



Belief in free will affects causal attributions when judging others' behavior

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Free will is a cornerstone of our society, and psychological research demonstrates that questioning its existence impacts social behavior. In six studies, we tested whether believing in free will is related to the correspondence bias, which reflects people's automatic tendency to overestimate the influence of internal as compared to external factors when interpreting others' behavior. All studies demonstrate a positive relationship between the strength of the belief in free will and the correspondence bias. Moreover, in two experimental studies, we showed that weakening participants' belief in free will leads to a reduction of the correspondence bias. Finally, the last study demonstrates that believing in free will predicts prescribed punishment and reward behavior, and that this relation is mediated by the correspondence bias. Overall, these studies show that believing in free will impacts fundamental social-cognitive processes that are involved in the understanding of others' behavior.

free-will belief | interpersonal perception | correspondence bias

Most people believe they have free will and judge themselves and others through this lens (1, 2). However, the question of whether free will exists or not is a long-standing philosophical controversy (3, 4). Within the last decades, the scientific plausibility of free will has been assaulted from several directions, including neuroscience, genetics, and psychology (e.g., refs. 5–7). As such anti-free-will viewpoints became in vogue not only within academia (8) but also in the popular press (e.g., refs. 9–11), psychological research has recently started investigating the psychological and social consequences of casting doubts on free will (e.g., refs. 12–15).

Such research has shown that belief in free will is a predictor of several behavioral and psychological variables. For example, correlational studies have shown that people with a strong belief in free will perform better in a variety of contexts, such as in work (16) and academic settings (17). Likewise, studies involving experimental manipulations of the belief in free will have demonstrated that weakening people's belief in free will increases antisocial behavior, such as cheating (18), racial prejudice (19), and aggressiveness toward others (1), as well as decreases prosocial attitudes expressed in altruistic (1) and cooperative behavior (20).

Taken together, these studies indicate that believing in free will impacts individuals' social behavior and that shaking this belief encourages cursory, impulsive, and selfish tendencies. Neuroscience and cognitive research suggests that these behavioral changes stemming from a weakened belief in free will may be linked to a degradation of neural and cognitive mechanisms underlying voluntary self-regulation, such as intentional action preparation (21), deliberate motor inhibition (22, 23), and the processing of performance errors (24, 25).

Although the research outlined above emphasized the effects of believing in free will on people's behavior, an intriguing and broader question is whether free-will beliefs affect fundamental social-cognitive processes that are involved in the perception and understanding of others' behavior as well. In this respect, previous studies indicate that the strength of the belief in free will predicts intolerance for unethical behavior in others as well as support for harsh criminal punishment (26–28). The general goal

of the present research is to examine whether the belief in free will affects basic social-cognitive processes underlying perception and judgment of other people's behavior.

Perceiving and interpreting the behavior of others is one of the most critical tasks people face in everyday social life (e.g., refs. 29 and 30). Past research has shown that, when judging others' behavior, individuals have the tendency to underestimate the impact of external forces (e.g., the situation) and overestimate the role of factors that are internal to the person (e.g., his or her personality)—a phenomenon referred to as the correspondence bias (31) or the fundamental attribution error (32). Given that some researchers question whether the terms “fundamental” and “error” are actually appropriate (e.g., ref. 33), we refer to the tendency to focus more strongly on internal factors as compared to external factors with the term “correspondence bias.”

The specific goal of the current study is to examine whether (and how) beliefs about free will affect the correspondence bias. Interestingly, previous literature offers two potential alternative hypotheses to this question. The “resource hypothesis” is based on the observation that the correspondence bias is caused by automatic processes. That is, individuals only correct for this bias when they have ample time, cognitive resources, and the motivation to do so (e.g., ref. 31). Given that the belief in free will has been linked to increased self-regulation (22–25, 34), strong free-will beliefs should attenuate the correspondence bias. Conversely, the “intention attribution hypothesis” derives from the empirical observation that the belief in free will is associated to an increased sense of agency (23, 35). That is, the more people believe in free will, the more they perceive their own behavior as generated by themselves (e.g., desires, goals), rather than by external forces (e.g., contexts, situations). Given the ample evidence that people use their own perspective to understand and predict other people's

Significance

The question whether free will exists or not has been a matter of debate in philosophy for centuries. Recently, researchers claimed that free will is nothing more than a myth. Although the validity of this claim is debatable, it attracted much attention in the general public. This raises the crucial question whether it matters if people believe in free will or not. In six studies, we tested whether believing in free will is related to the correspondence bias—that is, people's automatic tendency to overestimate the influence of internal as compared to external factors when interpreting others' behavior. Overall, we demonstrate that believing in free will increases the correspondence bias and predicts prescribed punishment and reward behavior.

