



Norm vigilance in reaction to control threat: A file drawer report

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In times of threat people often turn to social groups to fulfill various needs. In situations where this threat is related to people's personal sense of control, the model of group-based control provides a social-identity-based account of why thinking and acting in terms of group membership should become more likely to occur. We set out to extend this perspective to the perception and processing of information about norms. Our initial hypothesis, the norm vigilance hypothesis, was that threat to people's personal sense of control should induce a state where people become more vigilant for information about relevant social norms. This should become evident in more accurate recall of specifically this type of information under conditions of threat. In a series of four studies, we investigated this hypothesis with different paradigms, but were unable to find convincing evidence for the notion of norm vigilance in terms of enhanced accuracy. In a fifth study, we investigated an alternative hypothesis of motivated intergroup distortion of information about social norms after threat, but did not find convincing evidence for this mechanism either.

Keywords: social identity, control motivation, threat, norm conformity, vigilance, group processes

Introduction

When people feel their personal control to be threatened, they may restore their sense of control by defining themselves, and acting, as members of agentic groups (Fritsche et al., 2013). This way, the helpless "I" can turn into an agentic "We". In fact, when threatened, people have been shown to conform more to social rules and conventions of their own groups (e.g., Stollberg et al., 2017). At the same time, non-threatened participants rarely showed norm conformity (e.g., Jonas et al., 2008; Fritsche et al., 2010). If norm conformity is useful for restoring control as a group member, threatened people should be highly motivated to detect and learn about what the actual norms of their in-group are. This may lead to personal vigilance for norm information. The present research investigates the expressions and mechanisms of people's presumed norm vigilance following threat. Specifically, we hypothesized that threat to personal control would increase people's accuracy in detecting in-group norms.

Motivational Accounts of Norm Conformity

Researchers have proposed a number of specific motivational models to explain socially defensive reactions, such as norm conformity, to a range of situational stimuli, commonly referred to as psychological threat (Jonas et al., 2014). Broadly defined, the term threat refers

to stimuli which threaten or directly undermine some psychological need. The corresponding literature covers experimentation and theorizing on reactions to threats such as mortality salience (Rosenblatt et al., 1989), uncertainty threat (Hogg and Adelman, 2013), meaning threat (Proulx and Heine, 2008), environmental threat (Barth et al., 2018), economic threat (Fritsche and Jugert, 2017), as well as control threat (Fritsche et al., 2013; Kay et al., 2008). Not only may insights from this literature help to identify the motivational circumstances under which norm conformity is most likely to arise, the salience of social norms has also been proposed and empirically identified as a moderator of such defensive reactions to threat. This decisive role of salient social norms is in line with the well-established norm focus theory (Cialdini et al., 1991), which proposes that only norms that are in focus will guide behavior. The majority of studies demonstrating an interactive effect of threat and norm salience originate from the literature on Terror Management Theory (see Greenberg et al., 1986). In numerous published studies, participants threatened with mortality salience were more likely to conform to salient social norms (e.g. Routledge et al., 2004; Gailliot et al., 2008; Jonas et al., 2008; Cox et al., 2009; Rothschild et al., 2009; Fritsche et al., 2010; Jonas et al., 2013). Control threat (Stollberg et al., 2017), and other types of threat (e.g., Schumann et al., 2014; Berkowitz and Lepage, 1967)

have been shown to produce similar patterns depending on salient social norms and related environmental cues. Note that recently, the robustness and validity of mortality salience effects have been the subject of controversial discussion (see Klein et al., 2019; Chatard et al., 2020; Schindler et al., 2021). A recent meta-analysis of mortality salience x norm effects (Schindler et al., 2023) found evidence for mortality salience increasing people's conformity with salient social norms across 64 studies. While the meta-analytic interaction effect was of small to medium size, correcting for possible publication bias or *p*-hacking arrived at less strong effects, putting doubt on the reliability of these effects.

Vigilance as a Reaction to Threat

One possible mechanism underlying norm-related reactions to threat may be found in heightened vigilance after threat, as threat and vigilance have been identified to be closely related phenomena. States of arousal have often been associated with a shift in attentional focus to situationally dominant stimulus features (Kallgren et al., 2000). Several models of defensive reactions to threat assume that psychological threat, at least initially, elicits a state of attentional vigilance. In the literature on unconscious vigilance, reactions to threat are described as states of orientation to stimuli either related to the threat or relevant resources (Holbrook et al., 2011). Reactive Approach Motivation theory proposes that threat (more specifically, goal conflict) initially elicits the behavioral inhibition related state of anxious uncertainty, which people are motivated to overcome by engaging in approach motivated behavior (McGregor, Nash, Mann, and Phills, 2010). More generally, the behavioral inhibition system has been proposed to play an important role in immediate transient reactions to a range of psychological threats (Jonas et al., 2014) and is described to be associated with a psychological state of anxious arousal, avoidance motivation, as well as vigilance (Gray and McNaughton, 2003). Previous research has also demonstrated that moderate manipulations of control threat can facilitate subsequent processing of information (Pittman and D'Agostino, 1989). A mechanism like this might also represent a general, mostly unspecific vigilance in reaction to threat or a general accuracy motive. However, some research points toward more specific manifestations of vigilance after threat. For example, social rejection was shown to enhance memory performance for relevant social stimuli (Gardner et al., 2000), the experience of specifically uncontrollable painful stimuli has been shown to heighten vigilance for pain (Crombez et al., 2008), and meaning threats were shown to enhance both general readiness to perceive patterns as well as accuracy for correctly de-

tecting complex patterns (Proulx and Heine, 2009).

Norm Conformity as Control Striving

It has been argued that phenomena previously considered as basic defensive reactions to threat, such as in-group bias, are in fact dependent on salient social norms and hence represent identity based norm conformity effects (Giannakakis and Fritzsche, 2011). A large proportion of research on the moderating role of salient social norms on reactions to threat has focused on mortality salience threat. This tested the assumption of terror management theory that people strive for symbolic mortality by conforming to the ideals and standards of their own culture (Jonas et al., 2008). However, social identity related defensive reactions to mortality salience might be better explained by a desire to attain control and agency (Fritzsche et al., 2008). Social norms do not only represent information about what is considered appropriate in specific situations but also what constitutes thinking and acting in line with membership in a social group. According to the model of group-based control, groups can serve to maintain and restore perceptions of control and agency via a process of redefining the self in terms of group membership (Fritzsche et al., 2013; Greenaway et al., 2015). This should be the case especially in circumstances when personal control seems lacking or threatened and available in-groups are themselves perceived as agentic (Stollberg et al., 2015). At the same time, thinking and acting in terms of group membership, that is, thinking and acting in line with salient social norms, may be a potent strategy of attaining perceptions of agency and control. When acting as group members people demonstrate collective agency. Given that in-group norms can be conceptualized as information about socially appropriate behavior, it should come as no surprise that reactions to control threat are guided by salient social norms (Stollberg et al., 2017).

The Present Research

Building on the model of group-based control and the notion of vigilance as a consequence of psychological threat, we proposed that threat to people's sense of control should elicit what we termed norm vigilance. In contrast to the notion of unspecific general vigilance, we proposed that in the context of norm-related reactions to threat, a more specific mechanism may be at play: When personal control is threatened, information about appropriate behavior as a member of salient in-groups should become more relevant, leading to prioritized attention for and processing of such cues. Hence, threat to control should not only heighten conformity with salient in-group norms, but also enhance the allocation of attention to and processing of relevant nor-

mative information itself. This would be in line with previous research showing that norm primes require direct attention to be effective (Reno et al., 1993) and that participants demonstrated conformity with previously primed norms only when they had been exposed to a threat salience manipulation (Jonas and Fritzsche, 2012). Norm vigilance should become evident in measures of attention and comprehension such as recall accuracy. That is, when people become more motivated to conform to social norms of a group, they should pay more attention to information about those norms, and hence be more accurate in recalling this information. More specifically, we hypothesized the recall of previously presented information about relevant social norms, in contrast to information unrelated to in-group norms, to be more accurate after control threat. Consequently, such a mechanism may aid and facilitate efficient norm conformity.

However, none of our studies provided evidence for this hypothesis of increased norm vigilance after threat. In four out of five studies, we focused on the conceptualization of vigilance in terms of improved precision and accuracy for norm-related information. In one final study, we investigated the alternative conceptualization of norm vigilance as motivated intergroup distortion. Over the course of several years, we presented our ideas, work-in-progress paradigms and preliminary results at conferences and to colleagues in the field and there appeared to be general consensus that our hypotheses are consistent with existing theories, have face validity, and deserve further investigation. Hence, we hope this manuscript serves not only to empty our file drawer and make the data available to the field, but also to prevent others from unavailingly pursuing identical or very similar hypotheses without consideration of the existing null-findings.

Study 1

To investigate our novel hypotheses, we conducted a first study in which participants learned about the appropriateness of behaviors in their in-group and two out-groups. In addition to this, we manipulated the salience of control, resulting in a 2×3 mixed-factorial design with *control salience* as a between-subjects factor with two levels (high control vs. low control) and *surveyed group* (i.e., which group did a norm refer to) as a within-subjects factor with three levels. *Recall accuracy*, as in the number of accurately recalled items (i.e., was the behavior deemed either acceptable or unacceptable), for all behaviors represented our main dependent variable with a theoretical range of 0 to 6 correct items per group. In line with our concept of norm vigilance, we hypothesized an interaction of the two factors. More

specifically, we expected *control salience* to increase *recall accuracy* specifically for information about in-group norms.

Method

Participants

We aimed to collect a minimum of 50 participants per cell, because no previous data to estimate effect sizes was available. One hundred seventeen participants ($M_{age} = 23.06$, $SD_{age} = 3.7$) were recruited at a German university campus. Out of this group, 68 were female, 47 were male, and two did not specify a gender. Participation was voluntary and participants received a chocolate bar as compensation.

Procedure and Materials

After giving initial consent to participate in the study, participants worked on the material on a laptop computer in a public university hallway. Materials were presented using MediaLab and DirectRT (Jarvis, 2016).

Control Salience Manipulation. Participants were randomly assigned to one of two versions of the *control salience* manipulation: Participants in the low (vs. high) control condition were asked to think about and describe two aspects of their lives that made them feel unable to influence and control (vs. able to influence and control) important things in their life and that made them feel helpless (vs. efficacious). This task represented a slightly altered version of established manipulations of control salience (Fritzsche et al., 2013; Whitson and Galinsky, 2008). Instead of two aspects, Fritzsche et al. (2013) asked participants to list three aspects, while Whitson and Galinsky (2008) asked participants to describe one event. To provide a manipulation check, we then asked participants to indicate to what extent these aspects signified they had control or had no control over their lives on a 7-point scale (1 = *very low control* to 7 = *very high control*).

Delay Task. Then, all participants completed a translated version of the mind wander delay task adapted from McGregor, Nash, and Prentice (2010), in which they were asked to type out their thoughts for a period of three minutes, after which the task ended automatically. We included this task as a delay task to allow for effects of the threat salience manipulation to emerge. Delay tasks have been shown to increase effect sizes of defensive reactions to threat (Burke et al., 2010), and have been included in most previous experimental studies on group-based control phenomena (e.g., Fritzsche et al., 2008; Fritzsche et al., 2013; Stollberg et al., 2015; Stollberg et al., 2017).

Group Norm Presentation. Subsequently, we introduced participants to our bogus survey data task which served to introduce a range of in-group and out-group norms. We based our task on a similar task by Eriksson et al. (2015). In an introductory text, we told participants we were conducting research on the perception of survey data and would present them with real survey data from universities in Germany, Poland, and Czech Republic (to provide an in-group and two out-groups) concerning the appropriateness of a range of behaviors. Next, all participants read they had been randomly assigned to the mode of presentation as text and received some additional information about the nature of the task. They were instructed to pay close attention to the presented material, because we would later ask them about the appropriateness of the mode of presentation as well as about their personal opinion on some of the behaviors. During the task, participants saw 18 subsequent trials, each containing information about one of the three surveyed groups (Germans vs. Poles vs. Czechs) of which a majority was said to have deemed a behavior as either acceptable or unacceptable. In reality, we selected these behaviors on the basis of a small pretest ($n = 21$) by excluding items that evoked the clearest preference in the sample. In the following main task of our study, one third of all trials referred to one of the three groups, and in half of each group's trials, the behavior in question was described as either acceptable or unacceptable (e.g., "The majority of *German students* thought this behavior was *acceptable*: *Not tipping at a restaurant*."). Exact combinations of behavior, group and majority opinion were randomly assigned by the computer for each participant to avoid systematic confounding. Individual trial duration was not limited and participants were instructed to continue to the next trial by pressing a key.

Measure of Recall Accuracy. Directly following this task, participants completed our unannounced recall task. In this task, we asked participants to recall the majority opinion on each of the 18 behaviors from the previous task. The behaviors were presented in randomized order and participants were instructed to choose either acceptable or unacceptable and to guess in case they could not remember the corresponding trial from the previous task. From these answers in the recall task, we computed our dependent variable *recall accuracy*: Three indices of correctly recalled norms for each group, ranging from 0 to 6.

