



Strategically communicating minds

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Abstract:	Several recent theories postulate communicative functions for cognitive mechanisms previously thought to have individualistic functions—in particular reasoning and metacognition. These theories join older theories suggesting that many of our behaviors have communicative functions, for instance to communicate emotions, or to influence how people perceive us. Using the framework of the evolution of communication, we offer a series of questions to test these hypotheses. The first question is whether the mechanism enables effective communication. The second question takes into account the different strategic incentives between agents who send signals and those who receive them, asking whether receivers can discriminate beneficial from harmful signals. However, serving a function well is not sufficient evidence that a mechanism evolved to this end in particular. Accordingly, the third question bears on whether the mechanism serves other purported functions well, and the fourth on whether some of its features can be explained as specifically serving a communicative function. An overview of the literature suggests that these questions have been experimentally addressed for some cognitive mechanisms (reasoning in particular), but not others. This framework thus opens up avenues for further research that will enable researchers to better test hypotheses regarding the communicative functions of cognitive mechanisms.

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Abstract.

Several recent theories postulate communicative functions for cognitive mechanisms previously thought to have individualistic functions—in particular reasoning and metacognition. These theories join older theories suggesting that many of our behaviors have communicative functions, for instance to communicate emotions, or to influence how people perceive us. Using the framework of the evolution of communication, we offer a series of questions to test these hypotheses. The first question is whether the mechanism enables effective communication. The second question takes into account the different strategic incentives between agents who send signals and those who receive them, asking whether receivers can discriminate beneficial from harmful signals. However, serving a function well is not sufficient evidence that a mechanism evolved to this end in particular. Accordingly, the third question bears on whether the mechanism serves other purported functions well, and the fourth on whether some of its features can be explained as specifically serving a communicative function. An overview of the literature suggests that these questions have been experimentally addressed for some cognitive mechanisms (reasoning in particular), but not others. This framework thus opens up avenues for further research that will enable researchers to better test hypotheses regarding the communicative functions of cognitive mechanisms.

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3 A recent trend in cognitive science is to attempt to better understand some
4 cognitive mechanisms by postulating that they have a communicative function.
5 Two recent examples are Mercier and Sperber's argumentative theory of
6 reasoning (2011), and Shea et al.'s dual process theory of metacognition (2014).
7 Mercier and Sperber (2011) suggest that the main function of human reasoning
8 is communicative and, more specifically, argumentative: reasoning would have
9 evolved so that senders (i.e. individuals who send information) can provide
10 arguments to convince receivers (i.e. individuals who receive information), while
11 receivers can evaluate these arguments to decide whether they should change
12 their minds. This exchange of arguments would help senders and receivers
13 communicate when trust is not sufficient to guarantee that messages can be
14 safely accepted. Shea et al. (2014; see also Yaniv & Foster, 1995) suggest that
15 metacognition should be divided in two different sets of processes, an implicit
16 one whose function is to regulate behavior and cognition, and an explicit one
17 whose function is to communicate to others one's degree of confidence. Thanks
18 to this ability to communicate confidence, senders and receivers should be better
19 able to reach an agreement. These theories can be contrasted with more
20 standard theories holding that reasoning and metacognition serve the individual
21 function of regulating one's personal cognition, in particular by correcting
22 mistaken intuitions (e.g. Kahneman, 2011; Stanovich, 2004).
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27 The recent trend can be related to older theorizing that postulated
28 communicative functions for a range of other behaviors (and thus, implicitly, for
29 the cognitive mechanisms guiding these behaviors). Two salient examples are
30 emotional expressions and self-presentation. Several researchers have
31 postulated that many, if not all, emotional expressions—facial expressions in
32 particular—serve communicative functions. For instance, the function of the
33 expression of anger would be to communicate that one is about to aggress the
34 receiver(s) (Fridlund, 1997). Regarding self-presentation, a long tradition in
35 sociology and social psychology suggests that many of our behaviors aim at
36 influencing how others perceive us—either as a way of forcing this perception
37 onto them, or of communicating it to them (e.g. Leary, 1995).
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40 Following Sperber's (2001) lead, the goal of this article is to use the framework
41 of the evolution of communication to specify what these ascriptions of
42 communicative functions mean, and to highlight ways to test them. We focus
43 here on these four examples, but the framework can easily be extended to
44 related proposals (e.g. Baumeister & Masicampo, 2010; Johnson & Fowler, 2011).
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47 **An evolutionary perspective on communication**