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behavior (for an overview, see refs. 36 and 37), one could hypothesize that individuals will also perceive others' behavior as being more strongly generated by internal, as compared to external forces. As a consequence, high levels of free-will beliefs may enhance the correspondence bias.

To test the resource hypothesis against the intention attribution hypothesis, we conducted six studies that specifically investigated the link between the belief in free will and the correspondence bias. Stimulus material (*Supporting Information*) and data (*Datasets S1–S4*) of all our studies are made openly available. All studies were covered by the rules of the Institutional Review Board from the Faculty of Psychology and Educational Science of Ghent University and were run via Amazon's Mechanical Turk. All participants provided informed consent at the beginning of the experiment and were informed that participation was voluntary and that all answers were processed and stored anonymously.

Study 1

Participants and Procedure. A total of 210 participants (43.3% female) with ages ranging from 18 to 78 [mean (M) = 36.41, SD = 11.46] participated in the study.

To measure the correspondence bias, we let participants read an essay that was either in favor or against a controversial social issue, and then asked them to rate the author's attitude. The essays had been previously used in the literature (e.g., refs. 38 and 39) and consisted of arguments either in favor or opposed to prayer in school (*Supporting Information*). While one-half of the participants received an essay in which the author argued in favor of prayer in school, the other half of participants received an essay that argued against it. Crucially, participants were told that the essay was written by a student under a no-choice condition, that is, the student was instructed to either write in favor or against prayer in school.

After reading the essay, participants indicated their perception of the author's attitude toward prayer in school by responding to the question "What do you think is the author's attitude toward prayer in school? Is it in favor or against prayer in school?" on a seven-point scale ranging from 1 (strictly against) to 7 (strictly in favor).

Afterward, participants filled in the Free Will Inventory (FWI) (40) (*Supporting Information*). The FWI includes 15 items measuring the strength of the belief in free will and related constructs such as dualism/nonreductionism and determinism on seven-point rating scales. To obtain a global measure of how participants viewed their behavior as caused by their own free choice and independent from prior events and their biological makeup (4), we computed a compound score of the belief in free will by averaging the free-will items with the dualism/nonreductionism items and the reversed determinism items (for a similar approach, see refs. 22 and 25). The internal consistency of this compound free-will score was acceptable (Cronbach's α = 0.70).

Results. Confirming the presence of the correspondence bias, participants who read the essay arguing in favor of prayer in school perceived the essay author's attitude more strongly in favor of prayer in school (M = 5.97; SD = 1.57) than participants who read the essay arguing against prayer in school (M = 1.88; SD = 1.39) (t = 19.97, P < 0.001, d = 2.76).

To test to which degree the correspondence bias is related to people's endorsement of free will, we quantified—in line with previous research (e.g., ref. 41)—the correspondence bias as the extent to which participants' perceptions of the essay author's attitude differed from the midpoint of the scale (i.e., from value 4). The correlation analysis revealed that the correspondence bias positively correlated with the belief in free will (r = 0.18, P = 0.011). This observation indicates that the more people believe in free will, the stronger their tendency to ascribe the cause of others' behavior to factors that are internal to the person. This positive correlation supports the intention attribution hypothesis rather than the resource hypothesis, which would have predicted a negative correlation.

Study 2a

Studies 2a and 2b aimed at replicating and extending the findings of study 1 by using a different paradigm that focuses on the different weight people assign to internal vs. external factors when judging others' behavior.

Participants and Procedure. A total of 210 participants (45.4% female) with ages ranging from 18 to 78 (M = 37.77, SD = 11.99) participated in the study.

