



Examining the roles of intuition and gender in magical beliefs

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ABSTRACT

Four studies explored gender differences in magical beliefs, specifically examining whether reliance on intuition accounts for women's higher magical beliefs (vs. men's). In Studies 1a and 1b (N 's = 489, 1119), women's higher magical beliefs were accounted for by measures of reliance on intuition. Study 2 (N = 533) demonstrated that an intuition induction heightened men's magical beliefs (vs. control group), but not women's. In Study 3 (N = 404), women—but not men—exhibited more suboptimal choices in a lottery task after imagining that a dream told them to do so. These studies suggest that reliance on intuition helps account for women's higher magical beliefs.

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1. Introduction

Magical beliefs and behavioral manifestations of such beliefs are common across the world (e.g., Rozin, Millman, & Nemeroff, 1986; Subbotsky, 2001). For example, over 70% of people in Serbia, Ukraine, Latvia, Bosnia, and Armenia report believing in fate (Pew, 2017) and 25% of people living in the United States and Canada report believing in astrology (Lyons, 2005). Magical beliefs are persistent in the face of factors that might be expected to mitigate them, such as counter-arguing and education (Irwin, 2009). Despite the irrationality and lack of cognitive sophistication magical beliefs were once thought to reflect (Wagner, 1928; Vyse, 2013), they are now known to be prevalent among well-functioning adults. We refer to various paranormal, superstitious, and supernatural beliefs collectively as *magical beliefs*, given their overlap (Lindeman & Svedholm, 2012). Although magical beliefs can be symptoms of psychopathology, here we focus on beliefs in magical phenomena (e.g., fate, ghosts, and miracles) that are widely held among healthy adults.

Magical beliefs often arise from intuitions, helping to explain why they are so common and stubbornly persistent (e.g., Risen, 2016). We propose that the intuitive underpinnings of magical beliefs can also help explain why women report stronger beliefs in magical phenomena than men, a finding that has been well documented across the world (e.g., Lindeman & Aarnio, 2006; Rice, 2003; Wiseman & Watt, 2004) but largely unexamined. The present studies investigated how intuition guides magical beliefs

and helps account for gender differences in such beliefs. Before describing these studies, we review the links between intuition, magical beliefs, and gender.

1.1. Intuition and magical beliefs

A key feature of magical beliefs is their intuitive nature. Intuitive processing involves rapid, sometimes preconscious thinking that is often subjectively experienced as gut feelings or hunches (Epstein, 1994; Epstein, Pacini, Denes-Raj, & Heier, 1996). Intuitions are based on associationistic connections between past experiences and are often informed by affective cues (Epstein, 1994, 2010). For the intuitive system, seeing is believing: Intuitions are readily formed based on generalizations from one or a few cases, rather than on more general principles or logic (Shiloh, Salton, & Sharabi, 2002). Intuitive processing renders conflict detection difficult (Pennycook, Fugelsang, & Koehler, 2015) and enhances the use of heuristics that result in judgment biases (Alós-Ferrer & Hügelschäfer, 2012; Kahneman & Tversky, 1982). Intuitive judgments are subjectively perceived as self-evidently valid and correct (Hodgkinson et al., 2008), leading people to readily accept conclusions that seem true but are inaccurate.

Magical beliefs involve perceiving connections between actions, events, and objects that do not exist (Risen, 2016; Zusne & Jones, 1989). They also involve the “confusion of core knowledge about physical, psychological, and biological phenomena” (Lindeman & Aarnio, 2007). Magical beliefs arise from illusory pattern perception and a lack of conflict detection, which is bolstered by intuitive processing (e.g., Risen, 2016; van Prooijen, Douglas, & De Inocencio, 2018). Because intuitive processing results in heuristic judgments

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that are generalized from one or few cases, it is especially likely to incite beliefs in magical phenomena. When people think they have had personal experiences with magical phenomena or hear stories about these phenomena from others, they might view these experiences as accurate representations of reality rather than question the veracity of their assumptions (e.g., Epstein, 2010; King, Burton, Hicks, & Drigotas, 2007). At their essence, magical beliefs often result from gut feelings, hunches, or specific experiences that people have had, which they may readily accept as valid justifications for their beliefs.

If people do not have the motivation, ability, or contextual cues to override intuitions about magical phenomena, they are inclined to keep believing in them (Risen, 2016). Indeed, people maintain intuitions even when acknowledging them as irrational and false, a phenomenon termed “acquiescence” (Walco & Risen, 2017). People with a stronger tendency to trust their intuition might easily accept magical beliefs because they *feel* subjectively correct, whereas people who do not strongly trust their intuition might ignore these cues. Indeed, a host of studies have shown that individual differences in intuitive processing are linked to paranormal, superstitious, and magical beliefs (Aarnio & Lindeman, 2005; Epstein et al., 1996; Genovese, 2005; Gianotti, Mohr, Pizzagalli, Lehmann, & Brugger, 2001; King et al., 2007; Lindeman & Aarnio, 2006; Svedholm & Lindeman, 2013; Risen & Gilovich, 2008).

1.2. Measuring reliance on intuition

Two commonly used measures of reliance on intuition are the Faith in Intuition (FI) subscale of the Rational Experiential Inventory (REI; Pacini & Epstein, 1999) and the Cognitive Reflection Test (CRT; Frederick, 2005). FI was originally proposed within Cognitive-Experiential Self-Theory (Epstein, 1994), a dual process model emphasizing individual differences in information processing styles. Using self-report items, the FI scale assesses stable individual differences in the tendency to trust one’s intuition. FI is associated with the use of heuristics and some biases in judgment (Alonso & Fernandez-Berrocal, 2003; Alós-Ferrer & Hügelschäfer, 2012), but it is unrelated to cognitive ability measures more generally (Epstein et al., 1996).

Whereas FI assesses stable individual differences in *preferences* for using intuition for decision-making and is unrelated to cognitive abilities, the CRT taps into people’s *ability* to override an incorrect gut response in favor of a correct response and is associated with cognitive abilities and analytical reasoning skills more generally (Campitelli and Gerrans, 2014; Thompson et al., 2013). Intuition and analytical thinking are typically conceptualized as distinct processes, and people might simultaneously exhibit strong tendencies towards both cognitive processing styles (e.g., Epstein et al., 1996). Because the CRT assesses both the tendency to think analytically and the tendency to override intuitive responses, it is not a pure measure of intuition. Indeed, the precise construct(s) the CRT assesses is complex and may also capture motivations to avoid heuristics more broadly (Toplak, West, & Stanovich, 2011) or numeracy (Patel, Baker, & Scherer, 2019).

In past research, FI and CRT performance have been either weakly negatively associated or unrelated (Alós-Ferrer & Hügelschäfer, 2016; Heintzelman & King, 2016; Pennycook, Cheyne, Koehler, & Fugelsang, 2016), consistent with the idea that they are capturing distinct aspects of reliance on intuition. We acknowledge the complexity of measuring intuition and the limitations of the CRT. Nevertheless, we included the CRT in Studies 1a and 1b because it was the only other commonly used measure of reliance on intuition that we are aware of beyond the FI scale and because we wanted to test whether it produced parallel results to FI.

Both the CRT and FI have been linked to paranormal, magical, and religious beliefs in past research (Lindeman & Aarnio, 2006; Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012). FI was the strongest predictor of magical and paranormal beliefs in comparison to other factors, including need for cognition, experiencing negative life events, and a desire for control (Lindeman & Aarnio, 2006). Beyond indices of intuition, paranormal beliefs have also been linked to analytical thinking and reasoning *abilities* (Gray & Mill, 1990; Hergovich & Arendasy, 2005; Musch & Ehrenberg, 2002). In contrast, *preferences* for analytical thinking, often assessed with the need for cognition subscale of the REI, exhibit weak negative (Aarnio & Lindeman, 2005) or nonexistent (King et al., 2007) associations with magical beliefs. Magical beliefs are common among people who rely on intuitive processing and are especially likely among women, as we consider next.

1.3. Gender and magical beliefs

Since the 1980’s, research has accrued demonstrating that women report higher beliefs in many paranormal phenomena than men do. With a few exceptions, many studies have documented that women report greater global paranormal beliefs than men (Blackmore, 1991; Irwin, 1985; Lindeman & Aarnio, 2006; McGarry & Newberry, 1981; Randall, 1990; Randall & Desrosiers, 1980; Rice, 2003; Tobacyk & Milford, 1983) as well as higher beliefs in specific paranormal phenomena (Darwin, Neave, & Holmes, 2011; Persinger & Richards, 1991; Wolfradt, 1997). Although some of these studies were underpowered by modern standards for sample size, studies using larger samples have similarly demonstrated women’s higher magical beliefs (Carroll, 2007; Lyons, 2005).

Women are more likely than men to believe in supernatural causation (Gray, 1990) and superstitions (Blum & Blum, 1974; Voracek, 2009; Wiseman & Watt, 2004), and they are also more inclined to fear paranormal phenomena (Lange & Houran, 1999). A 2007 Gallup poll within the United States found women to be almost twice as likely as men to say they would be bothered by staying in a hotel room on the 13th floor (Carroll, 2007). Importantly, women’s higher paranormal beliefs have been documented across different nations, including Finland (Lindeman & Aarnio, 2006), Austria (Voracek, 2009), the United Kingdom (Wiseman & Watt, 2004), and the United States (Rice, 2003). Higher percentages of women (vs. men) report believing in haunted houses, astrology, and communicating with the dead in the United States, Canada, and Great Britain (Lyons, 2005). Gender differences have been demonstrated in both the strength of beliefs (comparing mean-level differences) and the prevalence of beliefs (comparing percentages of men and women endorsing beliefs), though because the present studies use continuous measures, we focus our predictions on mean-level gender differences in the strength of beliefs.

1.4. Intuition and gender

We predict that intuition may help explain why women believe in magical phenomena more strongly than men. Compared to men, women report higher FI, whereas men report higher need for cognition (e.g., Aarnio & Lindeman, 2005; Epstein et al., 1996; Lindeman & Aarnio, 2006; Norris & Epstein, 2011; Pacini & Epstein, 1999; Sladek, Bond, & Phillips, 2010). Importantly, gender differences in measures of intuitive processing are apparent on non-self-report measures as well. In the absence of gender differences in math cognition more broadly (Kersey, Brahm, Csumitta, Libertus, & Cantlon, 2018), women provide more intuitive responses on the CRT and score lower than men overall (Campitelli and Gerrans, 2014; Frederick, 2005; Pennycook et al., 2016; Pennycook et al., 2012; Welsh, Burns, & Delfabbro, 2013).

The reasons men and women differ in reliance on intuition are uncertain, and this topic has not received any comprehensive empirical attention. Socialization processes are a plausible contributor. Men are socialized to be rational and to disavow using feelings or emotions for decision-making, perhaps leading them to distrust intuition and view analytical thinking as paramount (Rogers, Hattersley, & French, 2019). Intuitive processing also involves attending to emotional experiences, an area where gender differences have been documented. Women report higher emotional intensity and lower emotional suppression than men (e.g., Diener, Sandvik, & Larsen, 1985; Ward & King, 2018a). Women's higher reliance on intuition could potentially result from experiencing more intense emotions or attending to emotions more strongly than men.

