Registered Report

Revisiting REVISE: (Re)Testing unique and combined effects of REminding, VIsibility,

and SElf-engagement manipulations on cheating behavior

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Abstract

Dishonest behavior poses a crucial threat to individuals and societies at large. To highlight situation factors that potentially reduce the occurrence and/or extent of dishonesty, Ayal, Gino, Barkan, and Ariely (2015) introduced the REVISE framework, consisting of three principles: REminding, VIsibility, and SElf-engagement. The evidence that the three REVISE principles actually reduce dishonesty is not always strong and sometimes even inconsistent, however. We herein thus conceptually replicate three suggested manipulations, each serving as an operationalization of one principle. In a large study with eight conditions and 5,039 participants, we link the REminding, VIsibility, and SElf-engagement manipulations to dishonesty, compare their effectiveness with each other, and test for potential interactions between them. Overall, we find that VIsibilty (in terms of overtly monitoring responses) and SElf-engagement (in terms of retyping an honesty statement) reduce dishonest behavior. We find no support for the effectiveness of REminding (in terms of ethical priming) or for any interaction between the REVISE principles. We also report two preregistered manipulation-check studies and discuss policy implications of our findings.

Keywords: REVISE, Cheating, Dishonesty, Replication, Registered Report, moral priming, monitoring, honesty statement

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Introduction

Dishonesty is a matter of utmost importance in many aspects of everyday life, affecting private lives as well as societies at large. The costs of dishonesty have been shown repeatedly to be tremendously high. For instance, the most recent EU Anticorruption Report (EU Commission, 2014) states that "corruption alone is estimated to cost the EU economy EUR 120 billion EUR per year, just a little less than the annual budget of the European Union" (p. 3). In a similar vein, high costs due to dishonesty have been reported with regard to bribing (Hardoon & Heinrich, 2011) or wardrobing (National Retail Federation, 2017).

Given the relevance of dishonesty, researchers from different disciplines have aimed to identify factors affecting the occurrence and extent of cheating behavior. One group of such factors focuses on individual differences. For example, Hilbig and Zettler (2015; see also Heck, Thielmann, Moshagen, & Hilbig, 2018; Kleinlogel, Dietz, & Antonakis, 2018) found that the Honesty-Humility dimension of the HEXACO Model of Personality (Ashton & Lee, 2007) explained variance in cheating across different paradigms. However, despite a medium to strong relation between Honesty-Humility and dishonesty (Heck et al., 2018), basic personality dimensions account for a limited proportion of variance only, so that a large proportion of variance in cheating behavior is still left to be explained by other factors.

Next to person factors, situation factors represent another group (potentially) affecting cheating behavior (for a review, see Pierce & Balasubramanian, 2015). Examples span across the extent of potential gains from cheating (Hilbig, & Thielmann, 2017), individual compared to team settings (Conrads, Irlenbusch, Rilke, & Walkowitz, 2013, Ścigała, Schild, Heck, & Zettler,

2018), or the identity of the receiver of the cheating reward (Lewis et al., 2012). Importantly, as compared to assessing and considering the personality characteristics of people in order to reduce cheating behavior, many situation factors can arguably be considered and implemented more easily in practice. Consequently, situation factors that may potentially reduce cheating should be of high interest for policy makers and organizations. And, indeed, effectiveness and ease of implementation of some situation factors has been shown by interventions of the Behavioral Insights Team (a social purpose company initiated by the UK Government) already: Referring to local social norms in tax letters, for instance, led to a 15% increase of tax debt payments compared to a control group in the UK (Behavioural Insights Team, 2012).

In an attempt to summarize important situation factors aimed at reducing cheating and to derive policy implications, Ayal et al. (2015) introduced the REVISE framework. Specifically, Ayal et al. (2015) suggested that three general principles—REminding, VIsibility, and SElf-engagement (REVISE)—reduce cheating. Herein, we do not only aim at replicating the effectiveness of each of the principles, but also, for the first time, investigate the joint effects of all possible combinations of the three REVISE principles (e.g., implementing both REminding and VIsibility simultaneously). Investigating combinations of the REVISE principles is important for both researchers and policy makers, because it is currently unclear whether the implementation of multiple principles simultaneously is more effective than implementing one principle only (or than having no principle implemented at all). Considering the potential resource costs for the implementation of each principle, shedding light upon this matter seems to be overdue: If, for example, the combination of a REminding and a VIsibility intervention is not more effective than one of the interventions alone, then there is no need to implement (with higher costs) both as compared to one only. Before describing our experiment, we define and

describe each REVISE principle, including practical approaches for implementation as well as summaries of relevant previous research findings (see also Table 1).

REminding

REminding refers to "the effectiveness of subtle cues that increase the salience of morality and decrease the ability to justify dishonesty" (Ayal et al., 2015, p. 739). Thus, the idea behind REminding is that people cheat less if they are reminded of ethical/moral concepts. Ayal et al. (2015) suggested that REminding can be implemented by providing "cues that increase the salience of ethical criteria and decrease ability to justify dishonesty", presenting them "at critical points (e.g., right before the temptation) and reactualizing them every now and then" (p. 740).

The hypothesis that REminding reduces cheating behavior has been supported by a prominent finding in the cheating literature. Specifically, Mazar, Amir, and Ariely (2008) asked participants to recall the 10 Commandments immediately prior to doing a matrix task in which participants had the opportunity to overreport their performance (i.e., to cheat) to obtain a higher profit (for more details, see Mazar et al., 2008; Verschuere et al., 2018). Mazar et al. (2008) found that, compared to a control group in which participants had to recall the names of ten books, recalling the 10 Commandments significantly reduced overreporting. Retesting these findings with a different paradigm, Welsh and Ordóñez (2014) found that a sentence-unscrambling task involving either moral or immoral concepts reduced overreporting.

Other studies on this subject, however, found no support for an effect of REminding on dishonesty. For instance, the results reported by Mazar et al. (2008) could not be replicated by a recent international, large-scale, direct replication attempt (overall $N = 4,674$; Verschuere et al., 2018). Importantly, this replication study included 25 different labs, was preregistered, and its' protocol was approved by the authors of the original study (for a response, see Amir, Mazar, &

Ariely, 2018). On the other hand, some studies found mixed support for an effect of reminders on

dishonesty. For instance, a conceptual replication using moral versus neutral book titles as

primes did not find a significant reduction effect of the moral reminder (i.e., moral book titles) on

cheating behavior (Kleinlogel et al., 2018). However, and in contrast to the findings by Welsh

and Ordóñez (2014), Kleinlogel et al. (2018) found that an immoral reminder (immoral book

titles) lead to increased cheating rates. Furthermore, Pruckner and Sausgruber (2013) found that

displaying a moral reminder ("Thank you for your honesty.") at unsupervised newspaper stands

with cashboxes significantly increased average payment, though not payment frequency. And a

different kind of reminder ("Stealing a paper is illegal.") did not have any effect on average

payments or payment frequency.

Overall, the idea of REminding appears to make sense intuitively, and moral reminders

can often be implemented relatively easily. At the same time, empirical support for this principle

is mixed overall, and the exact conditions under which it is effective in reducing dishonest

behavior are unclear (Amir et al., 2018; Houdek, 2017).

VIsibility

VIsibility refers to "social monitoring cues and aims to restrict anonymity, prompt peer

monitoring, and elicit responsible norms" (Ayal et al., 2015, p. 739). For implementation, the

REVISE framework suggests to "include procedures that increase people's feeling they are being

seen and identified" (Ayal et al., 2015, p. 740). One group of studies investigating how VIsibility

affects dishonest behavior has focused on subtle and implicit environmental cues. A prominent

example is the "watching eyes"-set up in which a picture of eyes is meant to simulate presence of

another individual and, in turn, to trigger socially desirable behaviors (e.g., Pfattheicher &

Keller, 2015). While this method has been found to lead to increased payments at an unobserved

payment box for coffee in a field study (Bateson, Nettle, & Roberts, 2006), no significant effects on cheating were found in a lab setting across several different paradigms (Cai et al., 2015). Another subtle cue for VIsibility, the degree of darkness in a room, showed a significant relation with dishonest behavior, such that participants were behaving more honest in a well-lit as compared to a slightly dimmed room (Zhong, Bohns, & Gino, 2010). In line with these mixed findings, a recent meta-analysis on artificial surveillance cues and their influence on generosity concluded that "surveillance cue effects should be interpreted cautiously" (Northover et al., 2017, p. 144).

