Metacognition

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All theories of judgment assume that information that comes from a trustworthy source and is relevant and applicable to the judgment at hand will exert more influence than information that does not meet these (or related) criteria. In other words, people evaluate their object-level, primary thoughts about a target and the outcome of this meta-level assessment can enhance, impair or reverse the impact of object-level information. How people think about their own thinking is the topic of metacognition research. The term *metacognition* was introduced by developmental and cognitive psychologists in the 1970s (for an early review, see Flavell, 1979). However, the issues addressed in metacognition research enjoy a much longer history in philosophy, going back at least to Aristotle (see selections in Sachs, 2001); they also played a pivotal role at the beginning of scientific psychology, when extensive experimental work in Wilhelm Wundt's laboratory focused on people's experience of their own mental processes (Wundt, 1883, 1896).

To date, the vast majority of metacognition research has been conducted in cognitive, developmental, and educational psychology, where researchers investigate the role of metacognitive processes in the regulation of learning and memory (for reviews, see Dimmitt & McCormick, 2012; Dunlosky & Metcalfe, 2009; Hacker, Dunloksy, & Graesser, 2009). How do people know, for example, that they know the answer to a question, even though it does not come to mind at the moment? How do students determine whether they learned something well enough to remember it at exam time? Social psychologists' explicit interest in metacognition is more recent, although people's thoughts about their thoughts have played a role in social psychological analyses for decades, from theories of cognitive consistency (Abelson et al., 1968) to theories of social cognition (Wyer & Srull, 1994). Social psychologists have extended the list of metacognitive topics from a focus on monitoring and regulating one's own thoughts to the investigation of inferences about the outside world. What do people infer from their own mental processes about the world in which they live? How do they assess the likelihood of an event, the truth of a statement or the risks posed by an investment opportunity? As different as these judgment tasks are, they share that people often arrive at an answer by attending to the dynamics of their own mental processes as a source of information. When the information they process feels familiar, for example, the thing it describes seems frequent, true and low in risk.

This chapter reviews core themes and insights of metacognitive research, illustrates them with representative findings, and addresses the implications of metacognitive processes for topics that are central to social psychology. It is organized as follows. The first section introduces basic concepts and process assumptions that cut across different areas of metacognitive research. The second section addresses how people evaluate their own thoughts. It begins with a short summary of core issues of metacognition research in cognitive psychology, namely, metamemory judgments of knowing and learning and their implications. It then turns to current issues of metacognition research in social psychology and discusses how people determine whether information, including their own beliefs, can be trusted. Of particular interest are the processes underlying judgments of truth, confidence, and related measures of attitude strength, and their implications for people's susceptibility to, and correction of, misinformation. The third section addresses judgments of liking and preference and highlights the affective component of metacognitive experiences. Next, the fourth section explores how people use lay theories of mental processes to draw inferences from the dynamics of their own thinking about states of the external world, as reflected in judgments of risk, novelty or temporal distance. The final section addresses the detection and correction of judgmental biases. The chapter concludes by

noting current ambiguities and outlining issues for future research. Throughout, the focus is on people's thoughts about their own thoughts and the downstream implications of these metacognitive assessments for judgment and behavior; people's thoughts about other people's thoughts are outside the scope of this chapter (and are addressed by Pronin, this volume).

BASIC CONCEPTS

It is useful to distinguish primary, *object-level* thoughts about a target of judgment from secondary, *meta-level* thoughts about one's own (primary) thoughts. Do I understand this information? Is it compatible with other things I know? As any other judgment, evaluations of one's own thoughts can draw on declarative as well as experiential information.

Declarative and Experiential Inputs

Relevant *declarative information* can include object-level information, such as other beliefs about the target, and meta-level information, such as episodic memories of where, when, and from whom one acquired the object-level information. The processes involved in these evaluations are familiar from judgment and persuasion research (e.g., Eagly & Chaiken, 1993; Kunda, 1999; Petty & Cacioppo, 1986; Wyer, 1974), except that they now apply to one's own thoughts. To determine whether one's impression of a target is likely to be accurate, for example, one may attend to whether it is consistent with other things one knows about the target; whether others share this impression; whether the information on which it is based came from a reliable source; and so on. Content analyses of people's thoughts about their thoughts similarly highlight the parallels to thoughts about others' thoughts (for a review, see Wagner, Brinol, & Petty, 2012). As is the case for any other judgment (see the contributions on Chaiken & Trope, 1999), the likelihood that people engage in such elaborate reasoning about their own thoughts increases with the relevance of the task and decreases with the available cognitive resources.

An alternative source of information is provided by the subjective experiences that accompany the reasoning process. Information about the target may be highly accessible and easily "pop to mind" or it may only be retrieved after an effortful search; new information one reads may seem familiar or novel; and the logical flow of a message may be easy or difficult to follow. Such *metacognitive experiences* arise from the dynamics of one's own information processing at the object level. At the most basic level they convey that what one does is easy or difficult. This information is often useful and provides an experiential proxy for more demanding analyses. As any learner knows, familiar material is indeed easier to process than novel material, which makes ease of processing a potentially useful input for a large number of tasks, from deciding whether one has seen the object before (Whittlesea, 2002) to estimating the frequency of an event (Tversky & Kahneman, 1973) or the popularity of an opinion (Weaver, Garcia, Schwarz, & Miller, 2007). Similarly, material that is internally coherent (Johnson-Laird, 2012) and compatible with one's beliefs (Winkielman et al., 2012) is easier to process than material that is internally contradictory or at odds with other things one knows, making ease of processing a potentially useful input for evaluating the quality of an argument. Unfortunately, material can be easy or difficult to process for many reasons and people frequently misread the experience arising from a given source as bearing on something else, as reviewed below.