Despite the empirical documentation of women's higher reliance on intuition, the downstream consequences of such have received limited attention, particularly within the realm of magical beliefs. We propose that gender differences in reliance on intuitive processing help account for gender differences in magical beliefs. One study provides initial support for this conjecture: In a large Finnish sample, gender differences in reliance on intuition partially explained women's higher paranormal beliefs (Aarnio & Lindeman, 2005). The present studies aimed to comprehensively probe how intuition and gender guide magical beliefs using a range of methods.

1.5. Overview and predictions

Four studies, using correlational and experimental designs, investigated gender differences in magical beliefs while examining whether reliance on intuition might account for these. These studies aimed to programmatically probe the robustness of these results to different operationalizations of magical beliefs and diverse methodological approaches. We started this series of studies by measuring an expansive array of magical beliefs (Study 1a) and aimed to refine and shorten the measures of beliefs to be used in subsequent studies that necessitated briefer measures. Showing that gender differences in magical beliefs emerge across different measures, samples, and methodological approaches would provide the strongest evidence for their robustness.

In Studies 1a and 1b, we predicted that women's higher magical beliefs would be accounted for by intuition, as measured by the FI scale and/or CRT. Study 2 manipulated intuitive processing, which we expected would increase magical beliefs, particularly among men. Finally, Study 3 examined whether gender differences in magical thinking would also emerge in behavior. We predicted that women's decisions would be more strongly affected by imagining that a dream told them to take a course of action compared to men's decisions. Together, these studies explored how intuitive thinking promotes the emergence and endurance of magical beliefs and further examined gender differences in these beliefs. Data and materials for all studies can be accessed on OSF¹: https://osf.io/yzg7a/?view_only=0fe66bd059234ee3b9424394a65fa215.

In all studies, we report how we determined our sample size, all data exclusions (if applicable), all manipulations, and all measures (in the Supplement where applicable; Simmons et al., 2012).

2. Study 1a

Study 1a examined if women would report higher magical beliefs than men and if this mean difference would be accounted

for by two widely used measures of reliance on intuition: the Faith in Intuition (FI) scale and the Cognitive Reflection Test (CRT). Study 1a also investigated whether gender differences are limited to specific types of magical beliefs (e.g., paranormal) or if they extend to a large range of phenomena. We included measures of paranormal beliefs, religiosity, superstitions and rituals, fate, self-transcendence, and more general magical beliefs. Considering the overlap between various dimensions of magical thinking (Lindeman & Svedholm, 2012), we expected similar gender differences to emerge across these measures. Nevertheless, because we included a wider range of beliefs than what is often studied, it was important to test for the possibility that gender differences might be limited to specific types of phenomena. We expected to replicate previously established findings that women have higher paranormal beliefs and religiosity than men. We included measures of superstitions and rituals to see if women would be similarly prone to believing in them more than men. Fate beliefs were included to examine if women would be especially likely to extend magical thinking to life events. Finally, to capture another aspect of supernatural and social magical beliefs, we measured self-transcendence, which assesses spiritual ideas about one's self being linked to a broader universe.

Study 1a also tested several other potential explanatory variables (beyond intuition) that may account for gender differences in magical beliefs. We included variables that were linked to magical beliefs and to gender in past research (e.g., anxious emotions, vulnerability, income).² For the sake of brevity, these variables and corresponding analyses are described in the Supplement. Note that measures of intuition accounted for gender differences in magical beliefs more strongly than the other plausible explanatory variables measured here.

2.1. Participants

Participants on Amazon Mechanical Turk (MTurk; $N = 514$) completed this study online (see Table 1 for demographics). Sample size considerations across studies were based on budget constraints and the number of available participants in research pools. We conducted sensitivity analyses using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) to evaluate the minimum effect sizes we could detect in each study with our sample sizes, assuming an alpha level of .05 and 80% power. For a two-sample two-tailed t -test, we had the power to detect a minimum effect size of $d = .25$. Participants with ≥ 2 incorrect responses ($n = 13$) to attention check questions or duplicate IP addresses ($n = 12$) were excluded from analyses (final $N = 489$).

2.2. Materials and procedure

Unless otherwise noted, all items were rated from 1 to 7, with higher scores reflecting stronger endorsement. Descriptive statistics for magical belief measures appear in Table 2.

Participants rated FI (7 items; $\alpha = .93$, $M(SD) = 4.44(1.34)$; Pacini & Epstein, 1999) and the CRT (3 items; $\alpha = .57$, $M(SD) = 1.46(1.16)$; Frederick, 2005), which included slightly modified items (see Supplement) to mitigate the possibility they were overly familiar with

¹ Regrettably, none of these studies are preregistered. During initial data collection in 2016, the first author was not aware of the correct procedures and process for preregistration.

² We also measured self-efficacy (5 items from IPIP; Goldberg et al., 2006), internal locus of control (4 items; Levenson, 1981), and impression management (10 items; Paulhus & Reid, 1991). There were no gender differences in self-efficacy or internal locus of control, so we did not probe them further. Women, $M(SD) = 4.52(2.63)$, scored higher than men, $M(SD) = 3.24(2.47)$, on impression management, $t(479) = 5.46$, $p < .001$. However, impression management was generally unrelated to most magical beliefs (r 's $< +/-.07$, p 's $> .14$ with general magical beliefs, beliefs about dreams, supernatural attributions, religiosity, self-transcendence, and fate beliefs) and was negatively related to paranormal beliefs, $r = -.11$, $p = .02$. Therefore, it could not account for women's higher magical beliefs.

Table 1
Demographic Information, Studies 1 through 3.

	Study 1a	Study 1b	Study 2	Study 3
Sample	Adults on Mturk	Undergraduate Students	Adult Qualtrics Panel	Adults on Mturk
Gender (n)				
Men	213	442	270	149
Women	268	676	263	251
Transgender Women	1	0	–	0
Transgender Men	3	0	–	1
Genderqueer	1	0	–	1
Not sure	1	0	–	1
Unreported	2	1	–	1
Age, M(SD)	35.17(11.26)	18.55(1.36)	41.40(16.00)	36.24(11.98)
Ethnicity				
White/Caucasian	78.7%	79.9%	83.1%	74.7%
Black/African-American	8.4%	6.4%	6.0%	9.7%
Asian	5.3%	4.2%	4.9%	7.4%
Hispanic/Latino	5.1%	1.5%	4.3%	5.5%
Multiracial	–	7.2%	–	–
Other	2.5%	.8%	1.7%	2.7%
Religious Affiliation				
Religiously Affiliated	52.5%	80.1%	69.2%	71.1%
Atheist	16.0%	6.2%	8.3%	10.5%
Agnostic	24.9%	7.5%	13.7%	16%
Other	6.5%	6.2%	8.8%	2.5%
Total Sample Size	489	1119	533	404

Note. Mturk = Mechanical Turk sample. The total sample size reflects the participants who successfully passed attention checks and/or writing instructions. Final Ns reported in analyses represent participants who identified as cisgender male/female. Additional demographics (e.g., education, income) for Mturk/Qualtrics Panel adult samples are reported in the Supplement.

Table 2
Gender Differences in Magical and Supernatural Belief Measures, Study 1a.

Measure	Magical Beliefs Aggregate	Paranormal Beliefs	Broad Magical Beliefs	Superstition and Ritual Behaviors	Dreams	Paranormal Attributions of Experiences	Self Transcendence	Religiosity	Fate Beliefs
α	.97	.95	.86	.90	.85	.80	.95	.95	.93
Grand M(SD)	2.95(1.21)	2.74(1.26)	3.69(1.48)	2.62(1.43)	3.42(1.66)	.80(1.35)	4.04(1.92)	3.42(2.10)	3.95(1.64)
Women, M(SD)	3.13(1.19)	2.89(1.23)	4.02(1.44)	2.76(1.44)	3.67(1.63)	.93(1.39)	4.51(1.84)	3.77(2.16)	4.33(1.61)
Men, M(SD)	2.71(1.22)	2.56(1.29)	3.29(1.43)	2.44(1.39)	3.07(1.66)	.62(1.27)	3.45(1.88)	2.99(1.96)	3.47(1.55)
t (df = 477)	3.83**	2.87*	5.54**	2.46*	3.98**	2.53*	6.16**	4.07**	5.92**
d	.35	.26	.51	.23	.36	.23	.56	.37	.54

Note. ** $p < .001$; * $p < .05$. Gender coded women = 0; men = 1. Magical Beliefs aggregate includes paranormal belief, broad magical beliefs, superstitions, and dreams items.

them already (e.g., Haigh, 2016) or could search online for answers. CRT scores reflect the number of correct answers. Inter-item correlations ranged from .29 to .32, suggesting the low alpha is likely due to the scale having only three dichotomous items.

The Revised Paranormal Belief Scale (Tobacyk, 2004) included 22 items assessing beliefs in psi, superstition, spiritualism, witchcraft, extraordinary life forms, and precognition (3–4 items each). We computed an aggregate of all scale items (see Supplement for analyses with subscales). We did not include the traditional religious belief subscale because it overlapped with our religion measures.

The Survey of Anomalous Experiences (Irwin, Dagnall, & Drinkwater, 2013) asked participants to rate whether five different events happened to them and, if so, whether they attributed it to a paranormal or supernatural event. For instance, “On at least one occasion I have had the impression I was in direct contact with a ghost” (response options; No; Yes, and it must have been an instance of paranormal activity; Yes, but it was probably just an illusion or wishful fantasy). Scores were computed by summing the number of times participants selected they had the experience described and attributed it to paranormal/supernatural reasons.

Nine items assessed superstitious beliefs and rituals (some were adapted from Wiseman & Watt, 2004; e.g., “I sometimes carry a lucky charm or object with me;” “I would avoid walking under a ladder because it is associated with bad luck”). We also included seven ad hoc items referring to a range of common beliefs (e.g., “I believe in astrology;” “I believe in karma”), three of which pertained to the interpretation of dreams (e.g., “Dreams contain messages to give you life advice;” referred to as “dreams” in subsequent analyses). See Appendix A for all items.

Six items assessed whether people attribute events to fate (e.g., “I believe in fate: that significant life events are predestined to occur;” Banerjee & Bloom, 2014). Eight self-transcendence items (seven from the self-transcendence scale of the Temperament and Character Inventory; Cloninger, Przybeck, Svrakic, & Wetzel, 1994, plus the item “I am a spiritual person.”) captured general spirituality (e.g., “I sometimes feel a spiritual connection with other people”). Religiosity was assessed with the five positively worded items from the intrinsic religiosity subscale of the Revised Intrinsic/Extrinsic Religiosity Scale (e.g., “I enjoy reading about my religion;” “I try hard to live all my life according to my religious beliefs;” Gorsuch & McPherson, 1989), consistent with recent

evidence suggesting the negatively worded items invalidate the scale (Cohen et al., 2017).

