Emotional tone and argumentation in risk communication

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Abstract

In this paper I explore how the evolution of emotional expression and co-operative planning in humans may inform the way they communicate about risks, and what implication this may have for models of rationality in risk communication. In particular, I focus on aspects of human language that enable successful co-ordination around shared tasks that involve the management of uncertainty by a group. I distinguish between performative (action-oriented) and constative (description-oriented) aspects of human communication, and argue that the human logical vocabulary of conditionals, quantifiers and probability expressions often conveys pragmatic signals that implicitly encourage or discourage a course of action that is under discussion. I review some studies that illustrate this perspective by highlighting the role of emotional undertone in risk communication and management, and show how it differs from existing models of risk communication and decision-making.

Keywords: risk, emotion, communication, pragmatics, argumentation.

1 Introduction

In this paper, I will take the view that the primary function of communication is to excite or inhibit behaviours in others, and only secondarily to evoke and describe states of the world (Luria, 1959). Taking the view that human language evolved first as a means of social influence, and only second as a means of describing and representing the world can help understand why human logical language — far from containing disinterested and dispassionate devices for describing reality — is essentially argumentative in structure and function (Sperber, 2001). Thus the conditionals, quantifiers and probability expressions that humans naturally use when making plans to deal with uncertainty will implicitly signal a speaker's attitude to the action under question, for example, whether he wishes to encourage or discourage it.

I argue that human communication emerges out of the expression of emotion, which primarily serves to influence the behaviour of conspecifics (Darwin, 1888/2004). The emotional tone inherent to risk communication will influence others with respect to avoiding dangers and planning to take advantage of opportunities. Framing and polarity effects which focus the hearer's attention either on the positive or the negative aspects of a question (Horn, 1989) are pervasive in discussions about de-

cisions, because actions can either be taken or not taken. There is no middle ground here, and one must therefore decide whether to flee or not to flee in the face of threat, to buy or not to buy a share, to recruit or not to recruit a candidate. Although we can hedge and qualify *judgments* by saying "she's *quite/rather/extremely* good", in making a *decision* we have to choose by saying "she's *the* one" or "he's not got what it takes". Due to this lack of middle ground, it is hard (if not impossible) to give completely disinterested and dispassionate advice about decisions, as the normal use of the human logical vocabulary leads us to argue implicitly either for or against taking the action in question.

This pragmatic view of risk communication is at variance with that which would emerge from the view that language is a purely representational system. In the representational view, the function of an expert (such as a doctor, a banker) might be to assemble the relevant facts and present them in an objective way to the client, so that the client could make an informed decision (to take a treatment, to make an investment). In this view, the aim of the expert will be to "re-present" reality in a client-centred way; that is, distil a view of reality that is relevant to what the client needs to know, but disinterested in that the expert does not communicate his own preferences. One purpose of this paper is to show that this (often laudable) goal of informing but not influencing the decision-maker may be harder than it might seem, as even the logical expressions used in human natural language are not value-neutral.

2 The argumentative structure of logical language

I begin by considering how the expression of emotion influences the behaviour of others in nonlinguistic communication. In humans, the basic emotional communication system that we share with other species will be overlaid with our ability to use language to describe things (opportunities and threats) that are not present (Gärdenfors, 2004), but this will not lead to a fundamental change in the way we communicate risk to others. In each case, the emotional expression of another conspecific serves as a *reason* for us to take an adaptive action, whether this action be an automatic reflex or the product of a reasoned plan. Below, I consider how this argumentative, action + reason structure could emerge from emotional communication that we share with other animals.

2.1 Human communication about threats: From automatic to intentional communication

The automatic expression of emotion communicates information about environmental benefits and hazards to others. For example, Blair (2003) argues that emotional expressions serve as unconditioned stimuli that enable a conspecific to evaluate the eliciting stimulus as positive or negative; for example, if another animal expresses disgust for a food, then conspecifics can learn to avoid this food. Indeed, animals are even able to use the emotional expressions of non-conspecifics to learn about dangers in their environment. For example, some Diana monkeys in the wild are able to infer from a chimpanzee's alarm call for *Leopard!* that a leopard must be present, and utter the Diana-ese warning call for *Leopard!* to their own conspecifics (Zuberbühler, 2000a; 2000b). Whether emitted automatically or intentionally, the Diana monkeys' warning calls to each other presumably enable the group to take early and appropriate action to avoid the impending threat.

