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Perceived Supernatural Support Heightens Battle Confidence: A Knife Combat Field Study

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### Abstract

Religiosity has been historically linked with propensities for both antisocial aggression and prosocial bravery, and prior research employing indirect measures affirms that envisioning the support of supernatural agents promotes confidence in engaging in violent conflict. Here, we provide the first test of this hypothesis within a realistic combat paradigm (i.e., simulated knife fighting). We primed the presence of supernatural aid and collected measures of trait religiosity as well as political orientation, which typically co-varies with religiosity and has been similarly linked with battle confidence in prior research. Consistent with predictions, participants evinced greater confidence in their own performance in an imminent knife battle following a guided visualization exercise analogous to prayer summoning supernatural aid. Moreover, individual differences in trait religiosity comparably predicted battle confidence, an effect that was not accounted for by co-varying differences in political orientation, which also predicted battle confidence if analyzed independently of religiosity. Against expectations, we observed no effect of the visualization manipulation, religious belief, or political orientation on coalitional confidence in the groups participants fought alongside. These results, derived from unusually valid methods, are discussed as they extend prior research on the confidence-enhancing effects of perceived supernatural support.

Keywords: religion, risk-taking, violence, threat, aggression, political orientation

"The LORD is the stronghold of my life – of whom shall I be afraid? When evil men advance against me to devour my flesh, when my enemies and my foes attack me, they will stumble and fall. Though an army besiege me, my heart will not fear; though war break out against me, even then will I be confident."

- Psalm 27:1-3, New International Version

Religious conviction has long been associated with both valor and violent extremism (Sosis & Alcorta, 2008; Johnson, 2008). Though the historical, social and psychological processes linking faith with force are many and complexly intertwined, one significant factor appears to be the capacity for envisioned supernatural support to bolster believers' confidence. Although some aggressive acts associated with religiosity may be motivated by factors such as moral convictions or societal norms orthogonal to supernatural cognition, convergent lines of evidence indicate that perceiving supernatural agents as sources of aid can inspire aggressive responses to conflict by bolstering confidence in victory, much as one might expect to follow from perceptions of access to powerful earthly allies. For example, participants semantically primed with thoughts of either actual or supernatural allies envision a threatening adversary as physically smaller and weaker than do controls (Holbrook, Fessler, & Pollack, 2016). Also consistent with the premise that perceived supernatural support can palliate anxiety about the mortal danger inherent to violent conflict, heightened belief in God has been associated with exposure to reminders of mortality (Holbrook, Izuma, Deblieck, Fessler, & Iacoboni, 2016; Jong, Halberstadt, & Bluemke, 2013), and experimental primes of the concept of God have been found to heighten willingness to engage in physically risky behavior while diminishing perceptions of the self as likely to suffer physical harm (Kupor, Laurin, & Levav, 2015). Beyond heightening

confidence in the face of harm, there is some evidence that cues of supernatural support can also enhance the propensity to initiate conflict, as subliminal primes of religious concepts increase levels of costly punishment in economic games in a manner reminiscent of retributive aggression (McKay, Efferson, Whitehouse, & Fehr, 2011). Religious faith in supportive supernatural agents is negatively associated with fear of death (Jong et al., 2013) and, with regard to coalitional conflict, religiosity also tracks propensities for aggression on behalf of in-groups (e.g., Atran & Ginges, 2012; Kruglanski, Chen, Dechesne, Fishman, & Orehek, 2009; Sosis, Phillips, & Alcorta, 2012). For example, in a sample of U.S. Christians, trait religiosity has been observed to positively predict support for engaging in violent warfare in the Middle East (Shaw, Quezada, & Zárate, 2011).<sup>1</sup>

The tendency for belief in supernatural support to spur aggressive confrontation with opposing groups may appear maladaptive given that imaginary benefactors cannot materially assist devout individuals or coalitions. However, when aggregated over numerous conflicts, overconfidence in one's group can actually foster success by hardening resolve to fight or by intimidating opponents (Johnson & Fowler, 2011; Wrangham, 1999). Thus, notwithstanding instances in which religiously motivated over-confidence may lead to disastrous outcomes, belief in supportive supernatural agents may well exert net positive dividends favored by cultural group selection (Richerson et al., 2016). Complementarily, the capacity for belief in supernatural entities—and the system of rituals, norms, and social institutions attendant to such beliefs—has been postulated to bolster cooperation and coordination within groups, with benefits theorized to transcend those related to intergroup conflict in particular (e.g., Bulbulia, 2004; Roes & Raymond, 2003; Richerson et al., 2016; Sosis, 2006). Potential adaptive benefits

notwithstanding, the representation of supernatural agents may have arisen as a by-product of mental adaptations for social functions such as mentalizing (Boyer & Bergstrom, 2008; Schjødt, Stodkilde-Jorgensen, Geertz, & Roepstorff, 2009) or interpersonal affiliation (Holbrook, Hahn-Holbrook, & Holt-Lunstad, 2015), rather than for a specific function unique to supernatural cognition (Boyer, 2003; but see Johnson, 2015; for a review of the debate, see Sosis, 2009). Thus, whether owing to an adaptation or a by-product, representing oneself as aided by powerful supernatural allies or magical forces should theoretically enhance confidence in prospective conflict, much as would representing oneself as aided by actual allies, weapons, or abilities.

Political conservatism typically covaries with religiosity, and similarly predicts confidence in aggression. Political orientation has been theorized to index individual differences in threat-reactivity (Hibbing, Smith, & Alford, 2014; Lilienfeld & Latzman, 2014). For example, when compared with liberals, conservatives evince greater physiological reactivity to threatening imagery or noise bursts (Oxley et al., 2008), invest more time looking at threats (Dodd et al., 2012), are more implicitly distracted by threatening imagery (Cararro, Castelli, & Macchiella, 2011; McLean et al., 2014), and are more likely to believe claims regarding hazards (Fessler, Pisor, & Holbrook, 2017). Crucially, threat-vigilance should not be mistaken for timidity, as conservatives generally favor aggressive responses to conflict (e.g., Herrmann, Tetlock, & Visser, 1999; Johnson, McDermott, Cowden, & Tingley, 2012; Jost & Amodio, 2012). For example, conservatives in both the United States and Spain envision perceived enemies as physically smaller and weaker than do liberals, evince greater confidence in the ability for their nation to defeat terrorist groups via confrontation (Holbrook, López-Rodríguez, Fessler, Vázquez & Gómez, 2017), and attribute less intelligence to terrorist militants relative to in-group soldiers (Holbrook, López-Rodríguez & Gómez, in press). In sum, conservatives appear more intensely reactive and aggressive toward threatening adversaries than liberals.