To measure participants' correspondence bias, we applied the procedure used by Kitayama et al. (42). Participants read four stories, with each story featuring a protagonist engaging in a certain behavior. After reading each of the four stories, participants indicated their agreement/disagreement with four statements on seven-point rating scales (1 = strongly disagree; 7 = strongly agree). Two statements measured the attribution to external factors, whereas the other two statements measured the attribution to internal factors (see *Supporting Information* for more details). Participants then filled in the FWI (40) to assess participants' belief in free will. As in study 1, an overall free-will score was computed (Cronbach's α = 0.82).

Results. In line with past research on the correspondence bias (42), participants ascribed the protagonists' behavior more strongly to internal factors (M = 5.64; SD = 1.03) than to external factors (M = 4.49; SD = 1.15) (t = 11.85, P < 0.001, dz = 1.05). To test how the correspondence bias is related to people's endorsement of free will, a correspondence bias score was computed by subtracting participants' external attributions from their internal attributions. High scores indicate a strong correspondence bias—that is, a strong causal attribution to internal, as compared to external factors. In accordance with the intention attribution hypothesis and the results of study 1, the correspondence bias positively correlated with the belief in free will (r = 0.39, P < 0.001), indicating that the more individuals believe in free will, the more strongly they interpret others' behavior as originated by internal, as compared to external factors.

Study 2b

In study 2b, we conducted a high-powered preregistered replication of study 2a (study plan available at <https://aspredicted.org/uw938.pdf>) by doubling the sample size of study 2a. Thus, we aimed at collecting 420 participants. Eventually, 469 participants (53.5% female) with ages ranging from 18 to 84 (M = 37.39, SD = 12.45) participated in our study (when we analyze the data with the first 420 participants only, the results remain the same). Cronbach's α for the overall free-will score was α = 0.76.

Similar to the results of study 2a, participants ascribed behavior more strongly to internal factors (M = 5.73; SD = 0.93) than to external factors (M = 4.58; SD = 1.12) (t = 17.32, P < 0.001, dz = 0.80). Moreover, in accordance with study 2a, the preregistered analysis yielded a significant positive correlation between belief in free will and the correspondence bias (r = 0.35, P < 0.001).

Study 3a

Taken together, studies 1, 2a, and 2b strongly support the hypothesis that believing in free will is positively associated with the correspondence bias. However, these findings are based on correlational data only. Therefore, in studies 3a and 3b, we adopted an experimental approach to manipulate participants' belief in free will before measuring the correspondence bias.

Participants and Design. A total of 164 participants (50.6% female) participated in our study [a few participants did not fill in the FWI (43); therefore, all analysis that involved the FWI could be run on n = 137 only]. The ages ranged from 18 to 68 (M = 36.42, SD = 11.82). The design was a 2 (belief manipulation:

anti-free will vs. control) \times 2 (attribution: internal vs. external) mixed design with belief manipulation as between-subject factor and attribution as within-subject factor.

Procedure. To manipulate belief in free will, we applied a manipulation that has been successfully and often used in previous research (for a metaanalysis, see *Supporting Information*) investigating the consequences of weakening people's belief in free will (e.g., 18, 21, 24, 25, 27, 43). Specifically, participants read a passage of the book *The Astonishing Hypothesis: The Scientific Search for the Soul* written by Francis Crick (44). While participants in the anti-free-will group read a text claiming that scientists now recognize that free will is an illusion, participants in the control group read a passage from the same book that did not mention free will (see *Supporting Information* for more details). After participants read the scientific text, the same scenarios used in studies 2a and 2b were administered. Afterward, participants completed the FWI (ref. 43; Cronbach's $\alpha = 0.82$).

Results.

Manipulation check. A *t* test for independent samples indicates that participants in the anti-free-will condition reported a weaker belief in free will ($M = 4.53$, $SD = 0.98$) than participants in the control condition ($M = 4.92$, $SD = 0.82$) ($t = 2.54$, $P = 0.012$, $d = 0.43$), indicating that the manipulation effectively weakened participants' belief in free will.

