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Citation

Ebert, Jeffrey P. and Daniel M. Wegner. 2011. Mistaking randomness for free will. *Consciousness and Cognition* 20(3): 965-71.

Published version

<https://doi.org/10.1016/j.concog.2010.12.012>

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Mistaking Randomness for Free Will

Jeffrey P. Ebert* and Daniel M. Wegner

Department of Psychology, Harvard University, 378 Kirkland St, Cambridge, Massachusetts
02138, USA

In press, *Consciousness and Cognition*

* Corresponding author.

Email address: jebert@wjh.harvard.edu (J. P. Ebert).

Abstract

Brief in free will is presented. The present research considers the reasons for the belief that actions are free rather than determined and randomness in behavior to free will. Experiment 1 found that participants who were prompted with random sequences experienced their behavior as more freely chosen than those who were prompted with deterministic sequences. Experiment 2 found that otherwise equal behavior was perceived as more freely chosen if it consisted of a random sequence than a deterministic sequence; this was true even when the degree of randomness in the behavior was a large product of the environment. Together, these findings suggest that randomness in behavior or actions can be mistaken for free will.

Characteristics:

Keywords: free will; randomness; illusion of control; world
 animal and perception

1. Introduction

This notion of alternative possibilities, its admission that any one of things may come to pass, is, after all, only a roundabout name for something the notion of which no sane mind can for an instant

William James, *The Dilemma of Determinism* (1896)

In making space for free will (1896), James conveys a confidence that it was sensible to believe in a future which is not preordained, but instead possible. Since James believed in indeterminism, it has gained respectability, and is now the standard according to some interpreters (1975) than it was in the past. Indeterminism is not a radical departure from the old world of quantum indeterminacy, regarding processes in the physical world (Compton, 1931; Nagel, 1968; Popper & Eccles, 1977)

Regardless of these advantages, there are reasons to doubt that random processes are the kind of free will we need (Day, 1984) and their appearance offers a clue as to why we believe that humans have free will (Sarkis, 2010). The question is not just whether the overwhelming majority of individuals say that free will is incompatible with the universe (Nichols & Beebe, 2010) which suggests that the belief depends to some extent upon the appearance of determinism. We take this observation as a step further and evidence of behavior in deterministic systems that are freely chosen even when they are determined by random processes that have no

with free will experiments test the hypothesis that people interpret randomness in the world (Experiment 1) or the environment (Experiment 2) as a violation of free will.

2. Experiment 1: Experiencing random noise

The near universality of free will belief suggests that the mind encourages the inference that actions are free. For example, when people are unaware of environmental and biological factors (Bargh & Chartrand, 2000; Ferguson, 2000; Nisbett & Wilson, 1977), they are likely to intend to act prior to acting (Gleason, Wright, & Pedding, 1983). The theory of mental causation (Wegner, 2002; Wegner & Wheatley, 1999) posits a function between intention and action that is independent of environmental and biological causes of behavior.

This theory explains why people believe that others act in other words, part of free will. It can imagine how one would experience willing a friend to do something. For instance, one might precisely minute as time goes by going to wiggle a finger, feel the hand or the finger move; however, one would predict that the hand would not move. This feeling of freedom is not the case if one were to observe a friend who is not free. Because randomness is a kind of prediction error, only interpretation of randomness is what is going on. There is no intent expressed by the prompts to the participants and deterministic cues of actions. In a random sequence, a hand was raised in response to a prompt, and they reported their behavior.

2. Method

2.1.1. Participants

Two hundred thirty individuals from the Study 4 P (female, 103 male) completed this online experiment in exchange¹ for course credit.

2.1.2. Procedure

Participants were randomly assigned to one of four trials in random order (preview: preview, no preview, and two significant conditions). Participants completed a series of 100 trials (repeatedly P to Q) presented on the screen until the participant responded. This prompt remained on the screen until the participant responded at which point the screen went blank. If the response was incorrect, the previous prompt was repeated. In the preview condition, the prompt was selected randomly, with a 50% chance of being a preview condition. Participants were given advance notice of the prompt they would perform that trial. For example, if the prompt was the preview, the phrase "Preview" appeared for 1 s, followed by a blank screen for .5 s, followed by the preview. The preview was meant to help participants become familiar with the amount of feedback and thought participants expected to receive (Wiegand & Wheatley, 1999) as well as the difficulty of the keypress condition. The trial began immediately after the prompt.

