

**Outcomes associated with believing in free will:  
Meta-analysis Registered Report**

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### Abstract

Scholars have long debated the function of free will beliefs—whether free will beliefs exist primarily to stimulate prosociality, enforce societal rules, or to help individuals pursue their own goals. There are findings consistent with each of these views, as researchers have found that the more people endorse free will beliefs, the more likely they are to be prosocial (e.g., altruism), adhere to social norms (e.g., less cheating and stealing), and pursue self-serving goals (e.g., job performance). We conducted a registered report meta-analysis evaluating empirical evidence of the finding supporting the three theoretical perspectives. A meta-analysis of XX correlational articles ( $k = XX$  studies) identified effect sizes between the belief in free will and prosociality ( $\rho = x.xx [x.xx, x.xx]$ ), norm adherence ( $\rho = x.xx [x.xx, x.xx]$ ) and personal outcomes ( $\rho = x.xx [x.xx, x.xx]$ ). We applied equivalence testing to compare the three effects, and found support for [difference/no-difference] between [one of the three/two of the three/all three] associations. Publication bias analysis indicated that <XXX key findings>. We also tested several theoretical and empirical moderators and found that <XXX moderators> <strengthened/weakened> the relationship between belief in free will and <XXX outcomes>. The findings highlight <XXX key conclusions>.

*Keywords:* free will; meta-analysis; registered report; prosocial; norm adherence; self-serving

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Philosophers have been debating free will and its existence for over two millennia with no resolution in sight. Yet the last two decades have witnessed the emergence of a research domain offering a new take on the free will issue, headed mostly by psychologists and experimental philosophers. Rather than attempting to resolve the issue of free will, the new approach focused on laypersons' understanding of the concept of free will, and the antecedents and consequences of free will lay beliefs. Free will is a complex and somewhat loaded term, which makes arriving at a common definition challenging. Yet, discussing free will beliefs, a multi-disciplinary forum and much of the subsequent literature has converged on defining it as the belief that humans have the capacity to act freely (Haggard et al., 2010; Kane, 2002, 2011), that per a specific behavior a person *could have chosen to do otherwise* (Nichols, 2004). The laypersons' understanding of free will seems to center on the concept of choice (Feldman et al., 2014), and of human behavior as reasonably free from internal and external constraints, across situations, for both self and others (Baumeister & Monroe, 2014; Feldman, 2017).

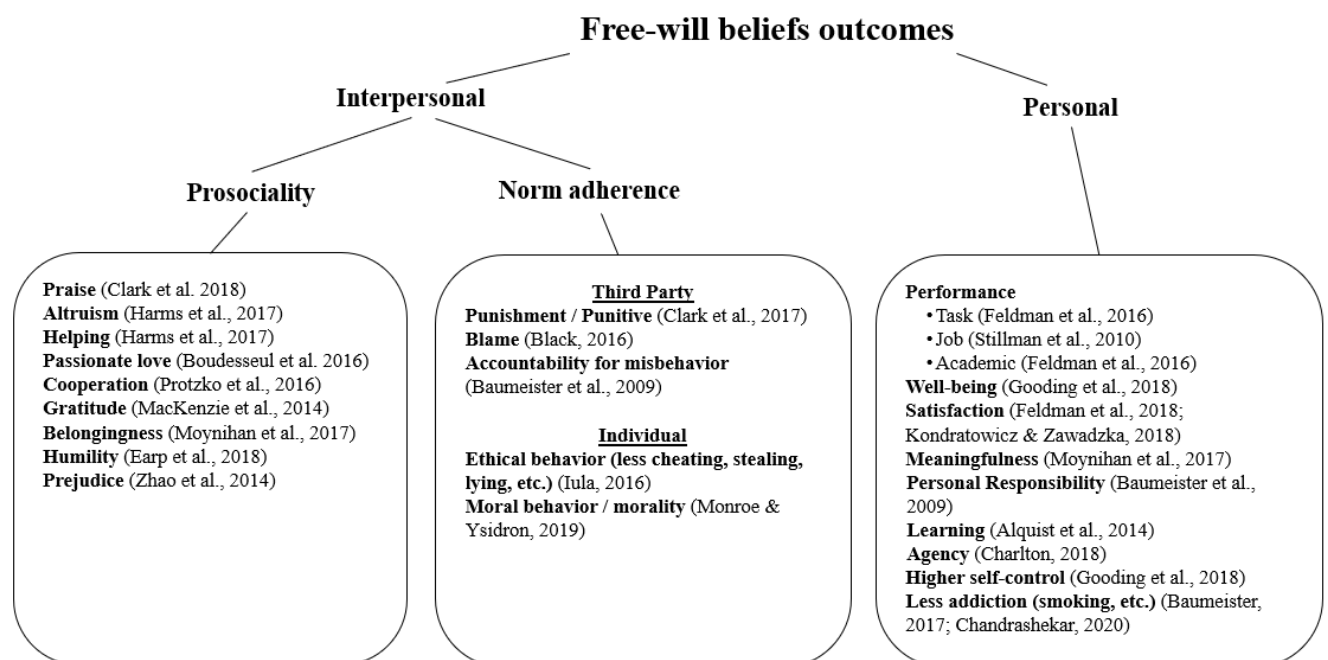
This approach has enabled researchers to conduct empirical studies assessing lay people's understanding of the concept of free will (Monroe & Malle, 2014), measuring free will beliefs (Deery et al., 2015; Nadelhoffer et al., 2014; Paulhus & Margesson, 1994; Paulhus & Carey, 2011; Rakos et al., 2008), and assessing outcomes associated with free will beliefs (e.g., Baumeister & Brewer, 2012; Baumeister & Monroe, 2014). The outcomes associated with free will beliefs may subsequently inform theoretical questions about free will, for example, *what is free will for?*

There are currently two main perspectives on the functional role of free will beliefs, arguing that the belief in free will has evolved as a mechanism (1) to promote interpersonal

outcomes for coexistence with others (Baumeister, 2005), and (2) to help humans pursue their own goals, wants, and needs (Dennett, 2003). The interpersonal perspective can be split into a prosociality component and a norm adherence component. We differentiate between norm adherence and promotion of prosociality as two distinct potential functions of free-will beliefs because, although both functions can serve similar end goals of influencing behavior, they do so in fundamentally different ways. Norm adherence tends to focus on injunctive monitoring, punishing, and preventing (Cialdini et al., 1991; Fehr & Fischbacher, 2004), whereas prosociality tends to be more promotive and positive (Aknin et al., 2018; Caprara et al., 2012; Dunn et al., 2008). Furthermore, the literature on prosocial behavior and norm adherence does not overlap; treating these two functions interchangeably would reduce our contribution and relevance to each literature. We summarized our model and study examples in Figure 1.