On the following screen, participants were asked to make a guess about the aims of our research. Next, we asked participants on a 7-point scale (1 = *not at all* to 7 = *fully*) how representative the presented survey results had been for the actual groups. Then, we measured sev-

eral potential moderating variables with a 6-item scale for perceptions of tightness versus looseness (Gelfand et al., 2011) regarding Germany ($\omega = .64$), a 6-item scale for desirability of control (Burger and Cooper, 1979; Jacobi et al., 1986; $\omega = .67$), and identification with each of the three groups, measured with three single item measures (Postmes et al., 2013). We asked participants for basic demographic information, as well as about their personal connection to Poland and Czechia on seven dichotomous items. Finally, participants were fully debriefed and thanked for their participation.

Results

Planned Analyses

To test whether participants had reflected on high vs. low personal control as intended, we conducted a Welch's one-way ANOVA with *control salience* (high control vs. low control) as independent variable and scores on our manipulation check item as the dependent variable. Confirming the viability of the manipulation, mean scores in the high control condition ($M = 5.16$, $SD = 1.29$) were revealed to be higher than mean scores in the low control condition ($M = 3.50$, $SD = 1.64$), $F(1, 104) = 36.7$, $p < .001$, $d = -1.13$.

To test our proposed interaction hypothesis, we entered *recall accuracy*, i.e., the number of correctly recalled items per surveyed group (with a theoretical range from 0 to 6), as the dependent variable in a 2 (high control vs. low control) $\times$ 3 (Germans vs. Poles vs. Czechs) mixed within-between factorial ANOVA. The expected interaction of the two factors was not statistically significant, $F(2, 230) = 0.308$, $p = .735$, $\eta_p^2 = .003$ ($f = .055$). Neither were the main effects of the two factors *control salience* and *group*; $p = 0.819$ and $p = 0.135$, respectively. The within-between interaction effect test had a statistical power of .08. A sensitivity analysis (WebPower; 2 $\times$ 3 mixed ANOVA; $N = 117$; $\alpha = .05$) indicated that .80 power requires an effect of at least $\eta_p^2 = .077$ ($f = .248$). Figure 1A contains a plot of the required power to detect within-between interaction effects between $\eta_p^2 = 0$ and $\eta_p^2 = .20$ given our design and sample size.

Exploratory Analyses

As displayed in Table 1, our main dependent variable was heavily skewed with skewness values ranging from -1.2 to -2.7 , cell means were close to the scale maximum with median values almost exclusively at the highest possible value of 6. We conducted further exploratory analyses including moderation analyses and exploratory exclusion of participants which are not de-

Table 1*Descriptive statistics and skewness of recall accuracy by control salience and surveyed group for Study 1.*

	Control Salience	German norms	Polish norms	Czech norms
N	Low Control	56	56	56
	High Control	61	61	61
Mean	Low Control	5.41	5.18	5.30
	High Control	5.43	5.30	5.28
Median	Low Control	6.00	5.50	6.00
	High Control	6.00	6.00	6.00
Standard deviation	Low Control	0.949	1.03	0.971
	High Control	1.10	1.10	0.951
Skewness	Low Control	-1.72	-1.20	-1.52
	High Control	-2.70	-1.39	-1.32

tailed here because they did not change the overall picture of null findings.

Discussion

We did not find any evidence for the proposed mechanism of norm vigilance in Study 1. Neither the hypothesized interaction effect, nor main effects of the experimental manipulation of *control salience* or the within-subjects factor *surveyed group* were detected. One possible explanation may be found in properties of our measure: Although there was some variability on the *recall accuracy* scale, mean values close to the scale maximum, median values above those high mean values, pronounced indices of skewness, as well as visual inspection of the scale distributions all pointed towards a ceiling effect. Accordingly, norm vigilance in reaction to threat may have occurred, but the novel paradigm we constructed for this study was unable to detect it.

Study 2

During the ongoing FIFA Football World Cup in 2010, Jonas and Fritsche (2012) conducted a study on the interactive effect of threat salience and norm salience. They demonstrated that participants in their study were more inclined to follow a group norm, when they had been exposed to mortality salience threat (vs. a control condition), and that the direction of this effect was dependent on the specific norm they had been presented with. We decided to take advantage of the, then ongoing, 2016 UEFA European Football Championship to attempt to replicate their study, but with the alteration of administering a manipulation of *control salience* instead of mortality salience threat. A replication of the original interaction effect appeared likely, as previous research has demonstrated that socially defensive reactions to mortality salience threat vary along with how

much salient death implies uncontrollability and similar reactions could be evoked by manipulating *control salience* (Fritsche et al., 2008). Moreover, in addition to replicating the design by Jonas and Fritsche (2012), we decided to add a simple measure of *recall accuracy* for the normative information presented in the material based on a similar measure by Hellmann et al. (2017). Our study had a 2×2 between-subjects design with the factors *control salience* (high control vs. low control) and *norm type* (optimistic vs. pessimistic odds). We measured personal *optimism* as well as *recall accuracy* in terms of absolute deviation in recall from the presented numbers. We hypothesized an interaction effect of the two factors on *optimism* (i.e., norm following), as found in the original study. In addition, we hypothesized that *recall accuracy* for in-group norms would improve for participants in the low control (vs. high control) condition. Furthermore, we hypothesized a mediation effect: We expected that, in the optimistic norm condition, the effect of *control salience* on *optimism* would be mediated by *recall accuracy*.

Method

Participants

We aimed to collect data from at least 72 participants, to match the sample size of the original study. One hundred twenty-four participants were recruited at a German university campus. We excluded seven participants who started but did not complete the procedure, as well as three participants who did not give answers on our primary *recall accuracy* measure. To match the procedure of the original 2010 study, we excluded six additional participants who specified a nationality other than German, resulting in a final sample of 108 participants ($M_{age} = 23.04$, $SD_{age} = 3.45$). Out of this group, 56 were female and 52 were male. Participation was

voluntary and participants received a chocolate bar as compensation.

Procedure and Materials

After giving initial consent to participate in the study, participants were randomly assigned to one of four experimental conditions and received the corresponding first of two parts of the printed questionnaire.

Control Salience Manipulation. Depending on experimental condition, participants completed one of two versions of the *control salience* manipulation task. This task and the corresponding manipulation check measure were identical to those described in Study 1.

Delay Task. Then, all participants completed the 60-item version of the PANAS-X (Grühn et al., 2010; Watson and Clark, 1999) which served as a delay task. As in Study 1, we included a delay task to allow for effects of the threat salience manipulation to emerge. Variations of the PANAS have been known for not mediating threat effects on symbolic defenses, such as responses of group-based control restoration (Fritzsche et al., 2013), cultural worldview defense (Pyszczynski et al., 1999), or reactive approach motivation (Jonas et al., 2014). Accordingly, we did not include this measure in further analyses of our studies.

Group Norm Manipulation.

Subsequently, participants read one of two versions of the group norm manipulation. We based this manipulation of descriptive norms on similar material by Jonas and Fritzsche (2012). Participants were instructed to carefully read the following text because they would later be asked about its contents. In the text, participants learned about the nature of betting agencies and betting odds. The text mentioned how betting odds usually provided a good indicator of public opinion and how odds from different betting agencies could vary depending on their location. This was illustrated by the presentation of recent betting odds for the event of the German soccer team winning the finals of the 2016 UEFA European Championship from two different betting agencies, one located in Germany, and one international agency located in London. Depending on participants' experimental condition, the German odds were clearly more optimistic than the international odds (optimistic norm condition) or vice versa (pessimistic norm condition). We adjusted the exact values to more closely resemble realistic betting odds at this point in time. To ensure participants had understood this information, we then asked them to indicate which of the two agencies' odds predicted a higher chance of winning for the German national team.

Distractor Task. Following the group norm manipulation, participants completed a questionnaire com-

posed of 14 questions about their sleep habits. We included this task as a filler to increase the task difficulty of our subsequent recall task and thereby potentially increase meaningful variance in the data.

Measure of Recall Accuracy. Following the distractor task, participants were instructed to return the first part of the questionnaire to an experimenter and received the second part of the questionnaire, which was identical for all conditions. On the very first page, they were asked to recall and note the betting odds from two betting agencies they had been presented earlier. From these values, we calculated the absolute deviation from the originally presented numbers as inverse measures of *recall accuracy*. As the betting agency located in Germany provided the in-group norm, the accuracy for this information represented our main dependent variable to detect norm vigilance.

Norm Following. Next, we measured participants' own *optimism* regarding the chances of the German team winning the championship with one item by asking them to put a cross onto a horizontal line representing this probability. The endpoints of the line were labeled with 0% at the leftmost end and 100% at the rightmost end. We measured the distance in millimeters from the leftmost end of the scale, which allowed us to calculate the percentage their choice represented (with 100% at 148 mm).

Additional Measures. Then, we measured additional variables on 7-point scales (1 = *not true at all* to 7 = *completely true*) to conduct exploratory analyses. Three items asked about participants' commitment to and interest in soccer and the German national team. Two items measured identification with Germans and German soccer fans. One item asked to what extent the national team represented Germans in the international sphere. For the final five items, we used the same graphical measure with horizontal lines representing percentages as for our norm conformity item. All of these items asked about perceptions of the group norm on different levels. Among those were the items "*To what extent do Germans expect the German team to win the finals?*" and "*To what extent do German betters expect the German team to win the finals?*". The latter served as our manipulation check for the norm manipulation. Participants were asked for basic demographic information, were fully debriefed and thanked for their participation. On the final page of our questionnaire, additional variables were collected for an unrelated pilot study for colleagues at our lab.

Results

Planned Analyses

To test whether participants had reflected on high vs. low personal control as intended, we conducted a 2 (high control vs. low control) $\times$ 2 (optimistic vs. pessimistic norm) ANOVA with scores on our corresponding manipulation check item as the dependent variable. Mean scores in the high control condition ($M = 5.50$, $SD = 0.97$) were revealed to be higher than mean scores in the low control condition ($M = 3.50$, $SD = 1.70$), as reflected in a significant main effect of *control salience*, $F(1, 100) = 48.50$, $p < .001$, $\eta_p^2 = .327$.

The main effect of *norm type* and the interaction effect were not statistically significant; $p = 0.343$ and $p = 0.499$, respectively. To test whether our norm manipulation had successfully manipulated norm perceptions, we conducted a 2 (high control vs. low control) $\times$ 2 (optimistic vs. pessimistic norm) ANOVA with scores on our corresponding manipulation check item (optimism of German betters in %) as the dependent variable. Mean scores in the optimistic norm condition ($M = 67.7$, $SD = 17.2$) were revealed to be higher than mean scores in the pessimistic norm condition ($M = 56.5$, $SD = 20.0$), as reflected in a significant main effect of *norm type*, $F(1, 103) = 9.66$, $p = .002$, $\eta_p^2 = .086$. The main effect of *control salience* and the interaction effect were not statistically significant; $p = 0.863$ and $p = 0.467$, respectively.

To test our prediction that low control would elicit norm following in the direction of the presented norm, we conducted a 2 (high control vs. low control) $\times$ 2 (optimistic vs. pessimistic norm) ANOVA with personal *optimism* scores as the dependent variable. Although, descriptively, we found more pronounced conformity with the optimism norm in the low control condition than in the high control condition (see Table 2), the predicted interaction was not significant, $F(1, 103) = 0.89$, $p = .347$, $\eta_p^2 = .009$ ($f = .095$). The interaction effect test had a statistical power of .16. A sensitivity analysis (WebPower; 2 $\times$ 2 multiple way ANOVA; $N = 107$; $\alpha = .05$) indicated that .80 power requires an effect of at least $\eta_p^2 = .07$ ($f = .273$). The main effect of *control salience* and the main effect of *norm type* were not statistically significant; $p = 0.772$ and $p = 0.540$, respectively.

To test our prediction that *recall accuracy* for in-group norms would improve for participants in the low control (vs. high control) condition, we conducted a 2 (high control vs. low control) $\times$ 2 (optimistic vs. pessimistic norm) ANOVA with *recall accuracy* (absolute deviation from the presented odds from a German betting agency) as the dependent variable. Contrary to our prediction,

Table 2

Cell sizes (N), means (M), and standard deviations (SD) for central variables in Study 2.

	Control salience	Norm Type	Norm German betters	Norm Germans	Optimism	Recall deviation German agency	Identification with Germans
N							
Low		Pessimistic	24	24	24	25	25
		Optimistic	28	28	28	28	28
High		Pessimistic	26	26	26	26	26
		Optimistic	29	29	29	29	29
M							
Low		Pessimistic	54.8	55.1	47.9	0.490	2.80
		Optimistic	68.7	66.6	54.2	0.227	2.86
High		Pessimistic	58.0	58.7	52.9	0.627	3.77
		Optimistic	66.7	58.0	51.6	0.113	3.83
SD							
Low		Pessimistic	21.3	15.2	19.1	0.598	1.71
		Optimistic	19.7	20.1	21.1	0.867	1.88
High		Pessimistic	19.1	18.2	20.7	1.12	2.21
		Optimistic	14.7	19.3	22.1	0.191	1.63

there was no significant main effect for *control salience*, $F(1, 104) < 0.01$, $p = .939$, $\eta_p^2 < .001$. The interaction effect of the two factors was not statistically significant, $F(1, 104) = 0.72$, $p = .399$, $\eta_p^2 = .007$ ($f = .084$). The interaction effect test had a statistical power of .14. A sensitivity analysis (WebPower; 2×2 multiple way ANOVA; $N = 107$; $\alpha = .05$) indicated that .80 power requires an effect of at least $\eta_p^2 = .07$ ($f = .273$). Figure 2A contains a plot of the required power to detect interaction effects between $\eta_p^2 = 0$ and $\eta_p^2 = .20$ given our design and sample size. Unexpectedly, we found a statistically significant main effect of *norm type*, $F(1, 104) = 6.92$, $p = .01$, $\eta_p^2 = .062$. As displayed in Table 2, participants in the optimistic norm condition recalled the odds more accurately (i.e., with lower absolute deviation) than participants in the pessimistic norm condition. We conducted a mediation analysis to test our prediction that, for participants in the optimistic norm condition, there would be an indirect effect of *control salience* on norm following (i.e., personal *optimism*) via *recall accuracy* for the German betting odds. Bias-corrected bootstrapped confidence interval with 10,000 samples included zero for both the direct effect of *control salience* on norm following, 95% CI [-7.26, 8.60], and for the indirect effect via *recall accuracy*, 95% CI [-8.71, 1.63].