In addition, easy processing is experienced as more pleasant than difficult processing and elicits

a spontaneous positive affective response that is reflected in self-reported momentary mood (Monahan, Murphy, & Zajonc, 2000) and increased zygomaticus activity (Winkielman & Cacioppo, 2001; for a review, see Winkielman, Schwarz, Fazendeiro, & Reber, 2003). Both, the metacognitive experience of ease or difficulty and the accompanying affective response provide experiential information that people can draw on in making a wide variety of judgments.

Sensitive to the Feeling but Not to Its Source

Because thinking can be easy or difficult for many reasons, it is often unclear why a given metacognitive experience arises. Is it difficult to remember who initially came up with this idea because I never knew it in the first place, learned it a long time ago, or are too distracted to focus on the task? Indeed, many findings show that people are very sensitive to their experience of ease or difficulty, but insensitive to its source. They are likely to account for a given experience in terms of the first plausible explanation that comes to mind (as discussed below). As a result, numerous incidental variables can influence metacognitive experiences and the resulting judgments (for reviews of relevant variables, see Alter & Oppenheimer, 2009; Reber, Schwarz, & Winkielman, 2004).

Visual and auditory variables can influence the speed and accuracy of low-level processes concerned with the identification of a stimulus' physical identity and form. Examples include figure-ground contrast (e.g., Reber & Schwarz, 1999); the readability of a print font (e.g., Song & Schwarz, 2008) or hand-writing (e.g., Greifeneder et al., 2010); the familiarity of a speaker's accent (Levy-Ari & Keysar, 2010); or the duration of a stimulus presentation (e.g., Whittlesea, Jacoby, & Girard, 1990). The associated metacognitive experience is often referred to as perceptual fluency (Jacoby, Kelley & Dywan, 1989). Other variables influence the speed and accuracy of high-level processes concerned with the identification of stimulus meaning and its relation to semantic knowledge structures. Examples include the complexity of a message (e.g., Lowrey, 1998), its consistency with its context (e.g., Masson & Caldwell, 1998), or the availability of knowledge that facilitates its processing (e.g., Reder, 1987). The associated metacognitive experience of ease or difficulty is often referred to as conceptual fluency (Whittlesea, 1993). How fluently a stimulus can be processed is also profoundly influenced by the perceiver's exposure history; consistent with principles of knowledge accessibility (Higgins, 1996), recent or frequent exposure to a stimulus facilitates perceptual as well as conceptual processing, as does priming with related material.

Numerous variables can also influence the ease or difficulty with which material can be recalled from memory. Relevant examples include all variables known from memory research, such as frequency and recency of exposure, priming, contextual influences, and task demands, such as the request to recall only a few or many examples. The associated metacognitive experience is often referred to as retrieval fluency (Benjamin & Bjork, 1996). A similar set of variables influences the ease or difficulty with which thoughts (e.g., Wänke, Bless, & Biller, 1996) or mental images (e.g., Petrova & Cialdini, 2005) can be generated.

While these types of fluency experiences have received the lion's share of attention, there are many other variables that can elicit the experience of ease or difficulty. Some words are harder to pronounce than others (e.g., Song & Schwarz, 2009), writing feels more difficult when using one's non-dominant hand (Briñol & Petty, 2003), and tensing the corrugator during task performance makes anything seem harder, from recalling examples of one's own behavior (e.g., Stepper & Strack, 1993) to

recognizing names (e.g., Strack & Neumann, 2000). Throughout, the actual source of people's experience of ease or difficulty is less relevant than its perceived source. This presumably reflects that different sources of (dis)fluency result in similar phenomenal experiences, which are open to different interpretations.

As observed in numerous sensory perception studies (for an early review, see Berelson & Steiner, 1964), people are more sensitive to changes in sensory input than to stable states; they also consider changes more informative, consistent with the covariation principle of attribution research (Kelley, 1973). The same applies to the informational value of subjective experiences (Schwarz, 2012). Accordingly, metacognitive experiences exert more influence when people experience *changes* in fluency, e. g., when one target is more fluently processed than another. This makes within-participant manipulations more powerful than between-participant manipulations (e.g., Hansen, Dechêne, & Wänke, 2008; Shen, Jiang, & Adaval, 2010; for a meta-analysis, see Dechêne, Stahl, Hansen, & Wänke, 2010). Several authors concluded from this observation that "expectancy-discrepant" fluency experiences are particularly informative, suggesting that people compare their current experience to some standard (e.g., Whittlesea & Williams, 1998, 2000; Dechêne et al., 2010). However, stable pre-computed norms are as unlikely for fluency as for other variables (Kahneman & Miller, 1986); instead, the standard is assumed to derive from the fluency with which other, concurrent stimuli in the same context can be processed (Dechêne et al., 2010). This makes the comparison notion redundant with the more parsimonious general assumption that change in an experience is more informative than a constant experience; to date, studies that can separate these possibilities are missing.

Lay Theories: The Role of Metacognitive Knowledge

How people interpret a given metacognitive experience, and what they infer from it, depends on which of many potentially applicable lay theories is most accessible at the time. Consistent with the pragmatic (James, 1890) and situated (Smith & Semin, 2004) nature of cognition, an applicable lay theory is usually brought to mind by the task at hand and allows the person to arrive at an answer that seems "obvious" in context (Schwarz, 2004, 2010). Other potentially applicable theories receive little attention, consistent with the general observation that information search is truncated once a satisfying explanation is generated (Einhorn & Hogarth, 1986; Wyer, 1974) – yet, one of those neglected lay theories might have driven the person's inferences had it come to mind first. This renders inferences from metacognitive experiences highly malleable.