Given that political conservatism and religiosity appear to comparably foster confidence in aggressive action, tests of the unique contribution of either construct should account for the contribution of the other. Unfortunately, prior research programs exploring the relationships between religiosity or political orientation and confidence in aggression (or non-violent risktaking) have generally proceeded independently of one another. Moreover, both prior literatures have relied on indirect methods administered in laboratories or online, far from actual hazard. In addition, much of the prior work disproportionately relies on convenience samples of undergraduate psychology majors. Here, we sought to redress these limitations by testing whether perceived supernatural support would predict battle confidence, in a field study which realistically approximated actual violent conflict and took political orientation into account. We recruited a community sample of participants enrolled in a knife combat training class, primed them with supernatural support or a control topic, and collected measures of their trait religiosity and political orientation. We staged knife battles and solicited ratings of both their personal confidence in their own battle performance and their *coalitional* confidence in the overall performance of the members of the group that they were randomly assigned to fight alongside. This design enabled us to test three directional predictions derived from the prior literature, but which have not previously been tested in the context of imminent physical conflict:

- i) Experimental primes of supernatural support will heighten battle confidence.
- ii) Trait religiosity will predict greater battle confidence.

iii) Political orientation will predict battle confidence such that liberals exhibit less confidence than conservatives.

This design also allowed us to exploratorily assess iv) whether perceived supernatural support comparably predicts personal confidence in oneself and coalitional confidence in one's group within the context of knife combat. Given the predominantly dyadic nature of the mode of simulated knife combat employed in this paradigm—essentially a series of brief one-on-one confrontations with relatively little coalitional coordination—we tentatively anticipated greater effects of perceived supernatural support on confidence in one's personal battle performance. Finally, we also exploratorily tested v) whether effects of trait religiosity would be accounted for by covarying individual differences in political orientation—or vice versa.

### Methods

The study design was pre-registered shortly after data collection commenced and prior to analysis (note that our data analysis strategy was not specified in the pre-registration document; see <u>http://osf.io/sxfk2</u>). The full materials, dataset, and analysis syntax are available in the Supplemental Online Material.

**Participants and overview of procedure.** 104 participants were recruited via social media to take part in the study in exchange for the opportunity to receive knife fighting instruction and eligibility for a \$50 raffle prize. As there was no prior research employing these methods to consult in determining the appropriate sample size, we sought a relatively large sample to minimize the risk of obtaining spurious results or exaggerated effect sizes which can be artifacts of using small samples. Data were pre-screened for completeness, reporting greater ability to mentally picture the visualizations than "not at all well", and participating in the battle

simulations.<sup>2</sup> The final sample consisted of 92 adults (57.6% male; 34.8% White, 22.8% Latino, 22.8% Asian, 5.4% Black, 3.3% Native American, 6.5% More than one, and 4.3% Other;  $M_{age} =$  31.99, SD = 9.06). All participants provided informed consent prior to participation.

In a mixed design, participants engaged in two simulated group knife battles, each of which was preceded by a guided visualization task lasting approximately 90 seconds. Each participant experienced both the Supernatural and control visualizations, in balanced order. The battles were 30 seconds in duration, involved approximately 10-15 same-sex combatants each (broken into two opposing groups of equal numbers), and required substantial physical effort (e.g., rapidly leaping, feinting, and striking; see Figure 1, top panel; also see Videos 1 and 2 in the Supplemental Online Materials [SOM]). The battles were same-sex in order to minimize concerns regarding sex asymmetries in physical attributes such as arm length (i.e., on average, women expecting to fight with knives against men might be less confident, and vice versa).

All participants were previously unfamiliar with knife fighting and received approximately 20 minutes of instruction in basic techniques prior to each battle. The participants were taught where to strike and how to feint, slash, lunge, advance, retreat, gauge an opponent's reach, and so on. This initial training period functioned both to establish rudimentary fighting skills and to minimize likely practice effects, which might introduce noise, by providing all participants a substantial degree of practice prior to the visualization manipulations. Participants were randomly assigned to one of two groups who stood on opposing ends of the class area, practiced together during training intervals, and wore colored duct tape on their shirts to make group membership clear during battle (see SOM Figure S1). Participants were instructed not to attack fellow group members during the battle simulations, but only to attack members of the opposing group. The knives were blunt replicas commonly used for training purposes. Although safe, being slashed or stabbed with these training knives can be painful, as participants will have learned during the training sessions.

The study was framed as ostensibly exploring the impact of mental visualization on athletic performance, with no mention of religiosity or aggression. The Supernatural visualization primed participants to envision support from unseen powers protecting and guiding participants during the battle; the control nature visualization shared a generally positive valence with the Supernatural visualization, but involved vividly imagining a tree. The nature of the unseen supernatural support was left intentionally vague in order to engage persons of differing faiths as well as avowed atheists or agnostics. The visualizations were presented in counterbalanced order and played aloud using portable speakers. Both visualizations were narrated by the same male voice (author JP; see SOM to access the audio stimuli). Participants in each group listened to the visualizations while sitting together with their eyes closed, out of earshot of the opposing group, prior to each battle (see SOM Figure S2). The instructions delivered by the research assistant prior to each visualization were identical:

"Your squad will be competing in a knife battle simulation with the other squad. First, I'm going to play a brief visualization exercise. Please form in a semi-circle around the speaker, and take a knee. Thanks. Now, please close your eyes. Listen closely, and follow the voice."