Exploratory Analyses

Overall, deviation scores on our *recall accuracy* measure were quite low. Normality is generally unlikely for measures of absolute deviation, due to the process of removing directionality from differences scores (i.e., distant positive and negative scores may be assigned the same value). For this reason, we investigated the distribution of difference scores underlying our variable. The mode of these difference scores was 0, and this was true for all experimental conditions and both the German and international betting odds. Adding to this, almost half of all participants in our sample (47.2%) recalled the betting odds of the German agency without any deviation.

Jonas and Fritsche (2012) found that threat salience increased national identification in their sample. To test whether we could replicate this finding in our sample and design, we conducted a 2 (high control vs. low control) × 2 (optimistic vs. pessimistic norm) ANOVA with national identification as the dependent variable. Unexpectedly, a significant main effect of *control salience* revealed a reversed pattern: Identification was higher for participants in the high control condition ($M = 3.80$, $SD = 1.91$) and lower for participants in the low control condition ($M = 2.83$, $SD = 1.78$), $F(1, 104) = 7.27$, $p = .008$, $\eta_p^2 = .065$. The main effect of *norm type* and the

interaction effect were not statistically significant; $p = 0.873$ and $p = 0.999$, respectively. In contrast to what we found for norm perceptions for German betters, an analysis of the perceived norm of Germans in general revealed no significant main effect of *norm type*, $F(1, 103) = 2.33$, $p = .130$, $\eta_p^2 = .022$.

We conducted further exploratory analyses including tests for moderation by identification on different levels but did not find any significant effects.

Discussion

As in Study 1, we were unable to find evidence for norm vigilance following threat to control. Participants in the low control condition were not more accurate in recalling the German betting odds than participants in the high control condition. We did however find an unexpected main effect of norm type. Optimistic norms were recalled more accurately than were pessimistic norms. One possible explanation for this pattern may be that optimistic norms were generally easier to recall because they were more in line with existing expectations our participants may have had about realistic betting odds in different countries. Interestingly, our norm manipulation significantly influenced the perceived norm of German betters but not of Germans in general. This raises the question whether the manipulation influenced the perceived norm of an in-group as we had intended. In addition to this, our measure of recall possessed problematic properties. Almost half of our participants recalled the betting odds perfectly. Hence, as in Study 1, the task difficulty of the recall task in Study 2 could be described as too easy.

Notably, the basic threat effect on norm conformity was not significant. However, the descriptive pattern matched the effect of the original study (Jonas & Fritsche, 2012), which had been conducted with a mortality salience instead of control threat salience manipulation. In-group optimism was higher in the low control condition than in the high control condition when an optimism norm was salient and lower when a pessimism norm was salient. As one possible explanation, the original effect might be weaker than expected. Alternatively, the specific set-up of the current study may have reduced the chances to detect the effect as, compared to the original study, the personal optimism measure was preceded by an additional extended delay questionnaire as well as the recall task. The latter task may have worked as a motivated affirmation of group-based control, given that optimistic norms were recalled better than pessimistic betting odds. Another explanation might lie in the comparably low levels of identification with the salient in-group. Interestingly, control threat led to lower identification with the proposed in-group in

our sample. This may point towards specific properties of this sample population or the specific historical context, which made norm conformity, as well as increased norm *recall accuracy*, after threat unlikely. Identification with Germany is typically low in German student, rather left-wing, samples, given the historical association of German identity with national socialism. In 2016, when the present study took place, the country was polarized on the left-right continuum, amplified by the so-called “refugee crisis” in 2015 (Bock, 2018). This may have emphasized rejection of national identification in left-wing students. We concluded that, before continuing with the construction of a novel paradigm to measure norm vigilance specifically for in-group (vs. out-group) norms, our next study should implement a more established paradigm to possibly establish the basic effect of threat on vigilance for normative information in general.

Study 3

In Study 3, we decided to use a more established paradigm to test our assumption of norm vigilance in a more general sense. That is, vigilance for situationally relevant norms in general. For this purpose, we decided to modify an existing paradigm established by Aarts and Dijksterhuis (2003). The original authors of the paradigm demonstrated that the salience of behaviorally relevant social norms enhanced the accessibility of related concepts in a subsequent lexical decision task. That is, correct response times for words related to the norm of being silent were faster than those for words unrelated to this norm. In line with more recent theorizing by one of the original authors Fennis and Aarts (2012), we decided to adapt the paradigm and extend the design by including the additional factor of *control salience*. This resulted in a 2×2 mixed-factorial design with the between-subjects factor *control salience* and the within-subjects factor *word type*. According to our theoretical ideas about norm vigilance, the enhanced accessibility of normative concepts should be further catalyzed by control threat, because of the associated heightened motivation to restore control via appropriate social behavior. Accordingly, in addition to replicating the basic effect of an advantage for norm-related words, we hypothesized a significant interaction effect of the two experimental factors. More specifically, we expected participants in the low control (vs. high control) salience condition to demonstrate the fastest correct responses to stimuli related to the salient social norm (vs. control words). The pre-registration for Study 3 can be found at <https://aspredicted.org/g657v.pdf>. In the pre-registration, we stated that for exploratory purposes, we

would include an item asking participants whether they were planning to visit the university library before taking part in the study. These exploratory analyses did not yield significant results and were not included in the manuscript.

Method

Participants

We aimed to collect data from 140 students from the University of Leipzig because an a priori power analysis indicated that this sample size would result in a statistical power of around 80% for our design and an assumed effect size of $d = .25$. One hundred forty participants were recruited and completed our materials at a German university campus in front of the entrance of the university's main library. Ten participants had to be excluded because their data could not be matched due to missing or empty questionnaires as well as some cases of erroneous assignment of subject identifiers during data collection. Participation was voluntary and participants received a chocolate bar as compensation.

Procedure and Materials

After giving initial consent to participate in the study, participants were randomly assigned to one of two experimental conditions and received a corresponding printed questionnaire. We told our participants this questionnaire represented one of two separate studies, the second of which would be taking place at a laptop computer.

Control Salience Manipulation. Depending on experimental condition, participants then completed one of two versions of the *control salience* manipulation task. This task and the corresponding manipulation check measurement were identical to those described in Study 1.

Delay Task. Then, all participants completed the 60-item version of the PANAS-X (Grühn et al., 2010; Watson and Clark, 1999) which served as a delay task. As in the previous studies, we included a delay task to allow for effects of the threat salience manipulation to emerge.

To aid our cover story of two separate studies, participants were then asked for basic demographic info as well as to make a guess about our research aims, before being instructed to hand back the questionnaire to an experimenter.

Then, participants were placed in front of a laptop computer to work on, what they were told was, a second study. We used MediaLab and DirectRT (Jarvis, 2016) to present the following materials.

Picture Task. On the first screen, participants were welcomed and thanked for their participation and received instructions for the first task. They were told that in the following picture task, they would be shown a picture of a place for a duration of 30 seconds and their task would be to memorize the picture as well as they could. In addition to this, we told participants that they would later on be asked to visit the place depicted in the picture in a final step of the study they were participating in. Subsequently, they were presented with a picture from inside the library they were in front of for a duration of 30 seconds. We based this picture task and the following lexical decision task on the experimental procedure by Aarts and Dijksterhuis (2003).

Lexical Decision Task. Subsequently, all participants were introduced to the lexical decision task and completed four practice trials to ensure they had understood the task before measurement began. Participants were instructed to indicate whether they were presented with real words or non-words and to answer as quickly and correctly as possible. The following lexical decision task was composed of 48 trials in total. Of 24 real words, 8 were related to the social norm of being silent in a library (e.g. still, quiet, silent, whisper), while 16 were unrelated to said norm (e.g. active, open, flat, shake). These control words were matched to the target words in frequency and usage with dlexDB (Heister et al., 2011). Twenty-four non-words were generated by utilizing a pseudoword generator (Keuleers and Brysbaert, 2010). We measured both participants' response times (RTs) as well as their correct and incorrect responses. Prior to further analysis, we identified and excluded extreme individual outliers in each participant's trial reaction times (cutoff set at $1.5 \times \text{IQR}$ above 3rd or below 1st quartiles of subjects' individual RTs). We then computed *inverse efficiency scores* ($IES = RT / (1 - \text{error rate})$) for each factor combination, to include both information about speed and accuracy in a single measure. For participants with 100% correct responses, the *IES* represents their RT in ms. For participants with higher error rates, the *IES* represents an upward corrected RT in ms (e.g., 1000 ms instead of 900 ms for a 10% error rate). We adapted this method of transformation from (Koranyi et al., 2015).

Additional Measures. Next, we asked our participants to make another guess about the aims of our research and collected some basic demographic data. Then, with three 7-point scale (1 = *not at all* to 7 = *very strongly*) items, we measured participants' self-reported general tendency to follow social norms. Subsequently, we measured ease of retrieval regarding the control threat salience manipulation with two 7-point scale items (1 = *not easy at all* to 7 = *very easy*). This

measure was included because it had been shown to be a potential moderator for the effects of autobiographical recall manipulations (Lammers et al., 2017). We then asked whether participants had previously taken part in similar studies, and if so, how long ago this had been, and whether they knew the manipulation of control threat from previous participation. Finally, participants were asked for basic demographic information, were fully debriefed and thanked for their participation.

Results

Planned Analyses

To test whether participants had reflected on high vs. low personal control as intended, we conducted an ANOVA with the between-subjects factor control salience and scores on our corresponding manipulation check item as the dependent variable. Mean scores in the high control condition ($M = 5.32$, $SD = 1.36$) were revealed to be higher than mean scores in the low control condition ($M = 3.30$, $SD = 1.65$), as reflected in a significant main effect of control salience, $F(1, 125) = 60.7$, $p < .001$, $\eta_p^2 = .327$.

We conducted a 2×2 mixed-factor ANOVA with the factors *control salience* (between-subjects) and *word type* (within-subjects) with participants' *IES* as the dependent variable. Descriptive means of *IES* by condition are displayed in Table 3. The main effect of the factor *word type* was not significant, $F(1,127) = 1.78$, $p > .05$, $\eta_p^2 = .014$ ($f = .119$). The within-subjects main effect test had a statistical power of .27. The main effect of the factor *control salience* was not significant, $F(1,127) = 2.76$, $p = .099$, $\eta_p^2 = .021$ ($f = .146$). The between-subjects main effect test had a statistical power of .38. The interaction of the factors word type and *control salience* reached significance, $F(1,127) = 4.57$, $p = .034$, $\eta_p^2 = .035$ ($f = .190$). The within-between interaction effect test had a statistical power of .57. A sensitivity analysis (WebPower; 2x2 mixed ANOVA; $N = 129$; $\alpha = .05$) indicated that .80 power requires an effect of at least $\eta_p^2 = .058$ ($f = .249$). In the low control condition, *IES* were significantly lower for norm words ($M = 843$) than for control words ($M = 907$), $t(62) = -2.93$, $p = .005$. In addition, *IES* for control words were significantly lower in the high control condition ($M = 762$) than in the low control condition ($M = 907$), $t(127) = -2.54$, $p = .012$. Figure 3A contains a plot of the required power to detect within-between interaction effects between $\eta_p^2 = 0$ and $\eta_p^2 = .20$ given our design and sample size.

To test for moderation, we entered the mean of our ease of retrieval items ($r = .61$, $p < .001$) as the moderator and the between-subjects factor *control salience*

Table 3

Cell sizes, mean inverse efficiency scores (IES), and standard errors by word type and condition in Study 3.

	Control Salience	Norm words	Control words
N	High	66	66
	Low	63	63
Mean IES	High	777	762
	Low	843	907
Std. error mean	High	61.2	38.4
	Low	40.9	42.4

as predictor in two separate linear models with *IES* for both item types as the dependent variables. The interaction effect was not statistically significant for norm words or control words, $p = 0.874$ and $p = 0.926$ respectively.

We repeated the same analyses with the mean scores from our items measuring a self-reported general tendency to follow norms ($\alpha = .87$) as the moderator. The interaction effect was not statistically significant for norm words or control words, $p = 0.769$ and $p = 0.797$ respectively.