People correctly assume that familiar (previously seen) material is easier to process than novel material. Hence, they erroneously "recognize" a novel stimulus as one they have previously seen when it is easy to process due to the influence of other variables, such as the clarity or duration of its presentation (Whittlesea, Jacoby, & Girard, 1990). Conversely, people also correctly assume that is easier to perceive a stimulus when it is shown with high rather than low clarity or for a long rather than short time. Hence, they erroneously infer higher clarity and longer duration when the stimulus is easy to process due to previous exposure (e.g., Witherspoon & Allan, 1985; Whittlesea et al., 1990). Thus, fluency due to visual presentation variables can result in "illusions of memory", just as fluency due to memory variables can result in "illusions of perception" (for a review, see Kelley & Rhodes, 2002).

This malleability of metacognitive inferences is at the heart of the pervasive influence of fluency experiences across many domains of judgment. It presumably results from three variables. First,

different manipulations of fluency induce similar subjective experiences that do not carry salient markers of their source. Second, people hold a wide range of lay theories about mental processes, which can provide a multitude of explanations for why a given operation may feel easy or difficult. Third, these theories are recruited in a context sensitive manner, which privileges theories that are applicable to the task at hand. This allows the same subjective experience of ease or difficulty to inform a wide range of different judgments, with sometimes opposite implications.

Processing Style

In addition, metacognitive experiences can influence people's choice of information processing strategies. In general, people prefer processing strategies that have been characterized as analytic, systematic, bottom-up and detail-oriented when they consider their current situation "problematic," but prefer strategies that have been characterized as intuitive, heuristic, and top-down when they consider their current situation as "benign" (for reviews, see Schwarz, 2002; Schwarz & Clore, 2007). Numerous variables --from task characteristics to incidental environmental cues, moods, and bodily approach or avoidance feedback-- can convey this information and have been found to influence processing style. One of these variables is the fluency with which information can be processed, presumably because disfluency signals that something is unfamiliar and potentially "wrong". For example, when asked, "How many animals of each kind did Moses take on the ark?" most people answer "two" despite knowing that the biblical actor was Noah (Erickson & Mattson, 1981). Presenting this Moses question in a difficult to read print font dramatically reduces reliance on the first answer that comes to mind and doubles the number of readers who realize that the actor was not Moses (Song & Schwarz, 2008). While this improves performance on misleading questions, the feeling that something isn't quite right impairs performance on questions where one's first spontaneous association would be correct (Song & Schwarz, 2008). Both observations reflect that familiar questions, and the associations they bring to mind, receive less scrutiny than unfamiliar ones. Similarly, Alter, Oppenheimer, Epley, and Norwick (2007) reported that manipulations that increased subjective processing difficulty improved participants' performance on reasoning tasks that benefit from a more analytic processing style (for a review see Alter, in press).

Informational Value of Feelings

The use of metacognitive experiences as a basis of judgment follows the logic of feelings-as-information theory (for a review, see Schwarz, 2012), which was initially developed to account for mood effects in evaluative judgment (Schwarz & Clore, 1983). The theory assumes that people attend to their feelings (including metacognitive experiences, moods, emotions, and bodily sensations) as a source of information, which they use like any other information. The impact of a given feeling increases with its perceived relevance to the task at hand and decreases with the accessibility and consideration of alternative diagnostic inputs, which is a function of processing motivation and capacity (for a review, see Greifeneder, Bless, & Pham, 2011). What people conclude from a given feeling depends on the epistemic question on which they bring it to bear and the lay theory they apply, as discussed above.

Whenever a feeling is attributed to a source that is irrelevant to the task at hand, its informational value is undermined and the otherwise observed influence eliminated. For example, realizing that a text is difficult to process because the print font is hard to read (Novemsky, Dhar, Schwarz, & Simonson, 2007) eliminates the influence of processing fluency on judgments of the target,

just as attributing one's bad mood to rainy weather eliminates mood effects on unrelated judgments (Schwarz & Clore, 1983). Conversely, experiencing a feeling despite opposing influences increases its perceived informational value; for example, finding recall easy despite allegedly distracting music enhances the impact of the accessibility experience (Schwarz, Bless, Strack, Klumpp, Rittenauer-Schatka, & Simons, 1991). Thus, discounting as well as augmentation effects (Kelley, 1972, 1973) are obtained, as is the case for the use of any other information.

EVALUATING ONE'S THOUGHTS

To date, the bulk of metacognition research has been conducted in cognitive and educational psychology. In cognitive psychology, memory researchers wondered how we can "know" that we know something even though we cannot retrieve it at the moment. How can we be certain that an answer is already "on the tip of the tongue" (Brown & McNeill, 1966) or confident that it will eventually come to mind (Hart, 1965)? At about the same time, developmental psychologists began to explore how children's knowledge about memory influences their learning strategies (Flavell, Friedrichs, & Hoyt, 1970; Flavell & Wellman, 1977; for a review, see Flavell, 1979), which became a major topic in educational psychology (for a review, see Dimmitt & McCormick, 2012). Complementing this work, researchers in many fields -- from learning to law – asked whether people's confidence in the accuracy of their knowledge and memories is indicative of actual accuracy (Dunning, Heath, & Suls, 2004). Is a confident eyewitness, for example, more likely to be correct (Wells & Olson, 2003)? These research programs share an interest in the role of metacognitive processes in the regulation of memory and learning, making metamemory a burgeoning area of research. Extensive reviews of this work are available (see the contributions in Dunlosky & Borg, 2008; Hacker, Dunlosky, & Graesser, 2009) and this chapter merely summarizes key conclusions.

Judgments of Knowing, Learning, and Memory

Do I Know It?