### Supernatural Visualization Recording:

Take three deep breaths. One... two... three. Good. Now, I want you to imagine yourself, knife in your hand, ready to fight. Now, imagine that there's a powerful

force with you. You might call that force God, or spirit, or the universe, or maybe even just the power of intention. Whatever that higher power is for you, imagine that it is with you now, that it is by your side, that it is within you, in every part of you. Imagine that power guiding your hands and your eyes, guiding your knife steady, protecting you as you move through the battle. Know that this powerful guide is with you, and with your team, helping your team, wanting your team to win. What does this powerful energy feel like? Feel it deeply within and all around you. It is protecting you, it is guiding you, it is yours. Now take a few more moments to feel this power, to feel this force. And on the count of three, I want you to slowly open your eyes. One... two... three. Okay, slowly open your eyes, and rise to your feet.

### Control Visualization Recording:

Take three deep breaths. One... two... three. Good. Now, I want you to imagine yourself, knife in your hand, ready to fight. Now, imagine that you are standing next to a tree. The tree might be an oak, or a pine, or a eucalyptus, or whatever sort of tree you prefer. Whichever tree you prefer, imagine standing next to it. The tree is by your side. Imagine what the bark looks like. Imagine what the leaves look like. Imagine touching the tree. What does it feel like? Now take a few more moments to imagine this tree. And on the count of three, I want you to slowly open your eyes. One... two... three. Okay, slowly open your eyes, and rise to your feet. Participants received brief surveys immediately after each visualization and before each battle. Two face-valid, 9-point Likert ratings probed confidence in the imminent battle (1 = Not at all well; 9 = Extremely well).<sup>3</sup> Personal confidence was measured according to responses to "How well do you feel you will perform in the battle compared with members of the opposing squad?"; *coalitional confidence* was measured according to responses to "How well do you feel your squad will perform compared with the opposing squad?" As a manipulation check, we also probed participants' ability to imagine the contents of each visualization, using the same scale anchors: "During the visualization, how clearly were you able to picture what was described?" Participants who reported the least ability to picture the visualization (i.e., "not at all well") were dropped prior to analysis, and we detected no significant effect of condition on visualization clarity, p = .083, 95% CI = [-.980, .061]. (Follow-up tests confirmed that re-inserting these individuals does not alter the pattern of results, nor does controlling for visualization clarity.)

Following the two battles, after a brief rest and water break, participants completed a final packet including measures of religiosity and political orientation among demographic questions. Religiosity was assessed according to two measures. First, participants rated how closely connected they felt with "God or a Higher Power," using a modified version of the Inclusion of the Other in the Self scale composed of seven pairs of circles ranging from non-overlapping to almost entirely overlapping (Aron, Aron, & Smollan, 1992). This closeness measure was explicitly framed as distinct from trait religious belief: "Some people may have firm belief, but not feel a strong connection, while other people may have less firm belief, but still feel a strong connection" (see SOM for the complete measure). Second, participants completed a modified three-item version of Gervais and Norenzayan's (2012) measure of

religious belief using 9-point Likert scales (e.g., "I believe in a personal God or a Higher Power";  $\alpha = .85$ ; see SOM). These two measures (r[90] = .71, p < .001) were then standardized as z-scores and averaged to form an overall religiosity score. Employing these distinct measures of perceived spiritual connection to supportive supernatural agents versus belief in their existence permitted exploratory tests of the relative contribution to perceived state support versus trait doctrinal support on battle confidence.

Next, participants' political orientation was measured according to a modified version of a previously validated political attitude index (Dodd et al., 2012; see SOM). Participants rated whether they agreed, disagreed, or were uncertain about an array of topics, presented in random order, half of which were conservative in nature (e.g., "school prayer," "tax cuts") and half of which were liberal in nature (e.g., "abortion rights," "socialism"). For each conservative topic, agreement was scored as +1 and disagreement was scored as -1. For each liberal topic, agreement was scored as -1 and disagreement was scored as +1. All "uncertain" responses were scored as zero. The responses were then tallied such that positive values indicate conservatism and negative values indicate liberalism ( $\alpha = .85$ ).

Finally, the raffle was conducted. The raffle tickets were shaken in a large hat and the participant with the winning number received \$50. Participants were then thanked, compensated, and debriefed.

### Results

We used multilevel modeling (the SPSS MIXED command) to test whether the visualization condition, trait religiosity, or political orientation predicted personal or coalitional battle confidence outcomes (for descriptives, see SOM Table S1). Models for personal and

coalitional confidence were run separately. All models including participants' two confidence ratings at Level 1 and visualization condition at Level 2 (0 = Control, 1 = Supernatural). Random intercepts and slopes were included in all models to account for the shared variance in confidence ratings within participants; unstructured covariance matrices were used. The order of visualization presentation, the weekend on which data collection occurred, participant age, and gender were also included as covariates, as was the interaction between the Supernatural visualization and the order in which it was presented. (Follow-up tests confirm that removing any or all of these covariates does not alter the pattern of statistically significant results). All linear variables were standardized (z-scored) to increase ease of model interpretation.

Supernatural visualization and battle confidence. As hypothesized, the model revealed that personal confidence was greater following the Supernatural Ally visualization (M = 6.28, SD = 1.30) than following the control visualization (M = 5.93, SD = 1.57), coef = .58, t = 4.41, p < .001, 95% CI = [.318, .839] (see Figure 1; see Table 1 for full model). No effects of the order of visualization, weekend on which data collection occurred, age, or gender were observed (see Table 1), although there was a significant interaction between order and the visualization condition (for details, see SOM Table S1).<sup>4</sup> Against expectations, there was no significant effect of visualization condition on coalitional confidence in the model, although there was a trend, p = .051 (see SOM Table S2).



Figure 1. *Top:* Participants engaged in realistic simulated knife combat. (Image of participants used with their permission.) *Bottom:* Marginal means and 95% confidence intervals (see text for model details). Participants were more confident about their imminent battle performance after visualizing supernatural aid than after a control visualization.