2.3. Results

We submitted all magical and supernatural belief measures (Revised-Paranormal Beliefs Scale, broad magical beliefs, superstitions/rituals, dreams, religiosity, self-transcendence, fate) to a principal components analysis. Results indicated that these measures loaded on one factor, eigenvalue = 5.96; accounting for 66% of the variance, supporting the idea that these varied experiences represent a similar underlying magical belief factor (Lindeman & Svedholm, 2012). Nevertheless, because of the conceptual differences among the measures (e.g., behavior vs. beliefs; beliefs about life events vs. metaphysical beliefs), we treated them separately in analyses. To simplify some of the subsequent analyses, we formed a “magical beliefs aggregate,” consisting of items from the following scales: Revised-Paranormal Belief Scale, broad magical beliefs, superstitions/rituals, and dreams. These scales were all strongly correlated, r 's > .63, p 's < .001.

Table 2 shows the magnitude of gender differences across all belief measures. Women scored significantly higher than men on paranormal beliefs, broad magical beliefs, superstitions, dreams, self-transcendence, religiosity, and fate beliefs. Women were also slightly more likely to attribute anomalous events to paranormal reasons than men. Comparing effect sizes across these measures showed that gender differences in paranormal beliefs ($d = .26$) and superstitions ($d = .23$) were smaller in magnitude than gender differences in broad magical beliefs ($d = .51$), self-transcendence ($d = .56$), fate beliefs ($d = .54$), and religiosity ($d = .37$). Fig. 1

displays the distributions of beliefs among men and women in the aggregate magical belief variable. As can be seen, women's beliefs had a normal distribution with a higher mean score than men's. Men's magical beliefs followed a slightly bimodal distribution: The modal belief score was low, yet there were also several men who scored around the midpoint of the scale.

Women reported higher FI and scored lower on the CRT than men. For FI, $M(SD) = 4.71(1.27)$ for women and $M(SD) = 4.13(1.36)$ for men, $t(478) = 4.77$, $p < .001$, $d = .44$. For CRT, $M(SD) = 1.35(1.16)$ for women and $M(SD) = 1.60(1.16)$ for men, $t(479) = 2.39$, $p = .017$, $d = .22$. FI was moderately correlated with all magical belief measures, from $r = .22$ with religiosity to $r = .52$ with fate, p 's < .001. The CRT was negatively related to all magical belief measures, from $r = -.19$ with dreams and magical attributions of experiences to $r = -.29$ with fate, p 's < .001 (all correlations appear in the Supplement). Consequently, the CRT and FI measures might help account for gender differences in magical beliefs.

Next, we wanted to investigate whether the link between gender and magical beliefs was explained by FI and the CRT. Table 3 displays the results of multiple mediator models, using 5000 bootstrapped resamplings (Hayes, 2012; Model 4), testing whether the CRT and FI jointly account for the effect of gender in predicting the magical belief aggregate, paranormal beliefs, superstitions/rituals, and religiosity. The FI and CRT were correlated $-.25$, $p < .001$, so multicollinearity was not a concern. As shown in Table 3, FI and the CRT fully mediated the effect of gender in predicting the magical belief aggregate, paranormal beliefs, and superstitions/rituals; FI and the CRT partially mediated the association between gender and religiosity. These results provide additional support for the

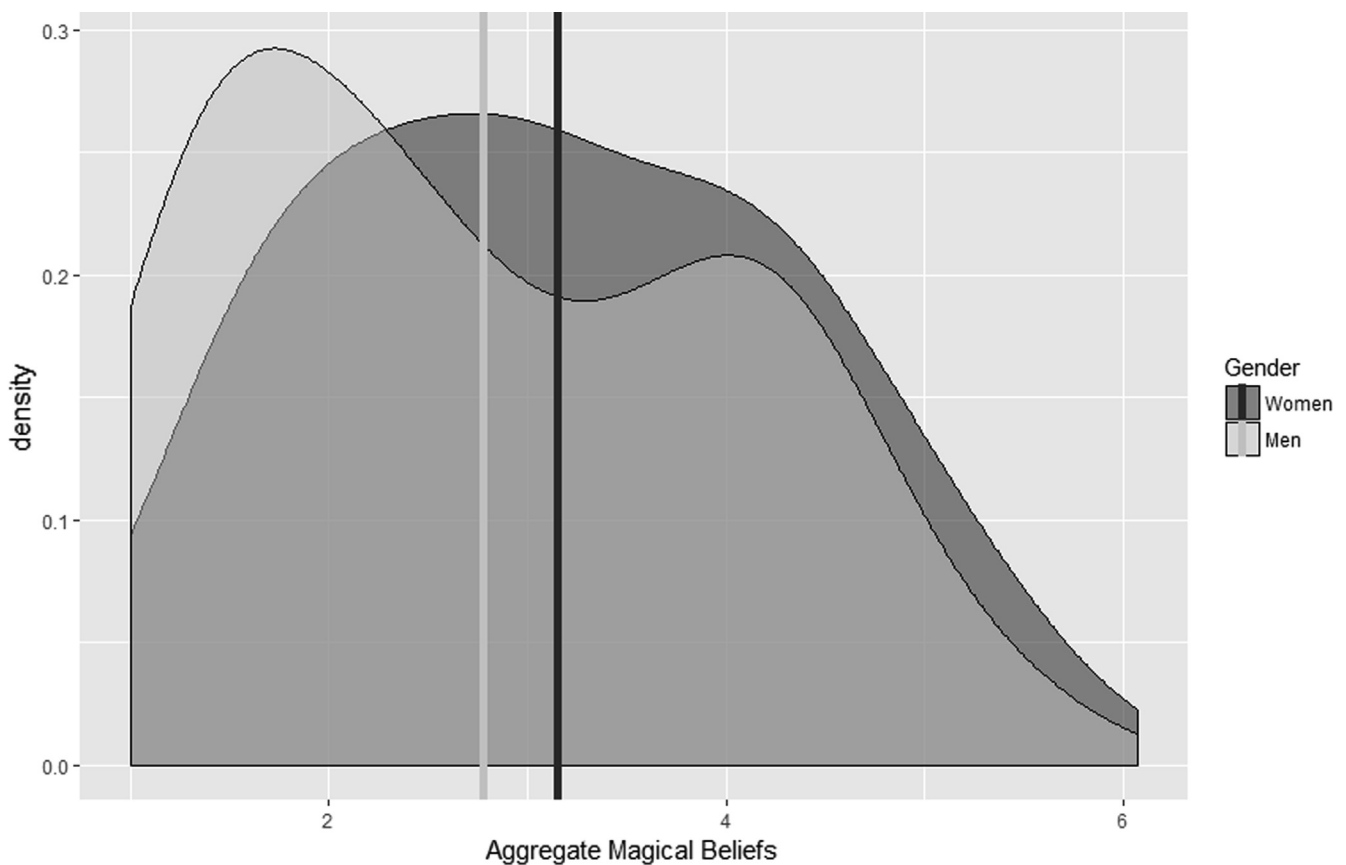


Fig. 1. Density Plots Showing Distribution of Aggregate Magical Beliefs by Gender, Study 1a. Note. Means for men (grey line) and women (black line) are shown in solid lines corresponding to groups shown in legend on the right. The Aggregate Magical Beliefs variable includes paranormal beliefs, broad magical beliefs, superstitions, and dreams items.

role of intuition in accounting for women's higher paranormal, magical, supernatural, and superstitious beliefs. Given the cross-sectional nature of these data, results should be interpreted with caution. Regression models examining these same predictors and dependent variables are shown in the Supplement.

Religiosity is, at times, related to magical beliefs (Orenstein, 2002; Pennycook et al., 2012; though cf. Aarnio & Lindeman, 2007), so it could possibly serve as an explanation for women's higher magical beliefs. Religiosity was moderately correlated with the magical beliefs aggregate, $r = .44, p < .001$ (refer to Supplement for additional correlations). When controlling for religiosity, $\beta = .42, p < .001, R^2 = .19$, gender still significantly predicted the magical beliefs aggregate, $\beta = -.10, p = .022, \Delta R^2 = .009$. Because supernatural beliefs, like religiosity, are similar in nature to other magical and paranormal beliefs (Lindeman & Svedholm, 2012), we treated religiosity as a magical belief outcome, rather than explanatory variable, in analyses.

2.4. Brief discussion

These results provide consistent evidence for gender differences across a range of magical, paranormal, superstitious, and supernatural beliefs. In all cases, women reported stronger beliefs in these phenomena than men, which was explained by intuition, as assessed by the CRT and FI. Together, the CRT and FI scales fully accounted for gender differences in magical, paranormal, and superstitious beliefs.

All magical and supernatural belief measures (paranormal beliefs, broad magical beliefs, superstitions/rituals, dreams, religiosity, self-transcendence, fate) loaded onto one larger factor, consistent with the idea that paranormal, superstitious, and supernatural beliefs are strongly conceptually and empirically related (Lindeman & Svedholm, 2012). The high correlations between the Revised-Paranormal Beliefs Scale (the most widely established measure) and broad magical beliefs provided assurance that they were capturing similar beliefs, which helped to inform our measurement approach in subsequent studies. We decided to measure varied, broad magical beliefs in the subsequent studies (choosing items that had high alpha reliabilities in Study 1a), rather than rely on lengthy established scales, which would be imprudent to administer in experiments or in lengthy online surveys. In addition, pilot testing and conversations with research assistants led us to recognize that many of the items on the paranormal belief scale were outdated and not widely understood (e.g.,

psychokinesis, abominable snowman of Tibet, Loch Ness monster, astral projection).

3. Study 1b

In Study 1a, both the CRT and FI measures accounted for gender differences in magical beliefs. Study 1b examined whether the CRT would account for gender differences in a range of commonly held magical and paranormal beliefs in a new sample: young adults. Replicating these findings in a new sample would provide additional evidence that gender differences in magical beliefs are attributable to intuitive processing. Time limitations prevented us from measuring both the FI scale and the CRT in this study. Consistent with Study 1a, we predicted that women would express higher belief in these phenomena than men and that this difference would be accounted for by women's lower CRT scores. Because this was a university student sample, we also examined whether women would have higher magical beliefs than men even among science/engineering majors. This would suggest that there is something beyond attitudes about science (or socialization into appreciating science) that underlies these gender differences.

3.1. Participants

Undergraduate students ($N = 1119$) at a university in the United States completed these questionnaires as part of a larger online study in partial fulfillment of research participation credit. Assuming 80% power, sensitivity analyses indicated that we had the power to detect a minimum effect size of $d = .17$ for a two-sample two-tailed t -test.

3.2. Materials and procedure

Participants rated how much they believe in karma, astrology, ghosts, and fate (e.g., "I believe in fate"), ranging from 1 *strongly disagree* to 7 *strongly agree*. A composite was formed with the mean of these four items, $\alpha = .74; M(SD) = 4.21(1.33)$. Participants completed the CRT, $\alpha = .47; M(SD) = .85(1.04)$; Frederick, 2005). Inter-item correlations ranged from .19 to .25, which was smaller than those in Study 1a but not so small as to suggest no relation between the items. During this study, participants selected their current (or most likely) major from a list of options.

Table 3
Mediator Models Predicting Belief Measures from FI and the CRT, Study 1a.