Figure 1

*Outcomes associated with free will beliefs: Categorization and examples*



**Free will outcomes: Classification****Interpersonal: Prosociality**

The currently dominant view in social psychology, often referred to as the “action-control perspective,” argues that the concept of free will has evolved to allow the self to coexist with others in society so as to override inherent immediate biological drives that mainly focus on the needs of the self (Kant, 1788/1997). The ability to override such drives arguably allows for prospection, long-term planning, action control, and coordination with others (Baumeister, 2005, 2008a; Seligman et al., 2013). In this view, all animals have the inherent tendency to behave selfishly in order to survive, but humans possess unique attributes that enable them to override the self in order to consider long term goals and postpone selfish urges and needs. This arguably gives humans a distinctive capacity to allow considerations of others in a cultural society (Baumeister, 2008b; Baumeister & Monroe, 2014). Simply put, under this perspective, free will is for social functioning and enabling coexistence with others (Baumeister, 2008a). If that is the case, belief in free will should be associated with prosociality (i.e., socially-desirable prosocial behaviors and attitudes).

Consistent with the action-control perspective, the “cultural animal framework” (Baumeister & Monroe, 2014, p.10) argues that free will beliefs evolved so that individuals could successfully navigate in their social environments and coexist with others, by overriding their own selfish biological urges, needs, and desires. Baumeister (2005, p. 44) stated, “What is necessary for living in culture, [...] is that the person can recognize several possible courses of action, can hold on to mental representations of their meanings and implications (including possible consequences) simultaneously, can analyze and compare them, and can choose among them in a way that is not fully and explicitly programmed in advance”. Free will beliefs may help increase people’s perceptions that their inherent biological drives are not pre-determined, allowing for developing a sense of shared goals and

meaning that go beyond the self, and that one relies on coexisting with others and behaving in socially desirable ways in order to enable long-term survival (Baumeister et al., 2009).

This theoretical association between free will beliefs and prosociality has been supported in empirical investigations, demonstrated with a breadth of outcomes such as cooperation and helping behaviors. One study manipulated participants' disbelief in free will and found that people assigned to the disbelief in free will condition were less cooperative than people in the control group who were given limited time to make a decision (Protzko et al., 2016). Baumeister et al. (2009) consistently found that disbelief in free will reduced prosocial behaviors and increased aggression, which has been partially replicated by Harms and his collaborators (2017). They revealed that disbelief in free will led to less altruistic behaviors only amongst non-religious participants. Furthermore, belief in free will has been found to be positively linked with other socially-desirable behaviors, including belongingness (Moynihan et al., 2017), passionate love (Boudesseul et al., 2016), gratitude (MacKenzie et al., 2014), modesty (Earp et al., 2018), humility (i.e., "a corrective to the natural human tendency to prioritize ourselves"; Earp et al., 2018, p. 18), and reduced prejudice (Zhao et al., 2014). Based on findings mentioned above, we expect to find that free will belief is positively associated with prosociality:

We therefore hypothesized:

*Hypothesis 1: Free will beliefs are positively associated with interpersonal prosociality.*

### **Interpersonal: Norm adherence**

Free will beliefs may play a role in society not only in enabling individuals' to override immediate biological urges, needs, and desires, but also in enhancing social cohesion by promoting socially normative behaviors and punishing (or attaching blame to) socially unacceptable behaviors (Chernyak et al., 2019). Simply put, under this perspective, free will

is paradoxically meant for "following rules" (Baumeister, 2008a). Specifically, proponents of this framework argued that in a well-functioning society, human beings are held accountable for their behavior. For laypersons and in most common contemporary social-legal systems, there exists an association between accountability and free, meaning that for individuals to be held accountable there needs to be the perception that they could have chosen to act differently.

One of the major roles of societies is to develop shared moral codes that guide members' sense of moral responsibility (i.e., the deservingness of praise, blame, reward, or punishment for action and inaction; Talbert, 2019). Societies establish processes for both praising individuals for adhering to social norms, and blaming and/or punishing individuals for violating social norms and engaging in other socially unacceptable behaviors (Clark et al., 2014). Though philosophically debatable, free will has evolved in societies to be commonly perceived as a prerequisite for moral responsibility (Feldman et al., 2016; Nichols & Knobe, 2007; Sarkissian et al., 2010; Stillman et al., 2011). In the literature, there is a strong association between free will and moral responsibility, with some authors operationalizing the belief in moral responsibility as a component in the measurement of free will beliefs (e.g., "People are always at fault for their bad behavior"; FAD Plus, Paulhus & Carey, 2011).

In sum, free will beliefs are commonly perceived as a prerequisite for moral responsibility and as enabling praise, blame, and punishment for norm adherence or violation. Free will beliefs may be associated with norm adherence through 1) stronger perceptions of and perceived importance of moral responsibility when evaluating others' behaviors, and 2) lower (higher) propensity by individuals to engage in norm violating (adhering) behaviors.

***Stronger perceptions of moral responsibility when evaluating others' behaviors***

A motivated account of free will argued that free will beliefs serve as a social tool for norm adherence (Clark et al., 2014; Clark et al., 2017; Clark et al., 2018; Shariff et al., 2014).

In this perspective, free will beliefs are associated with stronger desire to uphold accountability (Aspinwall et al., 2012; Carey & Paulhus, 2013; Feldman et al., 2016; Nettler, 1959), and less willingness to forgive others for their wrongdoings (Baumeister & Brewer, 2012; see summary in Nadelhoffer & Tocchetto, 2013). Studies found support for the association between free will beliefs and outcomes such as intolerance of socially unacceptable behaviors, and support for criminal punishment (Martin et al., 2017).

We therefore hypothesized:

*Hypothesis 2: Free will beliefs are positively (negatively) associated with stronger perceptions and perceived importance of norm adherence (violation) in both self and others.*

### ***Stronger adherence to social norms***

Several studies have also found that people holding weaker free will beliefs are more likely to engage in behaviors that violate social norms. For example, Vohs and Schooler (2008) found that exposure to anti-free-will essays claiming free will is an illusion was associated with cheating. One possible explanation was that when free will beliefs are diminished, people may claim that they could not have chosen to do otherwise and hence reject any moral responsibility for their misdeeds. Following this idea, Stillman and Baumeister (2010, p. 43) argued that belief in free will “facilitates exerting control over one’s actions”. Presumably the accountability and control afforded by belief in free will allows individuals to act in ways that are in accordance with social norms.

Based on the findings under this perspective, some scholars have warned of the potential hazards of announcing scientific findings in support of disbelief in free will (e.g. Shariff et al., 2008; Shariff & Vohs, 2014), with some even suggesting that it is imperative for society to maintain the 'positive illusion' of free will (see Nadelhoffer & Matveeva, 2009, for a summary).



We therefore hypothesized:

*Hypothesis 3: Free will beliefs are positively (negatively) associated with norm adherence (violation) behaviors.*

We note that some findings supporting the norm adherence view on free will beliefs have recently been challenged (Caruso, 2016, 2018; Focquaert et al., 2019; Lynn et al., 2014; Monroe et al., 2017; Shaw, & Pereboom, 2019). For example, several studies failed to replicate Vohs and Schooler's free will manipulation findings in large scale attempts (e.g., Crone & Levy, 2019; Ewusi-Boisvert, & Racine, 2018; Nadelhoffer et al., 2019; Open Science Collaboration, 2015; Smith, 2019; Zwaan, 2013). Given that these challenges and concerns and failed replications involve experimental manipulations of free will beliefs (see Ewusi-Boisvert, & Racine, 2013), we decided against including experimental studies in our meta-analysis. Correlational studies, which we focus on exclusively in this meta-analysis, do seem to show more consistent robust associations between free will beliefs and aspects of morality (e.g., Martin et al., 2017), compared to studies that manipulate free will beliefs, although these findings have also come into some debate (Crone & Levy, 2019; Monroe & Ysidron, 2019).