As readers know from their own experience, one can be confident that one knows something even though one cannot retrieve it at the moment. Such *feelings of knowing* (FOK) are moderately predictive of actual performance (as first observed by Hart, 1965): "participants unable to retrieve a solicited item from memory can estimate with above-chance success whether they will be able to recall it in the future, produce it in response to clues, or identify it among distracters" (Koriat, 2007, p. 306; for a meta-analysis see Schwartz & Metcalfe, 1994). Metacognitive experiences serve as the key input into these judgments. The *cue familiarity* approach (Reder, 1987) assumes that we infer that we know the answer when the cues provided in the question feel familiar. Accordingly, manipulations that increase the familiarity of elements of the question (e.g., through previous exposure) also increase feelings of knowing, even in the absence of any influence of cue familiarity on actual retrieval (e.g., Reder & Ritter, 1992). Whereas this account emphasizes cues that precede any retrieval effort, the *accessibility* account (Koriat, 1993) emphasizes cues provided by an initial retrieval attempt. Presumably, people try to retrieve the requested information and base their FOK judgment on the cues that come to mind at that point – the more bits and pieces they can recall, the higher their feeling of knowing, even when the recalled material is inaccurate.

Both accounts received empirical support (for a review, see Dunlosky & Metcalfe, 2009) and are

not mutually exclusive; instead, they may operate in combination as Koriat and Levy-Sadot (2001) showed. When the familiarity of the pre-retrieval cues is high, people infer that they may know the answer and probe memory, as assumed by the cue familiarity account. When this retrieval attempt is successful, the question is answered; when it is unsuccessful, they turn to the partial material they retrieved to arrive at a FOK judgment, as assumed by the accessibility account. When the familiarity of the pre-retrieval cues is low, however, people may never probe memory to begin with and may instead base their FOK judgments solely on pre-retrieval cue familiarity. As most other metacognitive judgments, feelings of knowing have behavioral consequences and predict how much time and effort people will – or will not – invest in a memory search (Dunlosky & Metcalfe, 2009; Koriat, 2007).

Will I Remember It?

When learning new material, one needs to determine whether one learned enough – will I remember the material when I need it or should I go over it one more time? Variants of this task are typically studied by presenting participants with a list of paired items, asking them to judge for each target how likely they will remember it if prompted with the associated cue. Similar to feelings of knowing, these *judgments of learning* (JOL) are moderately predictive of people's actual performance (for a review, see Dunlosky & Metcalfe, 2009). They can be based on one's beliefs about memory or on one's subjective experience during learning.

Drawing on their metacognitive experience during learning, people assume that easy-to-process items will also be easier to remember later on than difficult-to-process items. When an item is easy to encode, e.g., because it is easy to read due to a large print font (e.g., Rhodes & Castel, 2008), or easy to recall at immediate testing (e.g., Benjamin, Bjork, & Schwartz, 1998), learners are unrealistically optimistic that they will remember the material later on, which encourages premature termination of learning. Because many incidental variables can influence one's experience of processing during learning, learning efforts are often poorly calibrated. As in other domains of judgment, the immediacy of the fluency experience can trump the influence of declarative knowledge that could be brought to bear. For example, people know that forgetting increases over time and this insight is reflected in their general JOL reports. But once they study a set of items, they seem to rely solely on their current metacognitive experience, without consideration of the retention interval to which their JOL reports pertain – if it is easy now, it will also be easy tomorrow or in a week (e.g., Koriat, Bjork, Sheffer, & Bar, 2004). This insensitivity to retention intervals is not observed in the absence of fluency experiences, paralleling other findings that indicate that the immediacy of experiential information can trump more relevant inputs. One such finding is the observation that people who successfully completed the request to recall twelve events from their early childhood nevertheless inferred higher childhood amnesia than people who had been asked to recall only four events (Winkielman, Schwarz, & Belli, 1998). Not surprisingly, recalling twelve childhood events was more difficult than recalling four, giving rise to a negative assessment of memory despite excellent performance.

Performance Confidence

One of the most frequently assessed metacognitive judgments is people's confidence in some aspect of their cognitive performance, be it their future ability to recall something, the accuracy of their recall or their solution to a problem, the truthfulness of a statement, or the validity of their own beliefs.

This section focuses on confidence in one's performance on memory or problem solving tasks; confidence in one's beliefs is addressed in the context of judgments of truth and measures of attitude strength.

As other metacognitive judgments, performance confidence can be based on declarative inputs, from applicable general beliefs ("I'm good at math") to knowledge about the target and episodic memories of where one acquired it, as well as one's metacognitive experiences during task performance. Not surprisingly, the metacognitive experiences that increase feelings of knowing and judgments of learning also increase confidence that one got it right (e.g., Glenberg, Wilson, & Epstein, 1982; Koriat 2008; Reder & Ritter, 1992). For example, repeated exposure to the same question does not improve the actual accuracy of recall, but strongly inflates people's confidence that what they recall is correct (Shaw & McClure, 1996). Such findings led to the conclusion that confidence is not a useful predictor of accuracy, including the accuracy of eyewitness testimony (Smith, Kassin, & Ellsworth, 1989).

In many studies, confidence is assessed by asking participants how likely it is that their answer to a given item (e.g., their recall or problem solution) is correct. These item-specific probability judgments are then averaged across the item pool and compared to the person's average performance. Note, however, that any given answer is either correct or false; e.g., recognizing "Detroit" as a word that was on a previously seen list is never "80% correct" – it either was or was not on the list. This renders it problematic to compare probability judgments that pertain to single items with the average performance across many items (for a discussion, see Gigerenzer, 1994). Indeed, different measurement strategies yield different results. When participants provide per-item judgments, they are usually overconfident, which has become a well-known truism of the confidence literature; but when they estimate how many of their answers were correct, underconfidence is more likely (e.g., Gigerenzer et al., 1991; Griffin & Tversky, 1992). This observation parallels findings in many other domains of judgment, where narrow, low-frequency target categories (e.g., estimates for a single item) are associated with overestimation, whereas broad, high-frequency target categories (e.g., estimates for an aggregate of items) are associated with underestimation, suggesting the applicability of general models of information sampling (Fiedler, 2012).