	Gender to mediator	Mediator to outcome	Indirect effects	95% CI of indirect effect
Outcome: Magical Beliefs Aggregate				
Faith in Intuition	-.57(.12)**	.35(.04)**	-.20(.05)	[-.30, -.11]
Cognitive Reflection Test	.25(.11)*	-.18(.04)**	-.05(.02)	[-.10, -.009]
<i>Direct Effect of Gender when controlling for FI and CRT, b(SE) = -.18(.10), p = .08; 95% CI = [-.38, .02]</i>				
Outcome: Paranormal Beliefs				
Faith in Intuition	-.57(.12)**	.31(.04)**	-.18(.04)	[-.28, -.10]
Cognitive Reflection Test	.25(.11)*	-.18(.05)**	-.05(.02)	[-.10, -.01]
<i>Direct Effect of Gender when controlling for FI and CRT, b(SE) = -.11(.11), p = .32; 95% CI = [-.32, .11]</i>				
Outcome: Superstitions/Rituals				
Faith in Intuition	-.57(.12)**	.30(.05)**	-.17(.05)	[-.27, -.09]
Cognitive Reflection Test	.25(.11)*	-.16(.05)*	-.04(.02)	[-.10, -.008]
<i>Direct Effect of Gender when controlling for FI and CRT, b(SE) = -.011(.013), p = .38; 95% CI = [-.36, .14]</i>				
Outcome: Religiosity				
Faith in Intuition	-.57(.12)**	.23(.07)*	-.13(.05)	[-.26, -.05]
Cognitive Reflection Test	.25(.11)*	-.28(.08)**	-.07(.04)	[-.17, -.01]
<i>Direct Effect of Gender when controlling for FI and CRT, b(SE) = -.57(.19), p = .003; 95% CI = [-.95, -.20]</i>				

Note. ** $p \leq .001$; * $p < .05$. Gender coded women = 0; men = 1. All tests conducted using PROCESS macro in SPSS (Model 4; Hayes, 2012). Analyses were bootstrapped with 5000 resamplings. Values presented are unstandardized beta weights (SE). Magical Beliefs aggregate includes paranormal belief, broad magical beliefs, superstitions, and dreams items. CI = confidence interval.

3.3. Results

Women, $M(SD) = 4.45(1.28)$, reported higher magical beliefs than men, $M(SD) = 3.83(1.31)$; $t(1116) = 7.79, p < .001; d = .47$, representing a medium effect size. Fig. 2 displays the distributions of magical beliefs among men and women: Both men and women's beliefs had a relatively normal distribution and women's mean beliefs were higher than men's. What might account for these differences? Men, $M(SD) = 1.21(1.10)$, scored higher on the CRT than women, $M(SD) = .62(.92)$; $t(1116) = 9.64, p < .001; d = .58$. Magical beliefs were negatively correlated with the CRT, $r = -.28, p < .001$. Consequently, the CRT could potentially account for gender differences in magical beliefs, which we examined in a mediator model (Hayes, 2012; Model 4). The CRT partially mediated the effect of gender on magical beliefs; indirect effect, $b(SE) = -.18(.03)$; 95% CI = $[-.24, -.12]$; direct effect of gender (coded men = 1; women = 0) on magical beliefs, $b(SE) = -.62(.08)$, $\beta = -.23, p < .001$, 95% CI = $[-.77, -.46]$; direct effect of gender on magical beliefs controlling for the CRT, $b(SE) = -.44(.08)$, $\beta = -.16, p < .001$; 95% CI = $[-.60, -.28]$. These results show that the CRT helps account for gender differences in magical beliefs, but does not fully account for these differences.

We next looked at potential gender differences in magical beliefs among physical science (e.g., biology, chemistry, mathematics) and engineering majors ($n = 115$ men; $n = 93$ women). Analyses with other majors are reported in the Supplement. Even within these science and engineering majors, women had significantly higher magical beliefs, $M(SD) = 4.37(1.38)$, than men, $M(SD) = 3.57(1.28)$; $t(206) = 4.36, p < .001, d = .61$. Among these majors, women, $M(SD) = 1.02(1.14)$, also scored more poorly on the CRT than men, $M(SD) = 1.59(1.08)$; $t(206) = 3.70, p < .001$.

$d = .52$. Within these science majors, the CRT, $\beta = -.35, p < .001$ ($R^2 = .16$ for step), helped account for gender differences in magical beliefs, yet gender was still a significant predictor, $\beta = -.20, p = .002, \Delta R^2 = .04$. For comparison, gender predicted magical beliefs, $\beta = -.29, p < .001, R^2 = .08$, among science majors when entered alone in the model. These results show that even among people who are striving towards careers in science, women still espouse higher magical beliefs than men and have a stronger tendency to rely on intuition, which helps account for their heightened magical beliefs.

3.4. Brief discussion

Study 1b results demonstrated that women exhibit stronger magical beliefs in a range of phenomena than men do, which was partially accounted for by gender differences in the CRT. In Study 1a, together, the CRT and FI fully accounted for gender differences in magical beliefs. Comparing the results of Studies 1a and 1b suggests that each measure of intuition accounts for some aspects of the gender difference in magical beliefs. Thus far, we have only provided correlational evidence for the importance of intuition in accounting for gender differences in magical beliefs. If reliance on intuition helps account for women's stronger tendency to believe in magical phenomena, then experimentally enhancing trust in one's intuition should heighten men's beliefs, a possibility we turned to in Study 2.

4. Study 2

Study 2 examined whether enhancing trust in intuition would boost magical beliefs, specifically among men, who exhibit lower

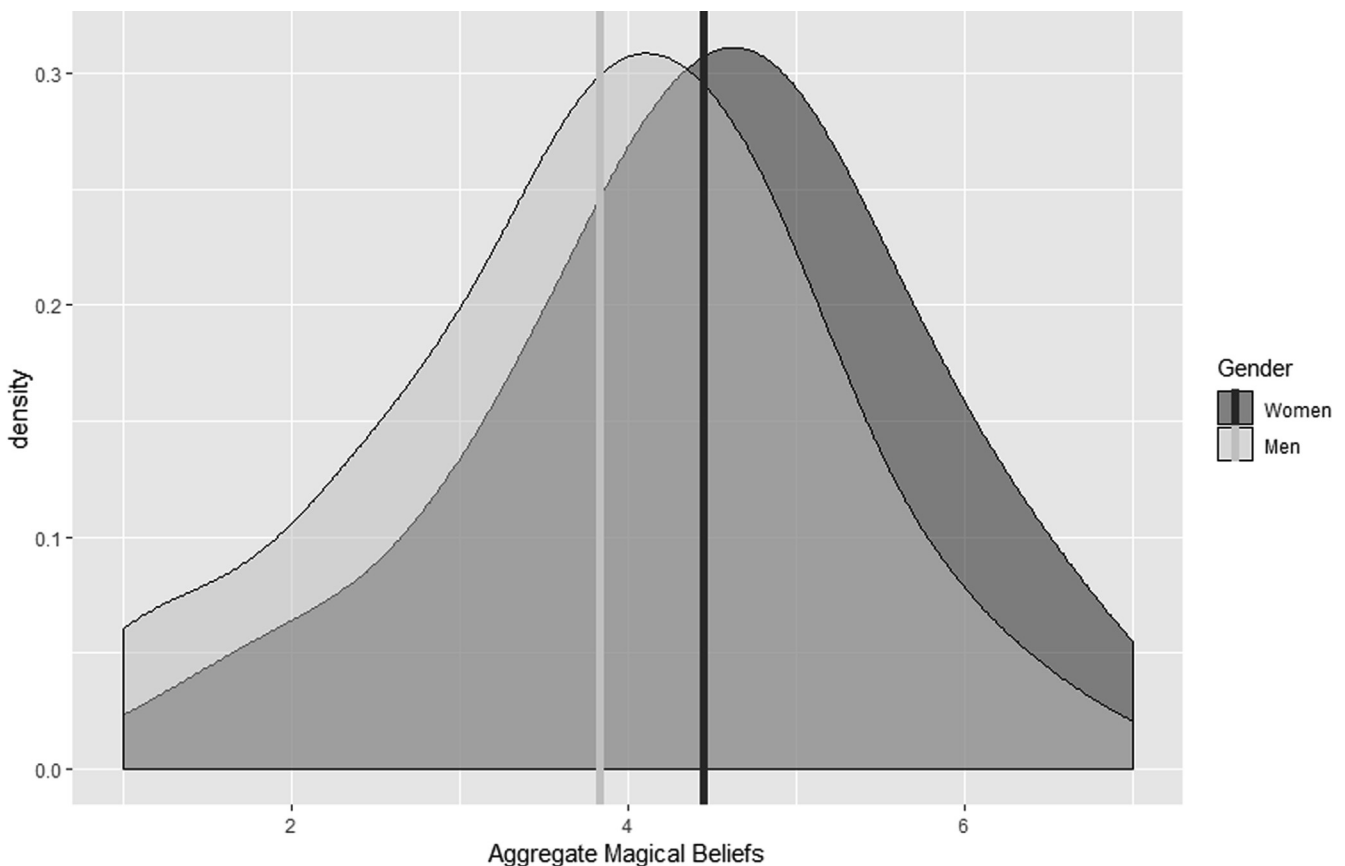


Fig. 2. Density Plots Showing Distribution of Aggregate Magical Beliefs by Gender, Study 1b. Note. Means for men (grey line) and women (black line) are shown in solid lines corresponding to groups shown in legend on the right.

trust in intuition than women do generally (e.g., Pacini & Epstein, 1999). In the control condition, we predicted that women would have higher magical beliefs than men. We expected gender differences in magical beliefs to be reduced or eliminated in the intuition induction condition. In addition to magical belief ratings, participants also rated magical attributions of events to evaluate whether the intuition manipulation would similarly affect both perceived event causality and beliefs. Past research has focused on beliefs only, but magical thinking can be manifest not only in beliefs but in explanations for experiences. Indeed, people can have the same experience and some might view it as magical and others may not. As such, in this study we were interested in probing whether magical attributions for events would show the predicted condition and gender differences.

4.1. Participants

We recruited as many participants as our budget permitted, $N = 674$ (restricted to cisgender men and women), through Qualtrics Survey Company (Table 1 displays demographics) for this online experiment. After excluding participants who did not follow writing instructions during data collection (see Supplement for discussion), $n = 270$ in the control condition (50% women) and $n = 263$ in the experimental condition (47% women). Assuming 80% power, sensitivity analyses indicated that we could detect a minimum effect size of $f = .14$ for a 2×2 ANOVA model.

4.2. Materials and procedure

Measures were administered in the order described below. All ratings were on 7-point scales. Participants were randomly assigned to one of two writing manipulations (see Supplement for details). Control participants were asked to write at least 8–10 sentences describing their last time grocery shopping. In the experimental condition, participants were asked to write at least 8–10 sentences describing why they think their intuition or gut instincts can be correct and useful to rely on and to describe a time their intuition led them in the right direction (adapted from Heintzelman & King, 2016; Shenhav, Rand, & Greene, 2012). Two manipulation check items from the FI scale were rated afterwards (“I like to rely on my intuitive impressions;” “I believe in trusting my hunches.”), from *not at all true* to *extremely true*; $\alpha = .83$, $M(SD) = 5.47(1.11)$.