In contrast, the evidence for the effectiveness of more direct and salient cues of VIsibility seems to be relatively stable. Participants self-report higher levels of performance (i.e., are likely to cheat more) when the performance sheet of an incentivized matrix task can be shredded (i.e., no visibility possible; Gino, Ayal, & Ariely, 2009; Mazar et al., 2008; Welsh & Ordóñez, 2014).

Often, direct VIsibility is associated with a higher probability of punishment as is the case for monitoring in the context of tax compliance and corruption through audits (e.g., Olken, 2007; Slemrod, Blumenthal, & Christian, 2001). In turn, one could argue that the impact of visibility on dishonesty may in fact be due to potential punishment rather than visibility itself. However, a recent study (Gneezy, Kajackaite, & Sobel, 2018) indicated that cheating decreases even when actual outcomes are merely monitored on a computer but not (monetarily) punished. In this study, participants in the non-observed condition had to open one out of ten envelopes in private (each containing a number between 1 to 10), report the number to the experimenter, and then claim an incentive corresponding to their reported number (i.e., the higher the number, the higher the incentive). In the observed condition, participants opened a virtual envelope on the computer, which implied that the randomly drawn number could be tracked. Importantly,

although both set ups allowed for cheating without being punished (e.g., by opening other envelopes or misreporting), cheating rates were lower in the observed condition.

SElf-engagement

SElf-engagement refers to situation factors that increase "the motivation to maintain a positive self-image" and that generate "personal commitment to act morally" (Ayal et al., 2015, p. 739). For implementation, the REVISE framework suggests to "break down morality into concrete behaviors" and "to generate and obtain self-commitment to act morally prior to behavior" (Ayal et al., 2015, p. 740). A prominent operationalization of this principle is the inclusion of so-called honor or honesty codes which promote honest behavior and are widely used at schools and universities (e.g., McCabe, Trevino, & Butterfield, 2002). Outside of the educational context, the use of honor codes has also been shown to be successful: Signing an honor code or statement (e.g., "I promise that the information I am providing is true.") before participating in a cheating task led to lower cheating rates in two lab studies (Mazar et al., 2008; Shu, Mazar, Gino, Ariely, & Bazerman, 2012) and to higher (and presumably more honest) reports of current mileage to an automobile insurance company in a field study (Shu et al., 2012).

Integration of previous findings

Overall, the REVISE framework (Ayal et al., 2015) suggests that cheating can be reduced by (subtly) reminding people of ethical/moral aspects (REminding), by restricting people's anonymity when potentially showing cheating behavior (VIsibility), and by increasing people's commitment to act ethically/morally (SElf-engagement). Each principle has been investigated in both lab and field studies, suggesting that policy makers or organizations might find ways to implement them. However, mixed findings have been reported concerning the effectiveness of REminding and VIsibility (with regard to the latter, depending on the operationalization in

particular). Even more importantly, we are not aware of any single study that directly compared the effectiveness of the three principles with each other and investigated their combined effects on dishonest behavior. Indeed, because different situation factors (interventions) are associated with different monetary and time costs, comparing the REVISE principles with each other as well as investigating their combined effects seems crucial for making suggestions for reducing dishonesty in practice.

Study 1

As summarized in the previous section, the evidence supporting the effectiveness of some of the REVISE principles is mixed or sparse, and should therefore be subjected to independent replication attempts—especially before policy implications are made. Furthermore, neither has the relative effectiveness of the three principles, nor the effectiveness of combining (some of) the principles been tested yet. As a remedy, we herein test the effectiveness of each principle in reducing cheating by implementing prominent approaches used and/or discussed in previous research on dishonesty, and we compare the relative effectiveness of the three principles with each other. Additionally, we test the effectiveness of all possible combinations of the three principles: REminding and VIsibility (RE+VI), REminding and SElf-engagement (RE+SE), VIsibility and SElf-engagement (VI+SE), and REminding, VIsibility, and SElf-engagement (RE+VI+SE).

Table 1

Overview of the REVISE principles

Principle	Definition	Suggested implementation	Exemplary original research finding	Our manipulation
REminding	"Reminding emphasizes the effectiveness of subtle cues that increase the salience of morality and decrease the ability to justify dishonesty." (p. 739)	"Provide cues that increase the salience of ethical criteria and decrease the ability to justify dishonesty." (p. 740) "Present cues at critical points (e.g., right before the temptation) and reactualize them every now and then." (p. 740)	Ethical priming with a sentence-unscrambling task decreased cheating rates in a matrix task (compared to a neutral priming condition; Welsh & Ordóñez, 2014).	Implementing ethical priming with a sentence unscrambling task before the cheating task.
VIsibilty	"Visibility refers to social monitoring cues and aims to restrict anonymity, prompt peer monitoring, and elicit responsible norms." (p. 739)	"Include procedures that increase people's feeling they are being seen and identified (e.g., by peers/ clients/ supervisors)." (p. 740)	Monitoring the opening of an envelope on the computer lead to lower cheating rates (compared to an unobserved condition; Gneezy, Kajackaite, & Sobel, 2018).	Monitoring the number participants chose in the mind game on the computer.
SElf-engagement	"SElf-engagement increases the motivation to maintain a positive self-image and generates personal commitment to act morally." (p. 739)	"Break down morality into concrete behaviors. Generate and obtain self-commitment to act morally prior to behavior." (p. 740)	Signing an honesty statement ("I promise that the information I am providing is true") before reporting car mileage lead to higher (i.e., more honest) reports (compared to a control group; Shu, Mazar, Gino, Ariely, & Bazerman, 2012).	Consenting to an honesty statement ("I promise that the information I am providing is true") before the cheating task.

Note. Definitions and suggested implementations are cited from Ayal, Gino, Barkan, and Ariely (2015).

Methods

Procedure and Variables. We conducted an online experiment, run via a professional German panel provider to recruit a heterogeneous sample concerning gender, age, and educational background. The experiment consisted of eight conditions (2x2x2 between-subject design): Next to a control condition without any intervention, we implemented three conditions with only one principle present—REminding (RE), VIsibility (VI), and SElf-Engagment (SE), respectively—, three conditions with two principles present—RE+VI, RE+SE, and VI+SE—, and one condition with all principles combined (RE+VI+SE). Cheating was measured with an adapted version of the mind-game paradigm (e.g., Jiang, 2013; Kajackaite & Gneezy, 2015) in which participants were asked to write down a target number between 1 and 8 in private. Next, a random number between 1 and 8 was displayed and participants were asked whether the displayed number matched the target number they wrote down beforehand. Importantly, in addition to their flat-fee for participation (set and paid by the panel provider), participants received a bonus incentive of 1.50 EUR when reporting that the target number they wrote down and the displayed random number matched. Consequently, participants had the opportunity to cheat in order to obtain the bonus incentive by reporting that the numbers matched even if they did not.

The probability of dishonesty d in each condition was estimated as described in Moshagen and Hilbig (2017). Note that typical analyses of binary cheating paradigms simply compare the expected percentage of winners (which equals 12.5% in our case due to using 8 random digits) against the observed proportion of winners. In contrast, the modeling approach by Moshagen and Hilbig (2017) takes into account that the observed proportion of win responses is contaminated by honest respondents who actually won, thus allowing for the unbiased estimation of the percentage of dishonest respondents. Note that this adjustment is not required for the

VIsibility conditions, in which we can directly estimate the probability of dishonesty d since the

target number of each participant was recorded (see below).

Operationalization of the REVISE principles.