In this way, animal expression of emotion serves as a means of communicating to their conspecifics and to other species (Darwin, 1888), and influences others' behaviour in a way that is adaptive for the group (and therefore the species), and which is in this sense "rational". There is also a sense in which the alarm call in the presence of a predator gives a "reason" for the group to take flight, and the fact that Diana monkeys are able to infer that a leopard is present from hearing the chimpanzees' alarm call for leopards shows that they have causal inference abilities. However, the processing of these alarm signals does not have to be conscious and deliberate for a communication system to be rational and adaptive for the group concerned.

For example, imagine I am talking to you, when you see my startled expression and hear my cry of alarm. Although my reaction has been automatic, it communicates to you that something potentially dangerous has come to my attention that has upset me, and which could also be dangerous to you. You may interpret my expression as effectively saying *Flee!* and do so without further ado. However, you may want more justification before doing so and so orient your gaze to look at what I am looking at, and if it is something dangerous (like a leopard that has just come into view), then take evasive action. Here you effectively interpret my line of regard as giving a reason for my emotional expression and saying *Flee! There's a leopard!* Finally, it may not be something physically present that has alarmed me, but a thought that has just come to my mind. For example, I may just have realised that unknown to the authorities, we are in an area that has just become potentially unsafe (e.g., a part of a zoo that is used to exercise animals after 5 o'clock), and now that it has just turned 5 o'clock, a leopard may come into view at any moment. Here I would normally have to use language to *explain* (intentionally and co-operatively) the reason for my alarm to you, saying *Flee! A leopard might come!*

2.2 Anticipatory planning and linguistic valence

Whereas avoiding harm may have an automatic, reflexive nature that is shared with other animals, the ability to engage in co-operative planning seems specific to humans, who can use language to describe things that are not present, and to evoke past states and negotiate future ones. Although chimpanzees and bonobos have shown some ability to use language as a representational system (Premack, 1976; Savage-Rumbaugh, Shanker & Taylor, 1998) and to communicate effectively about things that are physically present, they have difficulty in evoking things that are not physically present (Gardenförs, 2004). Detached representations of what is not physically present can enable humans to discuss future projects and co-operate to achieve them. Language may also help co-operation through serving as a "second signal system" (Luria, 1959) that enables us to respond to ideas that are for the moment just that, and so defer immediate individual gratification in order to reap the delayed benefits of mutual co-operation, something that is difficult for non-linguistic animals (Stevens & Stephens, 2004).

Nevertheless, the language that would be used in this kind of co-operative anticipatory planning seems to have an inherently valenced nature. For example, imagine a group of farmers who get together to build a fort to defend their harvests during the winter from attack by

brigands, and who discuss plans for the construction of that fort (cf. Gardenförs, 2004). Communication about planning seems to be inherently valenced, as in such co-ordination, it will be useful to encourage some actions and discourage others. For example, the farmers in our example could advise each other on profitable courses of action: "There are a few usable trees in that wood over there" sounds like an encouragement to work in that wood, whereas "There are few usable trees in that forest over there" sounds like a discouragement from doing so. These quantifiers do more than just denote proportions; they also signal what the speaker encourages and discourages (cf. Teigen & Brun, 1999) by suggesting *reasons*: "Work in that wood *because* there are a few usable trees" vs. "Don't work in that wood *because* there are few usable trees". Thus although a plan may be conscious in form (someone imagines a goal that he wishes to attain), its linguistic expression will necessarily be valenced.

In the examples used above, I have introduced quantifiers to give valence to conditional expressions. However, even without polarized quantifiers, conditional advice and instructions would also seem to have a similar property of conveying encouragement and discouragement. For example, if I say "If there are trees in that wood, then work over there" sounds more encouraging than saying "Work over there only if there are trees in that wood" or "If there are no trees in that wood, then don't work over there" (cf. Hilton, Kemmelmeier & Bonnefon, 2005; see below). What is striking is that there seems to be no "disinterested" middle way of making a statement about the quantity of trees available without implicitly suggesting that the characteristic in question is desirable or undesirable. In life, as in *The Lord of the Rings,* trees are generally thought of as good eggs: thus "There are a few trees over there" sounds more positive than "there are few trees over there".

