are reported on the diagonal. All correlations were $p < .001$ unless indicated otherwise. All intuitions are on a scale of 0–5. $M =$ mean; $SD =$ standard deviation; $ns =$ not significant.

* $p \leq .05$. ** $p \leq .01$. ^{ns} $p > .05$.

Table 3. Analysis of Variance for Differences Between Conditions for All Dependent Variables.

Intuitions	<i>F</i>	<i>p</i>	η_p^2
Realism	38.50	<.001	.19
Happiness	45.97	<.001	.22
Learning	38.16	<.001	.19
Meaningfulness	42.27	<.001	.21
Uniqueness	19.16	<.001	.11
Prosociality	6.75	=.001	.04
Future orientation	34.51	<.001	.17
Moral responsibility	29.79	<.001	.15

Note. All analyses of df were (2, 328).

compared to those low on the belief in free will. On realism, those low on the belief in free will did not differ from those high on the belief in free will in rating the realism of the indeterministic universe, but they did differ in perceiving a fully deterministic universe as more realistic.

Discussion

We set out to examine three research questions, and below we review each of those questions and related findings. A summary of the findings is provided in Table 6.

The first research question was whether the findings regarding the link between the belief in free will and outcomes would be reflected in laypersons' intuitions regarding free will. Based on previous social psychology literature linking the belief in free will to prosociality, future orientation, learning, meaning, and well-being, we expected that laypersons would more strongly associate these with an indeterministic universe compared to a fully deterministic universe in the experimental philosophy paradigm. The findings provide very strong support for these hypotheses. People have the overall intuition that an indeterministic universe (free will under the incompatibilist view) allows for better learning, a more meaningful, and happier life, in which people are more prosocial (less selfish) and where the future is more important than the past. The intuitions of prosociality are especially revealing, since the belief in free will has been previously linked to both prosocial (Baumeister

Table 4. Independent Sample *t* Tests Contrasting the Deterministic, Free Will, and Unknown Conditions.

Dependent Variable	<i>t</i>	<i>df</i>	<i>p</i>	<i>MD</i>	<i>LCI</i>	<i>UCI</i>	<i>d</i>
Deterministic universe versus indeterministic universe							
Realism	−8.85	211.67	.000	−1.65	−2.02	−1.28	−1.20
Happiness	−9.16	203.84	.000	−1.54	−1.87	−1.21	−1.24
Learning	−8.46	201.25	.000	−1.49	−1.84	−1.14	−1.14
Meaningfulness	−9.18	192.96	.000	−1.30	−1.58	−1.02	−1.24
Uniqueness	−5.60	199.38	.000	−0.94	−1.27	−0.61	−0.76
Prosociality	−3.54	204.27	.000	−0.54	−0.85	−0.24	−0.48
Future orientation	−8.28	208.67	.000	−1.79	−2.21	−1.36	−1.12
Moral responsibility	−7.63	175.55	.000	−1.42	−1.78	−1.05	−1.02
Deterministic universe versus uncertain universe							
Realism	−5.36	221.00	.000	−1.07	−1.46	−0.68	−0.72
Happiness	−6.27	213.46	.000	−1.09	−1.44	−0.75	−0.84
Learning	−5.59	221.00	.000	−1.04	−1.41	−0.67	−0.75
Meaningfulness	−4.35	221.00	.000	−0.67	−0.97	−0.36	−0.58
Uniqueness	−1.51	193.78	.132	−0.25	−0.57	0.08	−0.20
Prosociality	−2.47	221.00	.014	−0.40	−0.72	−0.08	−0.33
Future orientation	−5.19	218.70	.000	−1.07	−1.48	−0.66	−0.70
Moral responsibility	−3.85	207.45	.000	−0.78	−1.18	−0.38	−0.52
Indeterministic universe versus uncertain universe							
Realism	3.17	218.00	.002	0.58	0.22	0.95	0.43
Happiness	2.97	218.00	.003	0.45	0.15	0.75	0.40
Learning	2.83	214.83	.005	0.45	0.14	0.77	0.38
Meaningfulness	5.06	211.05	.000	0.64	0.39	0.89	0.68
Uniqueness	5.13	218.00	.000	0.69	0.43	0.96	0.69
Prosociality	1.00	218.00	.320	0.14	−0.14	0.42	0.13
Future orientation	3.17	218.00	.002	0.72	0.27	1.16	0.43
Moral responsibility	4.09	203.60	.000	0.63	0.33	0.94	0.55