Discussion

Descriptively, *IES* for norm words were generally faster than for control words as would be expected from the original experiment by Aarts and Dijksterhuis (2003). However this main effect of *word type* was not significant. This non-replication may be due to differences in our experimental design, specifically the inclusion of *control salience* without a neutral control condition. The main effect of *control salience* was not significant and the mean difference was in a direction contrary to our prediction: Descriptively, participants in the low control condition were generally slower to respond than participants in the high control condition. This pattern does not support the notion of generally facilitated processing of information after threat to control as observed by Pittman and D'Agostino (1989), but should not be overinterpreted because it was not statistically significant. Notably, some previous research demonstrated that severe control deprivation (i.e. working on unsolvable tasks for an extended duration) can also lead to decreases in task performance similar to learned helplessness phenomena (Sedik et al., 1993). However, the mindset priming manipulation employed in our experiments has previously been demonstrated to elicit socially defensive reactions (Fritsche et al., 2013) and its intensity is unlikely to be comparable to unsolvable tasks.

Although the hypothesized interaction effect did emerge, the pattern was largely not in line with our predictions. We hypothesized that *IES* would be lowest for norm words in the low control condition. Descriptively, *IES* were lowest for control words in the high control condition – a finding very much opposite to what we had expected. An isolated look at low control participants only did reveal a pattern in line with our predictions as well as with the original findings of the paradigm's authors: For those participants, norm words had significantly lower *IES* than control words. However, the completely unexpected role of *control salience* in the overall pattern renders an interpretation of this single difference as norm vigilance after threat difficult. Although this pattern was present for participants previously exposed to control threat, the role of threat itself was opposite to what we would expect in terms of norm vigilance, because mean *IES* were generally higher instead of lower for low control participants. Guinote (2007) demonstrated that participants primed with powerfulness (vs. powerlessness) showed facilitated and faster goal-directed behavior. This may help to explain why people in the high (vs. low) control salient condition were generally faster. Hence, future studies that use a lexical decision task may include a neutral control condition instead of a high control salient condition as a comparison group to prevent possible effects of high personal control from emerging.

Study 4

When designing Study 4, we decided to investigate whether the delay previously implemented after the control salience manipulation in all our studies might have been a reason for the lack of threat effects on measures of accuracy. Some researchers have classified vigilance as a rapid proximal reaction to threat, however this mostly refers to more general, unspecific forms of vigilance (Jonas et al., 2014). Although our theoretical conception of norm vigilance was not general unspecific vigilance after threat but vigilance specific for norma-

tive information, we decided to rule out this possible methodological issue. Hence, we included the presence of a delay task as an exploratory experimental factor in Study 4. We pre-registered that we would include or omit the factor delay in further analyses, depending on the emergence of a three-way interaction. Beyond this, we included the experimental factors *control salience* (between-participants) and *surveyed group* (within-participants) with two levels each. Overall, this resulted in a mixed-factorial $2 \times 2 \times 3$ design with the exploratory factor *delay* (present vs. none) and the factor *control salience* (high vs. low) as between-subjects factors, and the factor *surveyed group* (in-group vs. antagonistic out-group vs. neutral out-group) as a within-subjects factor. Although in-group information should be paramount according to our conception of norm vigilance, we suspected that, given sufficient cognitive resources, people may strive for distinctiveness from antagonistic out-groups and therefore allocate attention to information about such out-groups. Hence, we included three different groups to test whether an antagonistic out-group would yield different reactions than a more neutral out-group. We expected information about the latter to be less relevant for our participants' in-group identity and hence less affected by norm vigilance. We included three dependent variables, the first measuring norm *estimate accuracy* (i.e., the accuracy of an aggregate impression of each group's norms), second a measure of *recall accuracy* for all norm related information for all groups, and third, a measure of participants' opinion on the topic at hand to assess tendencies of *norm conformity*.

We included two measures of accuracy in norm perceptions to be able to assess effects that may go beyond mere retrieval of information. For these norm perception measures, we hypothesized the following: First, we expected a main effect for *control salience*, such that participants in the low control condition would generally be more accurate in recalling and aggregating the normative information. Second, we expected an interaction effect, such that the enhanced accuracy would be most pronounced for information about the in-group and least pronounced for information about the neutral out-group. Regarding norm conformity, we hypothesized that participants in the low control condition would adjust their personal opinion in the direction of the in-group norm more strongly than those in the high control condition. To provide an inter-group setting that was both applicable to a sufficient proportion of a convenience sample collected at a local campus as well as sufficiently relevant to our participants, we decided to use the political left as an in-group (vs. the antagonistic right) in our materi-

als. The pre-registration for Study 4 can be found at <https://doi.org/10.17605/OSF.IO/4ABQW>.

Method

Participants

Because no previous data to estimate the effect size existed, we pre-registered that we would collect a sample large enough to ensure a minimum cell size of 50 participants after exclusion. This pre-registered plan would have resulted in a (minimum) total sample of 200 participants after exclusion. However, due to miscommunication with the research assistants who collected the data, we ended up with a much larger final sample of 304 participants. To ensure our logic of in-group and out-group categorization would apply to the analyzed sample, we told participants we were looking for politically left-leaning subjects during recruitment. Participation was voluntary and participants received a chocolate bar as compensation. Due to a technical error, no demographic data were collected from our sample in this study. Participants were recruited from the same student population in the same location as the following Study 5. We pre-registered specific criteria for exclusion: To qualify for the final sample, participants had to specify their level of identification with the in-group above the scale midpoint, specify their level of identification with the antagonistic out-group below the scale midpoint, and indicate their political orientation left of the visually highlighted scale midpoint on a left-right scale of political orientation. Based on these strict criteria, 113 participants were excluded from further analyses. Eight additional participants were excluded from the data set, because they handed in only one of two questionnaires and/or did not give final consent. No participants had to be excluded due to accurate hypothesis guesses or an incomplete control salience manipulation. This resulted in a final sample of 304 participants. Several participants handed in incomplete questionnaires with some items left unchecked, and could therefore only be included in some, but not all analyses.

Procedure and Materials

After giving initial consent to participate in the study, participants were randomly assigned to one of four experimental conditions and received the corresponding first of two parts of the printed questionnaire.

Cover Story. We used an introductory text to establish our cover story. Participants learned that our research was about known differences in opinions on the hot topic of open data (i.e., the growing amount of data from various domains being made publicly available) between the political left and right. Furthermore,

we told participants that we were interested in differences in people's reasoning and would hence ask them to write a short essay later on in the procedure. To increase the motivational relevance of the topic, we informed them that some of these essays would later be made public.

Control Salience Manipulation. Depending on experimental condition, participants completed one of two versions of the *control salience* manipulation task. This task and the corresponding manipulation check measurement were identical to those described in Study 1.

Delay Task. Then, depending on experimental condition, half of our participants completed the 60-item version of the PANAS-X (Grühn et al., 2010; Watson and Clark, 1999) which served as a delay task. For participants in the no delay condition, this task was not included in the questionnaire.

Group Norm Presentation. Subsequently, participants read a text meant to introduce the topic of open data and increase plausibility of the following survey results. The text underlined the relevance of the topic by explaining how open data was becoming a hot topic with consequences for individuals and democracies alike and was bound to polarize political camps. Then, they were presented with a table of survey results with nine different percentages in total representing agreement to three different statements on open data from three different groups. A political left leaning sample served as in-group, a political right leaning sample served as out-group, while the third group's description was intentionally kept vague and unspecific to minimize chances of categorization and high identification with this group. In general, the left leaning sample was portrayed as more in favor of open data than the right leaning sample, while the third group's preferences were inconsistent.

Measure of Group Norm Estimate Accuracy. Following the group norm presentation, participants were instructed to return the first part of the questionnaire to an experimenter and then received the second part of the questionnaire, which was identical for all conditions. On the first page, they were asked to indicate their general impression of positive attitudes towards open data for all three groups with one item each, by asking them to put a cross onto a horizontal line representing percentages. The endpoints of the line were labeled with 0% at the leftmost end, 50% in the center, and 100% at the rightmost end and had vertical markings representing increments of 10%. We measured the distance in millimeters of participants' marking from the leftmost point of the scale and then calculated the absolute deviation from the theoretically accurate aggregate

of each group's norm as our measure of *norm estimate accuracy*.

Measure of Recall Accuracy. Next, participants were asked to recall and note as numbers the nine percentages they had been presented at the end of the first part of the questionnaire and indicate on a 7-point scale (1 = *not difficult at all* to 7 = *extremely difficult*) how difficult they had found this task. From the percentages given by participants, we calculated nine scores of absolute deviation from the presented number and then averaged these values for the three groups, resulting in three mean recall deviation scores as an inverse measure of *recall accuracy*.

Norm Conformity Measure. We measured participants' attitudes towards open data with two items (e.g., "All in all, open data will bring more good than bad.") on 7-point scales (1 = *not true at all* to 7 = *completely true*) each. We then computed the mean of those two items to serve as our measure of *norm conformity*. Because the in-group was portrayed as generally more in favor of the topic (while the antagonistic out-group was portrayed as opposed to it), higher values represented greater conformity with the in-group norm.

Additional Measures. Then, on 7-point scales (1 = *not true at all* to 7 = *completely true*), we measured participants' identification with the three groups with one item each (Postmes et al., 2013), perceived reliability of the survey results from the in-group with one item, and collective efficacy of the in-group regarding the group's goals in the area of open data with one item. With one final item, we measured participants' political orientation by asking them to put a cross onto a horizontal line with endpoints labeled *left* at the leftmost end, *right* at the rightmost end and a vertical marking representing the midpoint of the scale. We measured the distance in millimeters of participants' marking from the leftmost point of the scale, with 48 millimeters representing the visually highlighted scale midpoint. Finally, participants were asked to make a guess regarding the aim of our research, fully debriefed and thanked for their participation.

Results

Planned Analyses

To test whether participants had reflected on high vs. low personal control as intended, we conducted a 2 (high control vs. low control) $\times$ 2 (delay vs. no delay) ANOVA with scores on our corresponding manipulation check item as the dependent variable. Mean scores in the high control condition ($M = 5.29$, $SD = 1.17$) were revealed to be higher than mean scores in the low control condition ($M = 3.20$, $SD = 1.19$), as reflected in a

significant main effect of *control salience*, $F(1, 300) = 236.52$, $p < .001$, $\eta_p^2 = .441$. The main effect of *delay* and the interaction effect were not statistically significant; $p = 0.733$ and $p = 0.836$, respectively.

To analyze our two measures of norm perception, we conducted two separate mixed-factorial ANOVAs with *group* as a within-subjects factor and *control salience* and *delay* as between-subjects factors.

For our measure of *estimate accuracy*, we found no significant three-way interaction of the factors *group*, *control salience*, and *delay*, $F(2, 598) = 0.66$, $p = .519$, $\eta_p^2 = .002$ ($f = .045$). The test had a statistical power of .15. A sensitivity analysis (WebPower; general linear model; $\alpha = .05$) indicated that .80 power requires an effect of at least $\eta_p^2 = .016$ ($f = .130$). Figure 4A contains a plot of the required power to detect three-way interaction effects between $\eta_p^2 = 0$ and $\eta_p^2 = .2$ given our design and sample size. Furthermore, the interaction of the within-subjects factor *group* and the between-subjects factor *control salience* was not significant, $F(2, 598) = 0.40$, $p = .67$, $\eta_p^2 = .001$. However, when ignoring the within-subjects factor, there was a significant between-subjects interaction of the factors *control salience* and *delay* across all three levels, $F(1, 299) = 6.15$, $p = .014$, $\eta_p^2 = .02$. In tendency, the descriptive pattern represented more accurate recall after control threat across all groups when no delay was present. In addition, we found a significant main effect of the within-subjects factor *group*, $F(2, 598) = 16.05$, $p < .001$, $\eta_p^2 = .05$. Descriptively, norm estimates were generally least accurate for the neutral out-group, followed by the in-group, and most accurate for the antagonistic out-group. For our measure of *recall accuracy*, there was no significant three-way interaction of *group*, *control salience*, and *delay*, $F(2, 578) = 0.57$, $p = .566$, $\eta_p^2 = .002$ ($f = .045$). The test had a statistical power of .15. A sensitivity analysis (WebPower; general linear model; $\alpha = .05$) indicated that .80 power requires an effect of at least $\eta_p^2 = .016$ ($f = .130$). Furthermore, the interaction of the within-subjects factor *group* and the between-subjects factor *control salience* was not significant, $F(2, 578) = 0.02$, $p = .98$, $\eta_p^2 = .000$. However, we found a significant main effect of the within-subjects factor *group*, $F(2, 578) = 57.88$, $p < .001$, $\eta_p^2 = .167$. Descriptively, recall was generally least accurate for the neutral out-group, followed by the antagonistic out-group, and most accurate for the in-group.

To analyze scores on our measure of *norm conformity*, we conducted an ANOVA with the between-subjects factors *control salience* and *delay*. Here, we found no significant interaction, and no significant main effects, all $F_s < 1$.

Discussion

For the measure of group norm *estimate accuracy*, we found an interaction of *control salience* and the presence of a delay task, which was not specific for the in-group or any of the two out-groups. This finding is in line with the notion of generally improved processing of information after control threat, i.e. unspecific vigilance, occurring directly after threat (Jonas et al., 2014; Pittman and D'Agostino, 1989). However, it does not support our hypothesis of norm vigilance, as there was no vigilance specific for in-group norms, regardless of the presence of a delay task. Interestingly, we found that exact recall and processing in terms of aggregation was least accurate for the neutral out-group in both measures. This could indicate that our reasoning of including a neutral out-group alongside with an antagonistic out-group had merit. Quite possibly, the latter was more informative about in-group norms than the neutral group. However, remembering inconsistent information may also generally have been more difficult than remembering consistent norms. Importantly, we found no systematic effects of *control salience*, regardless of the inclusion of a delay. Contrary to our hypotheses and previous research on control threat, we also did not find heightened norm conformity after threat, regardless of the presence of a delay task. One possible explanation may lie in the deviation from previous research investigating norm conformity after threat to control: Our participants worked on the norm perception and recall measures before giving their own preference regarding open data. This may have activated an analytical mindset in participants, preventing automatic motivational effects to occur (Simon et al., 1997).