2.3 Argumentation and logical vocabulary for dealing with uncertainty

I argue that the essential structure of human communication about decision-making is argumentative. Communication about decision-making therefore has essentially an action + reason structure where an action (e.g., flight from a danger, or work to be done) is recommended on the basis of a reason (e.g., the presence of a danger, or of an opportunity). Arguments have to be either for or against a course of action or a point of view, and hence assume a positive or negative aspect. They cannot be neutral, nor will the inherently polarised nature of human language permit this. For this reason, argumentation is inbred in the structure of language itself, and part of the meaning of conditionals, quantifiers and probability expressions

comes from their polarity (positive or negative) which allows — even forces — the speaker to express his attitude to the action in question. This phenomenon, whereby key parts of the human logical vocabulary automatically and invariantly express the speaker's attitude to the proposition in question without changing its truth-conditions generates what are known as "conventional implicatures" (Levinson, 1983). These conventional implicatures generate automatic inferences about the speaker's attitude to a proposition, that are as inherently part of the meaning of these words as the quantities and probabilities described by them.[1]

3   Performative vs. constative models of risk communication

As Austin (1962) pointed out, words are used to *do* things to the world, not just describe it. Following Austin, we may make a distinction between performative and constative functions of language. The *performative* function of language is to make a change to the world, for example by requesting help, menacing someone, or by contracting to do something through a promise. The *constative* function of language is simply to describe a state of the world as it is or has been (a proposition) or as it will be (a prediction). In the constative view of language the function of language is to represent reality, which it can do more or less faithfully. Here, the value of a linguistic expression essentially depends on its *accuracy* as a description of the world to which it is applied. For example, it would be an incorrect use of language to say that "France have beaten England at rugby *most* times they have played" if in fact they have not done so. Likewise if a government spokesman says "It is *unlikely* that climate change will create problems in the coming century," when he knows all the evidence points to the contrary, his statement could reasonably be characterised as untruthful.

Somewhat like Rodin's well-known statue of the Thinker, the decision-maker in the "constative" perspective appears lost in thought, detached from his emotions and abstracted from his social surroundings. For example, the languages of quantification and probability

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[1]A classic example of conversational implicatures is demonstrated through the choice of the connectives *and* vs. *but* which allows — or forces — a speaker to express an attitude to the proposition concerned. For example, *Nicole went to the party and Paris Hilton was there* suggests that this consequence of going to the party was somehow expected and even desirable in a way that *Nicole went to the party but Paris Hilton was there* does not. Note that both descriptions hold true in exactly the same conditions, i.e., Nicole went to the party, and Paris Hilton was there. However, both descriptions could reasonably be uttered about the same event by speakers who have different points of view on what happened.

are seen as more-or-less accurate representations of reality, and the key research question became to assess how verbal quantifiers (*few, many, most* etc.) and probability expressions (*possible, likely, unlikely* etc.) function as verbal substitutes for more precise numerical expressions (Beyth-Marom, 1982; Lichtenstein & Newman; 1967; Pepper & Prytulak, 1974). Subsequent research has sought to formalise these "pictures" of frequency or probability ranges as membership functions (Wallsten, Budescu, Rapaport, Zwick & Forsyth, 1986) and to show how these membership functions can be integrated with contextually given base-rate information (Wallsten, Fillenbaum & Cox, 1986).

Constatives should therefore be used when a speaker aims to give disinterested judgements that can inform decisions without influencing them one way or the other. For example, a meteorological station will have many clients and will simply aim to inform in a general way, allowing its audience to make the appropriate inferences about what to do from the information given. For example, the prediction that "there is a 60% chance of rain in SW France next week" (or alternatively, "there is a 40% chance of no rain in SW France next week") may persuade a farmer to plant his crops, but may dissuade a tourist from taking a holiday in the area. However, note how readily such statements may become valenced when uttered in a particular interactional context where a collaborative action is at stake. For example, suppose *we* are discussing whether to go on holiday together in SW France next week. Thus, if I say "Well, the weather station does say there is a 60% chance of rain next week," I may perhaps convey to you that I am less keen to go on holiday there than if I say "Well, the weather station does say there is a 40% chance of no rain next week." Although both statements are equally true, research reviewed below suggests that my choice of framing may be dictated by my wish to influence you towards choosing one option over the other.

Whereas constative uses of language are truth-valued — that is, they can be true or false of the world — performative actions can be either successful or not in attaining speaker goals. For example a bluff ("If you don't get out of here, I'll call the police"), may be literally false (it contains an empty threat, and hence an untrue prediction about what will happen if the addressee does not move). However, it will be considered to be a successful speech act from the speaker's point of view if it causes the addressee to back down. Decision-making is also essentially performative in nature; as decisions are taken in order to bring about desired states of the world. Below, I review a number of recent studies which illustrate the "performative" approach to risk communication, whereby the meaning of quantifiers and probability expressions is evaluated in terms of their argumentative functions.