Note. Indeterministic universe: $N = 108$, deterministic universe: $N = 111$, and uncertain universe: $N = 112$; *LCI* = lower confidence intervals 95%; *UCI* = upper confidence intervals 95%; *d* = Cohen's *d*.

Table 5. Interactions Between the Deterministic Versus Indeterministic Experimental Conditions and Belief in Free Will.

Intuitions Factor	Realism			Happiness			Learning		
	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2
Experimental condition	83.55	.000	.28	85.23	.000	.28	71.67	.000	.25
Belief in free will	4.19	.042	.02	1.11	.293	.01	0.02	.898	.00
Interaction	9.56	.002	.04	7.67	.006	.03	3.97	.048	.02
Intuitions Factor	Meaningfulness			Uniqueness			Prosociality		
	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2
Experimental condition	83.60	.000	.28	32.77	.000	.13	12.47	.001	.06
Belief in free will	2.73	.100	.01	11.43	.001	.05	1.46	.229	.01
Interaction	0.03	.872	.00	0.84	.361	.00	0.51	.476	.00
Intuitions Factor	Future Orientation			Moral Responsibility					
	<i>F</i>	<i>p</i>	η_p^2	<i>F</i>	<i>p</i>	η_p^2			
Experimental condition	68.29	.000	.24	57.72	.000	.22			
Belief in free will	0.00	.973	.00	3.37	.068	.02			
Interaction	0.28	.598	.00	.93	.337	.00			

Note. Bolded values indicate a significant interaction between the experimental condition (deterministic vs. indeterministic universes) and belief in free will. Indeterministic universe: $N = 108$ and deterministic universe: $N = 111$.

et al., 2009; Crescioni et al., 2016) and self-promoting (Alquist et al., 2013; Feldman, Chandrashekar, et al., 2016; Stillman et al., 2010) behaviors (see discussion in Feldman, 2017). Our findings are in support of laypersons' intuitions following the Baumeister-ian view that "free will is for following rules" (Baumeister, 2008a, 2008b; Baumeister, Crescioni, & Alquist, 2011; Baumeister & Monroe, 2014; Monroe, Vohs, & Baumeister, 2016) facilitating sociofunctioning coexistence with others rather than the pursuit of selfish needs regardless of others. We also replicated previous findings in experimental philosophy using a similar experimental paradigm showing that people associate higher moral responsibility with an indeterministic universe than they do to a deterministic universe, lending support to the overall validity of these findings. Put together, the findings show a wide array of broad intuitions associated with indeterminism, which paves the way for future studies in experimental philosophy to build on findings in social psychology about free will beliefs to explore laypersons' philosophical understanding of other theoretically important factors.

The second research question was whether individual differences in free will beliefs would predict differences in free will-related intuitions. Belief in free will predicted perceiving humans as more unique, with a marginal effect for perceiving people as more morally responsibility (in line with Monroe, Brady, & Malle, 2017). All other intuitions were not directly associated with individual differences in believing in free will. We therefore conclude that beliefs in free will had little direct impact on the examined intuitions.