Belief in free will and correspondence bias. To test the effect of the belief manipulation on the correspondence bias we ran a 2 (belief manipulation: anti-free will vs. control) \times 2 (attribution: internal vs. external) mixed ANOVA. The analysis revealed a main effect of attribution [$F_{(1,162)} = 127.56$, $P < 0.001$, $\eta_p^2 = 0.44$], indicating that participants attributed the cause of the protagonists' behavior in the scenarios more to internal ($M = 5.82$, $SD = 0.88$) than to external factors ($M = 4.71$, $SD = 1.05$). The main effect of the belief manipulation was not significant [$F_{(1,162)} = 0.69$, $P = 0.41$]. More important for our hypothesis, however, was the significant interaction between belief manipulation and attribution [$F_{(1,162)} = 6.72$, $P = 0.01$, $\eta_p^2 = 0.04$], indicating that participants in the anti-free-will group showed a smaller correspondence bias ($M = 0.87$, $SD = 1.15$) than participants in the control group ($M = 1.39$, $SD = 1.40$) ($t = 2.59$, $P = 0.01$, $d = 0.41$) (Fig. 1). Further post hoc analyses indicated that participants in the anti-free-will group ($M = 4.87$, $SD = 0.99$) put more emphasis on external factors than control participants ($M = 4.52$, $SD = 1.09$) ($t = 2.17$, $P = 0.032$, $d = 0.34$). There was no statistically meaningful difference between anti-free-will participants ($M = 5.74$, $SD = 0.89$) and control participants ($M = 5.91$, $SD = 0.87$) in terms of internal factors ($t = 1.19$, $P = 0.24$).

Finally, we tested whether the correspondence bias correlated with the belief in free will. In line with our previous studies, the belief in free will showed a positive correlation with the correspondence bias ($r = 0.18$, $P = 0.037$).

Study 3b

Method. To replicate the previous experimental finding, in study 3b we conducted an exact and high-powered preregistered replication of study 3a (study plan available at <https://aspredicted.org/w82be.pdf>; see *Supporting Information* for further details) with 504 participants (60.9% female). The ages ranged from 18 to 79 ($M = 40.41$, $SD = 13.15$). Cronbach's α for the overall free-will score was $\alpha = 0.77$.

Results.

Manipulation check. Like in study 3a, a *t* test for independent samples indicates that anti-free-will participants reported weaker belief in free will ($M = 4.55$, $SD = 0.82$) than control participants ($M = 4.72$, $SD = 0.73$) ($t = 2.50$, $P = 0.013$, $d = 0.22$).

Belief in free will and correspondence bias. The 2 (belief manipulation: anti-free will vs. control) \times 2 (attribution: internal vs. external) mixed ANOVA yielded a main effect for attribution

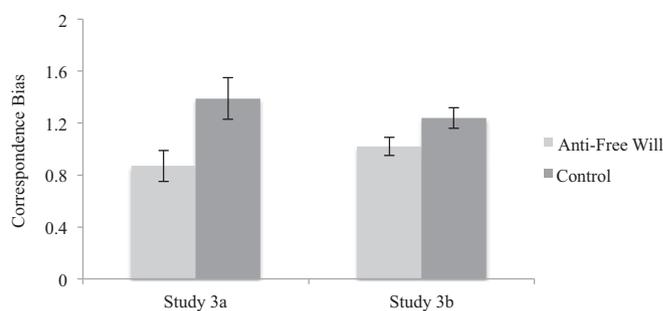


Fig. 1. Correspondence bias as a function of belief manipulation in studies 3a and 3b. Error bars represent SEs.

[$F_{(1,502)} = 487.48$, $P < 0.001$, $\eta_p^2 = 0.49$], indicating that participants attributed the protagonists' behavior more to internal ($M = 5.92$, $SD = 0.74$) than to external factors ($M = 4.80$, $SD = 1.03$). The main effect of the belief manipulation was not significant [$F_{(1,502)} = 0.11$, $P = 0.75$]. Crucially, however, the interaction between belief manipulation and attribution was significant [$F_{(1,502)} = 4.41$, $P = 0.036$, $\eta_p^2 = 0.01$]. This indicates that anti-free-will participants showed a smaller correspondence bias ($M = 1.02$, $SD = 1.10$) than control participants ($M = 1.24$, $SD = 1.20$) ($t = 2.10$, $P = 0.036$, $d = 0.19$) (Fig. 1). Further post hoc analyses indicate a statistical trend that control participants ($M = 5.99$, $SD = 0.69$) put stronger emphasis on internal factors than anti-free-will participants ($M = 5.86$, $SD = 0.79$) ($t = 1.93$, $P = 0.055$, $d = 0.18$). There was no significant difference between anti-free-will participants ($M = 4.84$, $SD = 1.02$) and control participants ($M = 4.75$, $SD = 1.03$) in terms of external factors ($t = 0.96$, $P = 0.34$).