¹As a precaution, participants were excluded for having either a median RT greater than 2 s or a proportion correct less than .5 on the keypress task, and 26 more for maximum gain inconsistency and a difference between the two trials. The exclusion of these participants did not change the significance of the main results.

After these trials participants completed the primary dependent measure, Likert scale; analysis confirmed that participants using perceived choice during the press (I felt that I WAS FORCED which; key to that press had NO CHOICE about which key to press), I COULD HAVE PRESSED A DIFFERENT KEY; CHANCE, which key I COULD HAVE AS THE UNPREDICTABLE PRODUCT OF RANDOMNESS. Items were designed to capture definitions of free will philosophy and (Baumeister, 2008; James, 1980; Nichols & Knobe, 2007; Wegner, 2002). As a manipulation check, participants completed Likert scale (± = .92) concerning perceived unpredictability of the press from which keys I was told to press (RANDOM vs. PREDICTABLE). Which keys I was told to press (PREDICTABLE or UNPREDICTABLE).

To assess potential confounds, participants completed items (± = .72) concerning how boring they found the key press task (I found the task INTERESTING and ENGAGING vs. BORING); a two-item scale (± = .59) concerning how much they enjoyed the task (I THOUGHT I WAS ABLE TO CONTROL the order of prompts vs. I SIMPLY WAITED to see which prompt would appear next [R]); and two items (± = .65) concerning whether they were able to control which prompts appeared (I BELIEVE THAT I HAD CONTROL over which prompts appeared) and whether they were able to control which prompts appeared (I BELIEVE THAT I HAD CONTROL over which prompts appeared). They also completed the International Positive and Negative Affect Schedule Short-Form (Thompson, 2007) to assess potential moderators

²In both experiments items were administered in the order described.

participated in the 28-item Free and Determinism (FAD; Paulhus & Miller, 2008) scale. Likelihood ($r = .59$) concerning whether humans have free will. Human behavior is fully determined other than free will. and indicated sex, political orientation, and religious identification.

2. Results

The results of the random condition by preview interaction are shown in Table 1, confirming the success of the sequence manipulation. Unpredictability was greater in the random condition ($M = 3.53, SD = 1.02$) than in the deterministic condition ($M = 3.09, SD = 0.87$), $F(1, 210) = 13.00, p < .001, \eta^2 = .052$. Perceived unpredictability did not differ between the preview conditions ($F(1, 210) = 0.18, p = .67$), and there was no evidence of a main effect of sequence review ($F(1, 210) = 0.01, p = .87$). As predicted, perceived choice was greater in the random condition ($M = 3.87, SD = 1.02$) than in the deterministic condition ($M = 3.53, SD = 1.02$), $F(1, 210) = 10.09, p < .01, \eta^2 = .045$. This effect did not differ by preview condition as revealed by a non-significant Preview \times Review interaction ($F(1, 210) = 1.50, p = .22$). Perceived choice was somewhat lower in the random condition ($M = 3.53, SD = 1.02$) than in the no preview condition ($M = 3.69, SD = 0.91$), but this difference was not significant ($F(1, 210) = 2.70, p = .10$).

Might the effect of sequence condition on perceived choice be due to a difference between the two conditions in the amount of time spent on the keypress task? In fact, no differences were observed in RTs and a lower proportion of correct responses on the deterministic condition. However, RT nor proportion correct was correlated with perceived choice in

random or the deterministic condition on perceived choice. In the random condition, participants were given a choice between two options, and they were told that the choice was random. In the deterministic condition, participants were given a choice between two options, and they were told that the choice was deterministic. Results showed that participants in the random condition perceived their choice as more free than participants in the deterministic condition. This effect was moderated by participants' beliefs about free will. Specifically, participants who held stronger beliefs about free will showed a larger increase in perceived choice when they were in the random condition compared to the deterministic condition. This interaction was significant, $F(1, 99) = 4.12, p = .043$, in the random condition. In the deterministic condition, the effect of sequence condition on perceived choice remained marginally significant, $F(1, 99) = 3.70, p = .061$. Even among those given previews, the effect of sequence condition on perceived choice remained significant, $F(1, 99) = 4.12, p = .043$. These findings are consistent with the idea that positive affect experienced in the random condition led to a greater sense of perceived choice (Deci & Ryan, 1985).