48
49 In an evolutionary perspective, an influential way to define communication is in
50 terms of adaptive function. Communication occurs when an action (a signal)
51 produced by an individual organism causes a change (a reaction) in another
52 organism, where both the signal and the reaction have evolved to fulfill these
53 purposes (Maynard Smith & Harper, 2003; Scott-Phillips, 2008). If the action has
54 evolved to fulfill these purposes, but the reaction has not, then the interaction is
55 coercive; and if the reaction has evolved for these purposes but the action has
56 not, then the interaction is a cue.
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4 This adaptationist approach suggests a series of tests to evaluate whether a
5 given cognitive mechanism serves a communicative function (see Maynard Smith
6 & Harper, 2003). The first test is straightforward: does the cognitive mechanism
7 fulfill this communicative function well? This means that this mechanism should
8 allow senders to send messages that are understood by receivers, thus allowing
9 them to communicate effectively.
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12 However, senders and receivers often have different strategic incentives. As a
13 result, senders might have incentives to send signals that are dishonest, or in
14 some other way costly to receivers. So for communication to be evolutionarily
15 stable, widespread dishonesty must be either prevented or defended against.
16 Evolutionary biologists have identified several possible means by which this can
17 occur (for review, see Maynard Smith & Harper, 2003). Humans frequently
18 interact with unrelated individuals who have different incentives to their own,
19 and possess cognitive mechanisms that evolved to evaluate communicated
20 information (Sperber et al., 2010). Thus, a second test of whether a particular
21 cognitive mechanism has a communicative function is whether receivers are able
22 to evaluate communicated information in a broadly accurate way, rejecting the
23 most harmful signals while accepting the most beneficial ones.
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27 Having said that, showing that a cognitive mechanism fulfills a particular
28 function well is necessary but not sufficient. A mechanism can do something well
29 without being adapted especially for it—color vision didn't evolve for traffic
30 signals or hands for holding pens. To test whether the actual function of a given
31 cognitive mechanism is more general than the communicative function, one can
32 see how this mechanism performs non-communicative functions that have also
33 been ascribed to it. If the mechanism doesn't fulfill these other functions well,
34 this argues in favor of the communicative function. Relatedly, and as a final test,
35 some traits of the cognitive mechanisms should serve better a communicative
36 function than other functions.
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39 Reasoning.

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41 *Does it enable effective communication?*
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44 When people can discuss with each other, their performance increase on a wide
45 variety of tasks—logical, mathematical, and inductive problems, schoolwork,
46 medical diagnoses, economic predictions, and so forth (Mercier, 2016b; Mercier
47 & Sperber, 2011). More specifically, group members with sound insights into the
48 problem usually manage to convince others to accept these insights. That the
49 exchange of arguments is critical to this process has been demonstrated by
50 analyses of the transcripts of discussions (e.g. Moshman & Geil, 1998), and by
51 eliminating other potential explanations (for instance, that the expression of
52 confidence might be sufficient to account for the observed spread of the correct
53 answers, Trouche, Sander, & Mercier, 2014).
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56 *Can receivers discriminate beneficial from harmful signals?*
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Reasoning helps discriminate between beneficial and harmful signals by discriminating between good and poor arguments, which should correlate with overall signal quality in most cases. At least when they are motivated, people discriminate between good and poor arguments, being influenced by the former while they reject the latter (Hahn & Oaksford, 2007; Petty & Wegener, 1998). In particular, there is no experimental evidence that people are easily taken in by sophistry or fallacious arguments.

Does it serve other purported functions less well?

Reasoning largely fails to fulfill the individual function usually ascribed to it: a majority of participants fail to correct their mistaken intuitions even when doing so only requires elementary logical or mathematical reasoning well within their abilities (Frederick, 2005; Wason, 1966).

Can its features be explained as specifically serving a communicative function?