Magical event attributions involved rating whether actions described in three stories designed to sound potentially fated or “meant to be” (based on real events; see Appendix B) were the result of fate or destiny, ranging from 1 *not at all-it was a random or chance event* to 7 *very much*, $\alpha = .79$, $M(SD) = 3.91(1.85)$. Five magical beliefs ratings captured attitudes towards varied paranormal phenomena (e.g., “Ghosts can exist;” “Miracles can really happen;” see Appendix A); $\alpha = .80$, $M(SD) = 4.95(1.41)$, rated from *strongly disagree* to *strongly agree*.

At the beginning of the study, participants rated mood for exploratory purposes, but no gender differences were found and controlling for mood did not change key results. Additional exploratory variables were rated at the end of the study (see Supplement for details).

4.3. Results

The intuition induction led to higher trust in intuition, $M(SD) = 5.63(.99)$ vs. controls, $M(SD) = 5.32(1.19)$; $F(1, 529) = 11.16$, $p = .001$, $d = .29$ and was equally effective for men and women; for main effect of gender and gender \times condition interaction, $F_s < 1.74$, $p_s > .19$. Magical attributions and beliefs were strongly correlated, $r = .59$, $p < .001$.

Fig. 3 shows the means and 95% confidence intervals (CIs) for magical attributions (Panel A) and magical beliefs (Panel B) by condition and gender. Men increased their magical attributions and beliefs following the manipulation, but women did not. The intuition manipulation reduced, but did not fully eliminate, gender differences in magical beliefs. For magical attributions, there were main effects of gender, $F(1, 529) = 30.55$, $p < .001$, $d = .48$, and condition, $F(1, 529) = 5.49$, $p = .019$, $d = .20$; the gender \times condition interaction was not significant, $F(1, 529) = .78$, $p = .38$, $d = .06$. For magical beliefs, main effects of gender, $F(1, 529) = 34.78$, $p < .001$, $d = .51$, and condition, $F(1, 529) = 3.88$, $p = .049$, $d = .17$, were qualified by a significant gender \times condition interaction, $F(1, 529) = 4.36$, $p = .037$, $d = .18$.

We examined predicted gender differences in the control group using planned contrasts. Compared to men (coded -1), women (coded 1) had higher magical beliefs, $t(529) = 5.69$, $p < .001$, $d = .49$, and higher magical attributions, $t(529) = 4.56$, $p < .001$, $d = .40$ (men/women in intuition condition coded 0). These gender differences represent a medium effect size, similar to those observed in Studies 1a and 1b. Next, we examined predicted differences in men between conditions. Men in the intuition condition (coded $+1$) had higher magical beliefs, $t(529) = 2.89$, $p = .004$, $d = .25$; and higher magical attributions, $t(529) = 2.30$, $p = .022$, $d = .20$, than men in the control condition (coded -1) (women in both conditions coded 0). As shown in Fig. 3, though the gender differences in magical attributions and beliefs were reduced within the intuition condition (vs. control), men still had lower magical attributions and beliefs than women in this condition.

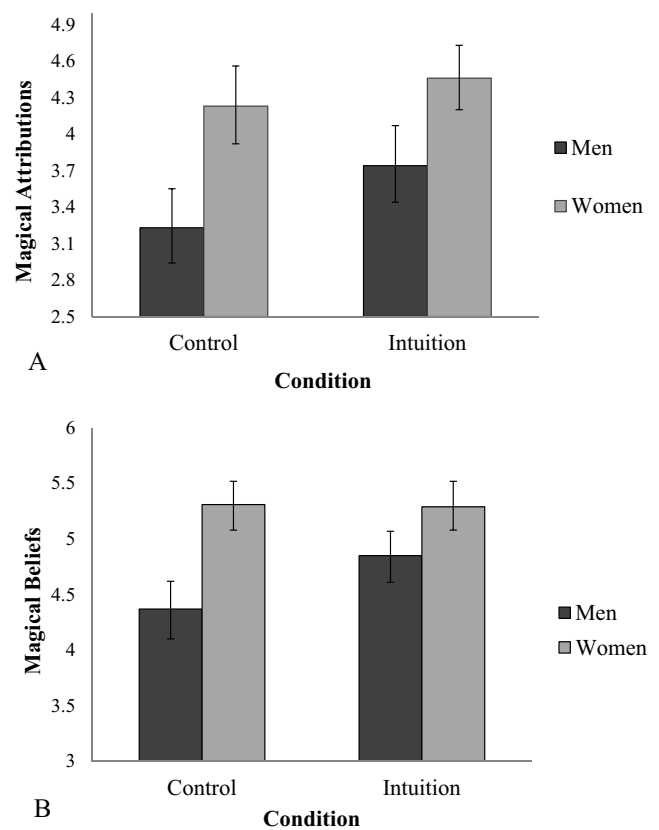


Fig. 3. Panel A: Magical Attributions made for Events as a function of Gender and Condition, Study 2. Note. Higher scores reflect stronger endorsement that events in stories resulted from fate or destiny. Bootstrapped 95% confidence intervals are shown for each group. Panel B: Magical Beliefs as a function of Gender and Condition, Study 2. Note. Higher scores reflect stronger endorsement of magical beliefs. Bootstrapped 95% confidence intervals are shown for each group.

4.4. Brief discussion

These results suggest intuition can bolster magical thinking: After pondering the usefulness of intuition, men—but not women—increased their magical beliefs and attributions for events. This provides experimental evidence that women's higher trust in intuition may explain their stronger tendency towards magical beliefs. Importantly, in the control group, gender differences were evident on measures of both magical beliefs and magical attributions, consistent with the results from Studies 1a and 1b, showing that gender differences in magical beliefs are robust across various measures. Although gender differences consistently emerged across studies in self-report measures of magical beliefs, it is uncertain whether these differences would emerge in behavior. Perhaps women are simply more likely than men to admit to such beliefs. Would women's actual decisions be more heavily swayed by magical cognitions than men's? Showing that women are more inclined than men to manifest magical thinking in actual decision-making would demonstrate that the previous findings are not explained by gender differences in the willingness to admit magical beliefs. This was the goal of Study 3.

5. Study 3

Study 3 participants were given a lottery entry and asked to decide whether they wanted a random number generator to select their numbers or to choose them personally. The random number generator option offered more lottery entries than personally selecting the numbers, thus representing the optimal choice. Prior to deciding their selection method, participants in the experimental condition were asked to imagine they had a dream that they won the lottery after choosing numbers corresponding to important personal events. Recall that women in Study 1a endorsed higher beliefs that dreams convey important information. Would such a belief affect behavior? We predicted that when providing a magical attribution—the dream—women would be more inclined to choose their own numbers (vs. in the control condition), corroborating the notion that women are more strongly influenced by magical ideas than men are. We expected that men would exhibit similar decisions in the control and magical attribution conditions, as men are more apt to discount the validity of magical phenomena.

5.1. Participants

We recruited as many Mturk participants as our budget permitted ($N = 456$) for this online study (see Table 1 for demographics). Sixteen respondents with duplicate IP addresses were excluded from analyses. Assuming 80% power, sensitivity analyses indicated that we could detect a minimum effect size of $w = .18$ for women and $w = .23$ for men.

5.2. Materials and procedures

Participants were randomly assigned to the control or experimental condition (see Supplement for full instructions). The experimental condition instructed participants to imagine they won a \$7 million lottery prize after using numbers corresponding to important life events from a dream. Participants were then asked to list the dates (and write about the importance) of past events that they would have used for their lottery entry. In the control condition, participants were asked to imagine, recall, and then write about important life events (e.g., experiences with loved ones, career/educational milestones). The control condition was carefully matched on positivity and social relevance but did not mention specific

dates in one's life, dreams, or a lottery (to avoid eliciting a heightened desire for control over one's lottery numbers). Participants who did not follow writing instructions ($n = 18$ in control; $n = 18$ in experimental condition) were excluded from analyses; final: $n = 211$ control condition (59% women); $n = 193$ experimental condition (66% women). Key results reported below did not differ when including participants who did not follow writing instructions, except that the gender difference in lottery decisions within the control group was significant, $\chi^2(1, N = 227) = 7.43, p = .006$ (16.3% of women chose to select their own numbers vs. 31.6% of men).

After writing, participants were informed that they would be receiving entries in a lottery for \$20 (paid as a bonus). Entries would consist of six numbers (from 1 to 50), and a winner would be selected using a random number generator (loosely based on Powerball rules). Then, participants chose their preferred selection method: "You get 5 lottery entries and you get to select the numbers you want to use for your entries (*control condition option ended here*), corresponding with the dates of the important life events you wrote about earlier and imagined you dreamed about." (*experimental condition*) or "You get 7 lottery entries and the numbers you have for the entries will be randomly selected by a computer generator." (*both conditions*). The number generator option maximized the odds of winning, thus representing an optimal decision.

FI was also measured in this study to evaluate its influence on decisions. Please refer to the Supplement for these results.

5.3. Results

As shown in Fig. 4, women were more likely to select the less optimal lottery choice after imagining they had a dream regarding making this choice (25.2%) vs. in the control group (14.5%), $\chi^2(1, N = 251) = 4.49, p = .034$. In contrast, men's decisions did not differ by condition, $\chi^2(1, N = 149) = .22, p = .64$; 24.7% men chose to select their own lottery numbers in the control vs. 28.1% in the experimental condition. Note that the gender difference in the control was not significant, $\chi^2(1, N = 209) = 3.45, p = .063$. The pattern of results (and statistical significance) was identical when using logistic regression models.

5.4. Brief discussion

After imagining that a dream told them to make a certain decision, women, but not men, were more inclined to follow advice from their dream. These results demonstrate that women's higher magical beliefs can manifest in behavioral choices, mitigating

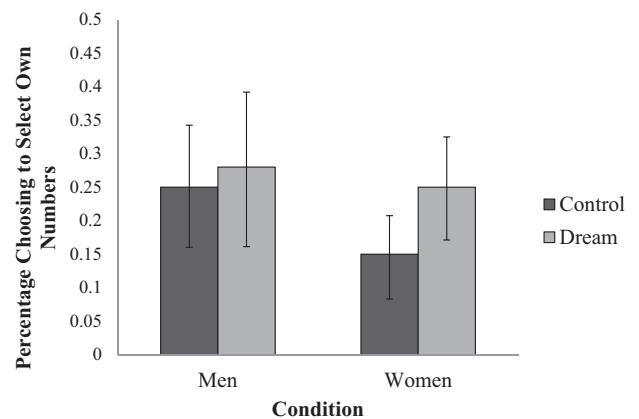


Fig. 4. Percentage of Participants Choosing to Select their Own Lottery Numbers (vs. choosing a Random Number Generator), Study 3. Note. Bootstrapped 95% confidence intervals are shown for each group.

concern that the previous results were due simply to men being less willing to admit to magical beliefs. Nevertheless, concerns of social judgment may still guide behaviors and decisions like that involved in this study.

Unexpectedly, men were slightly more likely than women to opt for the suboptimal choice for the lottery entry within the control condition. This finding is consistent with men's higher propensities towards risk-taking and gambling (e.g., Harris, Jenkins, & Glaser, 2006; Wong, Zane, Saw, & Chan, 2013). Perhaps women's lower tolerance for risk led them to be more rational when choosing whether to maintain control over the numbers for their entries or maximize their odds. This result is interesting because it shows women behaving rationally relative to men in the absence of a manipulation. In addition, illusions of control, like wanting to select one's own lottery numbers, are especially likely among people with high power (Fast et al., 2009) and self-esteem (Scheier, Carver, & Bridges, 1994); (Skinner, 1995). Men's higher sense of power and self-esteem (e.g., Bleidorn et al., 2016) might have made them more prone to illusions of control in this lottery decision context.