4 Polarity and argumentation about decision-making under risk

Hilton, Villejoubert and Bonnefon (2005) have argued that the human logical vocabulary (conditionals, quantifiers, probability expressions) is not inherently disinterested, as might be thought to be the case. Rather, when discussing actions to be taken, a choice of a particular formulation of a conditional or quantifier or probability expression will often implicitly convey the speaker's attitude (for or against) the action in question. For example, the choice of quantifier may signal the speaker's attitude to a proposition under discussion. If a travel agent says to a client "There are a few seats left" when discussing whether to make a reservation on the spot, then the travel agent may be seen as encouraging the client to take his time before making a final decision. However, if she says "There are few seats left," then she may be seen as discouraging the client from waiting too long before taking his decision. If the seats are going slowly, then the fact that there are *a few* seats left can be seen as an argument *for* taking one's time over a decision in order to get it right, while if there are *few* seats left then this can be seen as an argument *against* taking one's time.

Villejoubert and Hilton (2007) show that choice of quantifier polarity does indeed reflect this kind of goal structure. When there is a low risk of losing seats through waiting a few days before making a final decision, positive polarity quantifiers are chosen, regardless of the actual number of seats (15 vs. 45 on a 120 seat plane) available. However, when there is a high risk of losing the seat through waiting too long, negative polarity quantifiers are used. The number of seats available (15 vs. 45) influences the polarity of quantifier choice only when no information is available about the speed at which the tickets are disappearing; the more the number of tickets available, the more likely people are to use positive quantifiers. Importantly, there seems to be no middle way where one can express the quantity without implicitly conveying one's point of view through the polarity of a quantifier expression. Even numerical quantities, as we shall see below, can be polarized.

4.1 Linguistic polarity of quantifiers

Extensive research has been done which shows that quantifiers (Moxey & Sanford, 1993a, b; 2000) are polarized; that is, they focus on reasons for action, and these reasons are either positive or negative. For example, Moxey and

Sanford (1993) deal with constatives of the form:

A few tourists went to the Blue Lagoon because. . . .

Few tourists went to the Blue Lagoon because. . . .

They asked participants to give sentence completions, and found very strong tendencies for participants to give reasons for going in the case of positive polarity quantifiers like "a few", "some", "many" (e.g., because it was very famous), and reasons against in the case of negative polarity quantifiers such as "few", "not many", "not all" (e.g., because it was too hot). Moxey and Sanford (1993) obtained these results even though they showed that "few" and "a few" are considered to denote approximately the same numerical proportion (approx. 15–25%).

4.2 Linguistic polarity of verbal probability expressions

In a series of studies, Teigen and Brun (1995; 2000; 2003) have demonstrated polarity effects in verbal expressions of probability, and found comparable results using probability expressions in an advice setting (Teigen & Brun, 1999). Thus they found that the words "some possibility" and "quite uncertain" are interpreted to signify about 30–35% probability of a target event in a specific context happening. However, if the expression "some possibility" is used, hearers are likely to prefer the action in question (91%) over the case where the expression "quite uncertain" is used (32%). Teigen & Brun (1999) also presented a third condition where a numerical expression ("30% chance") was used, leading an intermediate number (58%) to prefer taking the action. However, as I show below, it would be premature to conclude from this result that numerical probability expressions are inherently neutral.

4.3 Framing of options and numerical probability expressions

In a study that extended Teigen and Brun's (1999) design, Juanchich (2006) used indicative conditionals that are used to give indirect advice, such as "If you take this operation, there is a chance of it succeeding." She used positive and negative verbal quantifiers that were perceived to convey an approximately 40% chance of an operation succeeding (a chance vs. not certain), and found that participants were more favourably disposed to taking the operation after receiving the positive polarity quantifier. However, the same numerical information can also be framed in a positive or negative way: thus the prediction can be expressed as "If you take this operation there is a 40% chance of succeeding" as opposed to the complement negative form "If you take this operation there is a 60% chance of it not succeeding." Juanchich found that the positive and negative framing had similar

effects with the numerical expressions as with the verbal expressions; participants were more likely to be disposed to take the action in question after the positive framing. Juanchich's results are consistent with the findings of Sher and McKenzie (2006) who found that a recommendation that focused on the number of successes obtained by a management team was interpreted as a more positive recommendation than a message that focused on the number of their failures.