One potential explanation for failed replication attempts is that the relationship between free will beliefs and norm adherence outcomes is subject to boundary conditions. For example, recently the motivated account of free will has been challenged for its conflation of moral responsibility as a component of free will, with some authors suggesting that free will is associated with outcomes beyond morality and presumed motivations to punish (Monroe & Ysidron, 2019). Other experimental studies have reported results consistent with this challenge (Feldman et al., 2016; Fillon et al., 2020). Potentially, measures of free will that conflate moral responsibility could have different relationships with outcomes compared to

measures that do not conflate moral responsibility. We thus include this as moderator in the present meta-analysis.

Another possible boundary condition is that of culture. Recent findings underscore the role of culture in understanding how people think about free will (Hannikainen et al., 2019). Specifically, being the source of one's actions is less salient in Asian cultures, conceivably because Asian cultures are relatively more likely to attribute outcomes to situations rather than rather than dispositions (Choi et al., 1999). Thus, many of the findings on free will beliefs to date may not be globally representative given that many of these studies "suffered from an important limitation: Most past studies relied on small and homogeneous North American samples" (Hannikainen et al., 2019, p. 11). To partially account for cultural differences, we include the cultural dimension of tightness versus looseness as a moderator (see moderators section for details).

#### **Personal: Free will for the self**

Another perspective views free will as a mechanism that allows the self to pursue self-enhancing desired states and goals, such that a person is free from external social constraints and thus able to pursue individual wants and needs (Hume, 1748; Edwards, 1754). Put more simply – free will is for enabling the individual to get what she or he wants (Dennett, 2003), and giving the self a stronger sense of autonomy and self-direction (Kane, 2002). In this view, free will beliefs encompass a much wider influence over human action than the mere link to prosociality and moral accountability, in that this belief enables a person to choose and pursue personal self-serving goals.

A common thread across both interpersonal and personal perspectives of free will is the link to responsibility and accountability for decisions and behavior. In prosociality, free will promotes the idea of being held accountable in society, yet for the individual it also represents a stronger sense of autonomy and control over their outcomes (Kane, 2005) and

the ability learn from one's own mistakes and initiate action to change direction when necessary (Feldman et al., 2016).

Consistent with this idea, several studies have found support for the link between free will beliefs and performance, motivation, self-regulation, choice, learning, satisfaction, and goal pursuit (Baumeister & Monroe, 2014; Feldman, 2017). For example, free will beliefs were positively associated with performance in a spell-checking task, and academic GPA (Feldman et al., 2016). This finding is suggestive of free will beliefs as facilitating learning and improvement, to view the self as a capable and active agent free to choose and pursue one's own path (Feldman et al., 2016). Similarly, employees' free will beliefs were a significant predictor of workplace performance (Stillman et al., 2010) and job satisfaction (Feldman et al., 2018).

Free will beliefs have also been associated with higher autonomy, less conformity, and more willingness to exert effort (Alquist et al., 2013; Moynihan et al., 2019), lower helplessness and stronger self-efficacy (Baumeister & Brewer, 2012), stronger motivation to succeed (Stillman et al., 2010), higher perceived ability and positive attitudes toward decision making (Feldman et al., 2014), actions more in line with own values (Stillman, Baumeister, & Mele, 2011), more meaningfulness (Moynihan et al., 2019), and more future-oriented views (Seligman et al., 2013). Moreover, free will beliefs have even been shown to influence basic cognitive volitional functions (Rigoni & Brass, 2014), such as heightened brain readiness potential in human motor actions (Rigoni et al., 2011), more efficient processing of errors (Rigoni et al., 2013; Rigoni et al., 2015) and better suppression of pain (Lynn et al., 2013).

While the results from many studies have supported the view that belief in free will enables one to pursue self-serving goals, results from other studies suggest a more nuanced view that depends on individual differences, the national culture, the study design, and other measures accounted for in the analysis. For example, one study found that the stronger people

believed in free will, the less indecisive they were, but this relationship did not hold for people with low concept clarity (Kokkoris et al., 2019, Study 4). Another study found that the previously supported positive association between free will beliefs and life satisfaction observed in US samples (see Bergner & Ramon, 2013; Crescioni et al., 2016) did not hold among Dutch respondents (Spronken et al., 2019, Study 1). In a later study, the authors found that among Dutch respondents, the relationship between free will beliefs and life satisfaction was significant only when life satisfaction was measured before free will beliefs (Spronken et al., 2019, Study 3). Finally, some studies have suggested that peoples' free will beliefs may not predict incremental variance when other related variables are included in the model, such as self-esteem (Alquist et al., 2015; Rakos et al., 2008), self-control (Baumeister, 2008; Baumeister & Monroe, 2014; Clarkson et al., 2015; Rigoni et al., 2012), or self-efficacy (Crescioni et al., 2016; Rigoni et al., 2011). Despite the challenges presented above to the self-serving view of free will beliefs, in hypothesizing a main effect, we followed the dominant perspective that free will beliefs are positively associated with personal outcomes.

We therefore hypothesized:

*Hypothesis 4: The belief in free will is positively associated with personal outcomes.*

We note that we decided to differentiate between individual norm adherence and personal outcomes to attempt to disentangle the individual from the social context. In many cases, the argument can be made that humans are social animals, and as such everything we do personally is also of social consequence. Following this view would lead us to conflate the individual and the social context and would reduce the value of the present meta-analysis. To provide an understanding of the relationship between free will beliefs and individual norm adherence outcomes (versus personal outcomes) without making unsupported assumptions, we will have independent coders categorize each outcome and classify each outcome as norm

adherence or personal only if there is adequate interrater agreement to do so. Otherwise, we will classify the outcome as both, neither, or unclear.

### **Comparing the perspectives**

The findings that stronger free will beliefs are associated with less conformity (see Alquist et al., 2013) are especially interesting as they pit personal and interpersonal views of free will against one another. If free will indeed serves the function of promoting adherence to social norms, then we would expect higher conformity with stronger free will beliefs, rather than lower. Is it possible that free will beliefs are associated with both stronger adherence to norms and less conformity at the same time? Similarly, if an individual faces competing motivations of promoting oneself or helping others, which motivation is stronger?