In applied areas, it is often more relevant to know whether confidence judgments discriminate between accurate and false answers than whether they are well calibrated, i.e., whether people generally over- or underestimate their performance. Note that the two questions are conceptually distinct. For example, assume a person is correct 10% of the time on task A and 30% of the time on task B, but beliefs to be correct 60% of the time on task A and 80% on task B. This person is poorly calibrated (she overestimates her performance), but her judgments discriminate accurately between the tasks. Empirically, discrimination improves with expertise, whereas calibration does not; that is, experts discriminate better than novices between tasks on which they perform poorly or well, but this rarely attenuates their overconfidence on single-item judgments (for a review, see Dunning, 2005; for a comprehensive review of the accuracy of people's self-assessments in many domains, see Dunning, Heath, & Suls, 2004).

Judgments of Truth, Confidence, and Attitude Strength

Whereas cognitive and educational psychologists focus on judgments of memory and learning, social psychologists are more interested in how people determine the accuracy of their beliefs or the

trustworthiness of a message presented to them. These topics enjoy a long history in persuasion research and their analysis has recently been reinvigorated by close attention to the role of metacognitive experiences (see the contributions in Briñol & DeMarree, 2012). The accumulating findings indicate that judgments of truth, confidence, accuracy, attitude strength and their relatives are based on similar declarative and experiential inputs, suggesting that the underlying processes may be conceptualized in a shared framework. These analyses also shed new light on the processes underlying the persistence of false beliefs (for a review, see Lewandowsky et al., 2012) and the success of debiasing procedures in judgment and decision making (for a review, see Schwarz et al., 2007).

Criteria and Inputs: The "Big Five" of Truth Assessment

Information that is considered valid, reliable, and relevant exerts more influence on judgment and behavior, independent of whether it is recalled from memory or received from someone else. In the absence of cues that give reason for suspicion, the tacit norms of everyday conversational conduct favor the acceptance of statements as true (Grice, 1975; Sperber & Wilson, 1986). Some research further suggests that mere comprehension of a statement requires temporary acceptance of its truth (Gilbert, 1991) before it can be checked against relevant evidence. People also assume that information that comes to mind is relevant to what they are thinking about (Higgins, 1998) – or why else would it come to mind now? These factors converge on making the acceptance of information as true and relevant to the task more likely than its critical examination, unless other variables suggest reason for second thoughts.

When people do evaluate the truth of a statement or belief, they are likely to attend to a limited set of criteria, usually a subset of what might be considered the "big five" of truth assessment: (i) the extent to which the belief is shared by others; (ii) the extent to which it is supported by evidence; (iii) the extent to which it is compatible with other things one believes; (iv) the internal coherence of the belief; and (v) the credibility of its source. Each criterion can be evaluated on the basis of declarative or experiential information. Whereas different declarative information is required by different criteria, this is not the case for experiential information. Instead, fluent processing fosters the evaluation of information as relevant and true under all criteria, whereas disfluent processing is likely to give rise to doubts. Accordingly, fluently processed information enjoys a large advantage – as long as thoughts flow smoothly, their content seems right.

Social consensus: Do others think so?

When the objective state of affairs is difficult to determine, people often resort to social consensus information to judge the truth value of a belief: if many people believe it, there's probably something to it (Festinger, 1954). Accordingly, people are more confident in their beliefs when they are shared by others (e.g., Newcomb, 1943; Visser & Mirabile, 2004) and trust their memories of an event more when others remember the event in similar ways (e.g., Harris & Hahn, 2009; Ross, Buehler, & Karr, 1998). However, explicit consensus information is often unavailable or difficult to determine and metacognitive experiences may serve as a plausible alternative input.

Because one is more frequently exposed to widely shared beliefs than to highly idiosyncratic ones, the apparent familiarity of a belief provides a (fallible) experiential indicator of its popularity. This privileges mere repetition of a belief over the more difficult to track number of people who actually endorse it. For example, Weaver and colleagues (2007) exposed participants to multiple iterations of the

same statement, provided by either the same or several different communicators; they later asked participants to estimate how many people share the belief. These estimates of social consensus increased with the number of repetitions, even if all repetitions came solely from the same single source: hearing the same person say the same thing three times was (almost) as influential as hearing three different people say it. Thus, a repetitive voice can sound like a chorus and other variables that increase the fluency (and, hence, perceived familiarity) of a belief can have the same effect.

Support: Is there much evidence to support it?

Not surprisingly, people have more confidence in beliefs that are supported by a large body of evidence. The extent of support can be assessed by an external search, as in a scientific literature review, or by recall of pertinent information from memory; in either case, confidence justifiably increases with the amount of evidence retrieved. Alternatively, the extent of support could be gauged from how easy it is to retrieve evidence – the more evidence there is, the easier it should be to find some (either in memory or the literature). The underlying lay theory (the more exemplars exist, the easier it is to bring some to mind) is at the heart of Tversky and Kahneman's (1973) availability heuristic and people infer higher frequency and probability when examples are easy rather than difficult to recall.

Because recall is easier when one attempts to retrieve only a few rather than many items, people report higher confidence in their opinion after generating few rather than many supporting arguments (e.g., Haddock, Rothman, Reber, & Schwarz, 1999; Tormala, Petty, & Briñol, 2002) – presumably, the difficulty of generating many arguments suggests that there aren't many. Similarly, people are more likely to choose a product after generating few rather than many reasons for its choice (Novemsky, Dhar, Schwarz, & Simonson, 2007). Again, the immediacy of the metacognitive experience trumps the implications of recalled content, as already noted for other judgments. Once misattribution manipulations call the diagnostic value of the (dis)fluency experience into question, people turn to the number of arguments retrieved as an alternative input (e.g., Haddock et al., 1999). This reverses the otherwise observed pattern and people report higher confidence after listing many rather than few arguments.