### Table 1

Parameter Estimates for Model Including Supernatural Visualization, Trait Religiosity, Political Orientation, Order of Visualization, Order\*Visualization, Weekend of Data Collection, Age and Gender as Predictors of Personal Battle Confidence

|                               | Parm. Est. | SE  | t     | р     | 95% CI     |
|-------------------------------|------------|-----|-------|-------|------------|
| Supernatural visualization    | .58        | .13 | 4.41  | <.001 | .318, .839 |
| Trait religiosity             | .28        | .10 | 2.95  | .004  | .092, .473 |
| Political orientation         | .13        | .10 | 1.34  | .183  | 061, .316  |
| Order of visualization        | .27        | .23 | 1.16  | .249  | 190, .725  |
| Order*Visualization condition | 57         | .17 | -3.34 | .001  | 903, .229  |
| Weekend of data collection    | .08        | .18 | .44   | .660  | 278, .436  |
| Age                           | 17         | .09 | -1.80 | .075  | 348, .017  |
| Gender                        | .03        | .19 | .13   | .894  | 345, .394  |
| Intercept                     | 33         | .21 | -1.59 | .115  | 746, .082  |

Note. N = 92. Parameter estimates are standardized. *Supernatural visualization*: 0 = Control, 1 = Supernatural. *Order of visualization*: 0 = Control first, 1 = Supernatural first. *Weekend of data collection*: 0 = First, 1 = Second. *Gender*: 0 = Female, 1 = Male. Random intercept was included to account for the shared variance within participants. The pattern of the order\*visualization interaction is given in SOM Table S1. **Religiosity, political orientation, and battle confidence.** Also as hypothesized, trait religiosity significantly predicted personal battle confidence (see Table 1). Against predictions, no effect of religiosity was observed with regard to coalitional confidence, p = .506. Somewhat unexpectedly, there were also no effects of political orientation on either personal confidence (see Table 1) or coalitional confidence, p = .785 (see SOM Table S2), in this model.

*Exploratory tests of potential distinct effects of feelings of spiritual connection versus religious belief.* We conducted exploratory tests of potentially distinct contributions of feelings of spiritual connection versus religious belief on battle confidence by including each variable as separate predictors, in models which once again also included the visualization condition and political orientation, as well as the order of visualization, order\*visualization interaction, weekend of data collection, age, and gender. Indeed, reported feelings of spiritual connection emerged as a significant predictor of personal battle confidence, *coef* = .39, *SE* = .12, *t* = 3.22, *p* = .002, 95% *CI* = [.148, .627], whereas religious belief had no apparent relationship with personal battle confidence, *p* = .416 (see SOM Table S3 for full model statistics). Similarly, feelings of spiritual connection significantly predicted coalitional battle confidence, *coef* = .27, *SE* = .13, *t* = 2.10, *p* = .039, 95% *CI* = [.014, .524], whereas religious belief had no apparent effect, *p* = .109 (see SOM Table S4 for full model statistics).

*Exploratory tests of potential effect of political orientation when disregarding religiosity.* As anticipated, trait religiosity and political conservatism were positively correlated, r(90) = .37, p < .001 (for descriptives, see SOM Table S5). Accordingly, we next explored whether political orientation might predict battle confidence in models which do not control for covarying religiosity. Consistent with the prior literature linking political orientation with combat confidence, once religiosity was removed from the model, political orientation significantly positively predicted personal battle confidence, coef = .23, SE = .09, t = 2.52, p = .014, 95% CI = [.048, .414] (see SOM Table S6 for full model statistics). However, there was no effect of political orientation on coalitional confidence, p = .578.

*Interaction tests.* Finally, we tested whether religiosity or political orientation moderated the influence of the visualization condition by running follow-up models including the relevant interaction terms (see SOM to access analysis syntax). We observed no two-way interactions between visualization condition and either religiosity or political orientation for personal or coalitional battle confidence, ps = .07 - .93, nor any three-way interaction between visualization condition for personal confidence, p = .057, or coalitional confidence, p = .73. Thus, we observed no interactions between the supernatural visualization, religiosity, and political orientation with regard to either measure of battle confidence.

### Discussion

We primed participants to visualize either supernatural support or a control topic immediately prior to engaging in immersive simulated knife combat. As hypothesized, we found that making salient the presence of supernatural support heightened confidence in one's performance during battle. Likewise, we observed parallel effects of religiosity, such that more religious participants reported greater personal battle confidence, in an effect which accounted for a comparable relationship between political conservatism and personal battle confidence. These overall results, obtained using an ecologically valid priming technique reminiscent of prayer and within a context of realistically simulated combat, bolster findings derived via less direct methods (e.g., Holbrook et al., 2016; McKay, Efferson, Whitehouse & Fehr, 2011), and may shed light on the real-world association between religiosity, political orientation, and confidence in engaging in violent conflict.

We observed no significant effects of the supernatural visualization, religious beliefs, or political orientation on coalitional confidence. The null effect of the manipulation may reflect the fact that the supernatural visualization did not highlight support for the entire group, but rather for the individual listener. In addition, the mode of combat employed here—knife fighting—was inherently dyadic in nature. Had we provided groups the opportunity to formulate coordinated strategies of attack prior to fighting, or had we utilized a more inherently coalitional mode of combat, we may well have detected greater effects on coalitional confidence. Further, we may not have sufficiently evoked a sense of group identity in our sample, particularly given that some participants arrived to the classes with friends or loved ones who were later randomly assigned to the opposing group. Thus, factors particular to the priming stimulus, sample, and/or mode of combat may have suppressed otherwise detectable effects of perceived supernatural support on coalitional battle confidence. Future research should explore these possibilities by explicitly priming supernatural support for entire coalitions fighting in a concerted manner against an opposing force which is not composed of real-world allies.

Notably, we did observe positive relationships between feelings of spiritual connection and both personal and coalitional confidence, whereas no such associations obtained with avowed religious belief. The link between feelings of spiritual support and confidence in coalitional teammates may reflect a structurally similar representation of the perceived support of present allies, in line with prior findings that the physical presence of proximate allies decreases the perceived formidability of antagonists (Fessler & Holbrook, 2013), and that subtle primes of the presence of physical allies can heighten participants' perceived relative formidability in a manner comparable to that of primes of the presence of supernatural allies (Holbrook et al., 2016). Indeed, supernatural agents appear to be largely conceptualized as persons (Barrett, 2000; Boyer, 2003; Kapogiannis et al., 2009; Schjødt, Stodkilde-Jorgensen, Geertz, & Roepstorff, 2009), and the measure of feelings of spiritual connection used in the present study referenced "God or a Higher Power," a framing likely to tap the relative sense of proximity with an imagined supportive agent.