Although the two perspectives on free will are not mutually exclusive, they have different foci—further social goals vs. further one’s own goals. An important question arises—which of these two links is stronger? To answer this question, we aim to meta-analyze studies completed to date to better understand the extent of the association between free will beliefs and outcomes associated with the different perspectives on free will. Specifically, we will address two research questions in this meta-analysis: What is the direction and strength of the relationship between free will beliefs and outcomes that are viewed as (1) primarily intended for social functioning, and (2) primarily intended to help individuals get what they want? Given that we have no basis for predicting the relative strength of relationships, we will investigate competing hypotheses:

*Hypothesis 5a: Free will beliefs are more strongly positively associated with group-oriented outcomes than self-oriented outcomes.*

*Hypothesis 5b: Free will beliefs are more strongly positively associated with self-oriented outcomes than group-oriented outcomes.*

Scholars have argued that behaviors that are self-serving are also often socially useful, and vice versa (Eldakar & Wilson, 2008; Gino et al., 2013; Melis & Semmann, 2010).

Although we focus here more on the immediate functions and outcomes associated with each behavior, we recognize that categorizing outcomes as furthering one's own goals versus furthering social goals may be blurry. Therefore, we will have multiple independent coders code each outcome to determine if each can be justifiably categorized as one or the other. We will allow for each outcome to be classified as either group-oriented, self-oriented, both, neither, or unclear.

## **Moderators**

### **Attitudes, intentions, and behaviors**

Authors investigating the consequences of free-will beliefs have assessed outcomes in terms of intentions (e.g., reported likelihood of conformity; Alquist et al., 2013, Study 1), attitudes (e.g., attitudes about choice ability; Feldman et al., 2014), and observed behaviors (e.g., aggression; Baumeister et al., 2009). Classic literature on attitudes, intentions, and behaviors suggests that the links from attitudes to intentions, and from intentions to behaviors are subject to several factors (Bagozzi, 1981, 1992). In other words, attitudes do not always lead to intentions, and people do not always do as they intend. We thus expect that the link between free will beliefs and outcomes will be strongest for outcomes measured as an attitude, and weakest for outcomes measured as a behavior. We will code these moderators as two dummy variables: one for attitudes (1 = attitude, 0 = non-attitude), and one for behavior (1 = behavior, 0 = non-behavior).

We therefore hypothesize:

*Hypothesis 6: Free-will beliefs are more strongly associated with outcomes measured as attitudes (compared to outcomes measured as intentions or behaviors).*

*Hypothesis 7: Free-will beliefs are less strongly associated with outcomes measured as behaviors (compared to outcomes measured as attitudes or intentions).*

### **Culture: Tightness vs looseness**

Literature on free-will beliefs and culture has started to show that peoples' understanding of free-will beliefs may be influenced by national culture (for a review, see Hannikainen et al., 2019; for non-WEIRD samples with findings different from previous WEIRD samples, see Kushnir et al., 2015; Martin et al., 2017; Spronken et al., 2019; Wente et al., 2016). On the other hand, authors have also found evidence suggesting that people from diverse cultures such as the US, Hong Kong, India, and Colombia show cross-cultural convergence on fundamental ideas about free-will (Sarkissian et al., 2010). One dimension of culture that is of particular relevance to the norm-adherence function of free will beliefs is cultural tightness, which refers to the extent that a culture has strong norms and a low tolerance for deviance (Gelfand et al., 2011). In tight cultures, free-will beliefs serve as a necessary antecedent to punishment. Thus, we expect that the relationship between free-will beliefs and norm-adherence outcomes will be stronger in tight cultures. We will obtain national tightness-looseness scores from Gelfrand et al. (2011), or from other updated sources where available.

We hypothesize:

*Hypothesis 8: The relationship between free will beliefs and norm adherence outcomes will be moderated by cultural tightness-looseness, such that the relationship will be stronger in cultures that score higher in cultural tightness.*

**Free will beliefs measure: Conflated with moral responsibility and agency**

Some measures of free will beliefs ask people to indicate whether they believe in free will, leaving the term “free will” open to the individual’s own lay conception (e.g., “Do you believe in free will”). Other measures impose a definition or conceptualization of free will (e.g., “People are always at fault for their bad behavior”; Paulhus & Carey, 2011). No literature has directly examined whether the conceptualizations used in commonly used scales overlap with people’s lay conception of free will. As an exploratory moderator, we will code each measure as to whether it imposes a definition of free will, or if it leaves interpretation open to the respondent. It is thus presently unclear whether existing measures truly examine free will beliefs (as per peoples’ lay ideas) or other ideas such as beliefs about moral responsibility or agency.

Some of the existing free will beliefs measurements conflate moral responsibility and free will (e.g., “People must take full responsibility for the bad things they do.”; FAD Plus, Paulhus & Carey, 2011). The relationship between moral responsibility and free will is complex. Some even view free will as a prerequisite for holding people morally responsible for their actions. Yet authors have also argued and found support for the idea that a desire to hold others morally responsible motivates free will beliefs (Clark et al., 2014). Recently, another study found that moral responsibility does not uniquely influence free will beliefs, but rather norm deviations (Monroe & Ysidron, 2019). Across several experiments, the authors found people’s expectations for norm adherence (and not motivation to blame immoral behaviors) explained malleability in attributing free will to others. Given these findings, it is possible that scales which include items relating to moral responsibility may show different effects compared to scales that do not measure moral responsibility in their measurements of free will beliefs. More specifically, we expect that scales that focus on moral responsibility



would be more strongly associated with interpersonal norm adherence outcomes (e.g., punishment, punitive blame, responsibility for unethical behavior).

We therefore hypothesize:

*Hypothesis 9: Free will beliefs are more strongly associated with norm-adherence outcomes and prosociality outcomes for measures of free will that more strongly conflate moral responsibility with free will.*

Recently, Clark and colleagues (2019) found that motivated free will beliefs and attributions remained robust after removing possible moral responsibility confounds. It is presently unclear whether the inclusion of moral responsibility as a feature of free will influence the relationship between free will beliefs and outcomes. Given the recent findings from Clark and colleagues (2019), it is possible that the association between free will beliefs and norm-adherence (and prosociality) outcomes do not depend on the extent to which the measure conflates moral responsibility with free will. We therefore draw a competing hypothesis:

*Hypothesis 10: The relationship between free will beliefs and norm-adherence (and prosociality) outcomes do not significantly vary as a function of the extent to which the measure used conflates moral responsibility with free will.*

Another common conceptualization of free will focuses on agency. Some measures (or items included in measures) conceptualize free will in terms of peoples' agency (e.g., "People do not choose to be in the situations they end up – it just happens", reverse-coded; Paulhus & Margesson, 1994). Indeed, scholars have found that agency, and more specifically the ability to make choices, is a key factor in how people think about free will (Feldman et al., 2014), yet not all measures focus on this conceptualization. Given that agency and choice gives people the opportunity to simultaneously express themselves and influence their

environment (Savani et al., 2017), we expect to find that measures that reflect ideas related to agency will be more closely related to personal outcomes.

*Hypothesis 11: Free will beliefs are more strongly associated with personal outcomes for measures of free will that more strongly conflate agency with free will.*

To test the above two hypotheses, we will have independent coders review measures of free will beliefs and code each item in each scale on the extent to which the item includes ideas related to moral responsibility (e.g., assertions that people should take responsibility for their actions) on a scale from 1 to 7, and the extent to which the item includes ideas related to agency (e.g., assertions that people can make choices and control their outcomes) on a scale from 1 to 7. We will then generate a “moral responsibility index” and an “agency index” for each measure and use those in testing whether the extent that each measure relies on agency and moral responsibility influences the relationship between free will beliefs and different categories of outcomes as specified in the above two hypotheses.