Study 5

Groups need agreed-upon rules and goals to appear agentic and to enable group members to enact group-based action. Thus, people should desire such norms when membership in agentic groups becomes important for them. Our initial theorizing was that we should expect improved accuracy for information about behaviorally relevant norms after threat to control. Due to the lack of empirical support for this hypothesis, we decided to investigate a possible alternative mechanism of motivated norm perception. As self-categorization research (Hogg, 2010; Turner et al., 1987) has shown, people perceive an in-group norm when intragroup consensus is high but at the same time strong intergroup differences are needed for people to detect a norm that is typical for the in-group. Although information about relevant norms should become more behaviorally relevant after threat, people may be so motivated to perceive

Table 4

Means and standard deviations (SD) for the central dependent variables of Study 4 by delay and control salience. Note that lower deviation scores represent higher accuracy.

			Norm Estimate Deviation			Norm Recall Deviation		
			Left	Right	Neutral	Left	Right	Neutral
Mean								
	No Delay	High Control	13.4	9.68	16.4	15.6	16.0	22.3
	No Delay	Low Control	10.0	8.64	12.6	14.4	16.5	21.8
	Delay	High Control	11.3	10.8	13.4	15.3	17.8	23.0
	Delay	Low Control	12.2	11.7	14.9	14.0	15.8	21.0
SD								
	No Delay	High Control	9.74	6.71	11.7	9.34	9.69	9.57
	No Delay	Low Control	9.51	8.39	11.5	8.63	10.6	10.1
	Delay	High Control	11.0	9.59	9.82	10.4	9.20	10.7
	Delay	Low Control	9.69	8.91	11.7	9.14	8.31	10.3

strong and distinct in-group norms, that motivated intergroup distortion of this information could trump accuracy and precision. In other words, accurately memorizing survey results may be less useful for thinking and acting in terms of group membership than mentally maximizing norm strength and distinctiveness in the proper direction. Hence, in Study 5, we modified the paradigm of Study 4 to be able to test this hypothesis of motivated intergroup distortion of normative information. Instead of providing exact numbers and asking participants to accurately recall them, we modified our material and the recall measure to be intentionally vague. For this purpose, instead of three groups, we now included four: The political left to serve as our in-group, the political right to serve as an antagonistic out-group, and two neutral out-groups we expected to be less relevant to participants. Survey results for all groups were presented to all participants, but we manipulated whether strong norm differences were present between the in-group and the antagonistic out-group (high relevance condition) or between the more neutral out-groups (low relevance condition). We included this factor to rule out the possibility of an unspecific effect. As in the previous studies, we manipulated high or low control salience. Hence, the study had a 2×2 between-subjects design with the factors *control salience* and *norm relevance*. Our central dependent variable was a measure of perceived norm tendency for each group, from which we computed the within-subjects factor *intergroup contrast* with two levels representing the contrast between the in-group and antagonistic out-group, and the contrast between the two more neutral out-groups. We expected low control (vs. high control) participants to perceive the greatest distance

between norms of the relevant groups (i.e., to maximize distinctiveness), but only when this difference was portrayed to exist between the in-group and the antagonistic out-group. Furthermore, we expected low control (vs. high control) participants to perceive stronger and more prevalent norms for the in-group and antagonistic out-groups, but not for the more neutral out-groups. Due to the high exclusion rate in Study 4, we did not set exclusion criteria for Study 5 and instead decided to test for moderation by political orientation.

Method

Participants

Because no previous data to estimate the effect size existed, we aimed to collect a sample of 50 participants per cell. Participants were recruited in front of a university library building. Participation was voluntary and participants received a chocolate bar as compensation. To ensure our logic of in-group and out-group categorization would apply to the analyzed sample, we told participants we were looking for politically left-leaning subjects during recruitment. After exclusion of six participants who aborted the procedure and/or did not give final consent, the total sample consisted of 194 participants ($M_{age} = 25.6$, $SD_{age} = 5.55$). Out of this group, 113 specified their gender as female, 55 as male and 9 specified other or no gender. Several participants handed in incomplete questionnaires with some items left unchecked, and could therefore only be included in some, but not all analyses.

Procedure and Materials

After giving initial consent to participate in the study, participants were randomly assigned to one of eight versions of the questionnaire and received the corresponding first of two parts.

Cover Story. We used an introductory text to establish our cover story. Participants learned that our research was about known differences in opinions on the topic of open data. Contrary to the introductory text used in Study 4 we did not specify these differences further. Furthermore, we informed participants that we were interested in differences in people's reasoning on the topic and would hence ask them to write a short essay later on in the procedure. To further increase the motivational relevance of the topic, we informed them that some of these essays would later be made public.

Control Salience Manipulation. Depending on experimental condition, participants completed one of two versions of the *control salience* manipulation task. This task and the corresponding manipulation check measurement were identical to those described in Study 1.

Delay Task. Then all participants completed the 60-item version of the PANAS-X (Grühn et al., 2010; Watson and Clark, 1999) which served as a delay task.

Group Norm Presentation. Subsequently, participants read a text meant to introduce the topic of open data and underline its relevance. Crucially, the text introduced the notion that opinions on the topic of open data were largely divided by exclusive preferences for either transparency or data protection. The text was designed to resemble a printout from the official website of the German Federal Agency for Civic Education to increase plausibility. At the bottom of the page, they were presented with a horizontal bar graph (see Figure 1) representing, in this order, bogus survey results from four different groups: A politically left leaning sample served as the in-group, a politically right leaning sample served as an antagonistic out-group, and employees of two different government agencies (the urban green space planning office and the local authority real estate office) served as two out-groups with relatively low relevance to participants' salient social identity. For participants in the low relevance condition, the first two groups were portrayed as undecided and without strong preference for either transparency or data protection, while the two less relevant groups were portrayed as having strong and opposing preferences. For participants in the high relevance condition, the first two groups were portrayed as having strong and opposing preferences, while the two less relevant groups were portrayed as undecided and without strong preference for either transparency or data protection. In addition,

we counterbalanced which of the two groups with strong preferences was portrayed to prefer transparency over data protection and vice versa. Hence, each participant saw one of four possible versions of this graph. Importantly, the graph was designed to be slightly cut off at the lower end and did not include a scale, to ensure participants would have no numerical reference regarding the visualized data, besides their general impression of the magnitude of the bars.

Plausibility Checks. Following the group norm presentation, participants returned the first part of the questionnaire to an experimenter and received the second part of the questionnaire, which was identical for all conditions. On the first page, they were asked to answer five 7-point scale items (1 = *not true at all* to 7 = *completely true*) concerning the reliability and quality of the article they had just read.

Group and Norm Perception Measures. On the following four pages, they answered nine items separately for each of the four groups from the previously presented bar graph. First, we asked about the group's tendency towards either transparency or open data. For this measure, participants were asked to place a cross on a horizontal line labeled *transparency* at the leftmost end and *data protection* at the rightmost end, as well as a vertical line representing the midpoint of the line. We measured the distance from the leftmost point of the scale, from which we computed two contrast scores as our main dependent variable at the two levels of the within-subjects factor *intergroup contrast*: One for the absolute deviation between the in-group and the antagonistic out-group estimates, and one for the absolute deviation between the two neutral out-groups. Next, we asked participants to indicate the proportion of group members that had a clear preference by writing down a percentage. Then, on 7-point scales, we asked how strong the preference of the group was (1 = *not strong at all* to 7 = *extremely strong*), how unified in its preference the group was (1 = *not unified at all* to 7 = *completely unified*), and how reliably the survey results reflected the group's opinion (1 = *not reliable at all* to 7 = *completely reliable*). With four 7-point scale items (1 = *not true at all* to 7 = *completely true*), we measured our participants' impression of the group's general agency based on a scale by (Stollberg et al., 2015). After evaluating each of the four groups separately, participants were then asked about their general impression of how clearly all groups had positioned themselves on a 7-point scale (1 = *not unambiguous at all* to 7 = *completely unambiguous*).

Norm Conformity Measure. Next, we asked participants to indicate their personal preference by placing another cross on a horizontal line labeled *transparency*

2 mixed-factorial ANOVA with the between-subjects factors *control salience* and *norm relevance* and the within-subjects factor *intergroup contrast*. As the two levels of the within-subjects factor, we entered the contrast score for the in-group vs. the antagonistic out-group as well as the contrast score between the two neutral out-groups. The outcome measure was the difference between the perceived norms of the two respective groups. Neither a significant three-way interaction, $F(1, 177) = 0.04, p = .850, \eta_p^2 = .000$, nor a two-way interaction of the within-subjects factor *intergroup contrast* with *control salience*, $F(1, 177) = 1.26, p = .262, \eta_p^2 = .007$, nor an overall main effect of *control salience*, $F(1, 177) = 0.244, p = .622, \eta_p^2 = .001$, or of *norm relevance*, $F(1, 177) = 1.52, p = .221, \eta_p^2 = .008$, were present. The test had a statistical power of .05. A sensitivity analysis (WebPower; general linear model; $\alpha = .05$) indicated that .80 power requires an effect of at least $\eta_p^2 = .042$ ($f = .211$). Figure 5A contains a plot of the required power to detect three-way interaction effects between $\eta_p^2 = 0$ and $\eta_p^2 = .2$ given our design and sample size. A significant interaction of the within-subjects factor *intergroup contrast* and *norm relevance*, $F(1, 177) = 233.8, p < .001, \eta_p^2 = .569$, revealed that greater differences between the groups were perceived depending on *norm relevance*, i.e., which were portrayed to differ from each other. The main effect of the within-subjects factor *intergroup contrast*, $F(1, 177) = 9.26, p = .003, \eta_p^2 = .050$, reached significance, indicating that on average greater differences were perceived between the more relevant groups than between the neutral groups.

We investigated a possible moderation effect by political orientation by examining a three-way interaction of political orientation and the two between-subjects factors on both levels of the within-subjects factor *intergroup contrast* in a general linear model, but no significant three-way interactions emerged ($p = .23$ for *relevant groups* and $p = .08$ for *irrelevant groups*).

To investigate effects on the perceived proportion of group members with a clear preference, we conducted a $2 \times 2 \times 4$ mixed-factorial ANOVA with the between-subjects factors *control salience* and *norm relevance* and the within-subjects factor group. As the four levels of the within-subjects factor, we entered the percentages estimated by participants for each group. The three-way interaction did not reach significance, $F(3, 378) = 0.158, p = .924, \eta_p^2 = .001$. The two-way-interaction of the within-subjects factor and *norm relevance* was significant, $F(3, 378) = 121.23, p < .001, \eta_p^2 = .491$, indicating that participants had adjusted their estimates according to the materials they had been presented, i.e., depending on which groups had been portrayed to have directional norms and which had not. No other main

effects or interaction effects were significant.

To investigate effects on perceived norm strength, we conducted a $2 \times 2 \times 4$ mixed-factorial ANOVA with the between-subjects factors *control salience* and *norm relevance* and the within-subjects factor group. As the four levels of the within-subjects factor, we entered the ratings of the corresponding items measuring perceived norm strength for each group. The three-way interaction did not reach significance, $F(3, 531) = 0.291, p = .832, \eta_p^2 = .002$. The two-way-interaction of the within-subjects factor and *norm relevance* was significant, $F(3, 531) = 140.865, p < .001, \eta_p^2 = .443$, indicating that participants had adjusted their estimates according to the materials they had been presented, i.e., depending on which groups had been portrayed to have directional norms and which had not. No other main effects or interaction effects were significant.

To investigate effects on perceived intragroup consensus, we conducted a $2 \times 2 \times 4$ mixed-factorial ANOVA with the between-subjects factors *control salience* and *norm relevance* and the within-subjects factor group. As the four levels of the within-subjects factor, we entered the ratings of the corresponding items for each group. The three-way-interaction did not reach significance, $F(3, 537) = 0.076, p = .973, \eta_p^2 = .000$. The two-way-interaction of the within-subjects factor and *norm relevance* was significant, $F(3, 537) = 67.89, p < .001, \eta_p^2 = .275$, indicating that participants had adjusted their estimates according to the materials they had been presented, i.e., depending on which groups had been portrayed to have directional norms and which had not. The main effect of *norm relevance* was significant, $F(1, 179) = 5.694, p = .018, \eta_p^2 = .031$, indicating that participants in the low norm relevance condition had generally rated consensus within group preferences to be higher than those in the high relevance norm condition. No other main effects or interaction effects were significant.

We limited the analyses of our norm conformity measure to the high relevance norm condition, as participants in the low relevance norm condition had not been presented with a directional in-group preference. Hence, we conducted an ANOVA on the appropriate sub-sample with the between-subjects factor *control salience* as the sole predictor. Descriptively, means generally tended in the direction of the group norm on both factor levels, however, the directional preference was stronger in the high control condition. The corresponding main effect of the factor *control salience* was not significant, $F(1, 96) = 1.69, p = .196, \eta_p^2 = .017$. We investigated a possible moderation effect by political orientation by examining a two-way interaction of political orientation and the between-subjects factor *con-*

trol salience in a general linear model, but no significant interaction effect emerged, $p > .05$.