Although women's choices differed only modestly by condition, these results remain intriguing considering that these choices reflected real opportunities for financial gain. Participants could win \$20 in the lottery so it is compelling that the manipulation influenced people's decisions in a suboptimal manner at all.

6. General discussion

Despite the sporadic, yet consistent, documentation of gender differences in magical beliefs, they have received limited theoretical and empirical consideration. Across studies with diverse methodological approaches and measures of magical beliefs, we showed that women exhibited higher magical beliefs and behavioral manifestations of such beliefs than men do. The present studies suggest that intuition helps account for gender differences in magical beliefs. After an intuition induction, men heightened their magical beliefs, corroborating its role in explaining gender differences. Just as intuition guides magical beliefs generally (Risen, 2016), it also appears to help explain why women can be more prone to these beliefs than men.

Women's higher paranormal beliefs have been extensively documented (e.g., Aarnio & Lindeman, 2005; Irwin, 1985; Lindeman & Aarnio, 2006; Randall, 1990; Rice, 2003; Lindeman & Aarnio, 2006), leading us to hypothesize that women may also have stronger beliefs in other similar phenomena, such as fate and superstitions. Indeed, we found that women exhibited stronger beliefs in an array of different magical phenomena than men did. Across studies using distinct measures of magical beliefs, the effect sizes for the gender difference ranged from $d = .23$ (superstitions, Study 1a) to $d = .49$ (beliefs in control group, Study 2), suggesting small to medium effects. In Study 1a, gender differences in superstitious beliefs and in the aggregate paranormal beliefs measure were less pronounced than gender differences in self-transcendence (spirituality) and fate beliefs. Perhaps, this could be because many superstitions and rituals, such as knocking on wood, are deeply culturally ingrained and become habitual, leading to less variability. Other beliefs, such as karma, might be more relevant to women, who tend to be more focused on connecting to the social world than men (Guimond, Chatard, Martinot, Crisp, & Redersdorff, 2006).

Culture and socialization can certainly give rise to many of the beliefs studied here, which are common among adults in the United States and, of course, not just among women. Most of the beliefs included in our measures are widespread and not risk factors for psychopathology, though mild forms of aberrant or magical

beliefs are linked to vulnerability towards developing schizophrenia-spectrum disorders (Cicero, Kerns, & McCarthy, 2010; Chun, Kwapil, & Brugger, 2019). Cultural norms might inform which magical beliefs are prevalent among healthy adults (e.g., fate) and which beliefs are more characteristic of psychological disorders (e.g., paranoia that an enemy is reading one's mind).

6.1. Contextualizing gender differences in magical beliefs

Although the present results provide consistent evidence for gender differences in magical beliefs, the precise reasons these differences emerge are challenging to pinpoint. In Studies 1a and 1b, measures of intuition accounted for gender differences in a range of magical beliefs, attesting to its relevance. However, in Study 2, the intuition induction did not fully eliminate gender differences in magical beliefs or attributions. Strongly held beliefs can be challenging to dramatically alter via information processing manipulations (e.g., Ward & King, 2018b) so we would not expect a brief manipulation to exert sizable changes on beliefs. Moreover, the complexity of gender differences in magical beliefs renders it unlikely that any single experimental manipulation would fully eliminate them. Mechanisms accounting for women's higher religiosity have been similarly difficult to pinpoint (Pew, 2016): Gender differences in religion hold even when controlling for numerous sociodemographic factors (Levin, Taylor, & Chatters, 1994).

Identifying factors that contribute to gender differences in magical and supernatural beliefs requires attention to the full suite of cognitive, social, and cultural forces that influence them. In the supplement, we describe our attempts to test additional mechanisms in Study 1a, including perceived vulnerability, demographics, and femininity, which ultimately did not substantially account for gender differences in magical beliefs. Nevertheless, there are many additional plausible explanations future research might want to test. For instance, women have higher risk aversion than men (e.g., Byrnes, Miller, & Schafer, 1999; Charness & Gneezy, 2012), which might enhance the tendency to believe in magical phenomena. It has been argued that women's higher religiosity might be explained by their lower tolerance for risk, as not being religious represents a risky decision (Miller & Stark, 2002). Women might similarly be drawn to a variety of other magical and supernatural beliefs that can offer explanations and predictive capacities about the social world.

Although Studies 1a and 1b provided consistent support that women have higher trust in intuition than men, the reasons for this are uncertain. Certainly, stereotypes about intuition and emotionality might explain why women and men differ in their endorsement of these decision-making strategies and why women are perceived as better at using intuition than men (e.g., Graham & Ickes, 1997). Responses to the FI measure may reflect identification with these stereotypes. Yet, as we demonstrated here, gender differences also extend to more objective measures of reliance on intuition, like the CRT. Understanding the precise mechanisms underlying women's higher reliance on intuition might help to illuminate strategies to mitigate gender differences on cognitive measures where intuition hinders performance, like the CRT and similar cognitive tests. In addition, probing *when* gender differences in trusting intuition develop could help to pinpoint additional mechanisms that promote the emergence of magical beliefs. Identifying when men and women learn to trust or devalue their intuition would help to explain why similar experiences might still give rise to very different beliefs over time.

6.2. Limitations and constraints on generality

These studies had several strengths, including demographically diverse adult (e.g., Mturk, Qualtrics panel) and student samples, as

well as self-reported (Studies 1–2) and behavioral manifestations of magical beliefs (Study 3). In Study 1a, we examined a wide range of magical, paranormal, superstitious, and supernatural beliefs to illustrate that gender differences are not just evident on one particular type of belief. We also showed that two different widely used measures of reliance on intuition (FI, CRT) help account for gender differences in magical beliefs (Studies 1a and 1b). Next, we consider some limitations of this program of studies.

All samples were from the United States and so our present findings may only be relevant in this context. Although women report higher paranormal beliefs than men in many countries (e.g., Finland, Austrian, United States, Great Britain), it is unclear to what extent intuition may account for these differences. East Asian cultures value using intuition more than analytical reasoning (e.g., Buchtel & Norenzayan, 2008; Norenzayan, Smith, Kim, & Nisbett, 2002). Perhaps, gender differences in magical beliefs would be less likely to exist in East Asian cultures where both men and women might place a similarly high value on intuition.

These studies provided consistent evidence that women report higher magical beliefs than men. Yet, only Study 3 examined behavioral manifestations of beliefs. It would be valuable to explore whether gender differences exist in other behavioral indicators of magical thinking, such as superstitions in everyday contexts or in gambling. Indeed, there may be domains where men display more magical beliefs than women. Men frequently exhibit superstitious behaviors in sports as well as higher levels of gambling and more problematic gambling habits than women (Stoltenberg, Batien, & Birgenheir, 2008). Identifying how motivational factors, intuition, and gender contribute to magical beliefs in different domains is an important area for future research.

Across studies, we used two widely established measures of reliance on intuition and a standard intuition manipulation. Intuition is a multifaceted construct and it is unclear what specifically about intuition leads people to form magical beliefs. Future research might benefit from probing the precise aspects of intuition that are most likely to predict magical beliefs and behaviors and by using a diverse range of intuition measures and manipulations. In addition, the CRT was included in Studies 1a and 1b, though it had low reliability (α 's = .57, .47, respectively). Using scales with stronger psychometric properties is recommended in future research.

Together, these studies suggest that reliance on intuition helps account for why women have stronger beliefs in magical phenomena than men do. Intuition underlies the tenacious appeal of magical beliefs, evincing why they are so prevalent even among adults.

Author contribution

The first author conceived of the study idea, designed the studies, ran all the analyses, and wrote the manuscript. The second author provided advice on all study designs and provided critical edits to the manuscript.

Appendix A. Magical belief items

A.1. Study 1a items

A.1.1. Broad magical beliefs

1. I believe in luck.
2. Luck is nothing more than random chance. (reverse coded)
3. I believe in miracles.
4. I believe in karma.
5. I believe in astrology.
6. I believe in ghosts.

7. I believe in extrasensory perceptions.

A.1.2. Superstitions/rituals

1. I sometimes knock on wood to avoid a bad outcome.
2. I sometimes cross my fingers because it can help produce a better outcome.
3. I own some objects that I consider to be good luck charms.
4. I occasionally perform rituals to bring good luck.
5. I try to avoid thinking about bad outcomes out of fear it may make them more likely to happen.
6. Talking about good things that might happen could jinx them.
7. I would avoid walking under a ladder because it is associated with bad luck.
8. I sometimes carry a lucky charm or object with me.
9. I sometimes say “touch wood” and actually touch or knock on wood for good luck.

A.1.3. Dreams

1. If I had a dream of something bad happening to someone I know, I would warn them.
2. If I had a dream that an important life decision was a bad choice for me, I would avoid that decision.
3. Dreams contain messages to give you life advice.

A.2. Study 2 items

1. Ghosts can exist.
2. Extrasensory perceptions (ESP) is a real phenomenon.
3. Miracles can really happen.
4. Fate influences what happens in people’s lives.
5. Karma does exist.

Appendix B. Event attributions & magical beliefs, Study 2

In the next task, you will be asked to read different stories and to provide your opinion about why you think the actions in the story happened. Please read each story carefully and then rate whether you think the events were a result of fate or destiny, or instead just random or chance events.

To what extent do you think that the event described was a result of fate or destiny?

1	2	3	4	5	6	7
Not at all-it was a random or chance event			Somewhat		Very Much	

Note: The following scenarios appeared in randomized order:
 In 2011 in Los Angeles, a woman who never buys lottery tickets buys one out of desperation because she has fallen on hard times and needs money. Days before, her father was in a severe car accident and now she needs to help him pay medical bills. To honor her father, she chooses her father’s birthday and lucky number as her lottery numbers. Surprisingly, her lottery numbers are selected and she wins the jackpot of \$2.6 million dollars.
 In 2002, a 70 year old man was killed on a road while riding a bike. About two hours later, his twin brother crossed the same road on a bike 1 mile from where his brother died and was also hit and killed by a truck.
 In 1937 in Detroit, a street sweeper was in an alley when a baby fell out of a fourth-story window directly on top of him. Both the baby and him were injured but survived. A year later, a 2-year-

old fell from a fourth-story window and landed on this same street sweeper.

Appendix C. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jrp.2020.103956>.