The supernatural support prime used in this study may have similarly engaged mechanisms common to those used in conceptualizing earthly allies. Alternatively, the supernatural support prime may instead, or in addition, have enhanced battle confidence via affective pathways orthogonal to perceived access to allies, such as by inducing feelings of rewarding calm associated with spiritual experience (Schjødt, Stodkilde-Jorgensen, Geertz, & Roepstorff, 2008), or by imbuing participants with a sense of invulnerability. Follow-up work should endeavor to disentangle the contributions of such related yet dissociable processes.

We engaged participants in simulated prayer (i.e., imaginative engagement with benevolent supernatural forces) and combat in unambiguous ways. Accordingly, some researchers might understandably raise concerns over potential demand characteristics. However, had participants reported greater personal battle confidence following the supernatural prime due to demand characteristics, they would presumably have likewise reported greater coalitional confidence. The selectivity of the observed effects therefore militates against a demand interpretation. Relatedly, our reliance on a diverse community sample rather than psychology undergraduates may have further reduced the risk of demand effects, as these participants were not concurrently receiving training in behavioral science research methods.

The naturalistic field study approach adopted here motivated the use of single-item ratings of battle confidence that have not been previously validated. Although the strengths of our approach with regard to translational validity offset the concessions inherent to utilizing single-item measures, future work might utilize measures of battle confidence that employ multiple items to establish reliability and to explore further theoretical nuances.

The present study extends existing work linking propensities for optimistic assessments of conflict to both religiosity (e.g., Sosis et al., 2012) and political orientation (e.g., Johnson et al., 2012). We found that a significant effect of relative political orientation on personal battle confidence was accounted for by covarying religiosity, but this result should be tempered by consideration of the relatively liberal orientation of our sample (see SOM Table S5). Had a greater proportion of conservatives participated, the effect of political orientation may have withstood including religiosity in the model. Nevertheless, these results highlight the potential importance of religiosity with regard to interpreting effects of political orientation. Scholars investigating the role of political orientation in hazard-detection or aggression might take the present results as motivation to include assessments of religiosity in their research.

Importantly, our claims do not extent to all human societies. Ethnographic research suggests that small-scale societies do not typically hold beliefs in moral supernatural agents monitoring human conduct or welfare (Atran & Ginges, 2012). In the present research, we studied individuals from a large-scale, WEIRD society (Henrich, Heine & Norenzayan, 2010) featuring religious doctrines concerning benevolent supernatural agents. Although cues of supernatural aid should be expected to heighten battle confidence in such cultural contexts, they may not yield comparable effects among societies characterized by less reassuring supernatural beliefs (e.g., Holbrook & Sousa, 2013).

Although we did not measure aggressiveness or risk-taking during the simulated combat, the present results regarding battle confidence agree with the growing literature reporting that religious cognition can potentiate aggression (e.g., Atran & Ginges, 2012; Kruglanski et al., 2009; McKay et al., 2011) and can attenuate the perceived threat posed by enemies (Holbrook et al., 2016). Future research should extend the approach adopted here to assess the effects of supernatural support primes and trait religiosity on actual combat performance as well as confidence. Likewise, field studies might assess the role of trait or experimentally heightened perceptions of supernatural support on nonconflictual forms of actual physical risk-taking (e.g., rock climbing, skydiving), as subliminal primes of the word "God" and trait intrinsic religiosity have each predicted financial risk-taking in the Balloon Analogue Risk Task (Chan, Tong, & Tan, 2014), and as subtle cues of supernatural support have been observed to increase hypothetical willingness to take nonviolent physical risks and to decrease perceptions of the self as likely to be injured (Kupor et al., 2015). Integrating the present results with these findings, perceived supernatural support does not appear to evoke aggressive tendencies in particular, but rather a physical risk-tolerance which can presumably facilitate nonviolent expressions of bravery in the face of danger (e.g., first responders) as well as violent behavior in conflictual contexts.

As we compared battle confidence following control versus Supernatural support visualizations, our findings might be interpreted as evidence of a suppressing effect of the control visualization on personal battle confidence, rather than an enhancing effect related to perceived supernatural support. Although this reading would accord with the present result, it does not appear plausible given that there is no apparent connection between the control topic (visualizing a tree) and battle performance, that we observed a parallel positive relationship between trait religiosity and personal battle confidence, and that the present study conceptually replicates effects of perceived supernatural support on confidence in the face of aggressive conflict (e.g., Atran & Ginges, 2012; Holbrook et al., 2016; McKay et al., 2011; Sosis et al., 2012) or physical risk (e.g., Kupor et al., 2015). Nonetheless, future work involving primes of supernatural aid might add a no-prime condition in addition to control visualization topics, thereby enabling the inference of causal directionality. In addition to a no-prime contrast condition, future work might compare the effects of primes of supernatural versus mundane sources of support, both of which should theoretically enhance battle confidence (Holbrook et al., 2016), when assessed under realistic conditions.

### Conclusion

Our knife combat field study yielded support for the hypothesis that perceiving oneself as supported by supernatural agents can engender confidence in the face of violent opposition, a finding with evident relevance to real-world phenomena such as religious extremism. Unfortunately, most research on human social processes (including much of our own past work) relies on contrived, often screen-mediated measures and hypothetical scenarios, a validity gap which is arguably even more pressing than concerns over replicability. Consequently, without disregarding the utility of conventional techniques or samples, we respectfully encourage our fellow researchers to consider augmenting their toolkits with more face-valid approaches. Maximizing validity is particularly imperative for research pertaining to life-or-death circumstances such as situations of potential violent conflict.