Exploratory Analyses

Because our measure of identification was positively correlated with our measure of norm conformity in the high relevance condition, $r = .38$, $p < .001$, we repeated the analysis of possible norm conformity effects with in-group identification as the moderator. However, there was no significant interaction effect, $p > .05$.

Discussion

In Study 5, we set out to address a possible alternative mechanism of norm perception after control threat. We hypothesized that threatened participants would strive to maximize the strength and distinctiveness of in-group norms. However, we did not find effects of control threat specific to in-group norms on any of our measures. Accordingly, the novel hypothesis was not supported. Due to this study being the first to test this specific hypothesis, it should be noted that this null-finding should not be overinterpreted. Notably, we also did not find a tendency of norm conformity after threat in this Study. One possible reason for this non-replication of an established effect may lie in the nature of our measure of norm conformity. In line with our hypothesis that threatened participants would strive to maximize norm strength, we operationalized norm conformity in terms of the strength of people's own preference in the direction of the presented in-group norm. However, due to the lack of an absolute scale during norm presentation, this may have created the issue that a proportion of participants did not consider extreme preference ratings to represent norm conformity with the in-group.

General Discussion

In a series of four studies, we investigated the hypothesis that threat to personal control facilitates a vigilant state specifically for information about relevant social norms. In Study 1, we tested our norm vigilance hypothesis by investigating how many acceptable and unacceptable behaviors attributed to different groups participants could correctly recall, and whether there was a specific advantage for in-group norm for participants in the low control condition. We were unable to detect such a pattern, possibly due to the non-sufficient difficulty of the recall measure developed specifically for this study. In Study 2, we modified the existing football-betting odds paradigm in which effects of threat on conformity with salient norms had previously been demonstrated, and extended the paradigm by adding a measure of recall accuracy for the normative information.

Again, we found no evidence for norm vigilance after threat. This may have been due to lacking categorization and identification with the in-group employed in our paradigm and resulting low chances of getting any group-based effect. Supporting this reading, a descriptive pattern of norm conformity after threat was not statistically significant. Interestingly, we found that optimistic norms were recalled better than pessimistic norms, although independently from control salience. In Study 3, we decided to apply the more established silence-in the library paradigm for measuring vigilance for norms, and extended this design by manipulating control salience. For the first time, we did find an effect involving control salience. However, the pattern underlying this effect was only partly in line with our expectations: Supporting our hypothesis, only those participants who were exposed to low (vs. high) control salience were faster in accurate responses to normative than non-normative stimuli. However, this effect has previously been demonstrated several times to be the baseline reaction for this part of the paradigm and thus, the present pattern of an eliminated effect under salient high control speaks rather for an effect of control elevation instead of control threat. Relatedly, high control participants generally performed better than low control participants. In the design of Study 4, we explicitly investigated two possible boundary conditions previously not addressed in our paradigms: First, we decided to manipulate the inclusion of a delay task to determine whether effects on norm vigilance may be moderated by temporal dynamics. Second, we introduced the distinction between an antagonistic and a more neutral out-group, to rule out the possibility that information about out-group norms may also become more relevant after threat in order to maximize distinctiveness of group-related behavior. Indeed, we did find that information about the neutral out-group was recalled least accurately, while accuracy for the in-group and antagonistic out-group was quite similar to each other. However, regardless of the presence of a delay task, we did not find an interaction pattern resembling specific norm vigilance after threat. However, we did find an interaction of delay and control salience, indicating a pattern of unspecific vigilance for the norms of all groups after threat when no delay was present. Once more, we did not find that control salience influenced conformity with in-group norms. Study 5 was a modified version of Study 4, in which we adjusted the paradigm to test an altered hypothesis of motivated intergroup distortion instead of accuracy for norms after control threat. However, we found no indication of this distortion occurring for normative information on several measures. A more general possible explanation of lacking *control salience*

effects on norm recall and personal preferences in both Study 4 and Study 5 might lie in the nature of the groups we used. Left-wing and right-wing people differ on various prominent normative features (e.g., attitudes towards immigration, national identity, etc.) that should have been highly salient for participants. Thus, perhaps, the left-leaning participants of this study did not need intergroup differentiation on open data policies to determine what the important, or central, norms of their left-wing in-group identity were.

The Absence of Norm Conformity

The bulk of our studies focused on identifying vigilant reactions to threat specific to in-group norms, instead of the full process of how this mechanism may then relate to norm conformity reactions in terms of mediation. However, we specifically set out to investigate norm vigilance as a phenomenon occurring in situations where control threat elicits norm conformity. In those studies where we did include some operationalization of norm conformity, we did not find effects of control salience on them. This was surprising, as norm conformity reactions after threat, and also specifically after control threat, have been previously observed numerous times (e.g., Stollberg et al., 2017). Notably, however, reported effect sizes for these norm conformity effects were typically rather small and designing studies specifically for conceptual replication would require large sample sizes to achieve appropriate statistical power. Although known boundary conditions and potential moderators of norm conformity were considered while designing our experiments, we did not focus on these downstream effects while designing them. This is why norm conformity was always measured after participants had been exposed to the recall tasks and norm estimations. This may have primed an analytical mindset. As symbolic threat defenses, such as norm conformity, can be assumed to occur under conditions of experiential thinking (Simon et al., 1997), this may have prevented these effects to occur. At the same time, the norm estimation tasks may have primed a personal assessment of norm prevalence that may have counteracted, and thus attenuated, the experimental norm manipulation. These circumstances should be kept in mind when considering the implications of our (null) findings on norm perception after threat and the failure to conceptually replicate the effect should be interpreted cautiously.

Evaluating the Norm Vigilance Hypothesis

Across five studies, we directly tested the norm vigilance hypothesis with varying operationalizations (although with a consistently strong focus on accuracy and

precision across four studies) and consistently failed to find convincing evidence for it. Plausible explanations for null-findings, such as boundary conditions that may not have been met, can almost always be found post hoc. Accordingly, we cannot rule out that norm vigilance does exist or occurs only under specific conditions. It is possible that vigilance for normative information does occur after threat, but that it does not manifest in terms of improved recall accuracy or improved performance in a lexical decision task. Moreover, some true effects may be so small that our studies were unable to detect them due to insufficient statistical power. After four studies focusing on precision and accuracy, our initial hypothesis began to seem unlikely and we arrived at the conclusion that the accumulated null-findings had rendered it too implausible to justify further empirical investigation without modifying our underlying theoretical assumptions. It should be noted that this decision was not merely pragmatic and data driven, but also accompanied and influenced by ongoing internal debate about possible flaws in our theoretical reasoning.

Motivated Intergroup Distortion as an Alternative Mechanism

Accuracy and precision may not be the only plausible manifestations of a vigilant state specific to group norms. Thus, in our final study, we adjusted our hypothesis away from the notion of enhanced accuracy specific to information about relevant norms to investigate the alternative possibility of motivated intergroup distortion of such information. Perceiving strong and distinct in-group norms may represent a more likely and powerful strategy to think and act in accordance with a salient in-group identity when perceptions of control are threatened. For a mechanism like this, where available information about in-group norms is exaggerated to enable a more efficient group-based reaction, accuracy may only be of secondary importance or largely irrelevant. However, the results of Study 5 did not provide support for this alternative account. It should be noted that in recent work by Potoczek et al. (2018), effects of control threat on the exaggerated perception of in-group norms did emerge. In their experiment, threatened participants (vs. high control participants) showed an increased tendency to classify normative information, which they had never seen before, as previously presented norms of a potential in-group. This findings points towards a similar mechanism to what we proposed: A tendency to distort reality in order to perceive group norms after threat. Similarly, unpublished work by Czepluch et al. (2018) demonstrates that threat, in this case mortality salience threat, may lead to enhanced social projection, i.e., ambiguous norms

being recalled as more pronounced in the direction of participants' own preference. Similarly, Fritsche et al. (2008; Study 1) found that estimates of in-group social consensus were elevated after death-related threat to control. Accordingly, this hypothesis of motivated intergroup distortion of information about norms after threat may not be disqualified by a single null-finding, although little published research on the phenomenon exists at this point in time.

The Role of Pre-Existing Assumptions About Norms

In most instances where groups may provide a meaningful social identity, it could be assumed that people who identify with those groups are not naive to what constitutes appropriate behavior as a group member. Accordingly, we should assume that people will often, if not most times, operate with existing and more or less malleable assumptions, or personal hypotheses, about the norms of relevant in-groups. This constitutes a major limitation of our norm vigilance hypothesis and may be crucial for identifying phenomena related to norm vigilance. This issue was also reflected in one of the main practical challenges we faced while designing our studies: How can a meaningful but not trivial social norm of a meaningful in-group be convincingly portrayed and manipulated experimentally? Indeed, this caveat represents both a practical problem for constructing appropriate experimental paradigms, and a basic theoretical one: If situations where people have no prior expectations about important social norms are difficult to create, why should vigilance play an important role in explaining real-world normative behavior? Even if the proposed process existed, and we simply failed to find evidence for it for one reason or another, the ecological validity of the process should prove to be rather small. Hence, we would now argue that a more viable strategy to explore the process underlying the relationship between control threat and norm conformity, should be the deliberate investigation of situations where people do have prior assumptions about appropriate social behavior. This would shift the focus away from mere search for previously unknown information, possibly a largely artificial setting, towards a better understanding of how available normative information is handled in more realistic settings where pre-existing ideas about what constitutes appropriate behavior may play an important role.

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Felix Czepluch: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing—Original Draft, Visualization, Project Administration. **Philipp Jugert:** Conceptualization, Funding Acquisition, Supervision, Writing—Review & Editing. **Immo Fritsche:** Conceptualization, Funding Acquisition, Supervision, Writing—Review & Editing.

Author order reflects relative contribution.

Open Science Practices



This article earned the Preregistration, Open Data, Open Materials, and Open Code badge for preregistering the hypothesis and analysis before data collection, and for making the data, materials, and code openly available. It has been verified that the analysis reproduced the results presented in the article. The entire editorial process, including the open reviews, is published in the online supplement.

References

- Aarts, H., & Dijksterhuis, A. (2003). The silence of the library: Environment, situational norm, and social behavior. *Journal of Personality and Social Psychology*, 84(1), 18–28. <https://doi.org/10.1037/0022-3514.84.1.18>
- Barth, M., Masson, T., Fritsche, I., & Ziemer, C.-T. (2018). Closing ranks: Ingroup norm conformity as a subtle response to threatening climate change. *Group Processes Intergroup Relations*, 21(3), 497–512. <https://doi.org/10.1177/1368430217733119>
- Berkowitz, L., & Lepage, A. (1967). Weapons as aggression-eliciting stimuli. *Journal of Personality and Social Psychology*, 7(2, Pt.1), 202–207. <https://doi.org/10.1037/h0025008>