### **Publication status**

Given that, traditionally, articles with nonsignificant findings are less likely to be published (Carter & McCullough, 2014), we expect that the publication status of the article will affect the relationship between free will and outcomes. Specifically, we expect that the relationship between free will beliefs and all outcomes will be stronger for studies that are published.

We therefore hypothesize:

*Hypothesis 11: The relationship between free will beliefs and outcomes (prosocial, norm adherence, and personal outcomes) are stronger in published studies (compared to not published).*

**Free will belief measure: General free will or one's own free will**

Some measures of free will beliefs refer to beliefs about free will in general, while others refer specifically to one's own free will. Given that people believe they have more free will than others in general (Pronin and Kugler, 2010), we expect that the relationship between free will beliefs and outcomes will be stronger for measures that ask participants to rate their own free will, as opposed to free will in general. To test this, we will ask independent coders to rate each measure as either measuring general free will or one's own free will.

We therefore hypothesize:

*Hypothesis 12: The relationship between free will beliefs and outcomes (prosocial, norm adherence, and personal outcomes) are stronger for measures that ask participants to rate their own free will compared to measures that ask participants to rate free will in general.*

**Methods**

[Note: If written in past tense, should be treated as TBD to be implemented and updated following Registered Report approval.]

**Pre-registration and open-science**

We pre-registered our meta-analysis on the Open Science Framework (OSF) and then proceeded to begin search and coding. The pre-registration and additional information about decisions are available in the supplementary materials. These together with coding sheet, protocols, datasets, and R/RMarkdown code were shared on the Open Science Framework: (review link) [https://osf.io/57sau/?view\\_only=2f9ba477f34e4fac9e98f4c0a172fa93](https://osf.io/57sau/?view_only=2f9ba477f34e4fac9e98f4c0a172fa93) ).

[Note: Review link is active and includes a copy of the suggested coding sheet and email template.]

## Design

The independent variable (IV) for this meta-analysis is belief in free will. The three categories of dependent variables (DV) are 1) interpersonal prosocial outcomes, 2) interpersonal norm adherence outcomes, and 3) personal outcomes.

## Eligibility criteria

Studies including measures of belief in free will and outcomes (see Table 1) are included in our analysis. We may include outcomes not listed in the table if they can be justifiably classified into one of our identified categories: prosocial, norm adherence, or personal.

## Search Strategy

Meta-analysis process and search process are outlined in Appendix A and B. We will use Google Scholar as the search database as Google Scholar has been shown to be a suitable database for gathering articles for the meta-analyses (for suitability for meta-analyses see Gehanno et al., 2013).

Combinations of the following search terms will be used to search the database systematically. Exact combinations and overall pattern to be used (i.e., combining all IV-related keywords with one of the DV-related keywords) can be found in the coding sheet under “Search Patterns Pre-Test”. The IV-related keywords are: *free will, free-will, freedom of will, personal choice, choosing*. The DV-related keywords are: *consequence, outcome, behavior/behavior, attitude, attribution, intention, unethical, ethical, prosocial, self-serving, positive, negative, motivation, performance, satisfaction, well-being, cheating, regret, guilt, punish, stealing, aggression, helping, blaming, learning, conformity, meaning, antisocial, volition, moral, punitive, gratitude, volunteering, counterfactual, self-improvement, prejudice, altruism, goals, humility, justification, policy, praise, passionate love, cooperation, belongingness, lying, responsibility, agency, self-control, addiction*. Additional keywords

identified through the process that match the criteria for inclusion will be documented clearly and our search will be updated accordingly.

During the search, keywords related to IV will be linked with the Boolean Logic operators “OR”, while keywords between IV and DV will be linked with the Boolean Logic operators “AND”. An asterisk will be added to the end of each keyword (e.g., “Belie\*”) to indicate truncations for keywords that may be spelled slightly differently (e.g., “belief” vs. “beliefs”, Robinson & Dickersin, 2002). This, along with variations of the respective keyword will be included in the search with the original keywords specified in previous points if search results on Google Scholar yield less than 100 results. The variations will be linked with OR. An example of our search pattern is as follows: (*"free will" OR "free-will" OR "freedom of will"*) AND (*"unethical"*).

The search will include papers listed under the “related articles” and “cited by” features in Google Scholar to identify papers that are similar or have cited the identified articles. Furthermore, the search will include using the “cited by” feature in Google Scholar to identify additional relevant studies that have cited the articles on the common measurements of free will beliefs. A skimming of reference sections of found articles will be conducted to check for additional relevant studies. We will also look at other articles that are published by previously identified authors in the field to check if there are other relevant papers that we may have missed. To ensure full coverage and maximize access to unpublished data and/or manuscripts, we will contact authors of the identified articles, issue a call for unpublished findings on research forums and social media platforms such as ResearchGate and Twitter, as well as post this meta-analysis project on ResearchGate and add all the identified articles to notify the authors about this project and request for more relevant but unpublished data. For all the articles, titles, abstracts, tables, and methods sections will be scanned to identify the relevance of a source.

**Selection procedure**

Studies collected through the database searches will be assessed for their eligibility based on their titles, abstract, and content. Database searches for each search pattern used will terminate once the researcher scans through three full pages of records on Google Scholar consecutively without relevant papers that fit our inclusion criteria. Two researchers will examine and determine the adequacy of the study for the meta-analysis and aim to reach an agreement. Any disagreements will be resolved through discussion with the coordinator or a third senior member. All decisions on inclusion and exclusion will be documented with reasons in any case.

**Inclusion criteria**

We focus on correlational studies in our meta-analysis. In our meta-analysis, we will only include studies that measured free will beliefs as an independent variable and not as an outcome. We will also only include measures of free will beliefs, and not studies that manipulated free will beliefs. We will also exclude studies that include other manipulations or interventions. Correlational meta-analyses typically exclude studies that had manipulations of the target variable before the said variable was measured (e.g., Chevance et al., 2019), or conduct a separate meta-analysis for studies with manipulations or interventions (e.g., Schmitt et al., 2014; van Kleeck et al., 2010). As this is a correlational meta-analysis, we will include correlations and effect sizes, as long as the effect size reported is based on a measure of free will beliefs, and not an experimental manipulation. We will include studies that report correlations between free will beliefs and outcomes that can be classified as prosocial, norm adherence, or personal. Most free will belief scales also measure other constructs, such as determinism (sometimes with subscales such as fatalistic determinism and scientific determinism; Paulhus & Carey, 2011), fatalism, moral accountability, dualism. This may create confounds that will be difficult to disentangle. To simplify, we will only use free will

scales and free will subscales in our analysis. We will also code 1) separate subscales (e.g., fatalism), and 2) aggregate scales that include free will subscales (e.g., free will and determinism scales), but these will only serve for future exploratory analyses and not for testing our main hypotheses.

