Actively Open-Minded Thinking (AOT) as Metacognition for Self and Others: A Review

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Reflection/impulsivity (R/I), Raven’s (Mellers et al.)

\[ r = .26 \]
Modern version of R/I: drift-diffusion models
Alternative: Dual-systems

stimulus system 1
magic: respond or ...

system 2 respond

Time →

1. Intuitive response (little or no effort, somewhat automatic, possibly a response, possibly incorrect)
2. If no response, some magic (assessment of confidence?)
3. Reflective consideration, response, possibly better
Search-inference model

Possibilities, evidence (arguments), and goals (criteria). The goals determine the effect of each piece of evidence on each possibility.

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Sources of non-optimality: overconfidence, myside bias

- Each possibility gets a strength at each step.
- Each step is a result of a search process (internal or external).
- The direction of search is optimal when it is fair to the possibilities.
- Search is continued on the basis of confidence in results so far.
  - Confidence should reflect the quality of previous thinking, its amount, and the strength difference between the best possibility and the closest alternative.
  - Thinking should stop when expected costs of more thinking > expected benefits.
- **Overconfidence** (unwarranted high confidence) is common.
- Most search may be directed: for or against a favored possibility.
  - E.g., search for a goal that it achieves, a goal it does not achieve;
  - or evidence in its favor, evidence against it, or evidence favoring/opposing an alternative possibility.
- **Myside bias** (favoring the current possibility, is common.)
Myside bias items:

▶ People should take into consideration evidence that goes against conclusions they favor.

▶ People should revise their conclusions in response to relevant new information.

▶ Changing your mind is a sign of weakness. (-)

▶ People should search actively for reasons why they might be wrong.

▶ It is OK to ignore evidence against your established beliefs. (-)

▶ It is important to be loyal to your beliefs even when evidence is brought to bear against them. (-)

▶ When faced with a puzzling question, we should try to consider more than one possible answer before reaching a conclusion.
AOT scale: Acceptance of norms for thinking

Overconfidence items:

- True experts are willing to admit to themselves and others that they are uncertain or that they don’t know the answer.
- Being undecided or unsure is the result of muddled thinking. (-)
- There is nothing wrong with being undecided about many issues.
- It is best to be confident in a conclusion even when we have good reasons to question it. (-)
- The time to make up your mind about people is never.*

* Direct quotation from a famous movie.
AOT beliefs and thinking: AOT as metacognition

- Baron (1991) found correlations between grades given to other students’ hypothetical thinking as a function of whether it was 1- or 2-sided, and their own used of two-sided thinking in discussing a novel problem (allocation of ocean mineral resources).

- West, Toplak & Stanovich (in various combinations, e.g., 2008 J ed Psych, 2014 Devel Psych) found correlations between a questionnaire (from which mine was originally derived) about AOT beliefs and various measures of biases ascribed to heuristics: base-rate neglect, gambler’s fallacy, conjunction effect, denominator neglect, Wason’s 4-card task, myside bias, etc.

- Baron (1995 T&R) found correlations between myside bias in thinking about abortion (making notes for a hypothetical class discussion) and judgment of other people’s thinking about the same issue.

- Haran, Ritov & Mellers (2013, JDM) found scale correlated with insufficient information acquisition in a perceptual judgment task, coupled with reduced overconfidence. Also more information acquisition in a football prediction task.
AOT vs. reflection/impulsivity (CRT), suggestive findings

- AOT correlated −.27 (−.41 corrected) with political conservatism in a study where CRT correlated 0.00 (data from Kahan & Corbin, 2016).
- Baron et al. (2015, in 4 studies) found that log(RT) of CRT items correlated just about as strongly with measures of utilitarian thinking and related beliefs as did the proportion of correct items.
- In the same study, AOT correlated more strongly than CRT or CRT-RT with the same outcome measures, much more strongly (.61 for AOT vs. .32 for CRT) with belief in “divine command theory”.
- Sirota & Juanchich (2018, public data) found r=.43 for AOT correlation with paranormal belief but .27 for CRT. Conversely, correlations with numeracy were .30 and .43, respectively.