- Bock, J.-J. (2018). Polarisation, and minority engagement in germany's refugee crisis. *International Journal of Politics, Culture, and Society*, 31(4), 375–396. <https://doi.org/10.1007/s10767-018-9288-8>
- Burger, J., & Cooper, H. (1979). The desirability of control. *Motivation and Emotion*, 3(4), 381–393. <https://doi.org/10.1007/BF0099405>
- Burke, B., Martens, A., & Faucher, E. (2010). Two decades of terror management theory: A meta-analysis of mortality salience research. *Personality and social psychology review*, 14(2), 155–195. <https://doi.org/10.1177/108886830935232>
- Chatard, A., Hirschberger, G., & Pyszczynski, T. (2020). A word of caution about many labs 4: If you fail to follow your preregistered plan, you may fail to find a real effect. <https://doi.org/10.31234/osf.io/ejubn>
- Cialdini, R., Kallgren, C., & Reno, R. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. In M. Zanna (Ed.), *Advances in experimental social psychology*. advances in experimental social psychology (pp. 201–234, Vol. 24). Academic Press. [https://doi.org/10.1016/S0065-2601\(08\)60330-5](https://doi.org/10.1016/S0065-2601(08)60330-5)
- Cox, C., Cooper, D., Vess, M., Arndt, J., Goldenberg, J., & Routledge, C. (2009). Bronze is beautiful but pale can be pretty: The effects of appearance standards and mortality salience on sun-tanning outcomes. *Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association*, 28(6), 746–752. <https://doi.org/10.1037/a0016388>
- Crombez, G., Eccleston, C., De, V., Van, D., & De, C. (2008). Is it better to have controlled and lost than never to have controlled at all? an experimental investigation of control over pain. *Pain*, 137(3). <https://doi.org/10.1016/j.pain.2007.10.028>
- Czepluch, F., Masson, T., & Jugert, P. (2018). *Psychological threat increases social projection* (Talk). 51. Kongress der Deutschen Gesellschaft für Psychologie, Frankfurt am Main, Germany.
- Eriksson, K., Strimling, P., & Coultas, J. (2015). Bidirectional associations between descriptive and injunctive norms. *Organizational Behavior and Human Decision Processes*, 129, 59–69. <https://doi.org/10.1016/j.obhdp.2014.09.011>
- Fennis, B., & Aarts, H. (2012). Revisiting the agentic shift: Weakening personal control increases susceptibility to social influence. *European Journal of Social Psychology*, 42(7), 824–831. <https://doi.org/10.1002/ejsp.1887>
- Fritzsche, I., Jonas, E., Ablasser, C., Beyer, M., Kuban, J., Manger, A.-M., & Schultz, M. (2013). The power of we: Evidence for group-based control. *Journal of Experimental Social Psychology*, 49(1), 19–32. <https://doi.org/10.1016/j.jesp.2012.07.014>
- Fritzsche, I., Jonas, E., & Fankhänel, T. (2008). The role of control motivation in mortality salience effects on ingroup support and defense. *Journal of Personality and Social Psychology*, 95(3), 524–541. <https://doi.org/10.1037/a0012666>
- Fritzsche, I., Jonas, E., Kayser, D., & Koranyi, N. (2010). Existential threat and compliance with pro-environmental norms. *Journal of Environmental Psychology*, 30(1), 67–79. <https://doi.org/10.1016/j.jenvp.2009.08.007>
- Fritzsche, I., & Jugert, P. (2017). The consequences of economic threat for motivated social cognition and action. *Current Opinion in Psychology*, 18, 31–36. <https://doi.org/10.1016/j.copsyc.2017.07.027>
- Gailliot, M., Stillman, T., Schmeichel, B., Maner, J., & Plant, E. (2008). Mortality salience increases adherence to salient norms and values. *Personality and Social Psychology Bulletin*, 34(7), 993–1003. <https://doi.org/10.1177/0146167208316791>
- Gardner, W., Pickett, C., & Brewer, M. (2000). Social exclusion and selective memory: How the need to belong influences memory for social events. *Personality and Social Psychology Bulletin*, 26(4), 486–496. <https://doi.org/10.1177/0146167200266007>
- Gelfand, M., Raver, J., Nishii, L., Leslie, L., Lun, J., Lim, B., Duan, L., Almaliach, A., Ang, S., Arnadottir, J., Aycan, Z., Boehnke, K., Boski, P., Cabecinhas, R., Chan, D., Chhokar, J., D'Amato, A., Ferrer, M., Fischlmayr, I., & Yamaguchi, S. (2011). Differences between tight and loose cultures: A 33-nation study. *Science*, 332(6033), 1100–1104. <https://doi.org/10.1126/science.1197754>
- Giannakakis, A., & Fritzsche, I. (2011). Social identities, group norms, and threat: On the malleability of ingroup bias. *Personality and Social Psychology Bulletin*, 37(1), 82–93.
- Gray, J., & McNaughton, N. (2003). *The neuropsychology of anxiety*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780198522713.001.0001>

- Greenaway, K., Haslam, S., Cruwys, T., Branscombe, N., Ysseldyk, R., & Heldreth, C. (2015). From “we” to “me”: Group identification enhances perceived personal control with consequences for health and well-being. *Journal of Personality and Social Psychology*, 109(1), 53–74. <https://doi.org/10.1037/pspi0000019>
- Greenberg, J., Pyszczynski, T., & Solomon, S. (1986). The causes and consequences of a need for self-esteem: A terror management theory. In R. Baumeister (Ed.), *Public self and private self* (pp. 189–212). Springer New York. https://doi.org/10.1007/978-1-4613-9564-5_10
- Grühn, D., Kotter-Grühn, D., & Röcke, C. (2010). Discrete affects across the adult lifespan: Evidence for multidimensionality and multidirectionality of affective experiences in young, middle-aged and older adults. *Journal of Research in Personality*, 44(4), 492–500. <https://doi.org/10.1016/j.jrp.2010.06.003>
- Guinote, A. (2007). Power and goal pursuit. *Personality and Social Psychology Bulletin*, 33(8), 1076–1087. <https://doi.org/10.1177/0146167207301011>
- Heister, J., Würzner, K.-M., Bubenzner, J., Pohl, E., Haneforth, T., Geyken, A., & Kliegl, R. (2011). Dlexdb – eine lexikalische datenbank für die psychologische und linguistische forschung. *Psychologische Rundschau*, 62(1), 10–20. <https://doi.org/10.1026/0033-3042/a000029>
- Hellmann, D., Dickel, N., Böhner, G., & Erb, H.-P. (2017). Mind over matter: Target states, not stimulus characteristics, determine information processing in minority influence. In S. Pappas-tamou, A. Gardikiotis, & G. Prodromitis (Eds.), *Current issues in social psychology. majority and minority influence: Societal meaning and cognitive elaboration* (pp. 137–157). Routledge, an imprint of the Taylor Francis Group.
- Hogg, M. (2010). Influence and leadership. In S. Fiske, D. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (pp. 1166–1207). John Wiley Sons, Inc. <https://doi.org/10.1002/9780470561119.socpsy002031>
- Hogg, M., & Adelman, J. (2013). Uncertainty-identity theory: Extreme groups, radical behavior, and authoritarian leadership. *Journal of Social Issues*, 69(3), 436–454. <https://doi.org/10.1111/josi.12023>
- Holbrook, C., Sousa, P., & Hahn-Holbrook, J. (2011). Unconscious vigilance: Worldview defense without adaptations for terror, coalition, or uncertainty management. *Journal of Personality and Social Psychology*, 101(3), 451–466. <https://doi.org/10.1037/a0024033>
- Jacobi, C., Brand-Jacobi, J., Westenhöfer, J., & Weddige-Diedrichs, A. (1986). Zur erfassung von selbstkontrolle. entwicklung einer deutschsprachigen form des self-control-schedule und der desirability of control scale. *Diagnostica*, 32(3), 229–247.
- Jarvis, B. G. (2016). *MediaLab & DirectRT* (Computer software; Version 2016.1.108). Empirisoft Corporation. New York, NY. <https://www.empirisoft.com/>
- Jonas, E., & Fritsche, I. (2012). Follow the norm! *Social Psychology*, 43(1), 28–32. <https://doi.org/10.1027/1864-9335/a000077>
- Jonas, E., Martens, A., Kayser, D., Fritsche, I., Sullivan, D., & Greenberg, J. (2008). Focus theory of normative conduct and terror-management theory: The interactive impact of mortality salience and norm salience on social judgment. *Journal of Personality and Social Psychology*, 95(6), 1239–1251. <https://doi.org/10.1037/a0013593>
- Jonas, E., McGregor, I., Klackl, J., Agroskin, D., Fritsche, I., Holbrook, C., Nash, K., Proulx, T., & Quirin, M. (2014). Chapter four - threat and defense: From anxiety to approach. In J. Olson & M. Zanna (Eds.), *Advances in experimental social psychology* (pp. 219–286, Vol. 49). Academic Press. <https://doi.org/10.1016/B978-0-12-800052-6.00004-4>
- Jonas, E., Sullivan, D., & Greenberg, J. (2013). Generosity, greed, norms, and death – differential effects of mortality salience on charitable behavior. *Journal of Economic Psychology*, 35, 47–57. <https://doi.org/10.1016/j.joep.2012.12.005>
- Kallgren, C., Reno, R., & Cialdini, R. (2000). A focus theory of normative conduct: When norms do and do not affect behavior. *Personality and Social Psychology Bulletin*, 26(8), 1002–1012. <https://doi.org/10.1177/0146167200261009>
- Kay, A., Gaucher, D., Napier, J., Callan, M., & Laurin, K. (2008). God and the government: Testing a compensatory control mechanism for the support of external systems. *Journal of Personality and Social Psychology*, 95(1), 18–35. <https://doi.org/10.1037/0022-3514.95.1.18>
- Keuleers, E., & Brysbaert, M. (2010). Wuggy: A multilingual pseudoword generator. *Behavior Research Methods*, 42(3), 627–633. <https://doi.org/10.3758/BRM.42.3.627>
- Klein, R., Cook, C., Ebersole, C., Vitiello, C., Nosek, B., Chartier, C., & Ratliff, K. (2019). Many labs 4: Failure to replicate mortality salience effect

- with and without original author involvement. <https://doi.org/10.31234/osf.io/vef2c>
- Koranyi, N., Schreckenbach, F., & Rothermund, K. (2015). The implicit cognition of lying: Knowledge about having lied to a question is retrieved automatically. *Social Cognition*, 33(1), 67–84. <https://doi.org/10.1521/soco.2015.33.1.67>
- Lammers, J., Dubois, D., Rucker, D., & Galinsky, A. (2017). Ease of retrieval moderates the effects of power: Implications for the replicability of power recall effects. *Social Cognition*, 35(1), 1–17. <https://doi.org/10.1521/soco.2017.35.1.1>
- McGregor, I., Nash, K., Mann, N., & Phills, C. (2010). Anxious uncertainty and reactive approach motivation (ram). *Journal of Personality and Social Psychology*, 99(1), 133–147. <https://doi.org/10.1037/a0019701>
- McGregor, I., Nash, K., & Prentice, M. (2010). Reactive approach motivation (ram) for religion. *Journal of Personality and Social Psychology*, 99(1), 148–161. <https://doi.org/10.1037/a0019702>
- Pittman, T., & D'Agostino, P. (1989). Motivation and cognition: Control deprivation and the nature of subsequent information processing. *Journal of Experimental Social Psychology*, 25(6), 465–480. [https://doi.org/10.1016/0022-1031\(89\)90001-2](https://doi.org/10.1016/0022-1031(89)90001-2)
- Postmes, T., Haslam, S., & Jans, L. (2013). A single-item measure of social identification: Reliability, validity, and utility. *The British Journal of Social Psychology*, 52(4), 597–617. <https://doi.org/10.1111/bjso.12006>
- Potoczek, A., Bukowski, M., Jaśko, K., & Jamróz, K. (2018). Influence of threat to personal control on norm interest, detection, and following: Social and cognitive underpinnings. *Talk given at 20th European Social Cognition Network (ESCON) Transfer of Knowledge Conference*.
- Proulx, T., & Heine, S. (2008). The case of the transmogrifying experimenter: Affirmation of a moral schema following implicit change detection. *Psychological Science*, 19(12), 1294–1300. <https://doi.org/10.1111/j.1467-9280.2008.02238.x>
- Proulx, T., & Heine, S. (2009). Connections from kafka: Exposure to meaning threats improves implicit learning of an artificial grammar. *Psychological Science*, 20(9), 1125–1131. <https://doi.org/10.1111/j.1467-9280.2009.02414.x>
- Pyszczynski, T., Greenberg, J., & Solomon, S. (1999). A dual-process model of defense against conscious and unconscious death-related thoughts: An extension of terror management theory. *Psychological Review*, 106, 835–845.
- Reno, R., Cialdini, R., & Kallgren, C. (1993). The transsituational influence of social norms. *Journal of Personality and Social Psychology*, 64(1), 104–112. <https://doi.org/10.1037/0022-3514.64.1.104>
- Rosenblatt, A., Greenberg, J., Solomon, S., Pyszczynski, T., & Lyon, D. (1989). Evidence for terror management theory: I. the effects of mortality salience on reactions to those who violate or uphold cultural values. *Journal of Personality and Social Psychology*, 57(4), 681–690. <https://doi.org/10.1037/0022-3514.57.4.681>
- Rothschild, Z., Abdollahi, A., & Pyszczynski, T. (2009). Does peace have a prayer? the effect of mortality salience, compassionate values, and religious fundamentalism on hostility toward outgroups. *Journal of Experimental Social Psychology*, 45(4), 816–827. <https://doi.org/10.1016/j.jesp.2009.05.016>
- Routledge, C., Arndt, J., & Goldenberg, J. (2004). A time to tan: Proximal and distal effects of mortality salience on sun exposure intentions. *Personality and Social Psychology Bulletin*, 30(10), 1347–1358. <https://doi.org/10.1177/0146167204264056>
- Schindler, S., Hilgard, J., Fritsche, I., Burke, B., & Pfattheicher, S. (2023). Do salient social norms moderate mortality salience effects? a (challenging) meta-analysis of terror management studies. *Personality and social psychology review : an official journal of the Society for Personality and Social Psychology, Inc*, 27(2), 195–225. <https://doi.org/10.1177/10888683221107267>
- Schindler, S., Reinhardt, N., & Reinhard, M.-A. (2021). Defending one's worldview under mortality salience: Testing the validity of an established idea. *Journal of Experimental Social Psychology*, 93, 104087. <https://doi.org/10.1016/j.jesp.2020.104087>
- Schumann, K., McGregor, I., Nash, K., & Ross, M. (2014). Religious magnanimity: Reminding people of their religious belief system reduces hostility after threat. *Journal of Personality and Social Psychology*, 107(3), 432–453. <https://doi.org/10.1037/a0036739>
- Sedik, G., Kofta, M., & Tyska, T. (1993). Effects of uncontrollability on subsequent decision making: Testing the cognitive exhaustion hypothesis. *Journal of Personality and Social Psychology*,

- 65(6), 1270–1281. <https://doi.org/10.1037/0022-3514.65.6.1270>
- Simon, L., Greenberg, J., Harmon-Jones, E., Solomon, S., Pyszczynski, T., Arndt, J., & Abend, T. (1997). Terror management and cognitive-experiential self-theory: Evidence that terror management occurs in the experiential system. *Journal of Personality and Social Psychology*, 72(5), 1132–1146. <https://doi.org/10.1037/0022-3514.72.5.1132>
- Stollberg, J., Fritsche, I., & Bäcker, A. (2015). Striving for group agency: Threat to personal control increases the attractiveness of agentic groups. *Frontiers in Psychology*, 6, 649. <https://doi.org/10.3389/fpsyg.2015.00649>
- Stollberg, J., Fritsche, I., & Jonas, E. (2017). The groupy shift: Conformity to liberal in-group norms as a group-based response to threatened personal control. *Social Cognition*, 35(4), 374–394. <https://doi.org/10.1521/soco.2017.35.4.374>
- Turner, J., Hogg, M., Oakes, P., Reicher, S., & Wetherell, M. (1987). *Rediscovering the social group: A self-categorization theory*. Basil Blackwell.
- Watson, D., & Clark, L. (1999). The panas-x. <https://doi.org/10.17077/48vt-m4t2>
- Whitson, J., & Galinsky, A. (2008). Lacking control increases illusory pattern perception. *Science*, 322(5898), 115–117. <https://doi.org/10.1126/science.1159845>

Appendix
Power Analyses for All Studies

Figure A1

Plot of the estimated required power to detect a within-between interaction effect of the factors control salience and surveyed group on recall accuracy between $\eta_p^2 = 0$ and $\eta_p^2 = .20$ given the design and sample size of Study 1. The filled circle represents the effect size η_p^2 and power obtained from our sample. The unfilled circle represents the estimated effect size required to obtain a power of .80.