### **Exclusion criteria**

We will exclude studies that measured free will beliefs as an outcome or a dependent variable, studies that do not directly measure belief in free will (including studies that measure only determinism or fatalism), studies which did not report crucial statistics such as correlation coefficients or sample sizes, and studies where the dependent variable cannot be justifiably classified into prosociality, norm adherence, or personal categories. We will also exclude experimental studies where either free will beliefs were manipulated or appeared after a manipulation.

### **Data extraction procedure**

The suggested coding sheet is available for review on (open for reviewer commenting):

[https://docs.google.com/spreadsheets/d/1R7CqMkAyV\\_hT3uXaieulHSoVjj69x9owuvX3otKTeCg/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1R7CqMkAyV_hT3uXaieulHSoVjj69x9owuvX3otKTeCg/edit?usp=sharing) and a copy has been uploaded to the OSF page).

We included a coding sheet as a separate file along with a codebook for details on how each column is to be coded specifically. For the coding procedure (see Appendix C), we will begin with briefly scanning each article yielded from search keywords to check for its relevance based on the inclusion criteria listed above. During the process, the searcher will add all articles that meet the criteria into the searched articles tab. For each paper in the searched article tab, one group member will download a copy and place the file in a collaborative cloud folder. All downloaded full-texts will be saved in a shared cloud folder

using the following format: first author last name-year-journal abbreviation-first five words of the title (e.g., Stroessner-1990-PSPB-Effects of belief in free).

After scanning the paper, the team member will indicate if this article should be included in our main coding sheet or not. If not, a specific failed inclusion criteria or exclusion criteria will be indicated in the searched article tab (e.g., if statistics are not reported or if outcomes cannot be classified as prosocial, norm adherence, or personal). If the paper meets the inclusion criteria, the coordinator will add the article in the main coding sheet assigning to one of the group members as indicated in the coding sheet. This may or may not be the same person that searched the paper and determined that it met the initial inclusion criteria outlined above.

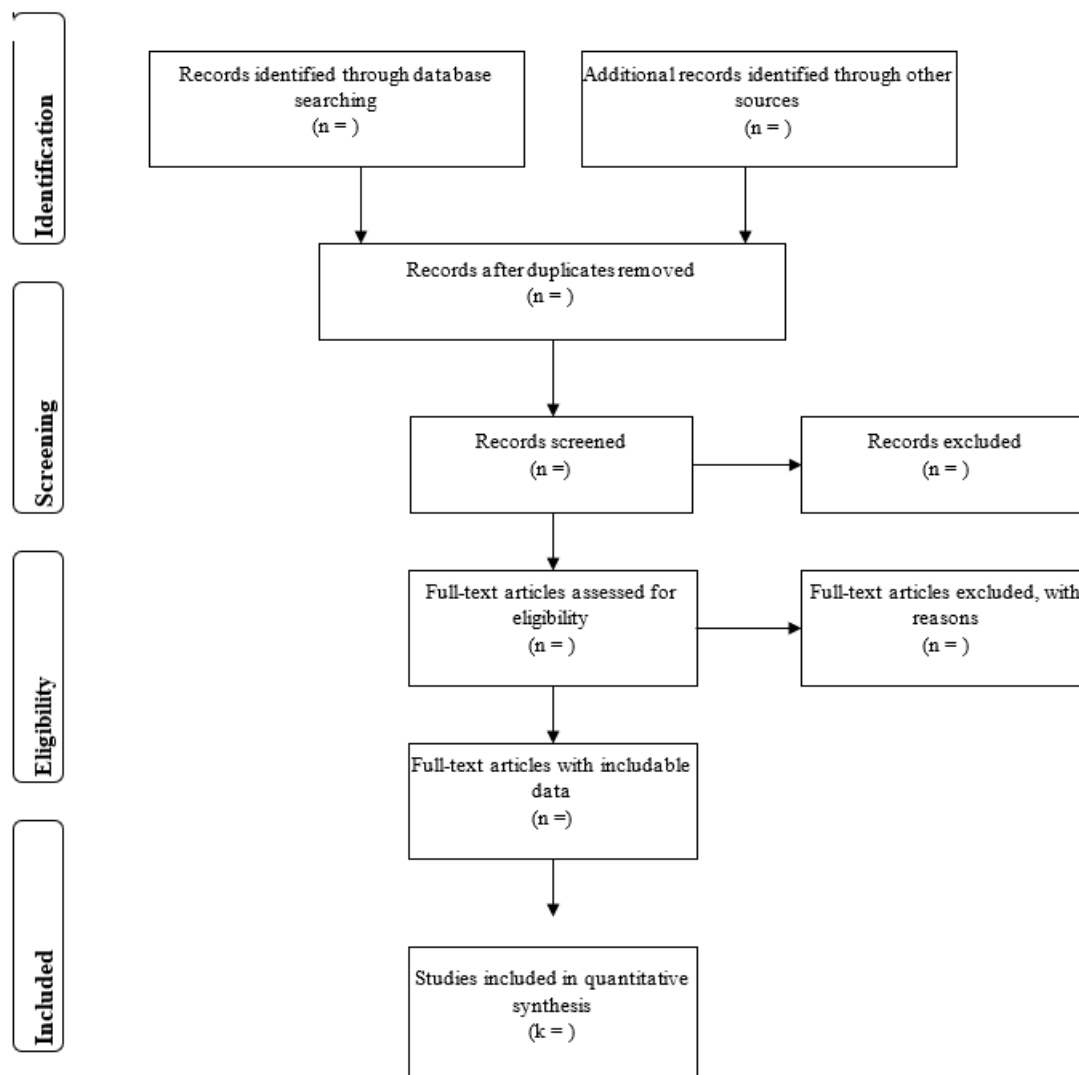
In the event that the person coding finds that the paper is not suitable given the inclusion and exclusion criteria, the coder must indicate that the article or study will not be included in the analysis and the reason (again indicated a specific failed inclusion criteria or exclusion criteria in the column reason for exclusion). Each article will be coded by a member of the group and checked by a separate member, to be finalized by a coordinator. In case of a disagreement in coding, the two coders will examine a possible source for error, and if there is one, will remedy and document. In case of a disagreement with no found errors, the coordinator or a third coder will make a decision. Gaps and inconsistencies identified will be documented and decisions will be reported in detail in the “decision documentation” tab of the coding sheet. The coding procedure will also be updated to address future similar situations. Coordinator will split coding and checking duties among team members, and the coordinator will randomly check entries at the end. Any discrepancy will be reported to the coordinator, the coordinator will provide input or ask a third member of the team to provide a perspective. If the coordinator is uncertain, he or she will ask one of the senior investigators



to assist with the issue. For data collection and analysis pipeline see "Overview" tab of the Coding Spreadsheet.

Figure 2

*Meta-analysis flow diagram (adapted from PRISMA 2009, Moher et al., 2009)*



## Analysis Plan

We are examining the relationship between free will beliefs and three categories of outcomes: The relationship between free will beliefs and interpersonal prosocial outcomes (e.g., cooperation), the relationship between free will beliefs and interpersonal norm adherence outcomes (e.g., punishment), and the relationship between free will beliefs and personal outcomes (e.g., performance). We will assess norm adherence outcomes in

aggregate, and further segmenting into third party (e.g., blaming) and individual (e.g., cheating) outcomes.