Before attributing these effects to the impact of fluency experiences, one may wonder whether they merely reflect that the arguments listed become less compelling as people attempt to generate more of them. Several lines of research suggest otherwise. First, once the informational value of recall difficulty is undermined, people's confidence increases with the number of supporting arguments they generated (Haddock et al., 1999; see also Schwarz et al., 1991; Sanna & Schwarz, 2003). This would not be the case if those arguments were of poor quality. Second, yoked participants, who merely read the thoughts generated by another and are hence deprived of that person's metacognitive experience, are more influenced when their partner lists many rather than few arguments, in contrast to the person who lists them (e.g., Wänke, Bless, & Biller, 1996). This increasing influence on others' judgments would not be observed if the quality of the arguments declined with the number generated. Finally, the same fluency effects are observed when all participants list the same number of thoughts and their subjective experience of difficulty is manipulated through facial feedback in the form of corrugator contraction, an expression associated with mental effort (e.g., Sanna, Schwarz, & Small, 2002; Stepper & Strack, 1993). In combination, these findings indicate that the observed effects are not driven by changes in the quality of the thoughts generated, although some changes in what comes to mind are part and parcel of the

experience of recall difficulty (Tormala, Falces, Briñol, & Petty, 2007).

Consistency: Is it compatible with what I believe?

Numerous findings in social judgment and persuasion research converge on the conclusion that information is more likely to be accepted when it is consistent rather than inconsistent with the recipient's beliefs (for reviews, see Abelson et al., 1968; McGuire, 1972; Wyer, 1974). Whether a given piece of information is consistent with one's knowledge can be assessed analytically by checking the information against other knowledge. This is effortful and requires motivation and cognitive resources. A less demanding indicator is again provided by one's metacognitive experience and affective response. Information that is inconsistent with one's beliefs elicits negative feelings (Festinger, 1957), an assumption shared by many theories of cognitive consistency (Abelson et al., 1968; Gawronski & Strack, 2012). In fact, the impact of cognitive inconsistency is eliminated when the accompanying affective experience is misattributed to an irrelevant source (for a review, see Zanna & Cooper, 1976), again highlighting the crucial role of experiential information. In addition, information that is inconsistent with one's beliefs is processed less fluently than information that is belief-consistent (Winkielman, Huber, Kavanagh, & Schwarz, 2012). Hence, analytic as well as intuitive processing favors the acceptance of messages that are compatible with a recipient's pre-existing beliefs: there are no elements that contradict other things one knows and the message is easy to process and "feels right".

Coherence: Does it tell a good story?

A given piece of information is also more likely to be accepted as true when it fits a broader story that lends coherence to its individual elements, as observed in basic research on mental models (for a review, see Johnson-Laird, 2012) and extensive analyses of jury decision making (Pennington & Hastie, 1992, 1993). A message is particularly compelling when it tells a "good story" that organizes the available information without internal contradictions in a way that is compatible with common assumptions about human motivation and behavior. Good stories are well remembered and gaps are filled with story-consistent intrusions. Once a coherent story has been formed, it is highly resistant to change; within the story, each element is supported by the fit of other elements, and any alteration of an element causes downstream inconsistencies that may render the alteration implausible. Not surprisingly, coherent stories are easier to process than incoherent stories with internal contradictions (Johnson-Laird, 2012). Hence, ease of processing can serve as an (imperfect) indicator of coherence and people draw on their fluency experience when they evaluate how well things "go together" (Topolinski, 2012).

Credibility: Does it come from a credible source?

A large body of findings also converges on the conclusion that message acceptance increases with the perceived credibility and expertise of the source (for reviews, see Eagly & Chaiken, 1993; Petty & Cacioppo, 1986). Evaluations of source credibility can be based on declarative information, as decades of persuasion research illustrate. However, assessments of source credibility can also be based on experiential information, which has received less attention. For example, repeated exposure to pictures of a face makes the face seem more familiar, resulting in judgments of higher honesty and sincerity (Brown, Brown, & Zoccoli, 2002), which can be observed for up to two weeks after exposure.

Similarly, the mere repetition of a name can make an unknown name seem familiar, making its bearer "famous overnight" (Jacoby, Kelley, Brown, & Jaseschko, 1989; Jacoby, Woloshyn, & Kelley, 1989), which may also result in an increase in perceived expertise—why else would the bearer be so well known? Hence, a spokesperson in a TV ad may seem credible merely because she seems familiar from a movie one no longer remembers. Other fluency variables can similarly increase credibility – the same statement is more likely to be considered true when presented in an easy rather than difficult to understand accent (X) or by a person with an easy rather than difficult to pronounce name (Newman, Sanson, Miller, Quigley-McBride, Foster, Bernstein, & Garry, 2013).

Summary

These considerations suggest that fluently processed information enjoys an advantage over disfluently processed information no matter which criterion people use to judge its truth value. Fluently processed information not only seems to enjoy high popularity and extensive supporting evidence, it also seems more consistent with one's own beliefs, tells a more coherent story, and comes from a more credible source. In addition, fluent processing feels good and positive affect itself makes analytic attention to detail less likely (Schwarz, 2002), as does the perception that the material is familiar (Song & Schwarz, 2008), which further increases the likelihood of acceptance.

Accordingly, numerous incidental variables that can influence processing fluency have been found to influence a set of closely related judgments, most notably judgments of truth and judgments of confidence, certainty, and related constructs that serve as measures of attitude strength.