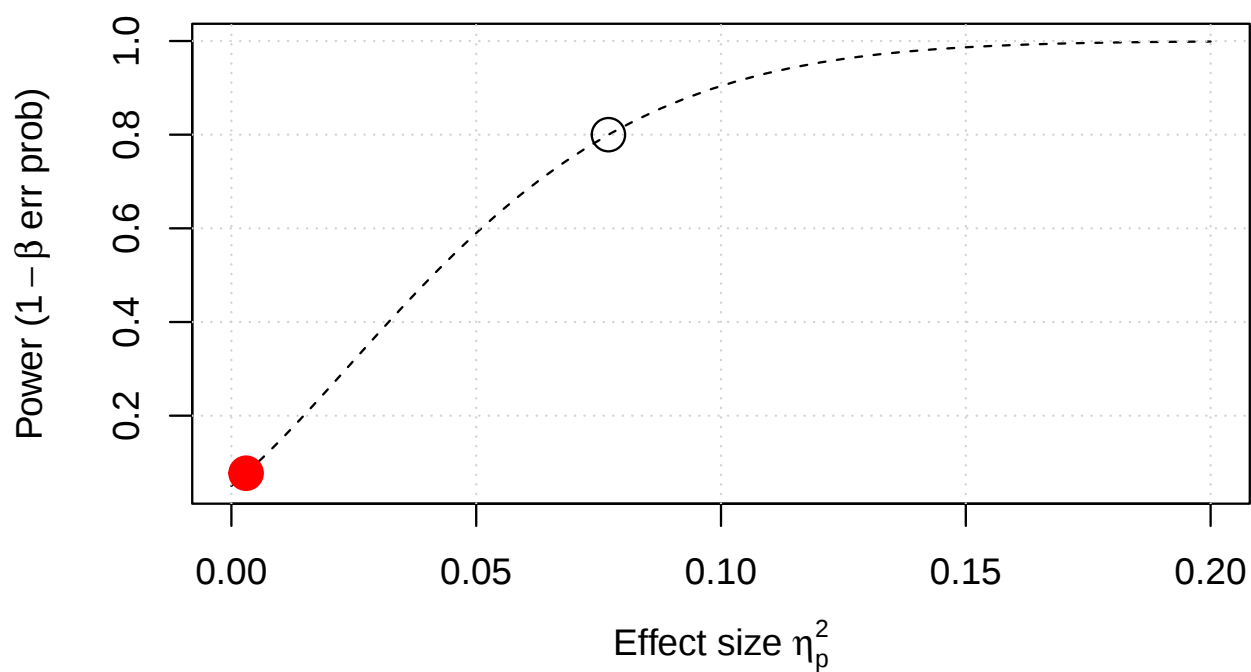


Figure A2

Plot of the estimated required power to detect an interaction effect of the factors control salience and norm type on recall accuracy as well as on optimism between $\eta_p^2 = 0$ and $\eta_p^2 = .20$ given the design and sample size of Study 2. The filled circle represents the values obtained for recall accuracy obtained from our sample. The triangle represents the values obtained for norm conformity in terms of optimism. The unfilled circle represents the estimated effect size required to obtain a power of .80.

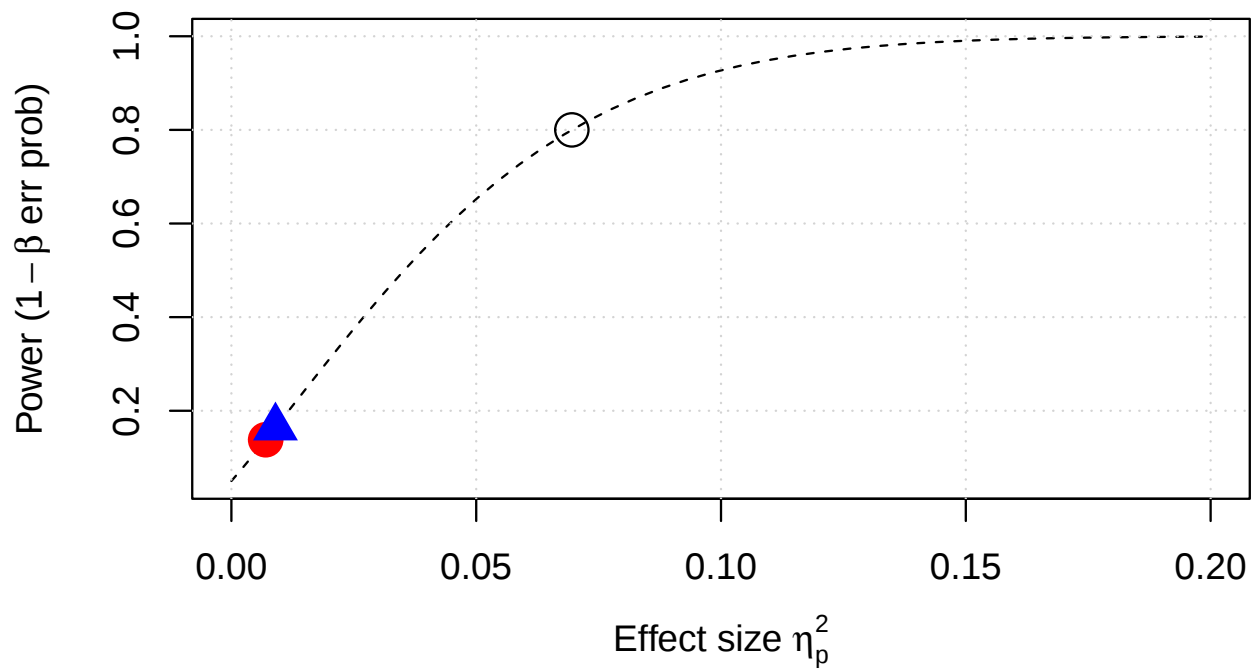


Figure A3

Plot of the estimated required power to detect within-between interaction effects on IES between $\eta_p^2 = 0$ and $\eta_p^2 = .20$ given our design and sample size in Study 3. The filled circle represents the effect size and power obtained from our sample. The unfilled circle represents the estimated effect size required to obtain a power of .80.

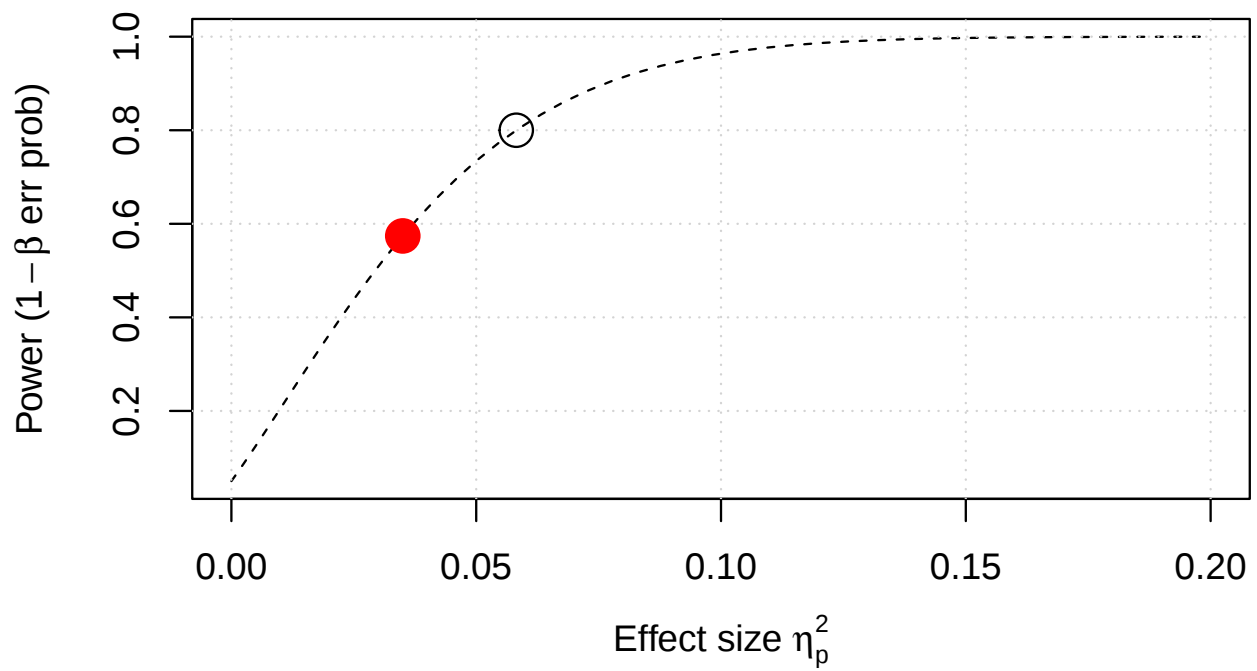


Figure A4

Plot of the estimated required power to detect three-way interaction effects between $\eta_p^2 = 0$ and $\eta_p^2 = .20$ given the degrees of freedom in Study 4. The filled circle represents the effect size and power obtained for the measure estimate accuracy. The unfilled triangle represents the effect size and power obtained for the measure recall accuracy. The unfilled circle represents the estimated effect size required to obtain a power of .80.

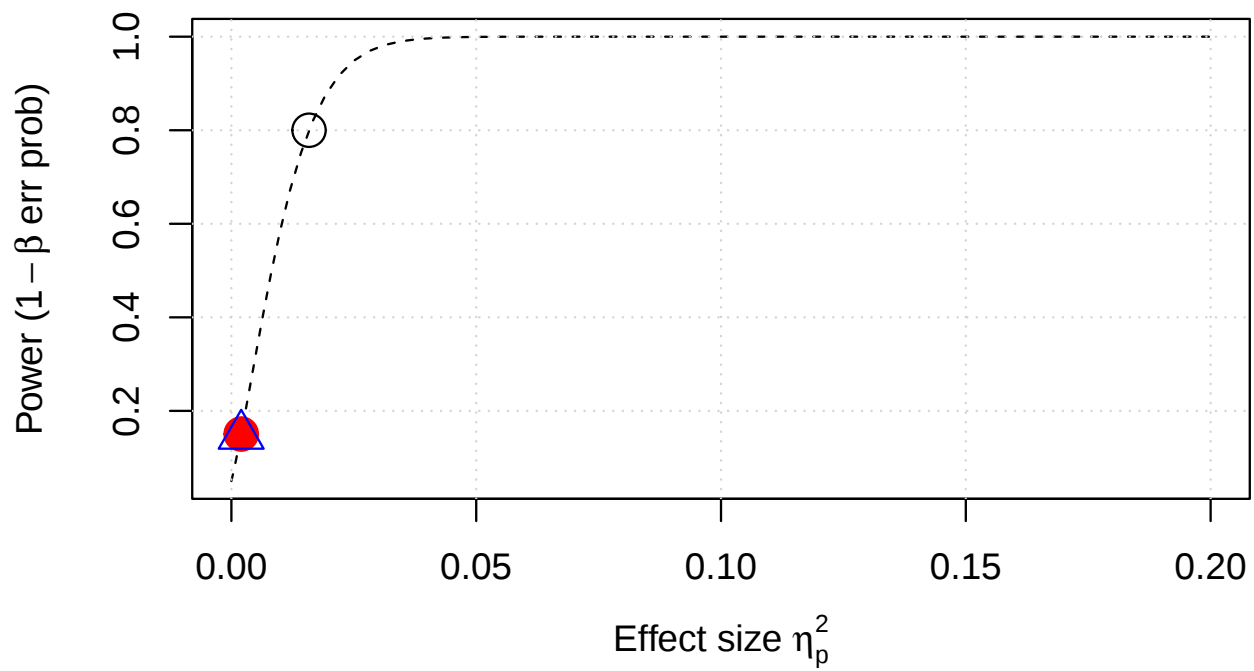


Figure A5

Plot of the estimated required power to detect a three-way interaction effect between $^2p = 0$ and $^2p = .20$ given the degrees of freedom in Study 5. The filled circle represents the effect size and power obtained from our sample. The unfilled circle represents the estimated effect size required to obtain a power of .80.