To test whether participants' beliefs about free will moderated the effect of sequence condition on perceived choice, a series of moderation analyses were conducted. In each regression, step 1 included sequence condition or demographic variable of interest, and step 2 included the interaction between sequence condition and the demographic variable. None of the free will or demographic variables were significant, $F(1, 99) = .149, p = .701$, and none interacted with sequence condition, all $F(1, 99) < 1.00, p > .315$.

2.3. Discussion

These results support the idea that people's sense of freedom is not based on the actual freedom of choice, but on the perceived freedom of choice. Actions performed in a random state were experienced more freely than actions performed in a deterministic state, even though in both cases were prompted and this effect did not differ due to any potential confounds. This effect was not moderated by participants' beliefs or characteristics. This suggests that it is difficult to experience freedom in one's actions (Wegner, 2008).

3. Experiment 2: Choice and action as free

Experiment 2 sought further evidence to attribute randomness to this feeling of perceived freedom of choice. This study explored a previous conception about how much freedom is perceived in the behavior of colored dots, which were asked to move in another planet. Previous research has shown that simple geometric shapes in motion give rise to the perception of intentionality in a person (Gay & Scassellati, 2006; Gergely, Nádas, Bíró, 1995; & Sidmel, 1944; Scholl, & Trempler, 2001). One of what gives rise to the perception of intentionality is the direction of movement that was observed (Feldman, 1990) in speed and direction of their principal movement (Feldman & Feldman, 2000) or perceived intentionality did not appear to be affected by all else, which would be seen as possessing a goal or intentionality.

Of course, participants did not behave in a way that is best explained from causes other than free will, but necessarily, the more free will to the more. The data clearly interpret the interpretation of predicted results. Experiment 2 was conducted that the original one, with one difference: behavior of each is displayed in a different environment. Specifically, participants were told that the alien shows a travel depicted as a contiguous white region in the middle of a darker area. In the videos, the alien remains in the area at least once, meaning that it is everywhere the aliens would go. Because the behavior is determined and is equally shaped by environments, we expect that the alien is more free than the alien. We predicted that random behavior would be perceived as having more control over their actions.

3. Method

3.1.1. Participants

Participants were recruited for an online study through Amazon Mechanical Turk. Participation was restricted to those who had a approval rate greater than or equal to 95%. In Experiment 1, 165 (165 female, 134 male) completed the experiment for \$0.60 (165 female) completed Experiment 2 for \$0.20.

³ As a precaution, participants in Experiment 2 were excluded if they completed the task in the top 2.5% or bottom 2.5% of completion times for maximally inconsistent responses on the primary dependent variable.

participants completed a between-item measure of free will belief, and indicated their sex, political orientation, and religious identification.

3.2 Results

For both experiments, participants in the deterministic and random conditions are shown in

3.2.1. Experiment 2a

Confirming the success of the sequence manipulation, perceived choice was greater than chance ($M = 3.0, SD = 1.1$) than the deterministic ($M = 1.7, SD = 0.9$) ($F(1, 62) = 0.3, p < .000, \eta^2 = .2$). As predicted, perceived choice was greater than chance ($M = 3.6, SD = 0.5$) than the deterministic ($M = 2.7, SD = 0.8$) ($F(1, 62) = 4.3, p < .000, \eta^2 = .1$). The random aliens also perceived to be thoughful but its behavior was deterministic; otherwise there were no significant differences were perceived (see Table 2).