References

- Aarnio, K., & Lindeman, M. (2005). Paranormal beliefs, education, and thinking styles. *Personality and Individual Differences*, 39(7), 1227–1236. <https://doi.org/10.1016/j.paid.2005.04.009>.
- Aarnio, K., & Lindeman, M. (2007). Religious people and paranormal believers: Alike or different?. *Journal Of Individual Differences*, 28(1), 1–9. <https://doi.org/10.1027/1614-0001.28.1.1>.
- Alonso, D., & Fernandez-Berrocal, P. (2003). Irrational decisions: Attending to numbers rather than ratios. *Personality and Individual Differences*, 35(7), 1537–1547. [https://doi.org/10.1016/S0191-8869\(02\)00368-9](https://doi.org/10.1016/S0191-8869(02)00368-9).
- Alós-Ferrer, C., & Hügelschäfer, S. (2012). Faith in intuition and behavioral biases. *Journal of Economic Behavior & Organization*, 84(1), 182–192. <https://doi.org/10.1016/j.jebo.2012.08.004>.
- Alós-Ferrer, C., & Hügelschäfer, S. (2016). Faith in intuition and cognitive reflection. *Journal of Behavioral and Experimental Economics*, 64, 61–70. <https://doi.org/10.1016/j.socec.2015.10.006>.
- Banerjee, K., & Bloom, P. (2014). Why did this happen to me? Religious believers' and non-believers' teleological reasoning about life events. *Cognition*, 133(1), 277–303. <https://doi.org/10.1016/j.cognition.2014.06.017>.
- Blackmore, S. J. (1991). Are women more sheepish?: Gender differences in belief in the paranormal. In L. Coly, R. A. White, L. Coly, & R. A. White (Eds.), *Women and Parapsychology* (pp. 68–89). New York, NY, US: Parapsychology Foundation.
- Bleidorn, W., Arslan, R. C., Denissen, J. A., Rentfrow, P. J., Gebauer, J. E., Potter, J., & Gosling, S. D. (2016). Age and gender differences in self-esteem—A cross-cultural window. *Journal of Personality and Social Psychology*, 111(3), 396–410. <https://doi.org/10.1037/pspp0000078>.
- Blum, S. H., & Blum, L. H. (1974). Do's and don'ts: An informal study of some prevailing superstitions. *Psychological Reports*, 35(1), 567–571. <https://doi.org/10.2466/pr0.1974.35.1.567>.
- Buchtel, E. E., & Norenzayan, A. (2008). Which should you use, intuition or logic? Cultural differences in injunctive norms about reasoning. *Asian Journal of Social Psychology*, 11(4), 264–273. <https://doi.org/10.1111/j.1467-839X.2008.00266.x>.
- Byrnes, J. P., Miller, D. C., & Schafer, W. D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin*, 125(3), 367. <https://doi.org/10.1037/0033-2909.125.3.367>.
- Campitelli, G., & Gerrans, P. (2014). Does the cognitive reflection test measure cognitive reflection? A mathematical modeling approach. *Memory & Cognition*, 42, 434–447. <https://doi.org/10.3758/s13421-013-0367-9>.
- Carroll, J. (2007). Thirteen Percent of Americans Bothered to Stay on Hotels' 13th Floor Retrieved from <http://news.gallup.com/poll/26887/thirteen-percent-americans-bothered-stay-hotels-13th-floor.aspx>.
- Charness, G., & Gneezy, U. (2012). Strong evidence for gender differences in risk taking. *Journal of Economic Behavior & Organization*, 83(1), 50–58. <https://doi.org/10.1016/j.jebo.2011.06.007>.
- Chun, C. A., Kwapil, T. R., & Brugger, P. (2019). Aberrant salience across levels of processing in positive and negative schizotypy. *Frontiers in Psychology*, 10, 2073. <https://doi.org/10.3389/fpsyg.2019.02073>.
- Cicero, D. C., Kerns, J. G., & McCarthy, D. M. (2010). The Aberrant Salience Inventory: A new measure of psychosis proneness. *Psychological Assessment*, 22(3), 688. <https://doi.org/10.1037/a0019913>.
- Cloninger, C. R., Przybeck, T. R., Svrakic, D. M., & Wetzel, R. D. (1994). The Temperament and Character Inventory (TCI): A guide to its development and use.
- Cohen, A. B., Mazza, G. L., Johnson, K. A., Enders, C. K., Warner, C. M., Pasek, M. H., & Cook, J. E. (2017). Theorizing and measuring religiosity across cultures. *Personality and Social Psychology Bulletin*, 43(12), 1724–1736. <https://doi.org/10.1177/0146167217727732>.
- Darwin, H., Neave, N., & Holmes, J. (2011). Belief in conspiracy theories. The role of paranormal belief, paranoid ideation and schizotypy. *Personality and Individual Differences*, 50(8), 1289–1293. <http://dx.doi.org.proxy.mul.missouri.edu/10.1016/j.paid.2011.02.027>.
- Diener, E., Sandvik, E., & Larsen, R. J. (1985). Age and sex effects for emotional intensity. *Developmental Psychology*, 21, 542–546. <https://doi.org/10.1037/0012-1649.21.3.542>.
- Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, 49(8), 709–724. <https://doi.org/10.1037/0003-066X.49.8.709>.
- Epstein, S. (2010). Demystifying intuition: What it is, what it does, and how it does it. *Psychological Inquiry*, 21, 295–312. <https://doi.org/10.1080/1047840X.2010.523875>.
- Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive-experiential and analytical-rational thinking styles. *Journal of Personality and Social Psychology*, 71(2), 390. <https://doi.org/10.1037/0022-3514.71.2.390>.
- Fast, N. J., Gruenfeld, D. H., Sivanathan, N., & Galinsky, A. D. (2009). Illusory control: A generative force behind power's far-reaching effects. *Psychological Science*, 20(4), 502–508. <https://doi.org/10.1111/j.1467-9280.2009.02311.x>.
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175–191.
- Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, 19(4), 25–42. <https://doi.org/10.1257/0895330057751967>.
- Genovese, J. E. C. (2005). Paranormal beliefs, schizotypy, and thinking styles among teachers and future teachers. *Personality and Individual Differences*, 39, 93–102. <https://doi.org/10.1016/j.paid.2004.12.008>.
- Gianotti, L. R., Mohr, C., Pizzagalli, D., Lehmann, D., & Brugger, P. (2001). Associative processing and paranormal belief. *Psychiatry and Clinical Neurosciences*, 55(6), 595–603. <https://doi.org/10.1046/j.1440-1819.2001.00911.x>.
- Gorsuch, R., & McPherson, S. (1989). Intrinsic/extrinsic measurement: I/E-Revised and Single-Item Scales. *Journal for the Scientific Study of Religion*, 28, 348–354. <https://doi.org/10.2307/1386745>.
- Graham, T., & Ickes, W. (1997). When women's intuition isn't greater than men's. In W. Ickes (Ed.), *Empathic accuracy* (pp. 117–143). New York: Guilford Press.
- Gray, T. (1990). Gender differences in belief in scientifically unsubstantiated phenomena. *Canadian Journal of Behavioural Science / Revue Canadienne Des Sciences Du Comportement*, 22(2), 181–190. <https://doi.org/10.1037/h0078898>.
- Gray, T., & Mill, D. (1990). Critical abilities, graduate education (Biology vs. English), and belief in unsubstantiated phenomena. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, 22(2), 162. <https://doi.org/10.1037/h0078899>.
- Guimond, S., Chatard, A., Martinot, D., Crisp, R. J., & Redersdorff, S. (2006). Social comparison, self-stereotyping, and gender differences in self-construals. *Journal of Personality and Social Psychology*, 90(2), 221–242. <https://doi.org/10.1037/0022-3514.90.2.221>.
- Haigh, M. (2016). Has the standard cognitive reflection test become a victim of its own success? *Advances in Cognitive Psychology*, 12(3), 145. <https://doi.org/10.5709/acp-0193-5>.
- Harris, C. R., Jenkins, M., & Glaser, D. (2006). Gender differences in risk assessment: Why do women take fewer risks than men?. *Judgment and Decision Making*, 1(1), 48.
- Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. Retrieved from <http://afhayes.com/public/process2012.pdf>.
- Heintzelman, S. J., & King, L. A. (2016). Meaning in life and intuition. *Journal of Personality and Social Psychology*, 110(3), 477–492. <https://doi.org/10.1037/pspp0000062>.
- Hergovich, A., & Arendasy, M. (2005). Critical thinking ability and belief in the paranormal. *Personality and Individual Differences*, 38(8), 1805–1812. <https://doi.org/10.1016/j.paid.2004.11.008>.
- Hodgkinson, G. P., Langan-Fox, J., & Sadler-Smith, E. (2008). Intuition: A fundamental bridging construct in the behavioural sciences. *British Journal of Psychology*, 99(1), 1–27. <https://doi.org/10.1348/000712607X216666>.
- Irwin, H. J. (1985). A study of the measurement and the correlates of paranormal belief. *Journal of the American Society for Psychical Research*.
- Irwin, H. J. (2009). *The psychology of paranormal belief: A researcher's handbook*. Univ of Hertfordshire Press.
- Irwin, H. J., Dagnall, N., & Drinkwater, K. (2013). Parapsychological experience as anomalous experience plus paranormal attribution: A questionnaire based on a new approach to measurement. *Journal of Parapsychology*, 77(1), 39–53.
- Kahneman, D., & Tversky, A. (1982). On the study of statistical intuitions. *Cognition*, 11(2). [https://doi.org/10.1016/0010-0277\(82\)90022-1](https://doi.org/10.1016/0010-0277(82)90022-1).
- Kersey, A. J., Braham, E. J., Csumitta, K. D., Libertus, M. E., & Cantlon, J. F. (2018). No intrinsic gender differences in children's earliest numerical abilities. *Nature: Science of Learning*, 3, 12. <https://doi.org/10.1038/s41539-018-0028-7>.
- King, L. A., Burton, C. M., Hicks, J. A., & Drigotas, S. M. (2007). Ghosts, UFOs, and Magic: Positive affect and the experiential system. *Journal of Personality and Social Psychology*, 92(5), 905. <https://doi.org/10.1037/0022-3514.92.5.905>.
- Lange, R., & Houran, J. (1999). The role of fear in delusions of the paranormal. *The Journal of Nervous and Mental Disease*, 187(3), 159–166. <https://doi.org/10.1097/00005053-199903000-00005>.
- Levenson, H. (1981). Differentiating among internality, powerful others, and chance. In H. Lefcourt (Ed.), *Research with the locus of control construct* (Vol. 1, pp. 15–63). New York: Academic Press.
- Levin, J. S., Taylor, R. J., & Chatters, L. M. (1994). Race and gender differences in religiosity among older adults: Findings from four national surveys. *Journal of Gerontology*, 49(3), S137–S145. <https://doi.org/10.1093/geronj/49.3.S137>.
- Lindeman, M., & Aarnio, K. (2006). Paranormal beliefs: Their dimensionality and correlates. *European Journal of Personality*, 20(7), 585–602. <https://doi.org/10.1002/per.608>.
- Lindeman, M., & Aarnio, K. (2007). Superstitious, magical, and paranormal beliefs: An integrative model. *Journal of Research in Personality*, 41(4), 731–744. <https://doi.org/10.1016/j.jrp.2006.06.009>.
- Lindeman, M., & Svedholm, A. M. (2012). What's in a term? Paranormal, superstitious, magical and supernatural beliefs by any other name would mean the same. *Review of General Psychology*, 16(3), 241. <https://doi.org/10.1037/a0027158>.
- Lyons, L. (2005). Paranormal beliefs come (super)naturally to some Retrieved from <http://news.gallup.com/poll/19558/paranormal-beliefs-come-supernaturally-some.aspx>.