REminding: Before completing the mind game (which assessed cheating behavior), participants

worked on a sentence-unscrambling task involving ethical sentences. In this task, participants

were presented with 20 sets—12 of which included ethical content—of five randomly positioned

words and then had to construct grammatically correct four-word sentences, e.g., "on – sleeping

– turn – the – lamp" unscrambled into "Turn on the lamp." ("sleeping" not used). Participants

were given seven minutes to complete the task. We received the original study material from

Welsh and Ordóñez (2014) and translated it into German; note that we adapted some of the

words/sets due to cultural/linguistic differences. Following the original study, we pretested the

unscrambled four-word sentences (presented in randomized order to $N = 12$ participants) to test

whether the ethical sentences were indeed perceived as more ethical than the neutral sentences

(20 in total; the neutral sentences item pool consisted of more sets out of which the same 8

sentences as in the original study were used). More precisely, we asked participants to rate each

sentence on a 7-point Likert scale from -3 "highly unethical" to +3 "highly ethical". As in the

original study, ethical sentences were rated more ethical ($M = 1.74$, $SD = 0.41$) than the neutral

sentences ($M = 0.06$, $SD = 0.18$) as indicated by a paired t-test ($t(11) = -13.28$, $p < .001$, $d =$

5.33).[1] We also tested for differences between the sentences finally chosen for the conditions

involving REminding. Again, when comparing the 12 ethical sentences ($M = 1.74$, $SD = 0.41$)

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[1] To be consistent with the original study, we also translated and pretested the unethical
sentences. As in the original study, unethical sentences were rated as being more unethical ($M = -2.08$, $SD = 0.48$) than the neutral sentences ($M = 0.06$, $SD = 0.18$), as indicated by a paired t-test ($t(11) = 14.05$, $p < .001$, $d = 5.88$)

with the 8 neutral sentences ($M = 0.14$, $SD = 0.18$), the ethical sentences were rated more

ethically ($t(11) = -15.21$, $p < .001$, $d = 5.10$).

VIsibility: To implement this principle, the same concept of anonymity was used as described in

Gneezy et al. (2018). In the mind game, instead of writing down a target number between 1 and 8

on a sheet of paper in private, participants were asked to enter the target number on the computer.

Following that, they were presented with a random number between 1 and 8, and asked whether

the target number they typed in equaled the displayed random number. Participants in the

conditions including VIsibility could easily infer that their target number was probably recorded

and thus visible to the researchers, implying that cheating could be detected. In order to avoid

demand characteristics, however, we did not explicitly inform participants that they are

monitored (following Gneezy et al., 2018).

SElf-engagement: In order to manipulate SElf-engagement we used an online adaptation of the

honesty statement used in Shu et al. (2012; "I promise that the information I am providing is

true."). Because we conducted an online study, participants were not asked to sign this statement

on paper. Instead, they were asked to write the statement into a box in order to consent with it.

Importantly, it was not possible to copy and paste the statement.

　　　　In conditions implementing multiple interventions (e.g., RE+SE), the order of the

interventions was randomized across participants. However, as the VIsibility implementation

changes the setup of the cheating paradigm, it was always presented last.

The study was set up via the open-source survey framework formr (www.formr.org; Arslan, Tata,

& Walther, 2018). Besides the response regarding the outcome of the mind game, we only asked

participants about their gender, age, and educational background. The complete study material is

available at the Open Science Framework

(https://osf.io/m6cnu/?view_only=494ccd3ee4af445c90c977d9d5e61152).

Power Analysis. To test the effectiveness of the REVISE principles, we adapted the modified

logistic regression model for cheating paradigms (Moshagen & Hilbig, 2017) to our 2x2x2

factorial design (for details, see analysis section below). Since closed-form solutions are not

available to compute the exact statistical power for these models, we relied on a simulation study

with the R package RRreg (Heck & Moshagen, 2018) to estimate the power for our design. We

simulated data under the alternative hypothesis assuming that all three REVISE principles and

their two- and three-way interactions result in a decrease of the probability of behaving

dishonest. More specifically, we assumed odds ratios of OR = 2/3 for the three main effects (a

small effect size; Rosenthal, 1996), and odds ratios OR = 1/2 for the four interactions (a small-to-

medium effect size; Rosenthal, 1996). Moreover, we assumed that $d = 30\%$ of the participants

are dishonest in the control condition (Heck et al., 2018).

Figure 1 shows the complete pattern of the hypothesized odds of dishonesty $d/(1-d)$

across the eight conditions. Vertical arrows illustrate the odds ratios of the main effects and

interaction terms relative to the control condition. Whereas the odds of dishonesty in the control

condition are simply computed based on the probability $d = .30$ (i.e., odds $= .30/(1-.30) =$

0.429), the odds in the three conditions implementing exactly one of the REVISE principle are

computed by multiplication with the odds ratio for a main effect (i.e., 0.429 * 2/3 = 0.286). In the

conditions implementing two of the REVISE principles at once, two main effects and the two-

way interaction have to be considered (i.e., 0.429 * 2/3 * 2/3 * 1/2 = 0.095). Note that, in the

hypothesized setup, the three-way interaction affects only the odds of dishonesty in the condition

implementing all three REVISE principles, in which the other six effects (main effects and two-

way interactions) are present as well. Based on the hypothetical odds of dishonesty shown in

Figure 1, the expected probability of observing a win response in the *non*-VIsibility conditions is

computed as $p = d + (1 - d) \cdot 0.125$ because 12.5% of the participants are expected to win
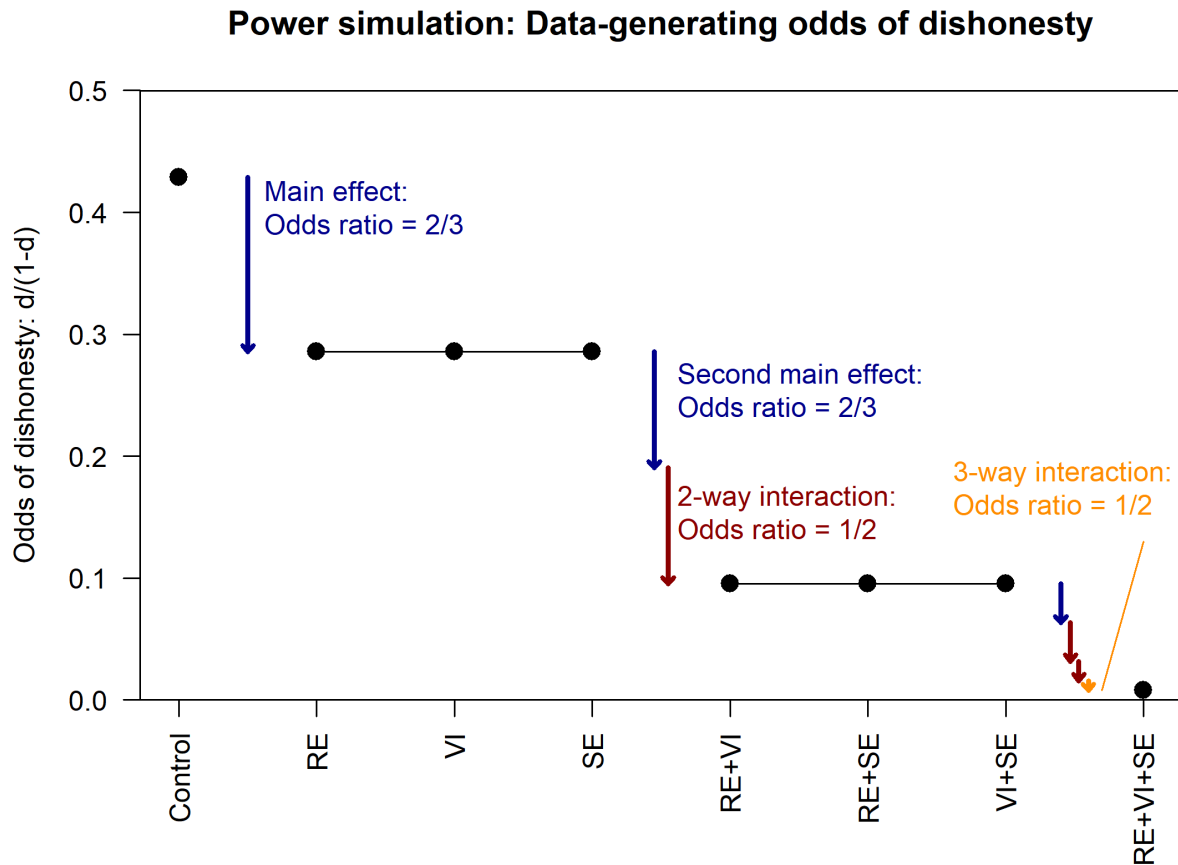
honestly (Moshagen & Hilbig, 2017).