To test whether participants will be different characteristics perceived moderated the effect of sequence on perceived choice, hierarchical regressions were conducted. Change in will subscale of the significantly predicted perceived choice ($\beta = .3, p < .001$), like will subscale measure of free will significantly predicted perceived choice ($\beta = .1$) and significantly interacted with $F(1, 62) = 10.1, p < .001, \eta^2 = .14$, indicating that free will beliefs were more likely than mere beliefs of aliens, but especially the random ones that were significantly predicted perceived choice. It interacted with sequence condition, all

3.2. Experiment 2b

Once again perceived unpredictability was greater for the random condition ($M = 2.7, SD = 1.2$) than for the deterministic condition ($M = 1.6, SD = 0.4, F(1, 89) = 25.2, p < .00001, \eta^2 = .41$). In addition participants in the random condition ($M = 1.8, SD = 0.8$) understood equally well that alien's movement was constant in the environment ($F(1, 89) = 17.7, p < .001, \eta^2 = .17$), as predicted, perceived choice was greater for the random condition ($M = 2.6, SD = 0.9$) than for the deterministic condition ($M = 1.8, SD = 0.7, F(1, 89) = 3.2, p < .01, \eta^2 = .13$). The random condition was also perceived to be more conscious though a bit less so than the deterministic condition. Otherwise there were no significant differences (see Table 2). Participants' free will beliefs and other characteristics were not perceived to moderate the effect of sequence on perceived choice ($p = .074$).

3.3. Discussion

These results support the hypothesis that actions in others' behavior come from the perception of a freely chosen action rather than from a behaviorally determined agent. It seems more freely chosen than those of a deterministically chosen agent though the former are perceived to be more intentional. This difference in perceived intention when observing behavior is a large byproduct of the current study and thus not given while procedural differences between Experiment 1 and Experiment 2 are retrieved between performing actions and observing them (see also more, Wolpert, & Frith, 2000).

both experiments found the heavy coin to be more likely to land heads than tails, which strengthens the conclusion that this is a general phenomenon.

4. General Discussion

The present results demonstrate that, under certain circumstances, people interpret randomness in their own and others' behavior as free will. This confusion is understood by incompatibilists (e.g., Jamieson, 1996) as requiring indeterminacy. The converse is not true: for example, flipping the coin with a machine would meet most definitions of free will, yet the evidence for behavioral indeterminacy is weak. And, as we saw, it is true that people would have acted differently if they were asked to the outcome of a random process, such as a coin flip, because people could have freely willed the alternative, just as easily as the coin could have just as easily landed heads.

Some caveats are in order. First, the present results, with their methods, do not establish that behavioral randomness is a necessary condition for free will, as freely chosen. Second, the present results do not establish that randomness is a necessary condition for free will. Third, regarding to necessity, our view is that randomness is not necessary for free will because it provides indeterminacy. Given that the level of complexity, behavior is deterministic and deterministic (Lötters, 2007) is possible for wholly determined actions to appear freely chosen. Fourth, regarding to the free will, we do not wish to imply that a random action is a minimum, thus a minimum sense within the context of free will. From this research, we take the present article as a contribution to the

which random events are just random, and deterministic behavior maintain in the random case give the impression of will, provided that the resulting behavior is broadly consistent with the at least be interpreted (Grazziano, Glick, & Higgins, 2009). Importantly, condition is met whenever a person chooses a similarly desirable option.

Finally, the present study about whether actual humans have free will, and it is not whether free will is effective (Baumeister, Maslach, & DeWall, 2009; Vohs & Schooler, 2008) or substantially effortful (Megan, 2009). Nevertheless, this finding helps to explain why this impression comes from Acknowledgment

This research was supported in part by NSF Grant BCS-0811156 for programming assistance and Joe Paxton for helpful comments.