Reasoning has several features that seem particularly well suited for a communicative function. For instance, reasoning has been shown to have a strong confirmation bias (more accurately called a myside bias; see Mercier, 2016a), so that when people generate reasons, they overwhelmingly find reasons that support their prior beliefs (Mercier, 2016a). This is largely why reasoning fails to correct solitary reasoners' intuitions. By contrast, the myside bias makes sense if reasoning has an argumentative function, since it helps people find arguments to defend their opinions.

Metacognition.

Does it enable effective communication?

When people face together decisions for which finding reasons is difficult (e.g. because the tasks are perceptual), they effectively communicate their degree of confidence, allowing the group to agree on the answer of the most confidence individual, who, in this type of tasks, tends to be right (Bahrami et al., 2010). Analyses of transcripts have revealed the richness of the linguistic means through which people manage to communicate their degrees of confidence (Fusaroli et al., 2012).

Can receivers discriminate beneficial from harmful signals?

Here, the honesty of a signal depends on whether the expressed degree of confidence (as interpreted by the receiver) correlates with the likelihood that the message is sound. Some researchers have claimed that receivers do not discriminate well between senders who consistently express confidence, whether they are right or wrong, and senders who are better calibrated (Anderson, Brion, Moore, & Kennedy, 2012; Kennedy, Anderson, & Moore, 2013). However, a literature review and further experiments have shown that, on the whole, misplaced expressions of confidence tend to degrade a sender's reputation, with the consequence that the expression of overconfidence is not a

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3 sound strategy in repeated interactions (Vullioud, Clément, Scott-Phillips, &
4 Mercier, 2016).

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7 *Does it serve other purported functions less well?*

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9 The main other function suggested for metacognition is to regulate individual
10 thought and behavior. If implicit metacognition fulfills this function well (Shea et
11 al., 2014), explicit metacognition suffers from several issues in this respect, being
12 affected by some consistent biases. For instance, people consistently
13 overestimate the degree of precision with which they can make estimates (Yaniv
14 & Foster, 1995).

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17 *Can its features be explained as specifically serving a communicative function?*

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19 Some features of explicit metacognition might be well suited for communicative
20 functions. For instance, the tendency to offer estimates that are more precise
21 than warranted has been cast as a way of increasing the relevance of one's
22 statements, rather than as exerting an undue influence on others (Yaniv &
23 Foster, 1995). Accordingly, overprecision does not seem to impair
24 communication, since receivers tend to adjust for senders' overprecision (see
25 Vullioud et al., 2016).

26 27 28 **Emotional signals.**

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30 *Do they enable effective communication?*

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32 Subtle changes in facial musculature can be detected quickly and their emotional
33 significance accurately evaluated by recipients over time (Jack, Garrod, & Schyns,
34 2014). If the extent to which those emotional signals are universal is debated,
35 locally-specific facial configuration and dynamics enable effective
36 communication of emotions (Jack, Garrod, Yu, Caldara, & Schyns, 2012).

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39 *Can receivers discriminate beneficial from harmful signals?*

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41 It has long been claimed that receivers react automatically to emotional signals
42 (Hatfield, Cacioppo, & Rapson, 1994). If it were so, senders could abuse
43 emotional signals to their advantage by repeatedly sending signals that benefit
44 them but not receivers. In fact, reactions to emotional signals are heavily
45 modulated by characteristics of the source and of the situation (for review, see
46 Dezechache, Mercier, & Scott-Phillips, 2013). For instance, signals of pain are
47 likely to elicit an empathetic response if the receiver expects to collaborate with
48 the sender, but no response, or a counter-empathetic response if the receiver
49 expects to compete with the sender (Lanzetta & Englis, 1989).