Finally, consistent with our previous studies, belief in free will showed a positive correlation with the correspondence bias ($r = 0.26$, $P < 0.001$).

Study 4

Studies 3a and 3b replicate the findings obtained in studies 1, 2a, and 2b. That is, the belief in free will correlates positively with the correspondence bias. In addition, both studies show that reducing participants' belief in free will decreases the correspondence bias. However, one may argue that reducing free-will beliefs by letting participants' read a scientific text that denies free will affects more than just participants' belief in free will. As a consequence, the correspondence bias might be affected by other factors rather than the belief in free will. Therefore, it is important to note that our claim that believing in free will is associated with the correspondence bias is not limited to experimental studies, but is especially based on the correlation between measured free-will beliefs and the correspondence bias. This correlation is significant in all of our studies. Nevertheless, it might be that other factors related to the belief in free will account for the correlation between believing in free will and the correspondence bias.

In particular, one might argue that believing in free will is related to locus of control, which in turn may account for the correspondence bias. According to Rotter (45), an individual perceives the outcome of an event as being either within or beyond his or her personal control and understanding. A person with an internal locus of control believes that he or she has influence over outcomes through ability, effort, or skills. On the other hand, a person with an external locus of control believes that forces outside the control of the individual determine outcomes. Therefore, one could hypothesize that individuals with a strong belief in free will have also a strong internal locus of control, and that it is the internal locus of control that accounts for the influence of free-will beliefs on the correspondence bias. In addition, given that individuals who believe in free will are expected to feel more in

control of their behavior (23, 35), they may also perceive more certainty when they are called to judge others' actions. Differences in the certainty of their judgments, rather than differences in the belief in free will itself, may thus account for the link between the belief in free will and the correspondence bias. Therefore, in study 4, we tested whether participants' locus of control as well as their certainty in their judgments can account for the link between believing in free will and the correspondence bias.

In addition, we investigated whether the correspondence bias accounts for the observation that believing in free will affects retributive punishment (27). As the correspondence bias contributes to how people interact with each other (46–48), one could reason that the correspondence bias mediates the relationship between an individual's belief in free will and his or her attitude toward others' behavior. One could therefore expect that believing in free will influences not only retributive punishment toward others but also rewarding behavior. Thus, in study 4, we examined whether the strength of the belief in free will predicts levels of prescribed punishment and reward for unethical and ethical behavior, respectively, and crucially whether this relationship is based on the level of participants' correspondence bias.

Participants and Procedure. A total of 212 subjects (48.60% female) participated in our study. The ages ranged from 18 to 71 ($M = 38.68$, $SD = 11.83$).

In line with studies 2 and 3, we assessed the correspondence bias with the scenarios introduced by Kitayama et al. (42). To assess prescribed punishing and rewarding behavior, participants indicated after each scenario on two seven-point scales to which degree they would reward or punish the other person's behavior (see *Supporting Information* for more details). For positive behaviors, we calculated the mean score of the reward item with the reversed item of the punishment item to compute an overall score of prescribed reward. Similarly, for negative behavior, we calculated the mean score of the punishment item with the reversed reward item to compute an overall score of prescribed punishment. Finally, to compute an overall score of prescribed behavior, we computed the mean of the total reward score and the total punishment score.

To assess participants' certainty in their judgments, they indicated after each scenario on a seven-point scale (1 = strongly disagree; 7 = strongly agree) whether they agreed with the following statement: "Regarding the statements above, I am sure that my judgments are correct."