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Table 1

Means and Standard Deviations for the Deterministic and Stochastic Conditions

	No Preview			Preview		
	Deterministic		p	Deterministic		p
	M (SD)	M (SD)		M (SD)	M (SD)	
Perceived choice	3.51 (0.93)	3.91 (0.78)	.01	3.26 (1.03)	3.72 (0.93)	.24
Freely choosing	3.25 (1.33)	3.71 (1.18)	.05	2.99 (1.23)	3.0 (1.42)	.70
Acted otherwise	3.77 (0.94)	3.10 (0.77)	.03	3.53 (1.04)	3.14 (0.85)	.02
Perceived unpredictability	4.33 (0.85)	3.60 (1.12)	.001	3.38 (0.87)	3.53 (1.20)	.00
Potential confounds						
Found task boring	4.58 (0.84)	3.37 (0.91)	.0001	4.77 (0.54)	3.57 (0.78)	.0005
Tried to control	2.00 (0.91)	2.82 (0.92)	.0001	1.99 (1.14)	2.69 (0.99)	.0007
Felt control over	3.53 (0.71)	3.41 (0.67)	.13	3.34 (0.51)	3.53 (0.80)	.074
Positive affect	2.51 (0.82)	2.63 (0.69)	.06	2.17 (0.82)	2.65 (0.80)	.006
Negative affect	1.75 (0.61)	2.30 (0.65)	.0007	1.88 (0.61)	2.70 (0.62)	.0003
Median RT (ms)	372 (90)	470 (61)	.0003	357 (87)	343 (86)	.439
Proportion correct	0.90 (0.12)	0.73 (0.19)	.0009	0.996 (0.10)	0.94 (0.02)	.0007

Note. The two components of perceived choice, as well as perceived unpredictability, are averages of a pair of items, one coded as high and one as low. The proportion correct are for the two conditions. The p-values in the table are from an ANOVA and indicate the significance of the difference between the two conditions.

Table 2

Means and Standard Deviations for the Deterministic and Random Conditions in Experiments 2 and 2b

	Experiment 2			Experiment 2b		
	Deterministic		Random	Deterministic		Random
	M (SD)	M (SD)	p	M (SD)	M (SD)	p
Perceived choice	2.76 (0.83)	2.66 (0.85)	.06	2.67 (0.73)	2.66 (0.79)	.00
Freely choosing	2.84 (1.03)	2.66 (1.04)	.46	2.66 (1.03)	2.61 (0.98)	.01
Acted otherwise	2.98 (0.87)	2.89 (0.93)	.52	2.89 (1.03)	2.91 (0.92)	.10
Consciously deciding	2.53 (0.95)	2.33 (0.89)	.25	2.33 (0.89)	2.33 (0.98)	.00
Freewill	2.64 (1.03)	2.48 (1.00)	.22	2.48 (0.93)	2.40 (1.00)	.01
Responsible	2.82 (0.93)	3.00 (1.00)	.24	3.00 (1.03)	2.87 (0.84)	.73
Other characteristics						
Alive	3.47 (1.23)	3.23 (1.24)	.60	3.23 (1.43)	3.26 (1.09)	.66
Conscious	3.14 (1.23)	3.33 (1.12)	.33	2.95 (1.23)	3.07 (1.02)	.31
Thoughtful	2.70 (1.03)	2.45 (1.12)	.21	2.45 (1.13)	2.40 (1.17)	.00
Intentional	3.04 (1.13)	2.89 (1.09)	.26	2.89 (1.23)	2.83 (1.12)	.03
Purposeful	3.01 (1.12)	3.36 (1.18)	.31	3.36 (1.22)	3.26 (1.24)	.76
Intelligent	2.56 (0.92)	2.41 (0.92)	.71	2.41 (1.12)	2.56 (1.14)	.56
Friendly	2.73 (0.72)	2.61 (0.73)	.85	2.61 (0.72)	2.68 (0.62)	.08
Competent	2.77 (0.82)	2.75 (0.94)	.86	2.75 (1.02)	2.89 (0.85)	.98
Soothing	2.32 (0.92)	2.05 (0.96)	.38	2.05 (0.92)	2.05 (0.86)	.66
Human	1.93 (0.92)	1.70 (0.92)	.05	1.70 (0.82)	1.70 (1.00)	.07
Similar to you	1.75 (0.81)	1.52 (0.92)	.78	1.52 (0.71)	1.52 (0.96)	.97
Perceived unpredictability	1.50 (1.15)	1.28 (1.15)	.02	1.28 (0.42)	1.20 (1.12)	.00

Unpredictable	1.82	(0.935)	1.6	(1.15)	0.01	1.34	(0.529)	1.7	(1.27)	0.00
Unpatterned	1.68	(1.022)	1.9	(1.30)	0.01	1.23	(0.420)	1.6	(1.15)	0.00

Note: The five components of perceived choice and the two components of perceived items, one of which was derived from an ANOVA and indicates the significance of