4.4 Co-ordination through linguistic polarity of risk communications

Villejoubert and Hilton's (2007) research suggests that evaluations of the desirability of an action (as evaluated in terms of its expected costs and benefits) will often determine choice of the polarity of quantifiers and probability expressions. For example, a doctor might be more likely to recommend a treatment to a patient if the treatment is cheap and fast-acting than if it is long and expensive, even if there are the same chances of cure in both cases. In the first case, treatment failure would not be serious, whereas in the second case the prospect of failure should be seriously considered before taking a decision. Accordingly, the doctor might emphasise the chances of success in the first case by saying "there is *some possibility* of success," whereas he might emphasise the chances of failure in the second case by saying "it is *quite uncertain* that it will succeed." There is evidence that hearers will indeed pick up the implicit preferences of the speaker in these kinds of scenario. Thus Teigen and Brun (1999, Expt. 1) found that judges who receive these predictions are much more likely to recommend treatment to a friend in the first case than in the second, even though both terms convey approximately the same probability.

Results such as these suggest that hearers (e.g., patients) are able to pick up the implicit preferences of the speaker (e.g., doctor) quite independently of perceptions of the probability of relevant outcomes. Indeed while both expressions may be equally "rational" in that they describe an objective probability equally well, the choice of "some possibility" over "quite uncertain" will be more *adaptive* if (say) it is in the patient's interest to persuade him to take the treatment in question. This alignment of preferences shows how the "emotional undertone" due to the polarity of probability expressions can achieve adaptive social co-ordination between speaker and hearer. Below, I further consider the issue of achieving social-co-ordination in the management of uncertainty through the use of conditional expressions.

4.5 Social co-ordination of planning

In the view that has been developed above, groups manage uncertainty either through emotional expressions or through performatives, which express intentions that are recognized and acted upon by others, and which serve as reasons for their acting (Strawson, 1964). These expressions can aim to avoid threats to well-being or to profit from opportunities. They thus concern actions that can either avoid a loss (prevention focus) or attain a gain (promotion focus) from one's present position (Higgins, 2000). Although avoiding losses and realizing gains both bring utility to the agent, alarm calls (that prevent undesired outcomes) may sometimes be automatic and reflexive in a way that the kind of conditional thinking that is needed to negotiate and promote outcomes is not. Nevertheless, conditional performatives incorporate an emotional tone that expresses the speaker's implicit attitude to the action in question.

In this section I review a series of studies which show how this emotional tone can be used to co-ordinate group action round a shared goal. I then review the implications of this co-ordination for models of rationality.

4.6 The conversational action planning model of conditional performatives

Hilton, Kemmelmeier and Bonnefon (2005) presented a conversational action planning (CAP) model of how conditional directives are used to co-ordinate responses to uncertainty. In the case that they studied, a boss (or principal) gives instructions to a subordinate (agent) about what to do should certain situations arise. For example, a security chief at an airport may give instructions to agents manning a luggage X-ray machine about what baggage they should take out and search. In the language of signal detection theory, there are two kinds of correct decision in such a vigilance task: a "hit" (when a suspect piece of baggage is correctly identified and taken out) and a correct rejection (when a piece of baggage is correctly identified as safe and is not taken out and searched). There are also two kinds of error: a "miss" (an error of omission, whereby a suspect piece of baggage is not taken out and searched) and a "false alarm" (an error of commission, whereby a safe piece of baggage is incorrectly identified as suspect and taken out and searched).

Below we consider how situational utilities might affect what the chief would most worry about, and thus guide the formulation of conditional instructions. For example, if there is a heightened threat of terrorist attack, the potential costs of missing a suspect bag will be very high, and therefore is much to be avoided. However, in a context where commercial considerations are salient, such as the potential costs of losing busy and lu-

crative passengers through making them wait too long for baggage searches, then the costs of false alarms will be salient. In Experiment 3, Hilton, Kemmelmeier and Bonnefon (2005) varied the contextual utilities in four scenarios involving conditional instructions by making either the potential costs of misses or false alarms salient. They asked participants who were placed in the role of the chief to rate how well each of four conditional instructions "expressed their intention" in the two types of context. When the potential cost of misses was salient (e.g., because there was a heightened risk of a terrorist alert), participants preferred to express their instruction through the "standard" *If p then do q* form of the conditional, that is, *If there is a suspect piece of baggage then take it out and search it.* However, when the potential costs of false alarms was salient (due to the risk of alienating busy and lucrative passengers) the other formulations of the conditional (*If and only if p then do q, Do q only if p, If not p then do not do q*) were preferred, i.e., *If and only if there is a suspect piece of baggage then take it out and search it, Take out the piece of baggage and search it only if it is suspect, If there is not a suspect piece of baggage then do not take it out and search it.*

