



On the belief that beliefs should change according to evidence: Implications for conspiratorial, moral, paranormal, political, religious, and science beliefs



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Abstract

Does one's stance toward evidence evaluation and belief revision have relevance for actual beliefs? We investigate the role of having an **actively open-minded thinking style about evidence (AOT-E)** on a wide range of beliefs, values, and opinions. Participants indicated the extent to which they think beliefs (Study 1) or opinions (Studies 2 and 3) ought to change according to evidence on an 8-item scale. Across three studies with 1,692 participants from two different sources (Mechanical Turk and Lucid), we find that our short AOT-E scale correlates negatively with beliefs about topics ranging from extrasensory perception, to respect for tradition, to abortion, to God; and positively with topics ranging from anthropogenic global warming to support for free speech on college campuses. More broadly, the belief that beliefs should change according to evidence was robustly associated with political liberalism, the rejection of traditional moral values, the acceptance of science, and skepticism about religious, paranormal, and conspiratorial claims. However, we also find that AOT-E is much more strongly predictive for political liberals (Democrats) than conservatives (Republicans). We conclude that socio-cognitive theories of belief (both specific and general) should take into account people's beliefs about when and how beliefs should change – that is, meta-beliefs – but that further work is required to understand how meta-beliefs about evidence interact with political ideology.

AOT-E (beliefs)	AOT-E (opinions)
People should always take into consideration evidence that goes against their beliefs .	People should always take into consideration evidence that goes against their opinions .
It is important to persevere in your beliefs even when evidence is brought to bear against them.*	It is important to persevere in your opinions even when evidence is brought to bear against them.*
Certain beliefs are just too important to abandon no matter how good a case can be made against them.*	Certain opinions are just too important to abandon no matter how good a case can be made against them.*
One should disregard evidence that conflicts with your established beliefs .*	One should disregard evidence that conflicts with your established opinions .*
Beliefs should always be revised in response to new information or evidence.	Opinions should always be revised in response to new information or evidence.
No one can talk me out of something I know is right.*	It is possible for someone to convince me to change my mind.
A person should always consider new possibilities.	A person should always consider new information.
I believe that loyalty to one's ideals and principles is more important than "open-mindedness".*	I believe that loyalty to one's ideals and principles is more important than "open-mindedness".*

* = reverse scored

Method

Study 1: N = 375, Amazon's Mechanical Turk; Study 2: N = 539, Lucid (nationally representative on age, gender, ethnicity, region); Study 3: N = 778, Lucid

Dependent variables

- **Conspiracy ideation**: 15-item General Conspiracy Beliefs Scale (Brotherton, French, Pickering, 2013)
- **Paranormal belief**: 22-item Paranormal Belief Scale (Tobacyk, 2004)
- **Religious belief**: 9-item Religious Belief Scale & single-item God Skepticism (Pennycook et al., 2012)
- **Moral values**: 6-item care/fairness (individualizing) & 4-item traditional values (binding) (Pennycook et al., 2014)
- **Political ideology**: Social and economic liberalism-conservatism & Democrat v. Republican affiliation
- **Free market ideology**: 5-item Free Market Ideology Scale (Heath & Gifford, 2006)
- **Conservative political opinions** relating to: abortion, same-sex marriage, military power, war, police authority, feminism, capital punishment, sexism for men, micro-aggressions, campus free speech.
- **Pro-science beliefs** relating to: evolution, anthropogenic global warming, big bang theory, old Earth, stem cell research, resistance to technology, genetically modified organism (GMO) resistance, vaccines as a cause of autism, belief in modern medicine, genetics, detoxing, IQ heritability, nuclear power.
- **Cognitive Reflection Test** (7-item) (Frederick, 2005; Thomson & Oppenheimer, 2016)

Is the *belief* that beliefs and opinions *should* change according to evidence (AOT-E) consequential for actual beliefs and opinions?

Table 1. Correlations (Pearson *r*) between AOT-E (Actively Open-minded Thinking about Evidence) and primary measures. ***indicates $p < .001$, **indicates $p < .01$, *indicates $p < .05$

	Conspiracy Beliefs	Paranormal Beliefs	Religious Beliefs	God Skepticism	Traditional Moral Values	Care/Fairness Moral Values	Social Conservatism	Fiscal Conservatism	Free Market Ideology	Conservative Opinions	Pro-Science Beliefs	Cognitive Reflection Test
Study 1 AOT-E (beliefs)	-.36***	-.40***	-	.52***	-.54***	.26***	-.46***	-.24***	-.34***	-.61***	.65***	-
Study 2 AOT-E (beliefs)	-.20**	-.14*	-.42***	.30***	-.37***	.12*	-.33***	-.27***	-.27***	-.55***	.40***	.27***
AOT-E (opinions)	-.25***	-.22***	-.20***	.26***	-.17**	.48***	-.26***	-.17**	-.23***	-.36***	.39***	.19**
Study 3 AOT-E (opinions)	-.19***	-.22***	-.20***	.13***	-.16***	.39***	-.17***	-.07	-.16***	-.29***	.35***	.20***

Table 2. Correlations (Pearson *r*) between AOT-E and specific political opinions. Opinion items are scored such that a higher score corresponds with a more strongly politically conservative position.