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### Footnotes

<sup>1</sup> It should be noted that, in a series of cross-cultural studies, Ginges and colleagues (2009) find that participation in religious community activities correlates with support for suicide attacks, whereas religiosity as indexed by prayer frequency does not, suggesting that coalitional affiliation associated with religiosity may drive support for at least some forms of coalitional aggression to a greater extent than does perception of access to supernatural support related to religious beliefs.

<sup>2</sup> Follow-up tests confirmed that the overall pattern of findings relating the supernatural visualization, religiosity, and political orientation to personal battle confidence remain statistically significant in models including the entire raw, unfiltered sample.

<sup>3</sup> Data collection occurred over two weekends. On the second weekend (N = 44), a new item exploring *rematch confidence* was added immediately after each battle, "If there were a rematch, how confident are you that you would perform better than members of the opposing squad?" ( $1 = Not \ at \ all \ well$ ;  $9 = Extremely \ well$ ). Analyses and discussion of this exploratory measure are provided in the Supplemental Online Materials.

<sup>4</sup> The model revealed a significant interaction between the visualization condition and the order of presentation (see Table 1). The effect of the Supernatural visualization was more pronounced in the first battle than in the second, in a pattern which appears to reflect a tendency for participants to feel greater confidence before the second battle than they did before the first (see SOM Table S1). The increase in battle confidence before the second battle plausibly owes to a practice / habituation effect which, while potentially interesting with regard to the psychology of combat, appears orthogonal to our hypotheses regarding the influence of

perceived supernatural support. Importantly, the supernatural visualization remains a significant predictor of personal battle confidence when removing the order\*visualization interaction term (or any of the other covariates) from the model.

### **Supplemental Online Information**

### to accompany

### Perceived Supernatural Support Heightens Battle Confidence

### Figures

- **Figure S1.** Panoramic image of participants training in groups prior to simulated battle.
- Figure S2. Participants listening to a visualization.

### Tables

- **Table S1.** *Descriptive Statistics for Personal and Coalitional Battle Confidence by Order of Visualization.*
- **Table S2.** Parameter Estimates for Model Including Supernatural Visualization, Trait Religiosity, Political Orientation, Order of Visualization, Order\*Visualization, Weekend of Data Collection, Age and Gender as Predictors of Coalitional Battle Confidence.
- **Table S3.** Parameter estimates for model including Feelings of Spiritual Connection, Religious Belief, Supernatural Visualization, Political Orientation, Order of Visualization, Order\*Visualization, Weekend of Data Collection, Age and Gender as predictors of Personal Battle Confidence.
- **Table S4.** Parameter estimates for model including Feelings of Spiritual Connection, Religious Belief, Supernatural Visualization, Political Orientation, Order of Visualization, Order\*Visualization, Weekend of Data Collection, Age and Gender as predictors of Coalitional Battle Confidence.
- **Table S5.** *Descriptive statistics for Feelings of Spiritual Connection, Intuitive Religious Belief, and Political Orientation.*
- **Table S6.** Parameter estimates for model including Political Orientation, Supernatural Visualization, Order of Visualization, Order\*Visualization, Weekend of Data Collection, Age and Gender as predictors of Personal Battle Confidence.

### **Exploratory Assessment of Rematch Confidence**

### **Survey Instrument**

- Cover Page (used on all surveys)
- Battle questions
- Final Survey Packet
  - Demographics
  - Modified version of Aron et al.'s (1992) Inclusion of the Other in the Self scale (assessing Feelings of Spiritual Connection)
  - o Modified version of Gervais & Norenzayan's (2012) Measure of Religious Belief
  - Exploratory measures for unrelated items included for reasons unrelated to present paper
  - Modified version of Dodd et al.'s (2012) Wilson-Patterson Issues Index (assessing Political Orientation)
  - Sincerity / Attention Question

# The complete dataset, syntax files, visualization stimuli and video recordings of the simulated battle are archived at <a href="http://osf.io/sxfk2">http://osf.io/sxfk2</a>



**Figure S1.** Panoramic image of participants training in groups prior to simulated battle. Note that the groups (designated via gold versus blue tape strips) trained together separately, on opposing sides of the class area. Image of participants used with their permission.



**Figure S2.** Participants listening to a visualization. The visualization prime occurred immediately prior to the groups engaging in simulated battle with the opposing groups. Both groups listened to the visualization simultaneously, in nearby locations out of each other's range of hearing. Image of participants used with their permission.

Descriptive Statistics for Personal and Coalitional Battle Confidence by Order of Visualization

|                                     | Personal |      | Coali | itional |
|-------------------------------------|----------|------|-------|---------|
|                                     | М        | SD   | М     | SD      |
| First Battle                        |          |      |       |         |
| Order 1: Control Visualization      | 5.65     | 1.78 | 6.01  | 1.42    |
| Order 2: Supernatural Visualization | 6.15     | 1.34 | 6.15  | 1.53    |
| Second Battle                       |          |      |       |         |
| Order 1: Supernatural Visualization | 6.49     | 1.24 | 6.43  | 1.37    |
| Order 2: Control Visualization      | 6.13     | 1.39 | 6.40  | 1.18    |

Note. N = 92. The order of presentation and visualization condition significantly interacted with regard to both personal confidence (see Table 1, main text) and coalitional confidence (see Table S2).