Contextual utilities (the importance of avoiding a miss vs. avoiding a false alarm) thus clearly influence the chief's selection of conditional instructions, and what kinds of actions he would like to encourage and what kinds of mistakes he would like to discourage. But do these different conditional instructions encode sufficient meaning to convey to the agent what to do when the contextual utilities are not clear to him? This may be the case when the agent is inexperienced, and does not know what is important to his chief or the organization that she represents. In Experiment 4, Hilton, Kemmelmeier and Bonnefon (2005) required participants to put themselves in the role of a subordinate (e.g., a shop assistant) who had received an instruction from a chief (e.g., a shop owner). Their aim was to see whether recipients would interpret the instructions consistent with the utility-structures that would have incited their chiefs to select these instructions in the first place. For example, were instructions of the form *If p then do q* such as *If a client touches the clothes then offer him assistance* interpreted as if misses (p but not doing q) were to be avoided? In fact, recipients of this instruction were indeed likely to interpret this instruction in the way intended; do q if p (thus avoiding a miss, p the case but q not performed), and to use their discretion if not p were the case. For the other instructions (*If and only if p then do q, Do q only if p, If not p then do not do q*) the recipients correctly perceived that they were expected not to do q when p was not the case (thus avoiding a false alarm, p not the case but q performed). There were also subtle differences between these conditional instructions about what to do when p was the case, which

were coherent with the speaker's evaluations of each conditional instruction in Experiment 3. This indicates that each conditional formulation has a distinct effect on the recipient's perceptions of what he has to do (see Hilton, Kemmelmeier & Bonnefon, 2005 for details).

Do participants in such a conversational exchange need to reason "logically" in order to co-ordinate effectively? Not necessarily. If we regard the phrasing of each conditional as carrying a "pragmatic signal" about what is important in the circumstances, then this may be sufficient to achieve co-ordination. Thus use of the "standard" *If p then do q* form of the conditional expression does not appear to be value-neutral and will be used when the action (q) is to be encouraged because there may be costs to not doing q. The other forms tested, (*If and only if p then do q, Do q only if p, If not p then do not do q*), all suggest that there could be costs to doing q, and act to discourage doing q unnecessarily.

For present purposes, what is important is that social co-ordination may be achieved through the emotional tone conveyed, and not through the logical interpretation of the conditional rule in question. It is of course also possible that participants' responses are driven by the different logical meanings of each of the four conditional formulations. This could be done if we imagine that each conditional formulation defines a different set of "utility-conditions" analogous to truth conditions for indicative conditionals (Over, Manktelow & Hadjichristis, 2004). It is of course possible that some participants react to the emotional tone, while others engage in full-blown analysis of the logical meaning of these expressions. Although reacting to the emotional tone of a conditional seems to have the advantage of being automatic and relatively effortless, for the purposes of the present argument it is enough to note that the "emotional tone" is sufficient to trigger appropriate behaviour in the recipient, not that it is the only mechanism by which this can be achieved. [2]

4.7 Social rationality and co-ordination: Explicit rules vs. implicit understandings

Successful co-ordination between the chief and the subordinate depends in part on the chief's ability to express his intentions clearly. This is not the same as being explicit, as the chief may want to leave some latitude to his subordinate to exercise his discretion appropriately depending on the circumstances. For example, in giving the instruction *If the client touches the clothes then offer him assistance* the shop owner makes explicit what the assistant is to do if the client touches the clothes, but leaves open the question about what to do if the client is not touching the clothes. Here the assistant may use her discretion, and offer assistance if she judges that the client would welcome it (e.g., the client is looking puzzled). However, the instruction *If and only if the customer touches the clothes then offer him assistance* is explicit about what should be done in both cases, and thus is highly directive. It is absolutely clear and specific, and leaves no discretion at all to the assistant.