Figure 1. Odds of dishonesty assumed by the power analysis for the eight conditions of the

2x2x2 factorial design. The vertical arrows illustrate the hypothesized effect of the main effect

and interaction terms in terms of odds ratios between conditions. RE = REminding, VI =

VIsibility, SE = SElf-engagement.

Using 500 replications, we generated and fitted the data with the R package RRreg (Heck

& Moshagen, 2018). Figure 2 shows that a total sample size of $N = 4{,}970$ results in an estimated

power of 85% for the three main effects and the three two-way interactions.[2] However, this

sample size only results in a power of 31.4% for testing the three-way interaction of all three

REVISE principles because statistical power for higher-order interactions is much lower in

general as compared to that for testing main effects or lower-order interactions (McClelland, &

Judd, 1993). Moreover, Figure 1 shows that in our hypothesized setup, the three-way interaction

has only a very small absolute effect on the odds in the condition implementing all three

REVISE principles. Since sufficient power for the three-way interaction would require an

extremely large sample size, we will estimate this effect only in an exploratory way (hence, if the

test of the three-way interaction turns out to be nonsignificant, this might be due to low power).

Further, we wanted to oversample slightly and thus aimed at a total sample size of $N = 5,000$

participants completing the study.

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[2] In the simulation, the total sample size N was distributed unequally to the eight conditions to take into
account that the VIsibility manipulation increases statistical power (because it is known which of the
participants cheated). Accordingly, we will assign $n = 700$ participants to the control, RE, and SE
conditions each; $n = 910$ participants to the RE+SE condition; and $n = 490$ participants to the VI, VI+RE,
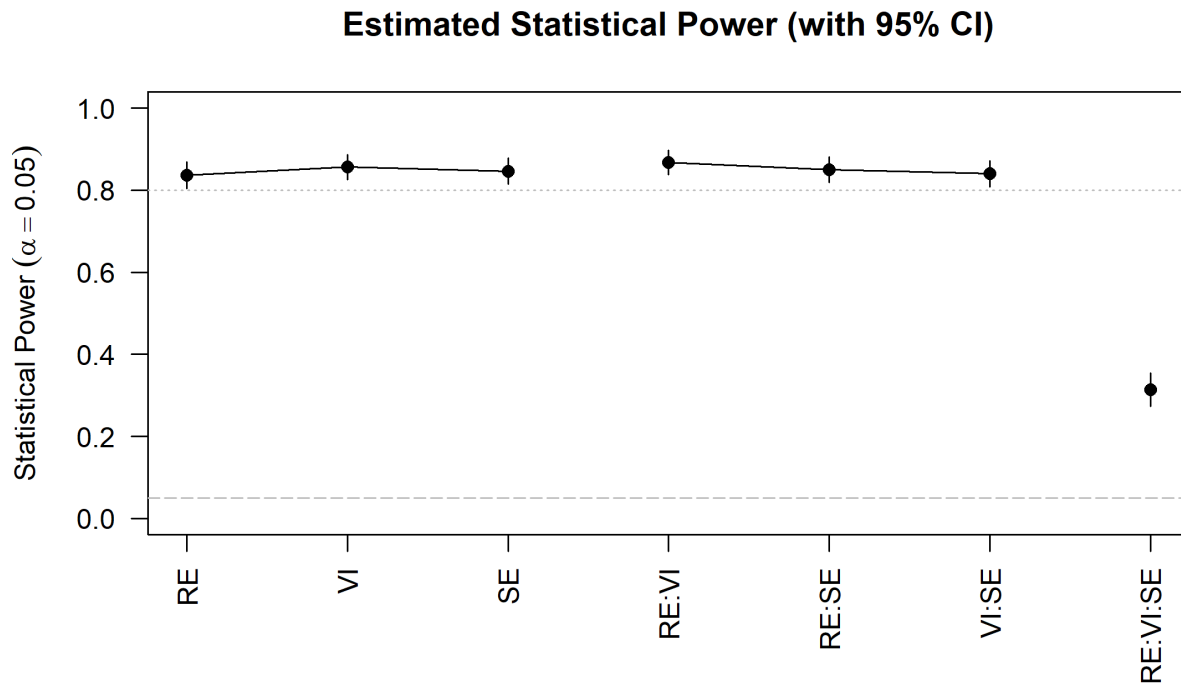VI+SE, and RE+SE+VI conditions each.

Estimated Statistical Power (with 95% CI)

Figure 2. Estimated statistical power for the main effects of the three REVISE principles and the corresponding two-way and three-way interactions. Error bars refer to 95% confidence intervals of the simulation estimates. RE = REminding, VI = VIsibility, SE = SElf-engagement.

Analysis plan. We used the modified logistic regression approach for cheating paradigms (Moshagen & Hilbig, 2017). This model accounts for the fact that the dependent variable in the non-visibility conditions (i.e., whether participants report that the target and the random number match) does not represent an unbiased measure of dishonesty because some participants actually observe matching numbers and report this outcome honestly. The method corrects for this additional measurement noise and provides unbiased estimates by changing the link function of the standard logistic regression (for details, see Moshagen & Hilbig, 2017). Importantly, this is not an issue for the conditions including VIsibility because the actual outcome is recorded so we know exactly who cheats. In these conditions, it is sufficient to analyze the responses only of

those participants who did not observe matching numbers using a standard logistic regression (because then, all of those participants who report matching numbers cheated; Perugini & Leone, 2009). Using the function RRlog of the RRreg package (Heck & Moshagen, 2018), we fitted a joint model to all eight conditions, which assumes the standard logistic link functions for the four VIsibility conditions and the modified logistic link function in the four remaining conditions.

To account for the 2x2x2 factorial design in a logistic regression, we used dummy coding for the three binary factors representing the REVISE principles (1 = principle implemented in a condition; 0 = principle not implemented). Similar as in the general linear model, two-way interaction terms were obtained by pairwise multiplication of the main-effect dummy variables. Similarly, the three-way interaction was obtained by multiplication of all three main-effect dummy variables. Regarding the interpretation, the three main effects for the REVISE principles estimate the decrease in dishonesty relative to the control condition, whereas the two-way interactions estimate the incremental effect above and beyond the two main effects when combining two of the principles. Similarly, the three-way interaction estimates the incremental effect above and beyond the main effects and two-way interactions when combining all three principles (see Figure 1). To facilitate interpretation, we report all effects as odds ratios (OR = $\exp(\beta)$, where β is the estimated slope in the logistic regression model). The analyses included all participants completing the entire study.

The substantive hypothesis predicts that each of the three REVISE principles and their combinations result in a decrease in the probability of dishonesty. Thus, we rely on one-tailed significance tests. The occurrence of an effect was considered successful if the corresponding one-tailed likelihood-ratio test was significant at the $\alpha = 5\%$ level. Moreover, we relied on 95% confidence intervals of the estimated odds ratios in the modified logistic regression model to

interpret the relative effect sizes for the different principles and their combinations. If two confidence intervals do not overlap, we interpret this as evidence that one manipulation is more effective in reducing dishonesty than the other. Reversely, however, we cannot interpret overlapping confidence intervals as evidence that the manipulations are similarly effective (since the power analysis is tailored to the hypothesis test whether a principle is effective at all, not to the relative effectiveness as tested in pairwise comparisons of the odds ratios). Note that the confidence interval for the three-way interaction is expected to be very large because it only affects the probability of dishonesty in one condition (see Figure 1).

Participants. The online study was conducted by a professional panel provider (see, e.g., Hilbig & Zettler, 2015) and resulted in a sample of $N = 5,039$ participants who completed the study. Participants were heterogeneous with respect to gender (51.30% female, 48.34% male, 0.36% other), age ($M = 46.28$, $SD = 14.68$), and education (secondary education: 59.52%; high-school diploma: 18.28%; university degree: 22.20%). The randomized assignments to experimental conditions resulted in sample sizes per group comparable to those specified in the preregistration (Control: 860; RE: 708; VI: 489; SE: 754; RE+VI: 415; RE+SE: 882; VI+SE: 504; RE+VI+SE: 427).[3] Note that we did not have access to any personal information of the participants other than their self-reported gender, age, and educational background. Moreover, the panel provider did not know how the potential bonus was determined and which experimental conditions were implemented. Thus, participants did not have to fear any retaliation for reporting untruthful outcomes.