Examining the relationship between the belief in free will and intuitions for the indeterministic versus deterministic hypothetical universes, we found that belief in free will strengthened perceived differences in intuitions between the

two universes for realism, happiness, and learning. Those who believed in free will perceived greater differences in learning and happiness between the two universes and found the free will universe to be more realistic than the deterministic universe. Yet, regardless of individual free will beliefs, people perceived the indeterministic universe to be more realistic than the deterministic world, only that those who believe in free will did so to a larger extent. This effect is revealing, because this means that it is not that people who are lower on free will beliefs reject free will indeterminism completely. Quite the contrary, even those who were relatively lower on belief in free will perceived an indeterministic universe as more realistic, only that they perceived a deterministic universe as slightly more likely and an indeterministic universe as slightly less likely. This finding may provide an explanation as to why manipulating free will beliefs did not always affect cognition and behavior in the expected way (Lynn, Muhle-Karbe, Aarts, & Brass, 2014; Monroe et al., 2017; Schooler, Nadelhoffer, Nahmias, & Vohs, 2014). We consider this an interesting example of the way by which the experimental philosophy paradigm examining intuitions provides new insights to social psychology's assessment of the belief in free will and its consequences.

Lastly, we set out to tease apart free will and determinism intuitions from mere uncertainty about the nature of the universe. The findings clearly show that people perceive the indeterministic universe as the most realistic, more so than they do the uncertain universe in which it is unclear whether the universe is fully deterministic or not. This is an important point which highlights that people are convinced that our universe allows for human indeterminism or free will under the incompatibilist philosophical view. The other intuitions we assessed