After participants completed all scenarios, they filled in the FWI (ref. 43; Cronbach's $\alpha = 0.75$). Finally, we assessed Rotter's (45) locus of control scale (*Supporting Information*). To compute a total score, we computed the sum score of the items (Cronbach's $\alpha = 0.83$). High values indicate a relatively strong internal, as compared to an external, locus of control.

Results.

Correspondence bias. As in our previous studies, we detected a strong correspondence bias, indicating that participants ascribed behavior more strongly to internal factors ($M = 5.80$; $SD = 0.90$) than to external factors ($M = 4.56$; $SD = 1.24$) ($t = 11.92$, $P < 0.001$, $d_z = 0.82$).

Relation between correspondence bias, belief in free will, locus of control, and perceived certainty in the judgments. To test the relation between the correspondence bias, belief in free will, locus of control, and perceived certainty in the judgments, we first ran correlational analyses. Belief in free will correlated with the correspondence bias ($r = 0.35$, $P < 0.001$), with locus of control ($r = 0.27$, $P < 0.001$), as well as with perceived certainty in the judgments ($r = 0.25$, $P < 0.001$). Moreover, the correspondence bias correlated with locus of control ($r = 0.14$, $P = 0.038$) and perceived certainty

in the judgments ($r = 0.18$, $P = 0.008$). Finally, perceived certainty correlated with locus of control ($r = 0.20$, $P = 0.004$).

To test whether locus of control and perceived certainty in the judgments account for the link between belief in free will and the correspondence bias, we computed two bias-corrected bootstrapping mediation analyses (49). Bootstrapping involves the repeated extraction of samples from the dataset (in this case, 5,000 samples were taken) and the estimation of the indirect effect in each resampled dataset. The totality of all estimated indirect effects permits the construction of a 95% confidence interval for the effect size of the indirect effect. A confidence interval that includes zero indicates a nonsignificant effect. In all analyses, we entered the correspondence bias as dependent variable and belief in free will as the independent variable.

In a first analysis, we entered locus of control as the mediator. The analysis indicates a significant relation between belief in free will and locus of control ($b = 1.70$, $SE = 0.42$, $t = 4.04$, $P < 0.001$). However, the path between locus of control and the correspondence bias did not reach significance ($b = 0.02$, $SE = 0.02$, $t = 0.79$, $P = 0.43$). The effect of free-will beliefs on the correspondence bias remained significant when controlling for locus of control ($b = 0.62$, $SE = 0.13$, $t = 4.96$, $P < 0.001$). The confidence interval (bias corrected) for the indirect path from belief in free will on the correspondence bias through locus of control was -0.04 to 0.12 and thus included zero, indicating that locus of control is not a significant mediator.

In a second analysis, we entered perceived certainty in the judgments as mediator into the equation. The analysis yielded a significant relation between belief in free will and perceived certainty ($b = 0.28$, $SE = 0.07$, $t = 3.80$, $P < 0.001$). The path between perceived certainty and the correspondence bias did not reach significance ($b = 0.17$, $SE = 0.11$, $t = 1.48$, $P = 0.14$). However, the effect of belief in free will on the correspondence bias remained significant when controlling for perceived certainty ($b = 0.60$, $SE = 0.12$, $t = 4.84$, $P < 0.001$). The bias-corrected confidence interval for the indirect path from belief in free will on the correspondence bias through perceived certainty was -0.003 to 0.128 and thus included zero, indicating that perceived certainty is not a significant mediator.

Relation between belief in free will, correspondence bias, and prescribed behavior. In a final series of analyses, we tested the relation between belief in free will, the correspondence bias, and prescribed behavior. Correlational analyses indicate that belief in free will correlates with overall prescribed behavior ($r = 0.33$, $P < 0.001$), but also with prescribed reward toward positive behavior ($r = 0.32$, $P < 0.001$) and prescribed punishment toward negative behavior ($r = 0.27$, $P < 0.001$).