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[3] The reported sample sizes exclude those participants in the VIsibility conditions who chose a target number that matched the random number (because these participants do not have an incentive to cheat). Because of the randomization via quotas the sample sizes per group do slightly differ from the registered ones.

Results

Preregistered Analyses. Figure 3 shows the estimates of the probability d of being dishonest for each of the eight conditions including 95% confidence intervals. In line with the hypothesis that the implementation of one or more of the REVISE principles decreases cheating, the control condition resulted in the (descriptively) largest estimate for dishonesty ($\hat{d} = .28$; $SE = .02$). Note that the absolute level of dishonesty was similar to the estimate $\hat{d} = .26$ reported in a recent large-scale analysis of standard cheating paradigms (Heck et al., 2018). When comparing the confidence intervals of the probability of dishonesty d for the three conditions implementing exactly one of the REVISE principles, Figure 3 shows that dishonesty decreased in the VIsibility condition ($\hat{d} = .11$; $SE = .01$) and in the SElf-engagement condition ($\hat{d} = .20$; $SE = .02$) but not in the REminding condition ($\hat{d} = .27$; $SE = .02$). In line with these results, the lowest estimate of dishonesty was observed in the condition implementing both VIsibility and SElf-engagement ($\hat{d} = .07$; $SE = .01$).

The visual impression that only VIsibility and SElf-engagement decreased dishonesty was confirmed by the modified logistic regression model outlined in the previous section. Figure 4 shows the estimated odds ratios for the three main effects and the four interactions including 95% confidence intervals. Whereas the REminding manipulation did not decrease cheating ($OR = 0.97$; 95% CI: [0.74, 1.28]; $G^2(1) = 0.03$; $p = .428$ one-tailed), the other two REVISE principles resulted in less dishonest responding (VIsibility: $OR = 0.32$; 95% CI: [0.23, 0.45]; $G^2(1) = 47.28$; $p < .001$ one-tailed; SElf-engagement: $OR = 0.63$; 95% CI: [0.47, 0.85]; $G^2(1) = 9.32$; $p = .001$ one-tailed). As indicated by the non-overlapping confidence intervals of the two significant main effects, the VIsibility manipulation was more effective than the SElf-engagement manipulation. Moreover, the two-way and three-way interactions did not have a

significant effect on dishonesty (all $p > .115$ two-tailed). Even more, the estimates of the

corresponding odds ratios pointed in the wrong direction (i.e., all $OR > 1$), thus indicating that

the simultaneous implementation of two or three of the REVISE principles leads to a

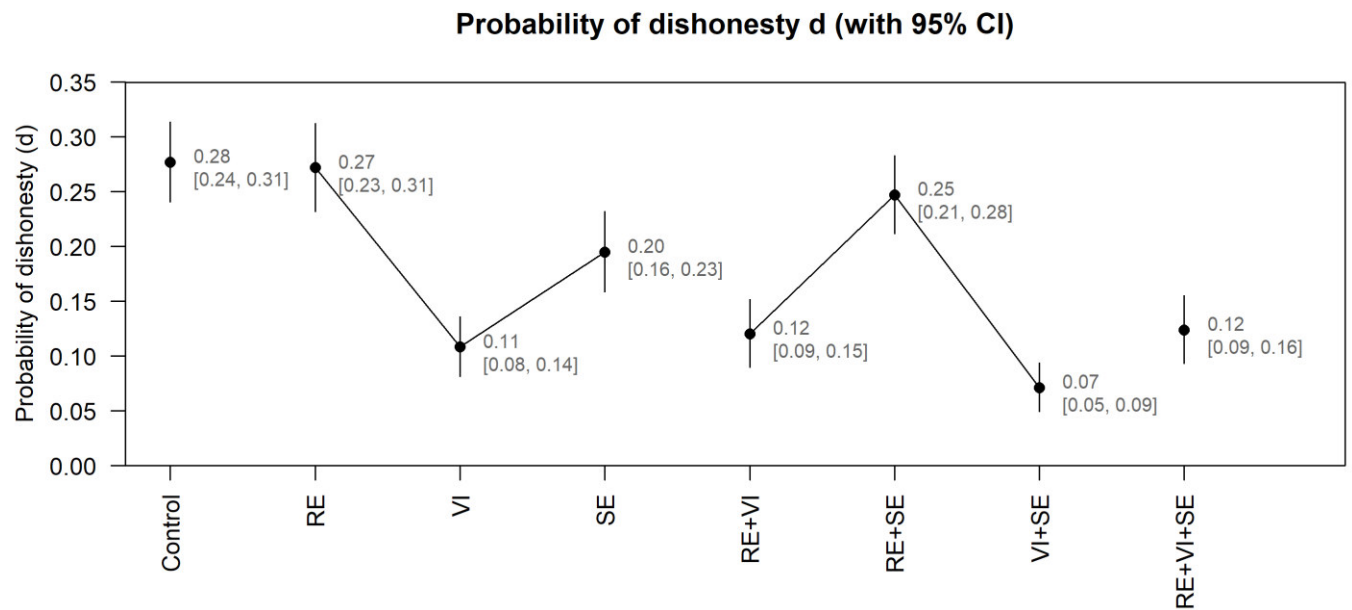(nonsignificant) *increase* in dishonesty over and above the simple main effects.

Figure 3. Estimated probability of dishonesty *d* for the eight experimental conditions. Vertical

lines indicate 95% CIs. RE = REminding, VI = VIsibility, SE = SElf-engagement.

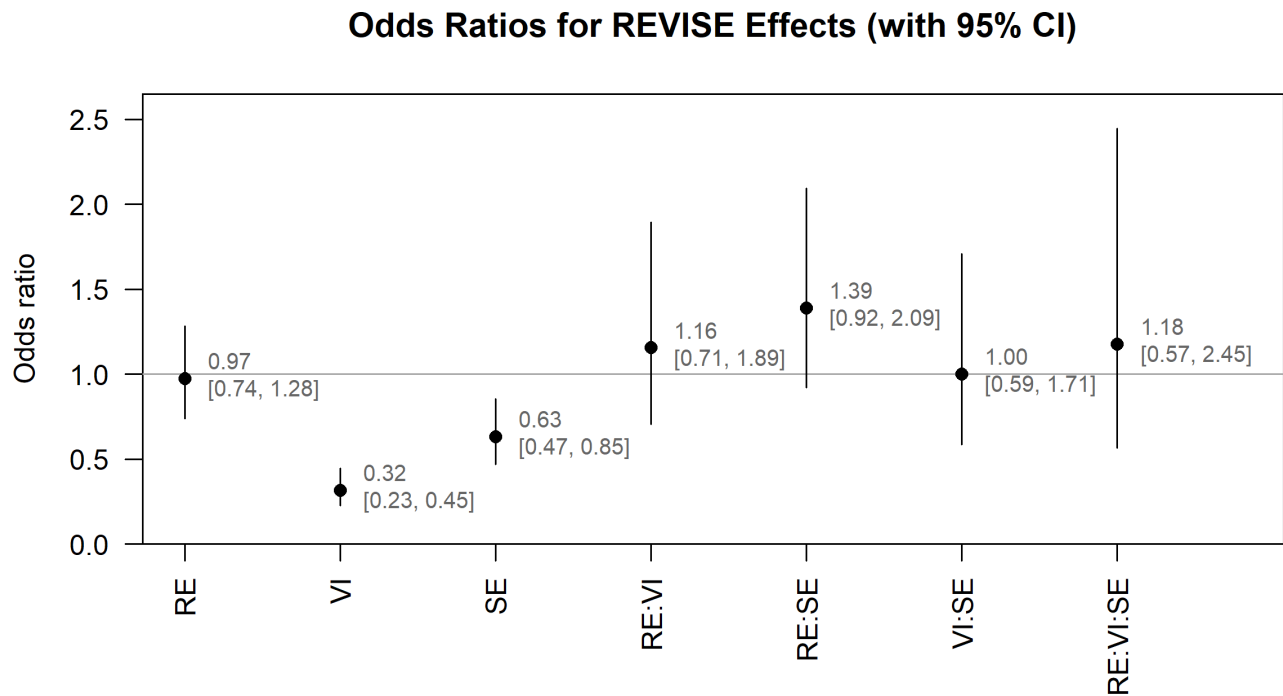**Odds Ratios for REVISE Effects (with 95% CI)**

Figure 4. Estimated odds ratios for the three main effects and four interaction terms based on the modified logistic regression model. Vertical lines indicate 95% CIs. RE = REminding, VI = VIsibility, SE = SElf-engagement.