Parameter Estimates for Model Including Supernatural Visualization, Trait Religiosity, Political Orientation, Order of Visualization, Order\*Visualization, Weekend of Data Collection, Age and Gender as Predictors of Coalitional Battle Confidence

|                               | Parm. Est. | SE  | t     | р    | 95% CI    |
|-------------------------------|------------|-----|-------|------|-----------|
| Supernatural visualization    | .30        | .15 | 1.98  | .051 | 001, .610 |
| Trait religiosity             | .07        | .10 | .67   | .506 | 135, .271 |
| Political orientation         | .03        | .10 | .27   | .785 | 173, .228 |
| Order of visualization        | .23        | .21 | 1.10  | .276 | 186, .644 |
| Order*Visualization condition | 49         | .20 | -2.46 | .016 | 885,094   |
| Weekend of data collection    | .24        | .19 | 1.28  | .204 | 135, .624 |
| Age                           | 12         | .10 | -1.18 | .242 | 309, .079 |
| Gender                        | 03         | .20 | 14    | .890 | 420, .365 |
| Intercept                     | 24         | .20 | -1.23 | .223 | 638, .151 |

Parameter Estimates for Model Including Feelings of Spiritual Connection, Religious Belief, Visualization, Political Orientation, Order of Visualization, Order\*Visualization, Weekend of Data Collection, Age, and Gender as Predictors of Personal Battle Confidence

|                                  | Parm. Est. | SE  | t     | р     | 95% CI     |
|----------------------------------|------------|-----|-------|-------|------------|
| Feelings of spiritual connection | .39        | .12 | 3.22  | .002  | .148, .627 |
| Religious belief                 | 11         | .13 | 82    | .416  | 368, .158  |
| Supernatural visualization       | .58        | .13 | 4.41  | <.001 | .318, .839 |
| Political orientation            | .17        | .10 | 1.80  | .075  | 018, .360  |
| Order of visualization           | .25        | .23 | 1.11  | .269  | 199, .704  |
| Order*Visualization condition    | 57         | .17 | -3.34 | .001  | 903,229    |
| Weekend of data collection       | .08        | .18 | .44   | .659  | 271, .427  |
| Age                              | 13         | .09 | -1.41 | .162  | 311, .053  |
| Gender                           | 02         | .18 | 11    | .911  | 385, .344  |
| Intercept                        | 30         | .21 | -1.44 | .153  | 705, .112  |

Parameter Estimates for Model Including Feelings of Spiritual Connection, Religious Belief, Visualization, Political Orientation, Order of Visualization, Order\*Visualization, Weekend of Data Collection, Age, and Gender as Predictors of Coalitional Battle Confidence

|                                  | Parm. Est. | SE  | t     | р    | 95% CI     |
|----------------------------------|------------|-----|-------|------|------------|
| Feelings of spiritual connection | .27        | .13 | 2.10  | .039 | .014, .524 |
| Religious belief                 | 23         | .14 | -1.62 | .109 | 505, .052  |
| Supernatural visualization       | .30        | .15 | 1.98  | .051 | 001, .610  |
| Political orientation            | .07        | .10 | .71   | .477 | 129, .274  |
| Order of visualization           | .22        | .20 | 1.06  | .294 | 190, .621  |
| Order*Visualization condition    | 49         | .20 | -2.46 | .016 | 885,094    |
| Weekend of data collection       | .24        | .19 | 1.26  | .211 | 136, .609  |
| Age                              | 08         | .10 | 80    | .428 | 272, .116  |
| Gender                           | 07         | .20 | 36    | .719 | 459, .318  |
| Intercept                        | 21         | .20 | -1.06 | .292 | 595, .181  |

Descriptive Statistics for Feelings of Spiritual Connection, Intuitive Religious Belief, and

Political Orientation.

|                                  | М      | SD   |
|----------------------------------|--------|------|
| Feelings of Spiritual Connection | 3.79   | 2.22 |
| Intuitive Religious Belief       | 5.77   | 2.71 |
| Political Orientation            | -10.00 | 8.33 |

Note. N = 92.

Parameter Estimates for Model Including Political Orientation, Visualization, Order of Visualization, Order\*Visualization, Weekend of Data Collection, Age and Gender as Predictors of Personal Battle Confidence

|                               | Parm. Est. | SE  | t     | р     | 95% CI     |
|-------------------------------|------------|-----|-------|-------|------------|
| Political orientation         | .23        | .09 | 2.52  | .014  | .048, .414 |
| Supernatural visualization    | .58        | .13 | 4.41  | <.001 | .318, .839 |
| Order of visualization        | .31        | .23 | 1.32  | .189  | 155, .774  |
| Order*Visualization condition | 57         | .17 | -3.34 | .001  | 903,229    |
| Weekend of data collection    | .06        | .19 | .32   | .752  | 313, .431  |
| Age                           | 11         | .09 | -1.14 | .258  | 293, .080  |
| Gender                        | 06         | .19 | 31    | .758  | 439, .321  |
| Intercept                     | 30         | .21 | -1.40 | .164  | 723, .124  |

#### **Exploratory Assessment of Rematch Confidence**

We added an exploratory test of potential effects of the supernatural prime on post-battle confidence in future combat midway through data collection (N = 44; see Study Instrument below for the added item). This question was presented to participants immediately *after* each battle. We ran a model including participants' rematch confidence ratings at Level 1 and visualization condition at Level 2 (0=Control, 1=Supernatural), observing no effect of visualization condition on rematch confidence, p = .49. Follow-up models of the same structure revealed no effect of religiosity, p = .86, or political orientation, p = .10, nor any two-way or three-way interaction between visualization, religiosity and/or political orientation on rematch confidence, ps .52 - .58. (Follow-up tests confirmed that including age, gender, order, and/or an order\*visualization interaction term does not alter this pattern of nonsignificant results.)

Given the observed effects of visualization, religiosity and political orientation on personal confidence before battle, the absence of any effect of these predictors on rematch confidence suggests that determinants of confidence about prospective combat may be less influential in the aftermath of the actual experience. Speculatively, the information garnered regarding one's actual performance (e.g., how many injuries one inflicted/sustained), and/or the related affective states engendered during the battle (e.g., physiological arousal) may tend to supercede other psychological factors contributing to battle confidence. Notably, the average rematch confidence ratings (following Supernatural Visualization: M = 6.55, SD = 1.47; following Control: M = 6.39, SD = 1.54) were higher than the pre-battle personal confidence ratings (see Table S1), suggesting that the experience of fighting tended to inflate confidence. Follow-up explorations of confidence in future combat performance should be conducted with larger samples and should include assessments of the cognitive and affective effects of fighting.

[Cover Page Preceding All Surveys]

# **INSTRUCTIONS**

This packet contains questions that explore perception and intuition.

Please...

...don't over-think it! Just use your first reaction, best guess, or feeling.

- ...don't talk with anyone as you complete the packet.
- ...don't look ahead or behind—just go one page at a time.