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53 *Do they serve other purported functions less well?*

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55 According to the two-stage models of the evolution of facial displays (Shariff &
56 Tracy, 2011), facial expressions of emotions first evolved to serve intrapersonal
57 sensory regulatory functions before being selected for their communicative
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3 function. Some effects of emotional expressions are compatible with an
4 individual function. For instance the widening of the eyes in fear increases
5 sensory acquisition (Susskind et al., 2008). However, the modifications of
6 sensory exposure in producers of facial display are limited, and they cannot
7 account for the evolution of other prototypical facial movements (such as the
8 activity of the zygomaticus major in the smile).
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11 *Can their features be explained as specifically serving a communicative function?*
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13 Following Ekman (Ekman, 2007), a tradition in psychology has viewed emotional
14 expressions as automatic read-outs of inner states. However, and as argued by
15 Fridlund, it is unlikely that humans would have evolved traits that can be detrimental
16 to them, for instance by automatically revealing fear when under stress. In a
17 number of studies, Fridlund (1994) also has shown that the intensity of
18 emotional facial displays (notably smiles) is modulated by the presence of an
19 audience and the sociality of the context.
20

21 22 **Self-presentation.** 23

24 *Does it enable effective communication?*
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26 A tremendous amount of research has been dedicated to showing how self-
27 presentation affects senders' behaviors, but relatively little work has been
28 dedicated to receivers' reactions to these behaviors (see Leary, 1995). For
29 instance, social psychologists have extensively studied the influence that
30 dissonance reduction has on individuals' behaviors, but have paid little attention
31 to how individuals who reduce dissonance (or who fail to do so) are perceived by
32 others (Cooper, 2007). As a result, it is difficult to tell if self-presentation enables
33 either effective communication, or if it effectively serves coercive goals for
34 senders (i.e. getting receivers to form a favorable impression of them, whether it
35 is warranted or not).
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39 *Can receivers discriminate beneficial from harmful signals?*
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41 As mentioned above, little work has borne directly on the question of how
42 people react to self-presentation. However, some work in a related area bears on
43 this question. One of the goals that self-presentation might serve would be to
44 make one's lies harder to detect by restraining behaviors that are perceived as
45 cues to lying, such as fidgeting, or by encouraging behaviors that are perceived
46 as cues to truth-telling, such as looking the receiver in the eyes (Global Deception
47 Research Team, 2006). If this were the case, then receivers might be made to
48 accept lies, raising the question of why they would keep attending to these
49 signals. Recent work in lie detection suggests, however, that people in fact pay
50 little attention to such unreliable cues, focusing instead on the content of the
51 message, and on whether the situation makes a lie more or less likely (Hartwig &
52 Bond, 2011). Thus, although we cannot exclude that self-presentation can
53 consistently deceive receivers, there is, to the best of our knowledge, no evidence
54 that this is the case either.
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3 *Does it serve other purported functions less well?*

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5 Some mechanisms of self-presentation, such as dissonance reduction, have been
6 postulated to serve non-social, regulatory functions (see Cooper, 2007).
7 However, self-presentation can lead senders to the adoption of misguided beliefs
8 and costly behaviors. For instance, dissonance reduction can lead participants to
9 believe that an excruciatingly boring task was not so bad after all (Festinger &
10 Carlsmith, 1959), and it can lead them to engage in personally costly but socially
11 desirable behaviors, such as having an instrument installed in their car to
12 measure its speed (for review, see Stone & Fernandez, 2008).
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15 *Can its features be explained as specifically serving a communicative function?*

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17 The type of work cited above suggests that, at least in the case of dissonance
18 reduction, features of self-presentation are best explained by a social than by an
19 individual function. However, the relative lack of work on receivers' reactions to
20 self-presentation makes it difficult to tell whether the features of self-
21 presentation fit best with a coercive or a communicative function.
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24 **Conclusion**

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26 We have offered a series of questions, informed by the perspective of
27 evolutionary adaptationism, that can help researchers test their hypotheses
28 about the communicative functions of cognitive mechanisms. In the case of
29 reasoning, the questions have all been experimentally addressed. However, for
30 the other mechanisms some questions have been the topic of little inquiry. In
31 particular, work on self-presentation could be usefully extended so that these
32 basic questions can be answered. We thus hope that the proposed framework
33 will prompt research in these directions. Another avenue for further research is
34 the influence of strategic incentives on senders. Senders likely evolved to
35 modulate their signals as a function of the receivers' vigilance—in particular, to
36 avoid the potential reputational costs of sending signals perceived as misleading.
37 Thinking of senders' behavior in this light might help explain otherwise puzzling
38 behaviors, such as why people take sunk costs into account (Arkes & Ayton,
39 1999), or why they exert caution in sending requests (Bohns, 2016).
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