- McGarry, J. J., & Newberry, B. H. (1981). Beliefs in paranormal phenomena and locus of control: A field study. *Journal of Personality and Social Psychology*, 41(4), 725. <https://doi.org/10.1037/0022-3514.41.4.725>.
- Miller, A. S., & Stark, R. (2002). Gender and religiousness: Can socialization explanations be saved? *American Journal of Sociology*, 107(6), 1399–1423. <https://doi.org/10.1086/342557>.
- Musch, J., & Ehrenberg, K. (2002). Probability misjudgment, cognitive ability, and belief in the paranormal. *British Journal of Psychology*, 93(2), 169–177. <https://doi.org/10.1348/0007126021262517>.
- Norenzayan, A., Smith, E. E., Kim, B. J., & Nisbett, R. E. (2002). Cultural preferences for formal versus intuitive reasoning. *Cognitive Science*, 26(5), 653–684. [http://dx.doi.org.proxy.missouri.edu/10.1016/S0364-0213\(02\)00082-4](http://dx.doi.org.proxy.missouri.edu/10.1016/S0364-0213(02)00082-4).
- Norris, P., & Epstein, S. (2011). An experiential thinking style: Its facets and relations with objective and subjective criterion measures. *Journal of Personality*, 79(5), 1043–1079. <https://doi.org/10.1111/j.1467-6494.2011.00718.x>.
- Orenstein, A. (2002). Religion and paranormal belief. *Journal for the Scientific Study of Religion*, 41(2), 301–311. <https://doi.org/10.1111/1468-5906.00118>.
- Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratiobias phenomenon. *Journal of Personality and Social Psychology*, 76, 972–987. <https://doi.org/10.1037/0022-3514.76.6.972>.
- Patel, N., Baker, S. G., & Scherer, L. D. (2019). Evaluating the cognitive reflection test as a measure of intuition/reflection, numeracy, and insight problem solving, and the implications for understanding real-world judgments and beliefs. *Journal of Experimental Psychology: General*, 148(12), 2129–2153. <https://doi.org/10.1037/xge0000592>.
- Paulhus, D. L., & Reid, D. B. (1991). Enhancement and denial in socially desirable responding. *Journal of Personality and Social Psychology*, 60, 307–317. <https://doi.org/10.1037/0022-3514.60.2.307>.
- Pennycook, G., Cheyne, J. A., Koehler, D. J., & Fugelsang, J. A. (2016). Is the cognitive reflection test a measure of both reflection and intuition?. *Behavior Research Methods*, 48(1), 341–348. <https://doi.org/10.3758/s13428-015-0576-1>.
- Pennycook, G., Cheyne, J. A., Seli, P., Koehler, D. J., & Fugelsang, J. A. (2012). Analytic cognitive style predicts religious and paranormal belief. *Cognition*, 123(3), 335–346. <https://doi.org/10.1016/j.cognition.2012.03.003>.
- Pennycook, G., Fugelsang, J. A., & Koehler, D. J. (2015). What makes us think? A three-stage dual-process model of analytic engagement. *Cognitive Psychology*, 80, 34–72. <https://doi.org/10.1016/j.cogpsych.2015.05.001>.
- Persinger, M. A., & Richards, P. (1991). Tobacyk's Paranormal Belief Scale and temporal lobe signs: Sex differences in the experiences of ego-alien intrusions. *Perceptual and Motor Skills*, 73, 1151–1156. <http://dx.doi.org.proxy.missouri.edu/10.2466/PMS.73.8.1151-1156>.
- Pew (2016). Theories explaining gender differences in religion. Retrieved from <http://www.pewforum.org/2016/03/22/theories-explaining-gender-differences-in-religion/>.
- Pew (2017). Religious belief and national belonging in central and Eastern Europe. Retrieved from <https://www.pewforum.org/2017/05/10/religious-beliefs/>.
- Randall, T. M. (1990). Belief in the Paranormal Declines: 1977–1987. *Psychological Reports*, 66(3_suppl), 1347–1351. <http://dx.doi.org.proxy.missouri.edu/10.2466/PRO.66.4.1347-1351>.
- Randall, T. M., & Desrosiers, M. (1980). Measurement of supernatural belief: Sex differences and locus of control. *Journal of Personality Assessment*, 44(5), 493–498. https://doi.org/10.1207/s15327752jpa4405_9.
- Rice, T. W. (2003). Believe it or not: Religious and other paranormal beliefs in the United States. *Journal for the Scientific Study of Religion*, 42(1), 95–106. <https://doi.org/10.1111/1468-5906.00163>.
- Risen, J. L. (2016). Believing what we do not believe: Acquiescence to superstitious beliefs and other powerful intuitions. *Psychological Review*, 123(2), 182. <https://doi.org/10.1037/rev0000017>.
- Risen, J. L., & Gilovich, T. (2008). Why people are reluctant to tempt fate. *Journal of Personality and Social Psychology*, 95(2), 293–307. <https://doi.org/10.1037/0022-3514.95.2.293>.
- Rogers, P., Hattersley, M., & French, C. C. (2019). Gender role orientation, thinking style preference and facets of adult paranormality: A mediation analysis. *Consciousness and Cognition*, 76, 102821.
- Rozin, P., Millman, L., & Nemeroff, C. (1986). Operation of the laws of sympathetic magic in disgust and other domains. *Journal of Personality and Social Psychology*, 50(4), 703. <https://doi.org/10.1037/0022-3514.50.4.703>.
- Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology*, 67(6), 1063–1078. <https://doi.org/10.1037/0022-3514.67.6.1063>.
- Shenhav, A., Rand, D. G., & Greene, J. D. (2012). Divine intuition: Cognitive style influences belief in God. *Journal of Experimental Psychology: General*, 141, 423–428. <https://doi.org/10.1037/a0025391>.
- Shiloh, S., Salton, E., & Sharabi, D. (2002). Individual differences in rational and intuitive thinking styles as predictors of heuristic responses and framing effects. *Personality and Individual Differences*, 32(3), 415–429. [https://doi.org/10.1016/S0191-8869\(01\)00034-4](https://doi.org/10.1016/S0191-8869(01)00034-4).
- Simmons, J.P., Nelson, L.D., & Simonsohn, U. (2012). A 21 word solution. Available at SSRN: <https://ssrn.com/abstract=2160588> or <https://doi.org/10.2139/ssrn.2160588>.
- Skinner, E. A. (1995). *Perceived control, motivation, and coping*. Newbury Park, CA: Sage.
- Sladek, R. M., Bond, M. J., & Phillips, P. A. (2010). Age and gender differences in preferences for rational and experiential thinking. *Personality and Individual Differences*, 49(8), 907–911. <https://doi.org/10.1016/j.paid.2010.07.028>.
- Stoltenberg, S. F., Batiem, B. D., & Birgenheir, D. G. (2008). Does gender moderate associations among impulsivity and health-risk behaviors?. *Addictive Behaviors*, 33(2), 252–265. <http://dx.doi.org.proxy.missouri.edu/10.1016/j.addbeh.2007.09.004>.
- Subbotsky, E. (2001). Causal explanations of events by children and adults: Can alternative causal modes coexist in one mind?. *British Journal of Developmental Psychology*, 19(1), 23–45. <https://doi.org/10.1348/026151001165949>.
- Svedholm, A. M., & Lindeman, M. (2013). The separate roles of the reflective mind and involuntary inhibitory control in gatekeeping paranormal beliefs and the underlying intuitive confusions. *British Journal of Psychology*, 104(3), 303–319. <https://doi.org/10.1111/j.2044-8295.2012.02118.x>.
- Thompson, V. A., Turner, J. A. P., Pennycook, G., Ball, L. J., Brack, H., Ophir, Y., & Ackerman, R. (2013). The role of answer fluency and perceptual fluency as metacognitive cues for initiating analytic thinking. *Cognition*, 128, 237–251. <https://doi.org/10.1016/j.cognition.2012.09.012>.
- Tobacyk, J. J. (2004). A revised paranormal belief scale. *International Journal of Transpersonal Studies*, 23(1), 11. <https://doi.org/10.24972/ijts.2004.23.1.94>.
- Tobacyk, J., & Milford, G. (1983). Belief in paranormal phenomena: Assessment instrument development and implications for personality functioning. *Journal of Personality and Social Psychology*, 44(5), 1029–1037. <https://doi.org/10.1037/0022-3514.44.5.1029>.
- Toplak, M. E., West, R. F., & Stanovich, K. E. (2011). The Cognitive Reflection Test as a predictor of performance on heuristics-and-biases tasks. *Memory & Cognition*, 39, 1275–1289. <https://doi.org/10.3758/s13421-011-0104-1>.
- van Rooijen, J. W., Douglas, K. M., & De Inocencio, C. (2018). Connecting the dots: Illusory pattern perception predicts belief in conspiracies and the supernatural. *European Journal of Social Psychology*, 48(3), 320–335. <https://doi.org/10.1002/ejsp.2331>.
- Voracek, M. (2009). Who wants to believe? Associations between digit ratio (2D:4D) and paranormal and superstitious beliefs. *Personality and Individual Differences*, 47(2), 105–109. <https://doi.org/10.1016/j.paid.2009.01.051>.
- Vyse, S. A. (2013). *Believing in magic: The psychology of superstition—updated edition*. Oxford University Press.
- Walco, D. K., & Risen, J. L. (2017). The empirical case for acquiescing to intuition. *Psychological Science*, 28(12), 1807–1820. <https://doi.org/10.1177/0956797617723377>.
- Wagner, M. E. (1928). Superstitions and their social and psychological correlates among college students. *The Journal of Educational Sociology*, 2(1), 26–36. <https://doi.org/10.2307/2961760>.
- Ward, S. J., & King, L. A. (2018a). Gender differences in emotion explain women's lower immoral intentions and harsher moral condemnation. *Personality and Social Psychology Bulletin*, 44(5), 653–669. <https://doi.org/10.1177/0146167217744525>.
- Ward, S. J., & King, L. A. (2018b). Individual differences in reliance on intuition predict harsher moral judgment. *Journal of Personality and Social Psychology*. <https://doi.org/10.1037/pspp0000153>.
- Welsh, M., Burns, N., & Delfabbro, P. (2013). The cognitive reflection test: How much more than numerical ability? *Proceedings of the Annual Meeting of the Cognitive Science Society* (35), 35.
- Wiseman, R., & Watt, C. (2004). Measuring superstitious belief: Why lucky charms matter. *Personality and Individual Differences*, 37(8), 1533–1541. <https://doi.org/10.1016/j.paid.2004.02.009>.
- Wolfradt, U. (1997). Dissociative experiences, trait anxiety and paranormal beliefs. *Personality and Individual Differences*, 23(1), 15–19. [https://doi.org/10.1016/S0191-8869\(97\)00043-3](https://doi.org/10.1016/S0191-8869(97)00043-3).
- Wong, G., Zane, N., Saw, A., & Chan, A. K. K. (2013). Examining gender differences for gambling engagement and gambling problems among emerging adults. *Journal of Gambling Studies*, 29(2), 171–189. <https://doi.org/10.1007/s10899-012-9305-1>.
- Zusne, L., & Jones, W. H. (1989). *Anomalous psychology: A study of magical thinking*. Hillsdale, NJ: Erlbaum.

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