...don't stop until you are done with the packet.

Thanks again!

# PLEASE WRITE YOUR PARTICIPANT NUMBER:

(the last 3 #s printed on your wristband)

SQUAD (circle one): GOLD BLUE

### [Pre-Battle Survey Questions]

• How well do you feel **you** will perform in the battle compared with members of the opposing squad?

| Not at all<br>Well | ! |  |  | Ε | Extremely<br>Well |  |
|--------------------|---|--|--|---|-------------------|--|
|                    |   |  |  |   |                   |  |

• How well do you feel **your squad** will perform compared with the opposing squad?



• During the visualization, how clearly were you able to picture what was described?



[Post-Battle Rematch Question (Added for the Second Weekend of Data Collection)]

If there were a **rematch**, how confident are you that **you** would perform better than members of the opposing squad?



[Final Survey Packet]

# **Demographics**

Your Age: \_\_\_\_\_

Ethnicity: \_\_\_\_\_

Country of Birth: \_\_\_\_\_

Your gender (circle one):

- o Male
- o Female
- $\circ$  Other identification

Is English your first language?

- o Yes
- $\circ$  No
- What is your height? Feet: \_\_\_\_\_ Inches: \_\_\_\_\_

• What is your weight, in pounds? \_\_\_\_\_

# [Modified version of Aron et al.'s (1992) Inclusion of the Other in the Self scale (assessing Feelings of Spiritual Connection)]

People feel different levels of connection with God or a Higher Power. Some people may have firm belief, but not feel a strong connection, while other people may have less firm belief, but still feel a strong connection.

Imagine that the pairs of circles below represent you and God or a Higher Power.

Please select the option below that best describes how closely <u>connected</u> you feel with God or a Higher Power:



[Modified version of Gervais & Norenzayan's (2012) Measure of Intuitive Religious Belief]

# Please rate the extent to which you AGREE with the following statements about your religious beliefs:

1. I believe in a personal God or a Higher Power.

| Not at All |   |   |   |   |   |   |   | Extreme | ly |
|------------|---|---|---|---|---|---|---|---------|----|
| О          | 0 | Ο | 0 | 0 | 0 | 0 | 0 | 0       |    |

2. When I am in trouble, I find myself wanting to ask God or a Higher Power for help.

| Not at All |   |   |   |   |   |   |   | Extremely |  |
|------------|---|---|---|---|---|---|---|-----------|--|
| Ο          | 0 | 0 | Ο | 0 | 0 | 0 | 0 | Ο         |  |

3. When people pray they are only talking to themselves.

| Not at All |   |   |   |   |   |   |   | Extremel | y |
|------------|---|---|---|---|---|---|---|----------|---|
| 0          | 0 | Ο | Ο | 0 | О | О | 0 | Ο        |   |

[Exploratory measure included for reasons unrelated to present paper]

# Estimated Lifespan

1. If you made the MAXIMUM EFFORT you could make to look after your health and ensure your safety, what do you think the chances would be that you would live to be 75 or more? 0 is 'no chance' and 100 is 'definitely'.

Please enter your chances here (any % from 0 to 100): \_\_\_\_\_%

2. If you made NO EFFORT AT ALL to look after your health and ensure your safety, what do you think the chances would be that you would live to be 75 or more? Again, 0 is 'no chance' and 100 is 'definitely'.

Please enter your chances here (any % from 0 to 100): \_\_\_\_\_%

## [Modified version of Dodd et al.'s (2012) Wilson-Patterson Issues Index (assessing Political Orientation)]

Please CIRCLE whether you agree, disagree, or are uncertain, with regard to each topic below:

| School prayer:                        | Agree | Disagree | Uncertain |
|---------------------------------------|-------|----------|-----------|
| Pacifism:                             | Agree | Disagree | Uncertain |
| Socialism:                            | Agree | Disagree | Uncertain |
| Pornography:                          | Agree | Disagree | Uncertain |
| Illegal immigration:                  | Agree | Disagree | Uncertain |
| Women's equality:                     | Agree | Disagree | Uncertain |
| Death penalty:                        | Agree | Disagree | Uncertain |
| Premarital sex:                       | Agree | Disagree | Uncertain |
| Gay marriage:                         | Agree | Disagree | Uncertain |
| Abortion rights:                      | Agree | Disagree | Uncertain |
| Evolution:                            | Agree | Disagree | Uncertain |
| Patriotism:                           | Agree | Disagree | Uncertain |
| Biblical truth:                       | Agree | Disagree | Uncertain |
| Bomb cities controlled by terrorists: | Agree | Disagree | Uncertain |

Please CIRCLE whether you agree, disagree, or are uncertain, with regard to each topic below:

| Welfare spending:              | Agree | Disagree | Uncertain |
|--------------------------------|-------|----------|-----------|
| Tax cuts:                      | Agree | Disagree | Uncertain |
| Waterboarding terror suspects: | Agree | Disagree | Uncertain |
| Gun control:                   | Agree | Disagree | Uncertain |
| Military spending:             | Agree | Disagree | Uncertain |
| Warrantless searches:          | Agree | Disagree | Uncertain |
| Pollution control:             | Agree | Disagree | Uncertain |
| Small government:              | Agree | Disagree | Uncertain |
| For-profit charter schools:    | Agree | Disagree | Uncertain |
| Foreign aid:                   | Agree | Disagree | Uncertain |
| Drone strikes:                 | Agree | Disagree | Uncertain |
| Obedience to authorities:      | Agree | Disagree | Uncertain |
| Compromise with enemies:       | Agree | Disagree | Uncertain |

# [Sincerity / Attention Question)]

How seriously have you taken the research questions today? Please tell the truth it is OK if you were really just "going through the motions". Your honesty will help us preserve the quality of the data. Your answers are totally anonymous and the research assistant will have no way of seeing your answer (these packets will be collected and placed in a folder and transcribed later, without anyone present today reading them.)

Select the phrase which <u>most truthfully</u> reflects your responses today:

- Totally sincere and serious
- Somewhat sincere and serious
- Sincere, but also quite distracted
- Not very sincere or serious
- Not at all sincere or serious