Judgments of Truth

In a classic study of rumor transmission, Allport and Lepkin (1945) observed that the strongest predictor of belief in wartime rumors was simple repetition. Numerous subsequent studies confirmed this conclusion and demonstrated that a given statement is more likely to be judged "true" the more often it is repeated. This *illusion of truth* effect has been obtained with a wide range of materials, including trivia statements and words from a foreign language (e.g., Begg, Anas, & Farinacci, 1992; Hasher, Goldstein, & Toppino, 1977) as well as advertising claims (e.g., Hawkins & Hoch, 1992) and political opinions (Arkes, Hackett, & Boehm, 1989). Mere repetition also increases the credibility and impact of eyewitness testimony, even if all repetitions come from the same single witness (Foster et al., 2012).

Other variables that increase processing fluency should have the same effect, provided that perceivers do not attribute the experienced fluency to an incidental influence. Empirically, this is the case. For example, substantively equivalent novel aphorisms seem more true when they are presented in a rhyming (e.g., "woes unite foes") rather than non-rhyming form (e.g., "woes unite enemies"; McGlone &Tofighbakhsh, 2000); unfamiliar factual statements ("Orsono is a city in Chile") are more likely to be accepted as true when they are presented in colors that make them easy (e.g., dark blue) rather than difficult (e.g., light blue) to read against the background (Reber & Schwarz, 1999); and previously primed words seem to be the more accurate answer to trivia questions (Kelley & Lindsay, 1993). Because people are more sensitive to changes in fluency than to a steady signal, illusion of truth effects are more pronounced when some statements are more fluent than others (as is the case in within-participant experiments) than when all statements are of similar fluency (as is the case in

between-participant experiments; for a meta-analysis, see Dechêne et al., 2010).

These findings reflect that fluent processing fosters acceptance of a belief as true on all of the major criteria used in truth assessment. Nevertheless, high fluency does not always guarantee that a claim is accepted. When people have reason to believe that lies are more common than truth in a given context (Skurnik, Schwarz, & Winkielman, 2000), or learned in a training phase that fluent messages are likely to be false (Unkelbach, 2007), they infer falsity from fluency. Such reversals of the otherwise observed effects are consistent with the general principle that inferences from metacognitive experience are context sensitive – if something sounds familiar in a context where false statements are more common than true statements, it's probably false.

Judgments of Confidence, Certainty, and Related Measures of Attitude Strength

How much confidence people have in the validity of their beliefs is likely to depend on how well a belief passes the "big five" criteria of truth assessment. If so, people should have more confidence in beliefs that are shared by others, consistent with other things they believe, supported by plenty of evidence, acquired from a credible source, and able to organize the pieces into a coherent whole. Decades of research into attitude strength have assessed people's confidence in their beliefs and related variables of attitude strength and the bulk of the findings is consistent with this generalization (for a review, see Visser & Holbrook, 2012).

People report higher certainty "that their attitudes are valid, accurate, and correct" (Visser & Holbrook, 2012, p. 24) when others share their attitude (e.g., Visser & Maribile, 2004). They also report higher attitude strength when their attitude judgment is based on a large rather than small amount of supporting information (e.g., Smith, Fabrigar, MacDougall, & Wiesenthal, 2008), in particular when this information is consistent across multiple dimensions (Fabrigar, Petty, Smith, & Crites, 2006). However, people's actual amount of knowledge and their perception of it are only weakly related (e.g., Radecki & Jaccard, 1995) and perceived knowledge, rather than actual knowledge, predicts attitude certainty (Smith et al., 2008). Similarly, merely believing that one has thought a lot about the topic is sufficient to increase certainty, independent of actual amount of thought (Barden & Petty, 2008). However, favorable perceptions of one's own knowledge, or of the amount of supporting evidence, are called into question when it feels difficult to generate supporting arguments; accordingly, people's certainty in their attitude decreases the more supporting arguments they attempt to list, even when the listing is successful (e.g., Haddock et al., 1996, 1999). Conversely, certainty is higher when one has examined the attitude object "with one's own eyes", which privileges information that has been acquired through direct experience (e.g., Fazio & Zanna, 1978), a variable that also increases the information's later accessibility.

Not surprisingly, people's confidence in the validity of their evaluative judgments has consequences. When people doubt their judgment, they are more easily persuaded that it may be wrong; more likely to change it even without persuasion attempts; and less likely to act on it. Accordingly, research into attitude strength consistently shows that strong attitudes are more resistant to change; more stable over time; and more predictive of behavior (for reviews, see Krosnick & Abelson, 1992, and the contributions in Petty & Krosnick, 1995). To attitude theorists' surprise, however, strong attitudes are just as susceptible to the influence of question context as weak attitudes (Krosnick & Abelson, 1992; Krosnick & Schuman, 1988), which is difficult to reconcile with a dispositional

conceptualization of attitudes as a "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (Eagly & Chaiken, 1993, p. 1).

All of these observations are consistent with attitude construction models that treat attitudes as evaluations in context (Ferguson & Bargh, 2007; Schwarz, 2007). From this perspective, evaluative judgments are similar across time and contexts when they draw on inputs with similar evaluative implications and are resistant to persuasion when those inputs are considered highly relevant and valid. The variables that foster high reports of attitude strength can accomplish this through their influence on the accessibility and perceived validity of the inputs. As noted in the discussion of truth criteria, the conversational inferences that are at the heart of understanding the intended meaning of a question (Clark & Schober, 1992; Schwarz, 1994) are less likely to be subjected to truth testing and do hence benefit less from the fluency variables that foster reports of high attitude strength. Recent developments in persuasion research, most notably Briñol and Petty's (2009; Petty, Briñol, & Tormala, 2002) self-validation approach, increasingly adopt this judgment-in-context perspective by incorporating metacognitive evaluations into models of persuasion, while attempting to maintain a dispositional conceptualization of attitudes.