***indicates $p < .001$, **indicates $p < .01$, *indicates $p < .05$

	Abortion	Same Sex Marriage	Military	War	Police Authority	Men in Feminism	Capital Punishment	Sexism for Men	Micro-aggressions	Campus Free Speech	Trust in Government
Study 1 AOT-E (beliefs)	-.43***	-.50***	-.40***	-.37***	-.51***	-.37***	-.33***	-.24***	.06	.25***	-.23***
Study 2 AOT-E (beliefs)	-.37***	-.37***	-.35***	-.37***	-.29***	-.35***	-.12*	-.32***	-.09	-.011	-.21***
AOT-E (opinions)	-.18**	-.33***	-.24***	-.30***	-.32***	-.24***	-.17**	-.21***	-.08	.19**	-.24***
Study 3 AOT-E (opinions)	-.15***	-.25***	-.18***	-.20***	-.23***	-.26***	-.11**	-.19***	-.07	.17***	-.30***

Table 3. Correlations (Pearson *r*) between AOT-E and specific science beliefs. Belief items are scored such that a higher score corresponds with a more strongly pro-scientific position.

***indicates $p < .001$, **indicates $p < .01$, *indicates $p < .05$

	Global warming	Evolution	Big Bang	Stem Cells	Vaccines/Autism	Old Earth	Modern Medicine	Tech Problems	GMO/Health	IQ Heritability	Detoxing	Genetics	Nuclear Power	Trust in Scientists
Study 1 AOT-E (beliefs)	.37***	.51***	.51***	.45***	.47**	.40***	.33***	.44***	.36***	-	-	-	-	.35***
Study 2 AOT-E (beliefs)	.35***	.33***	.28***	.29***	.31***	.23***	.12	.20**	.14*	.07	.14*	0.05	-.02	.30***
AOT-E (opinions)	.28***	.17**	.20**	.33***	.38***	.25***	.18***	.31***	.14*	.11	.13*	<.01	-.11	.27***
Study 3 AOT-E (opinions)	.28***	.16***	.15***	.32***	.30***	.21***	.15***	.30***	.06	.16***	-.01	.03	-.12**	.23***

Is the AOT-E differentially predictive for liberals (Democrats) and conservatives (Republicans)?

Table 4. Correlations (Pearson *r*) between AOT-E and specific political opinions among Democrats, Republicans, and Independents (Study 3). Opinion items are scored such that a higher score corresponds with a more strongly politically conservative position. ***indicates $p < .001$, **indicates $p < .01$, *indicates $p < .05$

	Abortion	Same Sex Marriage	Military	War	Police Authority	Men in Feminism	Capital Punishment	Sexism for Men	Micro-aggressions	Campus Free Speech	Trust in Government
Democrats (N = 302)	-.23***	-.31***	-.37***	-.29***	-.37***	-.34***	-.28***	-.37***	-.11	.10	-.37***
Republicans (N = 223)	.01	-.12	.08	-.06	-.04	-.14*	.21**	.02	-.01	.26***	-.18**
Independents (N = 239)	-.09	-.27***	-.06	-.15*	-.18**	-.20**	-.03	-.12	-.03	.24***	-.36***

Table 5. Correlations (Pearson *r*) between AOT-E and specific science beliefs among Democrats, Republicans, and Independents (Study 3). Belief items are scored such that a higher score corresponds with a more strongly pro-scientific position. ***indicates $p < .001$, **indicates $p < .01$, *indicates $p < .05$

	Global warming	Evolution	Big Bang	Stem Cells	Vaccines/Autism	Old Earth	Modern Medicine	Tech Problems	GMO/Health	IQ Heritability	Detoxing	Genetics	Nuclear Power	Trust in Scientists
Democrats (N = 302)	.43***	.28***	.24***	.38***	.47***	.27***	.19**	.39***	.15**	.16**	.11	-.05	-.20**	.29***
Republicans (N = 223)	.09	-.07	<.01	.28***	.19**	.05	.14*	.24***	.03	.12	-.02	.12	-.06	.14*
Independents (N = 239)	.25***	.22**	.15*	.26***	.18**	.24***	.13*	.23***	-.03	.24***	-.13*	.08	-.03	.18**

Key Findings

→ AOT-E **strongly** correlates with a wide range of beliefs, opinions, and values

→ Being more actively open-minded about evidence is associated with:

→ More skepticism about conspiratorial and supernatural (paranormal & religious) claims

→ Stronger “pro-science” beliefs

→ Less acceptance of traditional moral values (e.g., purity, respect for authority) & more acceptance of care/fairness moral values

→ Lower levels of political conservatism (both ideology and specific opinions)

→ $r = .30$ is a “large” effect size based on norms in the literature (Funder & Ozer, 2019) and only 10% of correlations are as large as $r = .41$ (Gignac & Szodorai, 2016)

→ Asking about “**beliefs**” (relative to “**opinions**”) inflates the correlation between AOT-E and religious belief (c/o Stanovich & Toplak, 2019), but doesn't otherwise impact predictive validity

→ AOT-E correlates with the **Cognitive Reflection Test**, but the overlap is not particularly strong. [Note: AOT-E tends to be a stronger predictor than CRT.]

Key Finding

→ AOT-E is a stronger predictor among Democrats than among Republicans across a range of political and scientific issues

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