Reference of the paper: Nahmias, E., Coates, D. J., & Kvaran, T. (2007). Free will, moral responsibility, and mechanism: Experiments on folk intuitions. Midwest studies in Philosophy, 31(1), 214-242.
Replication team: Jonathan Phillips & Fiery Cushman

Methods

Power analysis and required sample size:
(Please, describe briefly the power analysis you conducted to determine the minimum required sample size. If the original effect is a null effect, just describe the required sample size you obtained by doubling the original sample size.)

> A power analysis using the pwr.t.test function in the pwr package in R suggested that to achieve .95 power with a significance level of .05, we would need a sample size (per group) of ~56 for the *free will measure,* ~39 for the *moral responsibility measure*, ~56 for the 'up to the agent' measure, ~45 for the *blame measure*, and ~105 for the *praise measure*. To ensure adequate power, we decided to collect a sample somewhat larger than the one necessary for replicating the weakest effect (praise), resulting in the decision to recruit 250 participants.

Actual sample size and population:
(Describe the number of participants you actually recruited, and the nature of the population they are drawn from. Indicate whether the number of participants you actually recruited matched the one you planned on the OSF pre-registration. Describe briefly any difference between the population you drew your sample from and the population the original study drew its sample from.)

> 250 participants were recruited from Amazon's mechanical turk (135 females; M_{age} = 39.86; SD_{age} = 11.68), and paid a small amount of money ($0.31) for participating. 66 participants were excluded from our analyses for failing the comprehension checks. This sample differed from the original sample in that recruitment did not target students from a critical thinking course at Georgia State University.

Materials and Procedure:
(Describe the procedure you employed for the replication, like you would in the Methods section of a paper. At the end, indicate all important differences between the original study and replication, e.g. language,)

> Participants were randomly assigned to read one of the vignettes which described a deterministic universe. The four versions varied whether the mechanism by which determinism operated was described in psychological or neuroscientific terms and also whether the world that participants were reading about was meant to be our own actual world, or a different alien world (called "Erta"):

Real world: Most respected neuroscientists [psychologists] are convinced that eventually we will figure out exactly how all of our decisions and actions are entirely caused. For instance, they think that whenever we are trying to decide what to do, the decision we end up making is completely caused by the specific chemical reactions and neural processes [thoughts, desires, and plans] occurring in our brains [minds]. The neuroscientists [psychologists] are also convinced that these chemical reactions and neural processes [thoughts, desires, and plans] are completely caused by our current situation and the earlier events in our lives, and that these earlier events were also completely caused by even earlier events, eventually going all the way back to events that occurred before we were born.

So, if these neuroscientists [psychologists] are right, then once specific earlier events have occurred in a person's life, these events will definitely cause specific later events to occur. For instance, once specific chemical reactions and neural processes [thoughts, desires, and plans] occur in the person's brain [mind], they will definitely cause the person to make the specific decision he or she makes.

Ertan world: On Erta, the landscape and life are very similar to Earth, and there are advanced life forms called Ertans who look, talk, and behave very much like we do. For instance, the Ertans have families, schools, various jobs, parties, arguments, etc. However, the Ertans' science has advanced far beyond ours. Specifically, Ertan neuroscientists [psychologists] have discovered exactly how Ertans' brains [minds] work. For instance, they have discovered that whenever an Ertan is trying to decide what to do, the decision the Ertan ends up making is completely caused by the specific chemical reactions and neural processes [thoughts, desires, and plans] occurring in his or her brain [mind]. The neuroscientists [psychologists] have also discovered that these chemical reactions and neural processes [thoughts, desires, and plans] are completely caused by the Ertan's current situation and the earlier events in his or her life. these events were also caused by even earlier events, eventually going all the way back to the events that occurred before the Ertan was born.

So, once specific earlier events have occurred in an Ertan's life, these events will definitely cause specific later events to occur. For instance, once specific chemical reactions and neural processes [thoughts, desires, and plans] occur in the Ertan's brain [mind], they will definitely cause the Ertan to make the specific decision he or she makes.

After reading, participants completed a simple True/False comprehension check which made sure that they understood the deterministic nature of the situation presented in the vignette. Participants were then randomly assigned to rate their agreement with ten statements in random order, five of which were most critical for

their hypotheses. For example, in the Ertan world cases, these statements were as follows:

Free will: Ertans are able to make decisions of their own free will.

Moral responsibility: Ertans should be held morally responsible for their decisions.

Up to: Ertan's decisions are up to them.

Blame: If an Ertan does something bad, then he or she deserves to be blamed for it.

Praise: If an Ertan does something good, then he or she deserves to be praised for it.

Participants responded on a scale from 1 ('strongly disagree') to 6 ('strongly agree'), with an additional option to simply indicate "I don't know". Lastly, participants completed another similar comprehension check to ensure they had not forgotten the deterministic nature of the vignette they previously read.

Three notable differences between the original study and this replication are:

1. Participants were recruited from Amazon's Mechanical Turk (http://www.mturk.com) rather than from a critical thinking class at Georgia State University
2. Our sample size was somewhat smaller than the original study.
3. Participants only answered 5 (rather than 10) of the dependent measures included in the original study. These five measures were the ones of primary interest in the original study.

Results

Data analysis - Target effect:
(Focusing on the effect you singled out as the target effect for replication, describe the results you obtained. Then describe the statistical analyses you performed, detailing the effect size, the significance of the effect and, when applicable, the confidence interval.)

As in the original study, each dependent measure was analyzed using a 2 (Mechanism: Psychological vs. Neuroscientific) × 2 (World: Real vs. Ertan) analysis of variance (ANVOA). These analyses revealed a significant effect of mechanism on judgments of free will, $F(1,172) = 20\ .\ 08$, $MSE = 2.02$, $p < .\ 001$,$\eta^2_G = .\ 105$, moral responsibility, $F(1,173) = 11.04$, $MSE = 2.08$, $p = .\ 001$, $\eta^2_G = .\ 060$, blame, $F(1,173) = 8.72$, $MSE = 2.05$, $p = .\ 004$, $\eta^2_G = .\ 048$, praise, $F(1,175) = 18.14$, $MSE = 1.84$, $p < .001$, $\eta^2_G = .094$, and whether or not the agent's decisions were up to them, $F(1,175) = 20.94$, $MSE = 1.94$, $p < .001$, $\eta^2_G = .107$.

Data analysis - Other effects:
(If the original study included other effects and you performed the corresponding analyses, please, describe them in this section.)

Data analysis - Exploratory Analysis:
(If you conducted additional analyses that were absent from the original study, feel free to report them here. Just indicate whether they were planned in the OSF pre-registration, or exploratory.)

Discussion

Success assessment:
(Did you succeed in replicating the original result? If applicable, does the original team agree with you?)

> This is clearly a successful replication of the result originally reported in Nahmias, Coates, & Kvaran (2007).