Robustness Checks and Exploratory Analyses. In addition to the preregistered analyses, we report robustness checks and exploratory analyses in the following. First, we tested the robustness of our results with respect to the quality of the open-ended responses in the REminding and the SElf-engagement conditions. In the REminding condition, we *excluded* participants who responded with random letters or did not solve any of the sentence-unscrambling tasks. In the SElf-engagement condition, we *included* only those participants who either typed out the honesty statement (while ignoring grammatical errors and accepting abbreviations such as "I will be honest"), responded in any affirmative way to the honesty statement (e.g., "yes", "I agree", or "this is correct"), or signed the honesty statement with their name (which occurred 17 times). This filtering resulted in a subset of $N = 4,728$ participants. The

analysis with the modified logistic regression lead to identical conclusions as the analysis of the full sample above, meaning that only the main effects of VIsibility and SElf-engagement resulted in a significant decrease in dishonesty (see supplementary material for parameter estimates).

Second, we tested whether the (randomized) order of the REminding and the SElf-engagement manipulations affected cheating behavior. For this purpose, we analyzed only the data of those two conditions implementing both principles (i.e., RE+SE and RE+VI+SE). Next, we fitted a modified logistic regression model with the order of the REminding and the SElf-engagement manipulations as a dummy-coded predictor (0 = SE:RE; 1 = RE:SE). Moreover, we included VIsibility and the interaction term as predictors. Whereas the interaction term was not significant ($OR = 1.05$; 95% CI: [0.52, 2.12]; $G^2(1) = 0.02$; $p = .888$ two-tailed), both main effects indicated a significant decrease in dishonesty (VIsibility: $OR = 0.42$; 95% CI: [0.33, 0.55]; $G^2(1) = 14.62$; $p < .001$ two-tailed; ordering RE:SE compared to SE:RE: $OR = 0.59$; 95% CI: [0.40, 0.87]; $G^2(1) = 7.31$; $p = .007$). These results show that the SElf-engagement manipulation (i.e., typing out an honesty statement) was more effective if it directly preceded the cheating task as opposed to being temporally disconnected from the cheating task by the (non-effective) REminding manipulation.

Finally, we tested whether dishonesty was associated with individual differences. In line with two recent meta/re-analyses on this topic (Gerlach et al., 2019; Heck et al., 2018), our model-based analysis showed that older participants were generally less likely to cheat than younger participants (with an incremental effect of $OR = 0.97$ over and above the effects of the REVISE manipulations; 95% CI: [0.97, 0.98]; $G^2(1) = 82.39$, $p < .001$ two-tailed) whereas gender did not affect dishonesty (with an incremental effect of $OR = 1.11$ for male versus female participants; 95% CI: [0.94, 1.31]; $G^2(1) = 1.48$, $p = .223$ two-tailed).

Discussion

Our results replicate previous findings (Gneezy et al., 2018, Shu et al., 2012) by showing that both VIsibility and SElf-engagement reduce dishonest behavior (with the former being more effective than the latter). In contrast, the finding by Welsh and Ordóñez (2014) that REminding (implemented by the sentence-unscrambling task) reduces dishonesty was not replicated as no main effect of our manipulation was found. Moreover, while having a high statistical power (for two-way interactions), we observed null effects for the two-way interactions when implementing multiple of the REVISE principles simultaneously; we also did not find any hint for an three-way interaction comprising all three principles. Importantly, results were robust when excluding participants that did not meet quality criteria for the open-ended questions in the REminding and SElf-engagement conditions. Furthermore, exploratory analyses suggested that SElf-engagement was especially effective when being implemented directly before the cheating task as opposed to being implemented before the REminding manipulation. The reduced effectiveness of SElf-engagement when followed by REminding might be due to the increased time delay between the SElf-engagement manipulation and the cheating task, or due to an interaction between the SElf-engagement manipulation and the REminding manipulation (i.e., the unscrambling of four-word sentences) in a way that the REminding manipulation reduced the effectiveness of SElf-engagement.

Study 2a and 2b: Manipulation Checks

Study 1 aimed at testing the *effectiveness* of REminding, VIsibility, and SElf-engagement for reducing dishonest behavior. To the best of our knowledge, however, the underlying *mechanisms* of the REVISE principles and their discriminability as distinct theoretical concepts have not yet been explicitly tested—for instance, whether REminding manipulations actually

increase the salience of morality and decrease the ability to justify dishonesty, and whether SElf-engagement manipulations tackle something different. Such a test provides additional important information for drawing conclusions based on Study 1 as well as the REVISE framework in general, especially in the light of that some manipulations based on the three principles failed to reduce dishonest behavior (e.g., the specific REminding manipulation tested in the present study or the VIsibility manipulation of showing participants "watching eyes"; Pfattheicher, Schindler, & Nockur, 2018). Correspondingly, we test whether specific manipulations actually trigger the psychological mechanisms defined in the REVISE framework.

For this purpose, we conducted manipulation-check studies for each principle in addition to the main cheating study described above. In more detail, we ran two studies in which participants were confronted either with the REminding manipulation, the SElf-engagement manipulation, or no manipulation at all (Study 2a); or the VIsibility manipulation or no manipulation (Study 2b). At the end of each study (and in all conditions), participants were asked to answer eight manipulation-check items (in randomized order) which were directly derived from the theoretical definition of the REVISE framework (see Table 2). Note that two distinct studies were needed to investigate these questions, as the REminding and the SElf-engagement manipulations were implemented prior to the cheating task (in the main study), while the VIsiblity manipulation was implemented during the cheating task (in the main study). Consequently, the items were required to be presented in different tenses (e.g., "I feel monitored" vs. "I felt monitored").

Table 2

Overview of the manipulation-check items

Principle	Item (Manipulation-Check Study 2a)	Item (Manipulation-Check Study 2b)
REminding	I could hardly justify dishonest behavior in this study.	I could hardly justify dishonest behavior in the decision-making task.
REminding	I think that the concept of morality is important for this study.	I think that the concept of morality was important for the study.
VIsibilty	I feel monitored.	I felt monitored during the decision-making task.
VIsibilty	I feel anonymous.	I felt anonymous during the study.
SElf-engagement	I am motivated to maintain a positive self-image during this study.	I was motivated to maintain a positive self-image during the study.
SElf-engagement	I am committed to act morally during this study.	I was committed to act morally during the study.
Filler item	I like participating in this study.	I liked participating in this study.
Filler item	I find the study task very tiring.	I found the study task very tiring.

Results from these studies provide first insights into whether each of the REVISE manipulations

actually triggers the underlying process hypothesized by the corresponding REVISE mechanism,

and, if so, whether the effect is specific to the corresponding REVISE mechanism only.

Analysis Plan and Participants

To test whether the manipulations actually trigger the suggested underlying REVISE

mechanisms (only), we compared the two corresponding items between the experimental group

and the control group for each principle with one-tailed t-tests (e.g., we tested whether the two

REminding items differed significantly between the REminding experimental group and the

control group). To control for multiple testing, we set α at the 2.5% level. Further, as the

REminding and SElf-engagement manipulations (Study 2a) are arguably more subtle than the

VIsibility manipulation (Study 2b), we expected smaller effects for the REminding and SElf-

engagement manipulations than for the VIsibility manipulation. Specifically, we set the expected

effect size *d* to 0.30 (a small to medium effect size; Rosenthal, 1996) for the REminding and

SElf-engagement manipulations, and to 0.50 (a medium effect size; Rosenthal, 1996) for the

VIsibility manipulation.

Sample size calculations using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007)

revealed that the sample size required for a statistical power of 80% is $N = 352$ for the

REminding and SElf-engagement manipulations and $N = 128$ for the VIsibility manipulation.