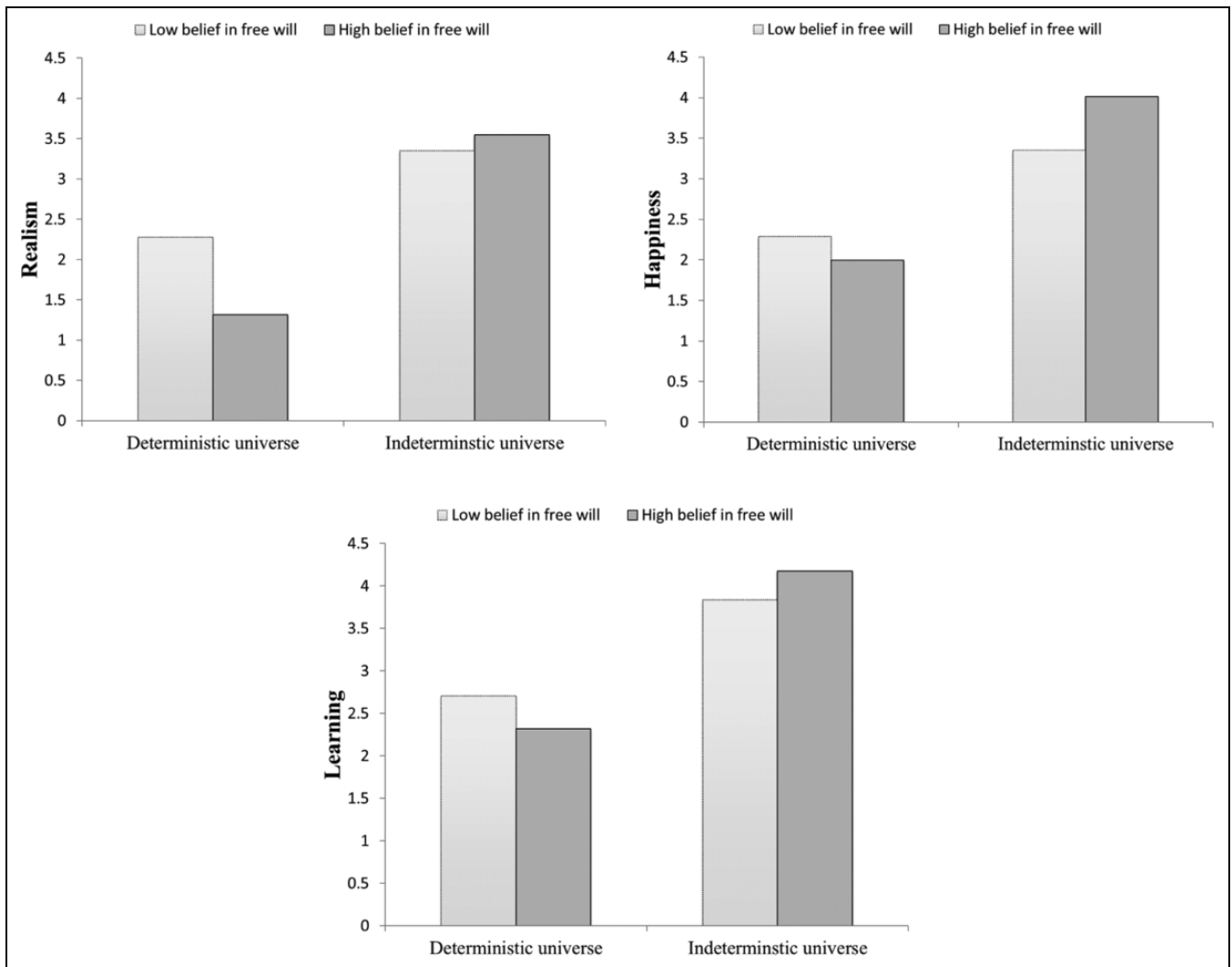


Figure 2. The graphs show the interactions between free will beliefs and ratings of deterministic and indeterministic universes for realism, happiness, and learning. The interactions for the other intuitions were not significant ($p > .05$) and therefore not included.

Table 6. Summary of Findings.

Predictions/Research Questions	Findings	Notes
Interaction between beliefs and realism intuitions	Significant interaction between free will beliefs and the contrast between indeterministic and deterministic universes	Preregistered. However, intuitions not reversed, weaker effect than expected
Higher moral accountability in the indeterministic universe	Supported. Higher than the uncertain universe and the deterministic universe. Deterministic universe lower than the uncertain universe	Preregistered. Replication for the indeterministic versus deterministic universe contrast in the literature
Higher uniqueness, happiness, and meaningfulness in the indeterministic universe	Supported. Higher than the uncertain universe and deterministic universe. Deterministic universe lower than the uncertain universe	Preregistered. In support of findings in social–psychology linking free will beliefs and related outcomes
Higher learning and meaningfulness intuitions in the indeterministic universe	Supported	In support of findings in social–psychology linking free will beliefs and related outcomes
Higher or lower prosociality in the indeterministic universe?	Higher prosociality in the indeterministic universe, compared to the other conditions	Exploratory. In support of the Baumeister-ian view of the sociofunctional role of free will
Are intuitions for the indeterministic and deterministic universes different than for an uncertain universe?	Significant differences for all intuitions: indeterministic universe highest, deterministic lowest, uncertain in between	Exploratory. Conclusion: certainty about indeterminism and related intuitions
Do free will beliefs predict differences in intuitions?	Significant interactions only for happiness and learning for the indeterministic versus deterministic universe contrasts	Exploratory. Conclusion: beliefs had no to weak effects over intuitions

may suggest a possible explanation. It is not only that an uncertain world is less likely but also that the uncertain universe world is associated with less meaning, well-being, learning, and moral responsibility. These intuitions, regardless of beliefs, could be the factors driving the human inclination to perceive human indeterminism (or free will), as is suggested by the wide literature regarding the ‘illusion of free will’ (Wegner, 2003, 2004; Wegner & Wheatley, 1999).

Conclusion

We demonstrated new links between the experimental philosophy paradigm assessing intuitions and the social psychology paradigm examining free will beliefs to offer new insights regarding the way people think about free will and determinism. People intuitively perceive the world as allowing for human indeterminism (or incompatibilist free will), and they do so with certainty. They associate the realistic indeterministic universe with more meaning, well-being, prosocial, future-oriented, and morally responsibility behavior, regardless of their own beliefs in free will, and their belief in free will serves to enhance perceiving free will in the world and its associated outcomes of happiness and learning. We call for more studies linking the experimental philosophy and social psychology paradigms to broaden our understanding of laypersons’ intuitions and beliefs regarding abstract philosophical notions like free will and determinism.