- In sum, AOT is about virtues: More is not always better.
- In particular, more time is not always better, especially when outside trustworthy sources are available. R/I is about time.
- AOT is related to overall “cognitive liberalism,” an ideology.
Other correlations of AOT scale (including similar scales)

- Predicts judgments of others’ thinking (Baron, 1995).
- $r = -0.61$ ($-0.82$ corrected) with belief in divine-command theory (Piazza & Landy, 2013).
- $r = 0.20$ correlation with trust in COVID-19 experts (Cohen et al., Risk Analysis 2021).
- $r = 0.3$ (corrected) with utilitarian responding in moral dilemmas (Baron et al., 2015).
- $r = -0.38$ correlation with political conservatism, Brexit.
- $r = -0.49$ with supernatural religious beliefs (Pennycook et al., 2014).
- $r = -0.44$ with superstitious beliefs (Svedholm-Häkkinen & Lindeman (2017).
- Lower negative correlations with belief in conspiracy theories and paranormal beliefs.
Correlation of AOT scale with myside bias in political statements, Study 1 (with Derrick High II)

8 pairs of items differing in recognition of otherside arguments, 100 Ss:

- **Type1** It would be flat out irresponsible to oppose tuition-free access to community or technical college programs — it will create a wave of new workers prepared for the 21st century economy.

- **Type2** Tuition-free access to community or technical college programs will create a wave of new workers prepared for the 21st century economy. Yes, it is expensive, but it is worth the price.

*How much can you trust the judgment of the person who said this?* (4-point scale)

- \( r = .35 \) between AOT and the Type2-Type1 difference

*How fairly has the speaker thought about the topic?* (4-point scale)

- \( r = .37 \) between AOT and the Type2-Type1 difference
Correlation of AOT scale with overconfidence of statements, Study 2

14 pairs of items differing in unjustified high confidence, 100 Ss:

▶ "Those tremors don’t mean anything. An earthquake won’t happen. (scientist)"

▶ "Those tremors probably don’t mean anything. An earthquake is unlikely. (scientist)"

Trust: “Consider someone who made this statement. How would this affect your willingness to rely on what this person says? (The type of person is in parentheses.)”

Difference between ratings of two types correlated .36 with AOT beliefs.

Credibility: “How credible is each statement by itself, when made by the source in parentheses?”

Difference correlated .47 with AOT.
Generality study: myside bias

Questions:

▶ In this case, when X favors one option, it is not worthwhile to look for its negatives

▶ When X leans toward one option, X should look for reasons why a different option might be better.

Highest and lowest items:

▶ A personnel manager X must decide whether to hire C for a job. Although C looks a little better than the other candidates in basic qualifications, a letter from C’s former employer states that C was caught twice revealing trade secrets to outsiders. (C was not taken to court because the company did not want the publicity.)

▶ X asks a friend for an opinion about restaurant A. The friend has been to this restaurant many times and found that it is always reasonably good.
Generality study: Confidence

Questions (immediately after myside-bias questions on same page):

▶ There is nothing wrong with X lacking confidence that the final choice is best.
▶ X should be completely confident in the final choice. If not, X is not thinking well.

Highest and lowest items:

▶ X asks a friend for an opinion about restaurant B. The friend has been to this restaurant once and thought it was excellent.
▶ X is in love with Y and is deciding whether to propose marriage now. X is sure that ’this is the one’. X has been seeing Y for over a year.
Generality: Myside bias results

![Graph showing relationship between Mean AOT for Myside questions and Mean AOT (myside items) by median split of subjects. The graph includes two lines, one red and one black, with data points scattered across the plot. The x-axis represents Mean AOT for item: Myside questions, ranging from 0.0 to 2.0, and the y-axis represents Mean AOT (myside items) by median split of subjects, ranging from -1.0 to 2.0.](image-url)
Generality: Confidence results

Mean AOT for item: Confidence questions

Mean AOT (confidence items) by median split of subjects
Summary

- AOT is based on a general normative model of thinking in which parameters of thinking are set optimally.
- Two common deviations from optimality are “overconfidence” and “myside bias” (a.k.a. “confirmation bias”).
- AOT is not the same as reflective thinking (a.k.a. analytic, System 2).
- Our beliefs about what counts as good thinking affect how we think, hence we can call AOT a basis of metacognition.
- Individual differences in beliefs are fairly general across content.
- We apply these beliefs in deciding whom we should trust when we “outsource” thinking.
- These beliefs are determined in part by social norms, particularly those of the Enlightenment. These are not fully accepted.