Considering that the REminding and SElf-engagement manipulations use the same control

group, this resulted in a final sample size of $N = 656$ which we oversampled such that we

collected data from 803 participants (603 in Study 2a and 200 in Study 2b). Participants were

relatively heterogeneous with respect to gender (Study 2a: 29.50% female, 69.50% male, 1.00%

other; Study 2b: 29.00% female, 71.00% male) and age (Study 2a: $M = 35.17$, $SD = 12.20$; Study

2b: $M = 34.21$, $SD = 11.65$). We ran this study in English via the panel provider prolific.ac (Palan

& Schitter, 2018).

Results

Study 2a. One-tailed *t*-tests indicated that participants in the REminding condition did not agree

more strongly with either of the two items assessing REminding than participants in the control

group; that is, neither with the item "I could hardly justify dishonest behavior in this study."

($t(387.96) = -1.94$, $p = .974$, $d = -0.19$) nor with the item "I think that the concept of morality is

important for this study." ($t(324.97) = -6.82$, $p = 1.000$, $d = -0.70$). Similarly, participants in the

SElf-engagement condition did not agree more strongly with the items assessing SElf-

engagement than participants in the control group; that is, neither with the item "I am motivated

to maintain a positive self-image during this study." ($t(408.73) = 0.26$, $p = .398$, $d = 0.03$) nor

with the item "I am committed to act morally during this study."($t(398.92) = -0.08$, $p = .531$, $d =$

-0.01).

Study 2b. One-tailed *t*-tests indicated that participants in the VIsibility condition agreed more

strongly with one item assessing VIsibility, namely, "I feel monitored."($t(197.64) = 3.57$, $p <$

.001, $d = 0.50$), than participants in the control group. In contrast, no differences were found for

the second VIsibility item ("I feel anonymous."; $t(196.87) = 0.00$, $p = .500$, $d = 0.00$). Figure 5

illustrates the results of Study 2a and 2b graphically. Exploratory *t*-tests testing if the

manipulations trigger mechanisms of the others principles differences can be found in the
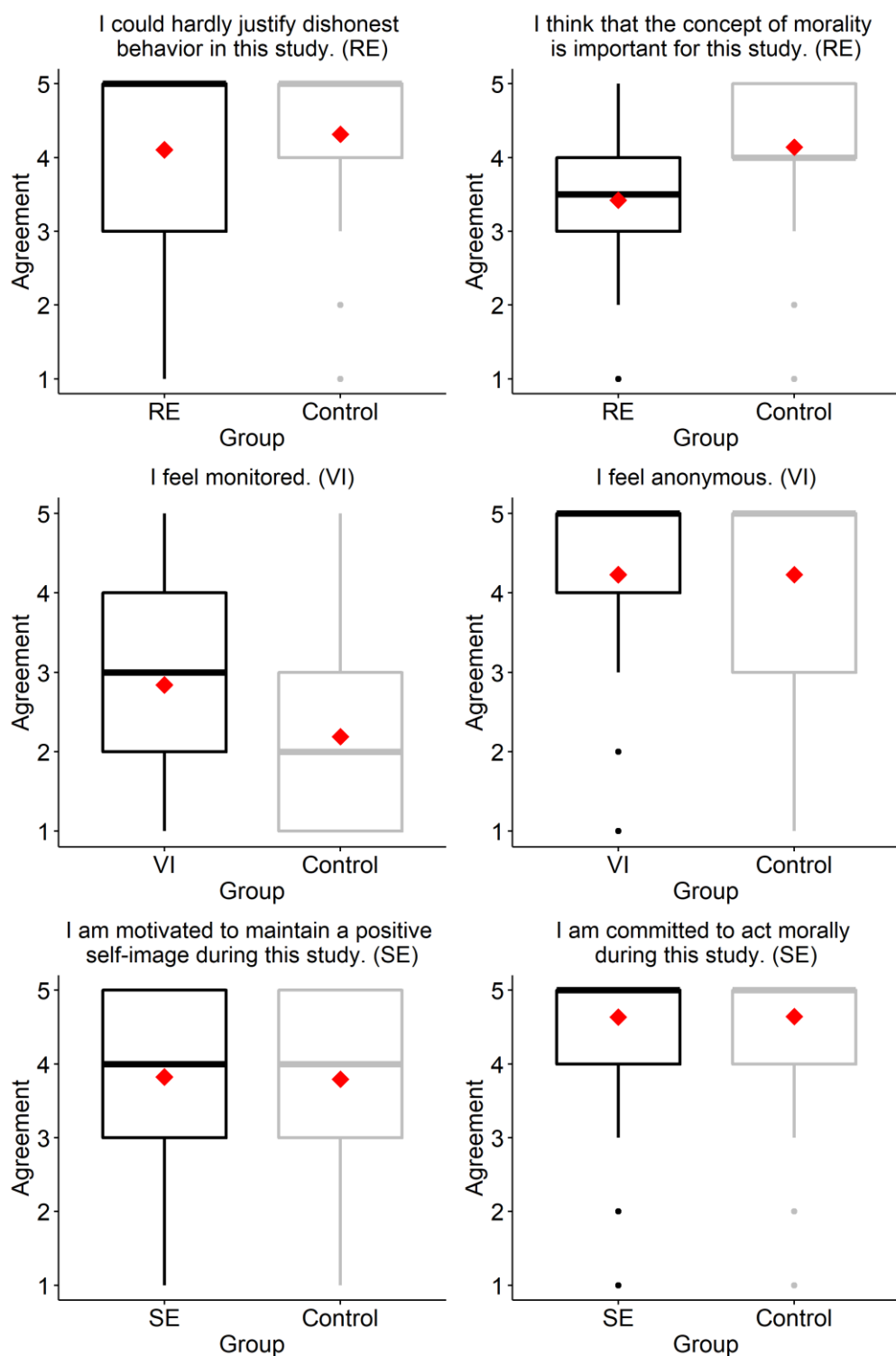
Analyses section of the OSF repository.

Figure 5. Horizontal lines represent medians, red diamonds represent means, boxes indicate

interquartile range, and vertical lines range from the lowest to the highest value (excluding

outliers). Outliers are indicated by dots. RE = REminding, VI = VIsibility, SE = SElf-

engagement. The Y-axis represents agreement to each statement as indicated on a 5-point Likert scale.

Discussion

Only one out of the six manipulation checks showed the expected effect: Participants in the VIsibilty condition felt more monitored than those in the control group. Since all items were directly derived from the definitions of the REVISE principles, this casts doubt whether these principles and their specific operationalization as implemented in our studies actually trigger the proposed mechanisms. However, note that especially manipulations of REminding and SElf-engagement are supposed to be subtle (Ayal et al., 2015). It is possible that such manipulations work outside of conscious awareness, so that effects of such manipulations might not be detectable in manipulation-check studies relying on explicit, subjective judgments. Different approaches such as implicit tests might be more valid to investigate whether (subtle) manipulations have (the intended) effects at all. Additionally, even though our studies had a statistical power of 80% to detect a medium-sized effect, they may have not been powered sufficiently high to detect more subtle effects. Moreover, it is possible that our manipulation checks, although derived directly from the theoretical definition of the REVISE framework, were not properly phrased to capture the mechanisms underlying the implemented manipulations. Overall, the insights into the underlying mechanisms of the principles provided by Study 2a and 2b are limited, meaning that we cannot draw strong conclusions whether the implemented manipulations affect the specific mechanisms as hypothesized in the REVISE framework. Hence, future studies should aim to provide better (implicit or explicit) tests of the underlying mechanisms, as this would allow researchers to understand why exactly some manipulations are

effective whereas others are not. Even more, this would facilitate the development of new manipulations that are specifically tailed to trigger those mechanisms.

General Discussion

We conducted a large-scale, preregistered study aiming to conceptually replicate the effects of three manipulations that have been shown to reduce dishonest behavior. The three manipulations represent principles described in the REVISE framework that should guide organizations and policy makers to reduce dishonesty (Ayal et al., 2015). For the first time, we tested whether the manipulations interact in reducing dishonest behavior.