Authors’ Note

Gilad Feldman designed and conducted the experiment and wrote the manuscript. Subramanya Prasad Chandrashekar conducted data analyses, wrote the methods and results, provided feedback, and approved the final draft for submission.

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Supplemental Material

The supplemental material is available in the online version of the article.

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Supplementary materials

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Power analyses

We based our experimental design on the Nichols and Knobe (2007) and Sarkissian et al. (2010) experimental philosophy paradigms. In these studies, participants were presented with an indeterministic versus deterministic universe and were asked which of the two was more similar to the real universe. In Sarkissian and colleagues' study 82% of the 66 American participants indicated that the free will universe is more realistic, resulting in a chi-square effect of 40.960 (compared to a 50-50 expected random response), which can be converted to a Cohen d effect of 2.56, a very large effect.

In our experimental paradigm participants were presented with only one of the options and were asked to indicate their answers on a scale rather than dichotomous choice, and we therefore expected that the effect would be weaker than the converted chi-square but still moderate to strong ($d > .60$) for the comparisons between indeterministic and determinism universes. We also introduced an uncertain universe condition, and we wanted to be able to detect more moderate effects ($d > .40$) in the comparison between either the deterministic and free will universe and the uncertain universe.

Using G*power 3.1.9.2 we calculate that to achieve .80 power with alpha of .05 and a one-tail effect size of .40 we require 78 participants per cell. We aimed for a sample of at least 100 per condition, and recruited 346 participants overall, achieving a post-hoc power of .91. The effect we found for the contrast between free will and determinism was $d = -1.20$ for realism and $d > .79$ for all other intuitions except prosociality. The found effect for the contrast between free will and uncertainty was $d = .43$ for realism and $d > .38$ for all other intuitions except prosociality.

Open Science

Data and code will be shared using the Open Science Framework. Files are available for review using the following link: https://osf.io/j4k9z/?view_only=753d0b85b2764f1c8cb44d8e5a3c9c1e

Procedure and data disclosures

Data collection

Data collection was completed before conducting an analysis of the data.

Conditions reporting

All collected conditions are reported.

Data exclusions

There were no data exclusions. All data is included in the provided data.

Variables reporting

All variables collected for this study are reported and included in the provided data.

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.

Pre-registration

We pre-registered the experiment on March 9th 15:03 UTC on the Open Science Framework and data collection was launched later that day. The pre-registration included additional studies and data collection unrelated to the research questions addressed in this manuscript.

The section pertaining to the current manuscript included the following below:

Hypotheses

Description of essential elements

Judging the indeterministic universe:

1. The indeterministic universe is most similar to our own universe in comparison with deterministic universe.

Universe manipulations

1. Higher happiness and meaning in the indeterministic universe.
2. Higher moral accountability in the indeterministic universe.
3. Higher theory of mind in the indeterministic universe.

Methods

Structure:

- Measure free will beliefs
- Manipulate universe - free will universe, deterministic universe, and control.
 - Questions to contemplate the universe, happiness, meaning, etc.

Planned sample:

1. American MTurk workers,
2. Requirements: 100-10000 tasks, 95%+ approval rate. No other pre-selection rules.
3. No data collection termination rules.

Anticipated data exclusion criteria:

1. We will code answers describing indeterministic, deterministic, and uncertain universe for whether the participant understood the universe. Serious misunderstandings of the manipulations may serve as exclusion criteria.
2. Failing attention and manipulation checks.
3. Duplicate IPs.
4. Surveys completed in unreasonably fast time.
5. No demographic exclusions.
6. data-based outlier criteria;
7. method-based outlier criteria (e.g. too short or long response times).

Procedure

1. Materials are fixed order display, all measures described in the Qualtrics. Randomization is evenly presented (Qualtrics option).