To test the indirect effect of the belief in free will on overall prescribed behavior via the correspondence bias, we ran an additional bias-corrected bootstrapping mediation analysis. The analysis yielded a significant relation between belief in free will and overall prescribed behavior ($b = 0.37$, $SE = 0.07$, $t = 5.12$, $P < 0.001$). Also, the path between belief in free will and correspondence bias ($b = 0.65$, $SE = 0.12$, $t = 5.38$, $P < 0.001$) as well as the path between the correspondence bias and overall prescribed behavior was significant ($b = 0.22$, $SE = 0.04$, $t = 5.66$, $P < 0.001$). Moreover, the bias-corrected confidence interval for the indirect path from belief in free will on prescribed behavior via the correspondence bias was 0.084 – 0.218 and thus did not include zero, indicating that the correspondence bias is a significant mediator of the relation between belief in free will and prescribed behavior (Fig. 2).

Relationship Between Free-Will Beliefs and Internal Versus External Attribution

All our studies demonstrate that believing in free will is positively related to the correspondence bias. An interesting question is whether this relation is due to an increase in internal attribution,

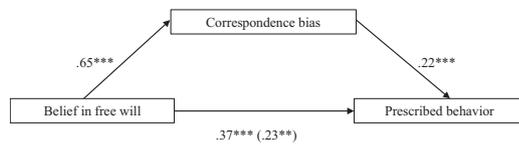


Fig. 2. Unstandardized regression coefficients for the relation between belief in free will and prescribed behavior as mediated by the correspondence bias. The coefficient between belief in free will and prescribed behavior, controlling for the correspondence bias, is in parentheses. *** $P < 0.001$, ** $P < 0.01$.

a decrease in external attribution, or both. To shed light on this question, we ran a mini metaanalysis (50) across all of our studies that assessed participants' attribution to external as well as to internal factors (i.e., studies 2–4). We first transformed each correlation into Fisher's z and then ran the metaanalysis. The analysis yielded a significant positive correlation between belief in free will and person attribution ($M_r = 0.29$, $Z = 10.75$, $P < 0.001$) and a significant negative correlation between belief in free will and situation attribution ($M_r = -0.14$, $Z = -5.63$, $P < 0.001$). Fully random effects tests of the same correlations were also significant, as indicated by one-sample t tests of the mean effect size against zero ($M_{\text{person attribution}} = 0.29$, $t = 5.10$, $P = 0.007$; $M_{\text{situation attribution}} = -0.14$, $t = -6.03$, $P = 0.004$).

General Discussion

Prominent scientists have questioned the existence of free will both in publications addressed to other scholars (e.g., refs. 5–7) and in the mass media (9–11). Independent of the validity of this claim, the question arises whether it matters if people believe in free will or not. In the studies reported in this paper, we tested the impact of the belief in free will on social perception. To this end, we investigated the relationship between the belief in free will and the correspondence bias in six studies (29, 31, 32). Our findings demonstrate that the belief in free will is positively associated with the correspondence bias, and that it is attenuated when people's belief in free will is weakened. Moreover, study 4 shows that the link between belief in free will and the correspondence bias can neither be explained by participants' locus of control nor by participants' certainty in their judgments. Moreover, study 4 demonstrates that the correspondence bias mediates the relationship between the belief in free will and prescribed punishment and rewarding behavior toward others.

These results have important theoretical implications. First, our findings allow for disentangling two contrasting hypotheses regarding the influence of free-will beliefs on the correspondence bias. On the one hand, the literature indicates that the correspondence bias is less pronounced when people are highly motivated or when they can exploit their cognitive resources (e.g., ref. 31). Given that it has been argued that believing in free will positively affects self-regulation (22–25, 34), the resource hypothesis predicts that believing in free will should reduce the correspondence bias. On the other hand, it has been demonstrated that believing in free will increases perceived intentional control (23, 35). As people use their own representations to understand and predict other people's behavior (for an overview, see refs. 36 and 37), the intention attribution hypothesis predicts that individuals also perceive others' behavior as internally driven and, thus, less strongly influenced by the environment, resulting in an increased correspondence bias. Our data clearly support the intention attribution hypothesis and thus suggest that it is not increased self-control, but perceived intentional control in others that fosters the correspondence bias.