We will use R and the metafor package for the statistical analyses (Viechtbauer, 2010). We will share all coding documentation and R/Rmarkdown code with reviewers and the academic community using the Open Science Framework.

### **Confirmatory analyses**

We will meta-analyze the overall strength of the relationship of free will beliefs and the following variables, as measured by Pearson's  $r$ : Prosocial outcomes, norm adherence outcomes, and personal outcomes. Given the range of different outcomes for each category, we expect the heterogeneity in the sample to be relatively high, and thus, a random effects model will be used for all the dependent variables in the first and second relationship. Split conditions due to possible moderators identified in the original studies will be collapsed to allow for a comparison of the relationships. All conversions and coding decisions will be documented, and the original text will be included in the coding sheet to allow for reproducibility.

Forest plots presenting the effect size of each study will be produced. A meta-analysis will examine the overall strength of the relationship between belief in free will and each of the different categories of outcomes. An equivalence test will be conducted to examine whether the effect size indicates a meaningful association, where a correlation of at least  $r = .10$  is expected (Cohen, 1988; Gignac & Szodorai, 2016; Lakens, 2016, 2017, 2018; Schäfer & Schwarz, 2019).

Meta-regression will be conducted to examine the suggested moderators. Additionally, considering the heterogeneous effects within this study, we will run multilevel analyses. Depending on the level of heterogeneity, we will either collapse the effects or run a multi-level meta-regression. This decision will be documented and justified based on our

observations of the final set of papers coded. Statistical heterogeneity will be determined using the Tau<sup>2</sup> test and quantified using I<sup>2</sup>, which represents the percentage of the total variation in a set of studies that is due to heterogeneity (Higgins et al., 2003). This meta-analysis will yield a point estimate, confidence interval, and p-value, along with statistics for heterogeneity, assessed using the Q-statistics, and the I<sup>2</sup> statistic. If there is indeed significant heterogeneity, we will explore potential moderators.

### **Exploratory analyses**

We expect to include more variables that are not listed in the pre-registered coding sheet as possible moderators as we examine the literature. These additional moderator analyses will be considered as exploratory and will most likely be conducted if tests of homogeneity reveal significant heterogeneity among the studies included in our meta-analysis.

### **Publication bias analysis**

We will report findings for the presence of publication bias using multiple methods, given that recent research has suggested that a combination of methods is the best approach (Carter et al., 2019) We will include funnel plots and statistical tests for publication bias (minimum: publication status as a moderator, compare effects for only published findings) and asymmetry (minimum: trim and fill, rank test, Egger's unweighted regression symmetry test). We will also conduct a p-curve (Simonsohn et al., 2014; Simmons & Simonsohn, 2017) and a p-uniform test (van Aert & van Assen, 2018).

In addition to the analyses outlined above, we will also explore measures that attempt to quantify publication bias. We will accomplish this using several different measures outlined briefly below. *Precision-Effect Test (PET)* and *Precision-Effect Estimate with Standard Error (PEESE)* are both regression techniques built on the idea that publication bias results in a small study effect such that statistically significant effect sizes from smaller

studies (i.e., smaller  $N$ ) are larger and have larger standard errors than those from relatively larger studies (Stanley & Doucouliagos, 2014). In other words, effect size positively correlates with standard error. To adjust for this via the PET technique, the analyst regresses effect size on standard error so that the intercept can be interpreted as the predicted effect size when the standard error equals zero (i.e., a perfectly precise estimate). *p-Curve* exploits the idea that the distribution of significant  $p$ - values resulting from tests of “true” effects will be right skewed (i.e., higher frequencies of small  $p$ -values). As effects and sample sizes get bigger, small  $p$ -values become more frequent and the distribution of significant  $p$ -values—*p*-curve—becomes more right-skewed. In contrast, null effects will produce significant  $p$ -values that are uniformly distributed; that is, all sizes of significant  $p$ - values are equally likely when the null is true. Thus, an analyst can glean the evidential value of a phenomenon from the degree of right-skew in the observed *p*-curve. *p-uniform* is also based on only significant  $p$ -values, but it employs a different estimation algorithm. Because these techniques make similar assumptions about effect sizes and selection bias, they perform equally well under similar conditions. However, unlike *p*- curve, the *p*-uniform technique provides confidence intervals for the estimated effect size.

### **Open Science Disclosures**

#### **Data collection status**

Data collection has not begun for this project.

#### **Reporting**

There are no other unreported/unlinked pre-registrations for this meta-analysis project.

### **Quality Control and Assurance**

The collaborative group will be responsible for data quality. One researcher will read all titles, abstracts and included papers to 1) determine study eligibility, and 2) conduct data extraction. Another researcher will double check the paper selected. Disagreements will be

resolved through discussion with a third author. The coding document provides a mechanism to ensure that verifications have been carried out. The coder must input his/her name in each row as well as the date of the input. The entry will then be marked as coded. Following this, a different group member will be assigned the task of verifying the data, and the verifier will input his/her name in a different column in the row as well as the date of the verification. The entry will then be marked as checked. In the event that the member verifying the entry finds any discrepancy, the entry will be marked as being a discrepancy and the coordinator will provide a third perspective, or ask another third member of the team to provide a perspective (there is also a column to identify the third party). If the coordinator is uncertain, he or she will ask one of the investigators to assist with the issue.

All documents will be kept in an open access cloud folder that is available for viewing for all. This folder will contain all documents mentioned, including a copy of this pre-registration, a copy of the completed coding sheet, a subfolder with copies of identified papers, and a subfolder of PDF copies of coded papers.

## Results

[**Note:** The following is meant as a rubric to simulate the expected results section prior to search, coding, and analysis. We expect major changes to this section, yet we will - at minimum, meet the reporting planned here.]

We conducted statistical analyses in R using the metafor package (Viechtbauer, 2010). The data analysis R scripts were written and registered before viewing the data (see [osf URL](#); R version ###; packages list, XXX). Meta-analysis forest plot is provided in Figure 3.

Six separate meta-analyses were conducted to examine the overall strength and direction of the relationship, as measured by Pearson's  $r$ , between belief in free-will and prosocial outcomes, norm adherence outcomes (third party, individual, and aggregate), and personal outcomes. We also ran a meta-analysis for the aggregate interpersonal category, including both prosocial and norm adherence outcomes.

In total there were  $k$  samples in  $n$  articles for prosocial outcomes,  $k$  samples in  $n$  articles for norm adherence outcomes, and  $k$  samples in  $n$  articles for personal outcomes. Standardized effect sizes were collected from authors of  $N$  original publications. For the remaining  $N$  articles, descriptive statistics or inferential statistics were used to re-compute standardized effect sizes.