Materials used in the experiment

Free will scale

In this part, you will be asked to answer a few questions about your general beliefs about life. Please note that some of the scales include attention checks, to make sure that you're paying attention. For the general questions, there are no right or wrong answers, so answer to the best of your understanding based on what you believe to be true.

Please indicate the extent to which you agree with the following statements:

1. Free will is a part of the human spirit
2. Free will is a basic part of human nature
3. I have free will even when my choices are limited by external circumstances
4. People have free will regardless of wealth or life circumstances
5. Life's experiences cannot eliminate a person's free will
6. I am in charge of the decisions I make
7. I decide what action to take in a particular situation
8. I am in charge of my actions even when my life's circumstances are difficult
9. I have free will

Attention checks:

10. One hundred is more than fifty
11. Poor people have more money than rich people

Universe manipulation

We now move to different type of scenario that may require a bit of imagination. In the next few pages you will be presented with an imaginary universe. Please read the scenario carefully and answer the questions that follow.

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.

Uncertain universe: 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.

Manipulation check

To make sure you understood Universe D, please answer - In Universe D, why did John decide to have French Fries?

1. It had to happen, John could not have chosen otherwise
2. John was free to choose not to eat the French Fries, but decided to eat it
3. It is unclear why John decided what he decided

Intuitions

Realism

1. How similar is Universe D to our own real universe?
 - a. Not at all like our universe (0) - Exactly like our universe (5)
2. To what extent does Universe D follow the same laws of nature as our own real universe?
 - a. Completely different laws of nature (0) - Exactly the same laws of nature (5)

Happiness

1. How happy do you think you can be if you were living in Universe D?
 - a. Not at all happy (0) - The happiest possible (5)
2. In Universe D, to what extent is happiness possible?
 - a. Happiness not at all possible (0) - Happiness very possible (5)

Learning

1. In Universe D, to what extent is learning possible?
 - a. Learning not at all possible (0) - Learning very possible (5)
2. In Universe D, does learning something mean anything?
 - a. Learning something is meaningless (0) - Learning something is very meaningful (5)

Future-orientation

1. In Universe D, which would be more important - past or the future?
 - a. Past would be more important (0) - Future would be more important (5)

Meaning

1. How meaningful do you think life would be for people living in Universe D?
 - a. Without any meaning (0) - Very meaningful (5)
2. How purposeful (filled with purpose) do you think life would be for people living in Universe D?
 - a. Without any purpose (0) - Very purposeful (5)
3. Please rate your level of agreement with the following: In Universe D human action is more meaningful (has unique meaning) than that of other animals
 - a. Strongly disagree (0) - Strongly agree (5)
4. Please rate your level of agreement with the following: In Universe D human action is more purposeful (has a sense of purpose) than that of other animals
 - a. Strongly disagree (0) - Strongly agree (5)

Uniqueness

1. Please rate your level of agreement with the following: In Universe D humans are just like any other object in the universe (reversed)
 - a. Strongly disagree (0) - Strongly agree (5)

2. Please rate your level of agreement with the following: In Universe D humans operate under different natural laws than all other objects
 - a. Strongly disagree (0) - Strongly agree (5)
3. Please rate your level of agreement with the following: In Universe D humans possess unique attributes that make them different from all other elements of nature
 - a. Strongly disagree (0) - Strongly agree (5)

Prosociality

1. In your opinion, would people living in Universe D be more pro-social or more self-centered?
 - a. Extremely self-centered (1) - Extremely pro-social (6)
2. In your opinion, would people living in Universe D prefer to promote their own goals or social goals?
 - a. Only own goals (1) - Only social goals (6)

Moral responsibility

1. Should people living in Universe D be held morally responsible for their negative actions?
 - a. People should NOT be held accountable for their actions (0) - People should definitely be held responsible for their actions (5)
2. Do you agree with the following statement? - If someone living in Universe D committed a crime, this person should pay for the crime committed
 - a. Strongly disagree (0) - Strongly agree (5)