However, it may well be that the shop owner *intends* his assistant to use her discretion in certain cases. In this case, fully effective co-ordination will depend on illocutionary pick-up by the shop assistant who understands what is expected of her in cases where the shop owner has deliberately left it implicit what the assistant is to do. For example, the instruction *If the customer does not touch the clothes then do not offer him assistance* leaves it to the assistant's discretion what should be done if the client is indeed touching the clothes. In giving this instruction the shop owner may wish to curb overzealous attentiveness to the shop's clients on the part of his assistant, but there would normally be an understanding that the assistant would at some point offer assistance to a client who is touching the clothes, for that is her role. However, if the assistant *never* approaches a client to offer her help, the shop owner could well reproach the assistant of not doing her job properly, even though she has respected the letter of his instruction not to approach the client if he is not touching the clothes. This is because the instruction in this case is explicit about what *should not* be done, but is implicit about what *should* be done, leaving the decision about when the client should be approached to the judgment of the assistant. If she exercises good judgment about when to approach clients when they *are* touching the clothes then the owner will be happy with her, and if she exercises poor judgment he will be unhappy with her. However, if she violates the explicit instruction by offering help to a customer who is *not* touching the clothes her boss may be entitled to feel angry with her, and not just disappointed with her performance.

4.8 Kinds of rationality: Rules, reasons and social co-ordination

In sum, the studies reviewed above show how it is possible for human work groups to co-ordinate around shared goals. Conditional instructions given by authorities or experts can be nuanced so that subordinates have a sense about what it is important to do and what to avoid doing in certain situations. Importantly, "doing the right

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[2]However, it is relevant to note that previous work does suggest that contextual manipulations designed to influence what participants should worry about (as manipulated by making the costs of misses rather than false alarms salient) can affect their behaviour (e.g., selections of cards on the Wason selection task (Wason & Johnson-Laird, 1972) without changing the logical interpretation of the conditional rule concerned (Hilton, Kemmelmeier & Bonnefon, 2005, Experiments 1 and 2).

thing" is to be evaluated in terms of aligning one's actions with the intentions of the speaker. In particular, successful illocutionary uptake (Austin, 1962; Strawson, 1964) is achieved when the agent (e.g., assistant) does what the principal (e.g., shop owner) would want in these circumstances, rather than by following some kind of logical rule or by calculating an individual's expected utility (Evans & Over, 1996). In this analysis, the agent does what she does for a *reason*, specifically as a result of the principal's instruction. Clearly, the linguistic polarity of the principal's instruction will give the agent important clues about what is required in the circumstances.

5   Conclusions

Research on human reasoning, judgment and decision-making has often been structured by a "man-the-scientist" analogy. Scientists are of course essentially *constative* in their approach to the world: they notice, they observe, they measure and they build theories whose primary aim is to be a true and accurate model of a slice of reality. In this picture, human judgments and decisions are (or should be) the product of thinking and reflection. And since thinking is above all the province of scientists, it has been understandable that psychologists should use scientific thinking as the standard with which to measure "lay" human thinking. Consequently Mill's method of difference and the related method of analysis of variance were proposed as models of human causal inference (Heider, 1958; Kelley, 1967), Popper's logic of falsificationism as a model of hypothesis-testing (Wason & Johnson-Laird, 1972) and Bayesian inference as a model for belief-revision in the light of evidence (Edwards, Lindman & Savage, 1963). This "man-the-scientist" analogy continues to structure debate about the rationality of human decision-making. Thus debate addresses questions such as which scientific standards should be used to evaluate human performance on a given task (e.g., Popperian falsificationism vs. Bayesian revisionism on Wason's four card task, see Oaksford & Chater, 1994), whether people can achieve high levels of decision performance using "simple but smart" heuristics (Gigerenzer et al., 1999), and whether experimental results demonstrate socially rational re-interpretations of experimental instructions or actual errors in reasoning (Hilton, 1995; Hilton & Slugoski, 2000; Kahneman & Frederick, 2002).

5.1   Communicative vs. cognitive pragmatics

Following Darwin's view emotions have a communicative function that leads them to direct the tendencies of others. This interpersonal perspective is what differentiates conversational pragmatics (Levinson, 1983), which deals with effective social co-ordination, from purely individualistic perspectives on emotion. For example, Zeelenberg et al. (this issue) present a "feeling-is-for-doing" perspective which they label as "pragmatic". In their view, the role of emotions is to "prioritise certain goals and thereby mobilize energy". Whereas cognitions are constative ("I am still not safe!"), emotions direct action tendencies and are performative in a kind of internal dialogue ("I better climb up that tree!"). However, the pragmatics involved here is not *interpersonal* in nature: the emotions are *felt* by an individual and modify his behaviour; they are not *expressed* to another to modify her behaviour. Likewise, Zeelenberg et al. give the example of how the experience of shame and guilt can differentially modify the experiencer's behaviour, but do not consider how the expression of shame or guilt after a wrongdoing can differentially affect an observer's perception and behaviour (Giner-Sorolla et al., in press).