Second, the basic observation that the belief in free will affects the correspondence bias indicates that such belief changes can eventually influence our social interactions. Shariff et al. (27)

already reported that believing in free will increases prescribed punishment of negative behavior. Our research expands this finding by demonstrating that free-will beliefs increase not only prescribed punishment of negative behavior but also prescribed reward of positive behavior. In other words, not only do free-will beliefs affect prescribed actions toward negative and immoral behavior, but they also have a broader influence on how people react to others' behavior. Moreover, the results of study 4 demonstrate that the relationship between free-will beliefs and prescribed behavior is due to stronger attribution to internal as compared to external causes. This result may be particularly relevant to court cases. For instance, recent research showed that judges afforded shorter sentences to hypothetical psychopathic criminals when the description of the criminals' psychopathy included internal causes, such as biomechanical components (51). Our results therefore raise the question whether shifting public perception toward a scientific "anti-free-will" perspective may encourage judges and jurors to emphasize external, as compared to internal, factors when taking a decision. As in the legal system the punishment strongly depends on the degree to which a person acted intentionally, a stronger focus on external, as compared to internal, forces would lead to lower retributive punishments.

Third, our research also has important implications for research on the correspondence bias itself. Previous research found that the correspondence bias is influenced by different moderators, such as mood (52) or cultural background (42)—to name just a few examples. The current research is in line with these findings, suggesting that the strength of the correspondence bias is based on top-down modulations. Moreover, our findings expand these results by demonstrating that the correspondence bias is influenced by abstract beliefs, such as the belief in free will.

Despite these implications, there are a few issues that need further discussion. First, some researchers recently documented difficulties in replicating the effect of reduced free-will beliefs on moral behavior (53–55) and other behavioral variables (15, 56). It is important to note, however, that in most of these cases the failed replications were not due to failed manipulation checks, but rather due to failures in replicating the relationship between the manipulation and the dependent variable. Moreover, previous research that could not significantly reduce individuals' belief in free will with the Crick text (e.g., ref. 53) used the Free Will and Determinism scale (FWD) (cf. 53) as manipulation check, which had a relatively low reliability (i.e., Cronbach's $\alpha = 0.43$), and tested rather few participants (i.e., ref. 57) rendering the interpretations difficult. In contrast, in our experimental studies, we assessed much larger samples and achieved good reliability of the FWI scale (i.e., $M_{\text{Cronbach's } \alpha} = 0.80$). Moreover, we replicated our findings within preregistered studies. Nevertheless, we have to acknowledge that, despite consistent results, the employed belief manipulation produced rather weak effects. A reason might be that all our studies were conducted in online settings in which participants' motivation may be limited. For future research, we therefore recommend using the belief manipulation in laboratory settings. On the basis of the preregistered study, we also recommend including selection criteria based on reading checks and the time participants spend on the crucial text passage.

Second, in all our studies, we assessed participants' belief in free will by computing a compound score of the FWI (40) that included the dualism/nonreductionism and the reversed determinism subscales. The reason for using such a compound score was that we wanted to measure to which degree participants believe that humans have free will in the sense that they can generate behavior that is not fully determined by prior events together with the laws of nature (4). The use of the compound score was further justified by an acceptable to good (58) internal consistency ($M_{\text{Cronbach's } \alpha} = 0.77$). Nevertheless, one may argue that the compound score does not capture specifically the folk intuition about free will (40, 57). It is important to note,

however, that a metaanalysis (for details, see *Supporting Information*) across all of our six studies indicates that also the FWI's free-will subscale significantly correlates with the correspondence bias suggesting that our results hold even when measuring more specific beliefs about free will.

Third, the scope of the present research was to examine the role of belief in free will on the attribution of other person's behavior. However, an open question is whether similar tendencies can be observed when individuals judge their own behavior. In this sense, a phenomenon related to the correspondence bias is the self-serving bias (for a review, see ref. 59)—people's tendency to attribute positive events to internal factors (e.g., own character)

and negative events to external factors (e.g., situation). At this point, we can only speculate to which degree belief in free will affects the self-serving bias. However, given that free-will beliefs increase internal attributions and decrease external attributions in the correspondence bias, one could assume that belief in free will increases internal attribution to positive events and decreases external attribution to negative events in the self-serving bias. Future research may aim at testing this assumption more directly.

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