### Main results

Overall, we found that free will beliefs was <positively/negatively> related to prosocial outcomes ( $\rho = x.xx [x.xx, x.xx]$ ), <positively/negatively> related to norm adherence outcomes ( $\rho = x.xx [x.xx, x.xx]$ ), and <positively/negatively> related to personal outcomes ( $\rho = x.xx [x.xx, x.xx]$ ). At the aggregate level for interpersonal outcomes, we found that free will beliefs was <positively/negatively> related to interpersonal outcomes ( $\rho = x.xx [x.xx, x.xx]$ ). Digging deeper into norm adherence outcomes, we found that free will beliefs was

<positively/negatively> related to third party evaluations ( $\rho = x.xx [x.xx, x.xx]$ ), and  
<positively/negatively> related to individual behavior ( $\rho = x.xx [x.xx, x.xx]$ ).

### **Belief in free-will and X outcomes**

[**Note:** Section template per each outcome type]

Meta-analytic estimates showed that belief in free-will was <positively | negatively> correlated with self-serving outcomes  $\rho = x.xx [x.xx, x.xx]$ .

### Exploratory Analyses

This section will elaborate on findings from moderation and exploratory analyses.

### **Moderator results**

TBD

### **Publication bias results**

TBD



Table 1

*Free will beliefs and outcomes: Study summary and effects (k = XX)*

Article	Study	Category	Sub-category	IV	DV	Moderator X	Effect size <i>g</i> + CIs
#	Authors (Year)	<interperson al/personal>	<prosocial/norm- adherence-third party/norm adherence- individual>	Measure			XX
#							

## Figure 3

*Meta analysis forest plot*

[insert meta-analysis forest plot here]

*Note.* Forest plot with the distribution of effect sizes for association between belief in free-will social-serving outcomes. Effect sizes for each study are depicted by the positioning of the filled square on the x-axis; the sizes of the squares represents the weight of the study. The vertical line with the value 0 is the line of no effect. The bars correspond with the 95% CI of the effect size (outer edges of polygon indicating limits of the CI. CI = Confidence Interval; RE Model = random-effects model)

The sample of studies had no / little / substantial heterogeneity ( $\tau^2 = XX$ ,  $Q(XX) = ,$   $p = XX$ ) with  $I^2 = XX$ . [If Q test approached significance]: Based on these indices, meta-regressions were conducted to test the following potential moderators - cultural distance, cultural tightness, and measures. Meta-regression results indicated a <significant | non-significant> effect of cultural distance ( $b = X$ , 95% CI: XX to YY,  $p = X$ ). [If significant]: The relationship between belief in free-will and social-serving outcomes was <larger | smaller> for greater cultural distance. For cultural tightness, meta-regression results indicated a <significant | non-significant> effect ( $b = X$ , 95% CI: XX to YY,  $p = X$ ). [If significant]: The relationship between belief in free-will and social-serving outcomes was <larger | smaller> for tighter cultures. Lastly, meta-regression showed a <significant | non-significant> effect of measure.

Various analyses were conducted to test for publication bias. The results are presented in Table 2. Funnel plots are presented in Figure 4 and 5 (by Trim and Fill method). The findings suggested <no | possible> publication bias in favor of the effect. [If publication bias present]: Corrections for publication bias showed that the relationship between belief in free-will and social-serving outcomes was  $\rho = x.xx [x.xx, x.xx]$  (Puniform),  $\rho = x.xx [x.xx, x.xx]$  (three-parameter selection model),  $\rho = x.xx [x.xx, x.xx]$  (Henmi & Copas),  $\rho = x.xx [x.xx, x.xx]$  (Trim and fill).

Table 2

*Publication bias analyses results*

<b>Publication bias analyses method</b>	<b>Results and adjusted models</b>
Three-parameter selection method	Likelihood ratio test: XX, $p = XX$ Adjusted model: $\rho = x.xx [x.xx, x.xx]$
PET	$b = XX [XX, YY], p = XX$
PEESE	$b = XX [XX, YY], p = XX$
Puniform	Adjusted model: $\rho = x.xx [x.xx, x.xx]$ XX significant

Figure 4

*Free will beliefs and [X type] outcomes: Funnel plot with Trim and Fill Method*  
[Insert funnel plot]

We also conducted a p-curve analysis (Simonsohn et al., 2014; Simmons & Simonsohn, 2017) to quantify the evidence in support of the relationship (see Figure 6). With an estimated power of X% (X% CI: XX% to YY%]), we conclude that based on the combination test (Simonsohn et al., 2015) there <was | was no> evidential value for the effect. The binomial test of right skew <was | was not> significant ( $z = \text{full p-curve XX/half p-curve XX}, p = \text{XX}$ ). The binomial test of whether the evidential value is adequate <rejected | did not reject> the hypothesis (flatter than 33% power:  $z = \text{full p-curve XX/half p-curve XX}, p = \text{XX}$ ).

Figure 5

*Free will beliefs and [X type] outcomes: P-curve analysis summary*

[Insert p-curve plot]

## **Discussion**

Placeholder for discussion section.



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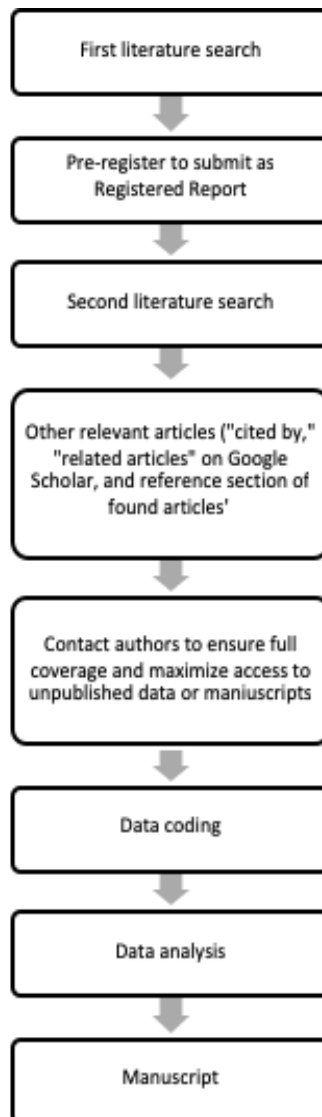
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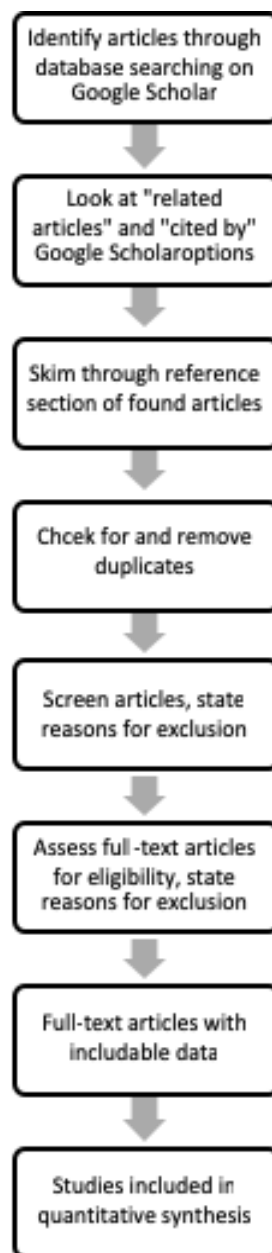
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### Appendix A: Meta-Analysis process





**Appendix B: Meta-Analysis Search**

### **Appendix C: Meta-analysis coding**