5.2   The argumentative nature of logical expressions

In this paper, we have examined the argumentative structure of human logical language. Although the logical definitions of connectives, quantifiers and conditionals such as *and, some, many, all, if*, etc., all refer only to their truth values, their ordinary language counterparts all seem to contain important pragmatic signals that suggest the speaker's attitude to the proposition concerned. Thus, although *and* and *but* have the same logical definition, being true in the same cases, in ordinary language, the choice of *and* rather than *but* suggests the speaker's attitude to a proposition, for example that he considers the conjoined elements to be consistent rather than inconsistent in nature. Likewise, saying *many* rather than *not all* focuses attention on the many that are rather than the few that are not, and may argue for taking an action in question rather argue against it. Saying *If p then do q* rather than *Do q only if p* suggests an encouragement for rather than a discouragement against doing the action in question (q). The series of studies reviewed above suggests that through quantifiers, probability expressions and outcome framing, advice-giving and instruction becomes inherently polarised. Such performatives are not value-neutral in that they will suggest either positive or negative reasons for doing something, and will thus shape people's preferences.

Ordinary logical language thus contains pragmatic signals that make it inherently argumentative, and thus conveys reasons *for* or *against* doing something. Following Gärdenfors (2004), we may suggest that logical expressions in ordinary language have a signal component (that

expresses the speaker's attitude to what is being said) as well as a symbolic component (that represents some part of reality). In terms of conversational pragmatics, we may think of these logical expressions conveying *conventional implicatures* which automatically express polarity (e.g., by suggesting reasons for or against doing something), as opposed to *conversational implicatures* which are calculated and have to be interpreted in context for their meaning to be retrieved (Levinson, 1983; 2000).

Although the impact of framing of options on preferences has long been recognized (e.g., Kahneman & Tversky, 1979), they have often been studied from the point of view of cognitive processes that might generate them (e.g., weighting functions for gains and losses). However, they may usefully be thought of in terms of discourse processes (cf. Bless, Betsch & Franzen, 1998). In particular, McKenzie (2004; Sher & McKenzie, 2006) has suggested that attribute framing (e.g., saying a glass is half-full rather than half-empty) leads to "information leakage" through triggering automatic inferences (e.g., that the glass was earlier empty rather than full). Similarly, choice of default option seems to communicate to respondents that the source of a message considers the default (e.g., a retirement plan) to be normal and desirable, and they therefore take this as an implicit recommendation (McKenzie, Liersch & Finkelstein, 2006). In this sense, outcome framing (e.g., focusing the chances of a successful rather than unsuccessful treatment outcome) can be considered as leading to information leakage, if the source does *not* explicitly want to influence the recipient's decision. However, if the speaker *does* want to influence the recipient's decision, then she may — consciously or unconsciously — choose the frame that "feels" best. For example, van Buiten and Keren (2006) show that participants placed in a role where they have to persuade a target to adopt a course of action choose the outcome framing that previous research has indeed shown will have the desired effect (Kahneman & Tversky, 1979). In this way, outcome framing can facilitate successful social co-ordination through communicating the speaker's preferences to the hearer.

I have argued that human logical language serves the function of co-ordinating actions to manage uncertainty by focusing participants' attention on what is important. In ordinary language, these "logical" words have an implicitly argumentative function in that they support reasons for and against taking actions. The signal value that is conveyed by these conventional implicatures is not conveyed by their symbolic or semantic meaning, which is formalised by logicians in their truth-conditional interpretations of the meaning of these words. Framing outcomes seems to have a comparable effect in serving either to encourage or discourage actions automatically, and outside of conscious awareness. In dialogue, they

enable the ready identification of reasons for or against a proposed course of action that could serve as input into the kind of reason-based decision-making process (Fox, 1980; Shafir, Simonson & Tversky, 1993) that seems to be both intelligible to and natural for humans. Whereas the pragmatic aspects of logical expressions would seem to be candidates for automatic processing, their semantic aspects are more likely to be the subject of more elaborate, conscious processing (cf. the related distinction between System 1 and System 2 processing, Sloman, 2002). Because the framing and choice of polarity of logical expressions are such intuitive processes, it is perhaps for this reason that researchers seem to have only recently recognized this fundamental aspect of their meaning.

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