Replicating previous findings, we found a medium to large effect of VIsibility (Gneezy et al., 2018) and a small effect of SElf-engagement (Shu et al., 2012) on (reducing) dishonest behavior. In contrast, despite having a high statistical power, REminding did not reduce dishonest behavior in our study. Moreover, no interaction effects between the REVISE manipulations were found. This implies that only the additive effects of VIsibility and SElf-engagement are effective in reducing dishonesty. The simultaneous implementation of both of the principles led to a decrease in dishonest behavior of almost 75% (corresponding to an odds ratio of $OR = 0.201$).

REminding

In contrast to findings by Welsh and Ordóñez (2014), we found no support for the impact of ethical priming with a sentence-unscrambling task on dishonest behavior. Our finding is conceptually in line with a previous large-scale replication attempt that found no effect of moral/ethical priming (by recalling the Ten Commandments) on dishonest behavior (Verschuere et al., 2018). Given these and our results, as well as the inconclusive pattern of other studies on ethical priming (e.g., Kleinlogel et al., 2018; Pruckner & Sausgruber, 2008), the effectiveness of

REminding on reducing dishonesty must be doubted. Importantly, the specific REminding

manipulations tested in previous literature arguably suffer from a low applicability in practice

(e.g., neither the sentence-unscrambling task nor the recall of books or the Ten Commandments

can reasonably be implemented when filling out tax forms). Hence, future research should

investigate the effectiveness of more practicable REminding manipulations before any valid

conclusions about the effectiveness of this principle for policy making can be drawn. Even if

some specific operationalizations of REminding are shown to be effective, the theory underlying

this principle needs to be specified in more detail. That is, the statement "cues that increase the

salience of ethical criteria and decrease the ability to justify dishonesty" (Ayal et al., 2015; p.

740) might be a too broad and imprecise definition to determine which kind of REminding

stimuli and cues can effectively reduce dishonest behaviors in which contexts. By now, our

findings as well as other studies (e.g., Verschuere et al., 2018) cast strong doubt on the

effectiveness of (rather artificial) REminding manipulations on dishonesty.

VIsibility

Although not paired with (monetary) punishment, the VIsibility manipulation of

monitoring participants during the mind game had a strong effect on reducing dishonest

behavior. This is in line with previous studies (e.g. Gneezy et al., 2018), indicating that

monitoring (in terms of being able to observe participants' falsified reports) should be considered

as a mean to decrease dishonest behavior in practice. In comparison, the effectiveness of more

subtle manipulations of VIsibility for reducing dishonesty appears to be less conclusive (e.g.,

watching eyes; Northover er al., 2017, Pfattheicher et al., 2018).

SElf-engagement

Replicating findings by Shu et al. (2012), the SElf-engagement manipulation of typing out an honesty statement reduced dishonest behavior in our study. Importantly, additional exploratory analyses indicated that this effect was larger when the honesty statement was signed right before the mind game, but smaller when it was followed by the REminding manipulation. On the one hand, this could imply that SElf-engagement manipulations should be implemented shortly before potential possibilities for cheating behavior. On the other hand, it is possible that the REminding manipulation itself resulted in a decrease in the effectiveness of the SElf-engagement manipulation. However, considering that a SElf-engagement manipulation can arguably be implemented relatively easily and less costly as compared to other manipulations (e.g., monitoring), it seems worthwhile to consider the SElf-engagement principle in practice. Although the effect was estimated to be smaller than that of VIsibility (i.e., cheating was reduced by approximately a third in Self-engagement as compared to by approximately two thirds in VIsibility), its implementation in practice could still lead to substantial cost reductions, especially if implemented on a large scale (e.g., small SElf-engagement effects could sum up to a considerable amount of money if they would work on tax declarations.

Interactions of the principles

Besides the replicative aspect of this investigation, we also tested whether the REVISE principles interact with each other in reducing dishonesty. In this regard, multiple outcomes would have been possible. For example, implementing one (effective) manipulation could have made one of the other (effective) manipulations ineffective. This would have suggested that implementing multiple manipulations could have been unnecessary. On the other hand, implementing two (effective) manipulations at once could have led to an interactive interaction that leads to a reduction of dishonesty over and above the simple main effects. Such a "golden

combination" of manipulations would be strongly relevant for policy making. Nevertheless, we did not observe any interactions in the study but two additive main effects of VIsibility and SElf-engagement. This, however, is important from both a practical and theoretical perspective. First, this suggests that VIsibility and SElf-engagement are not compensatory, that is, both principles need to be implemented simultaneously to achieve the maximum effect in reducing dishonesty (considering manipulations used in this study). Second, this hits at the possibility that the underlying mechanisms of VIsibility and SElf-engagement are psychologically and conceptually distinct, meaning that they increase honesty via (at least to some degree) distinct and unique pathways.

The REVISE framework

The REVISE framework aims to "guide the design of policy interventions to defeat dishonesty" (Ayal et al., 2015, p. 738). Without doubt, we applaud the effort to identify and classify situational factors that (potentially) shape dishonest behavior and provide explicit implication examples. Nevertheless, in the current version, the REVISE framework seems to have some limitations: It is imprecise regarding the expected effect sizes of each principle and does not discuss whether REVISE principles can or should be combined. In addition, studies cited as evidence underpinning REminding (Amir et al., 2018; Ayal et al., 2015) could not be replicated in preregistered, large-scale replication attempts (Verschuere et al., 2018; herein). Finally, the REVISE principles might not cover all potential situational manipulations that can tackle dishonesty, and it is unclear why some situational manipulations were included in such a framework, and others not. For example, dishonesty increases as a function of the (monetary) payoffs at stake (e.g., Hilbig & Thielmann, 2017; Rahwan et al., 2017). That is, the higher the incentive, the more people act dishonestly. Overall, we thus argue that the proposed REVISE

framework has room for improvement and might consequently need to be updated and revised, especially considering that an implementation of the REVISE principles in practice can have very high monetary costs.

Limitations

An important limitation of our study is that we only tested the effectiveness of the REVISE manipulations in an online study with a quite artificial outcome measure of dishonest behavior. However, previous studies found links between cheating in the lab and cheating in the field (e.g., Dai et al., 2017), and note that one of our manipulations (SElf-engagement) was actually derived from a field study (Shu et al., 2012) — resulting in similar results in the original and this replication study. Nevertheless, future studies should aim to estimate the effectiveness of the REVISE (or other) principles across different contexts, with different kind of measures, and both in the field and in the laboratory. Furthermore, we tested only one specific operationalization for each principle that has been suggested as a manipulation in previous studies. With this in mind, overall conclusions about the REVISE principles and their effectiveness should be drawn with caution, although the support for VIsability in terms of monitoring and SElf-Engagement in terms of affirming an honesty statement seems to be present.

Additionally, future research should focus more on the underlying mechanisms of each effective principle. Our Studies 2a and 2b suggest that the VIsibility manipulation triggers the feeling of being monitored whereas the REminding and SElf-engagement manipulations showed none of the expected patterns in the manipulation-check studies. In a similar vein, it can be argued that some manipulations cannot be strictly classified into only one of the three principles in the REVISE framework. For example, the typing out or signing of an honesty statement can

be seen as both REminding and SElf-engagement because the statement itself makes morality more salient (i.e., REminding) while at the same time generating personal commitment (i.e., SElf-engagement). Definitely, if a principle is found to be effective, explicit tests of the proposed mechanisms are needed.

Conclusion

This study aimed to conceptually replicate three suggested manipulations to reduce dishonest behavior. Each manipulation served as an operationalization of one principle of the REVISE framework (Ayal et al., 2015). Consistent with previous studies (Shu et al., 2012, Gneezy et al., 2018), the results show that VIsibilty (in terms of overtly monitoring responses) and SElf-engagement (in terms of retyping an honesty statement) reduce dishonest behavior. In contrast, we do not find support for the effectiveness of REminding (in terms of ethical priming) as well as for any potential interaction between the manipulations. Overall, the tested manipulations of VIsibility and SElf-engagement should therefore definitely be considered when aiming to reduce dishonest behavior in general. Future research should, however, aim to uncover underlying mechanisms of the principles as insights from manipulation check studies were limited. In fact, we suggest to revise the framework to classify situational factors affecting dishonesty in a way (a) that it is based on explicit tests what an effective situational factor actually triggers, and (b) that it includes effective principles only.

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