Implications for the Acceptance and Correction of Misinformation

For millennia, demagogues of all stripes knew that apparent truth can be created through frequent repetition of a lie – in Hitler's words, "Propaganda must confine itself to a few points and repeat them over and over again" (cited in Toland, 1976, p. 221). As already seen, metacognitive research into truth evaluations shows that any other variable that increases the fluency with which a message can be processed can similarly facilitate its acceptance as true; moreover, attitude strength research indicates that the same variables render the resulting judgment more resistant to correction. Changing trends in media use are likely to compound the real world impact of these processes. Beginning with the proliferation of cable TV and talk radio, citizens in democracies enjoyed ever more opportunities to selectively expose themselves to media that fit their worldview. Recently, this trend has been accelerated by social media, where the same message may be encountered over and over again as more and more friends repost it (Johnson, Bichard, & Zhang, 2009). The resulting echo chambers contribute to growing polarization in public opinion (Stroud, 2010); they are also likely to enhance the conviction with which polarized positions are held and to facilitate the spread of information that enjoys little support beyond its apparent social validation (see Lewandowsky et al., 2012, for an extended discussion).

Once it has been accepted, misinformation is difficult to correct as observed in domains as diverse as public opinion, health, and eyewitness testimony (for a review, see Lewandowsky et al., 2012). To date, public information campaigns aimed at correcting erroneous beliefs have rarely paid attention to metacognitive processes. Instead, their rationale is primarily based on content-focused theories of message learning (McQuail, 2000; Rice & Atkin, 2001) that assume that the best way to counter misinformation is to confront the "myths" with "facts", allowing people to learn what's correct. This strategy necessarily repeats the "myths" (false information) that it wants to correct, thus further increasing their subsequent familiarity (for a review, see Schwarz et al., 2007). Accordingly, the popular facts-and-myths strategy works when recipients of educational materials are tested immediately, while they still remember the facts presented to them. But next time they hear the false statements, the

myths sound all the more familiar and are *more* likely to be accepted as true than they would have been without any correction attempt.

Such backfire effects are even observed when information is repeatedly identified as false. For example, Skurnik and colleagues (2005) exposed older and younger adults once or thrice to product statements like, "Shark cartilage is good for your arthritis" and these statements were explicitly marked as "true" or "false." When tested immediately, all participants were less likely to accept a statement as true the more often they were told that it is false. But after a three-day delay, repeated warnings backfired for older adults, who were now more likely to consider a statement "true", the more often they had been explicitly told that it is false. Because explicit memory declines faster with age than implicit memory (Park, 2000), older adults could not recall whether the statement was originally marked as true or false, but still experienced its content as highly familiar, leading them to accept it as true.

As time passes, people may even infer the credibility of the source from the confidence with which they hold the belief. For example, Fragale and Heath (2004) exposed participants two or five times to statements like, "The wax used to line Cup-o-Noodles cups has been shown to cause cancer in rats." Next, participants learned that some statements were taken from the National Enquirer (a low credibility source) and some from Consumer Reports (a high credibility source) and had to assign the statements to their likely sources. As expected, the same statement was more likely to be attributed to Consumer Reports than to the National Enquirer the more often it had been presented. Thus, frequent exposure does not only increase the acceptance of a statement as true, but also facilitates the attribution of the presumably true statement to a highly credible source. This source attribution, in turn, may increase the likelihood that recipients convey the information to others, who themselves are more likely to accept (and spread) it, given its alleged credible source (Rosnow & Fine, 1976).

Such findings highlight that attempts to correct misinformation are likely to backfire when they focus solely on message content at the expense of the metacognitive experiences that accompany message processing. To avoid backfire effects, it is not sufficient that the correct information is compelling and memorable. It also needs to be closely linked to the false statement, to ensure that exposure to the "myth" prompts recall of the "fact." This is difficult to achieve and it will usually be safer to refrain from any reiteration of false information and to focus solely on the facts. The more the facts become familiar and fluent, the more likely it is that they will be accepted as true and serve as the basis of people's judgments and decisions without awareness of a potentially biasing influence (for extended discussions, see Lewandowsky et al., 2012; Schwarz et al., 2007; Wilson & Brekke, 1994).

Implications for Debiasing Strategies in Judgment and Decision Making

Because many biases arise from a narrow focus on the most accessible aspects of the issue under consideration, psychologists' favorite debiasing strategy encourages people to consider how things could be otherwise or to imagine the opposite (for reviews, see Fischhoff, 1982; Larrick, 2004). For example, people overestimate the likelihood of future success (e.g., Koriat, Lichtenstein, & Fischhoff, 1980), and underestimate how long it will take them to complete a task (e.g., Buehler, Griffin, & Ross, 1994), because they focus on what is likely to foster success and ignore what is likely to impede it. After learning about the outcome of an event, people feel that they "knew it all along" because they focus on outcome congruent knowledge and fail to consider variables that may have led to another outcome (e.g., Fischhoff, 1975). Accordingly, encouraging people to ask themselves, "What are some reasons that

my initial judgment might be wrong?" (Larrick, 2004, p. 323) seems good advice.

Unfortunately, this advice often fails and may even backfire. Note that the bias is assumed to arise because information that supports the biased conclusion is more accessible than information that might correct it. This makes it likely that the search for, and elaboration of, reasons why one might be wrong will be experienced as difficult. This, in turn, may convince people that there are few reasons why they might be wrong and that those they can think of do not seem very compelling. If so, the recommended debiasing attempt may leave people all the more convinced that their biased judgment is correct. Empirically, this is the case (for a review, see Schwarz et al., 2007). Thinking of many (experienced as difficult) rather than a few (experienced as easy) reasons for why an event may have turned out otherwise increases the hindsight bias (e.g., Sanna et al., 2002a,b) and thinking of many reasons for why one might fail, or why a project may not be completed on time, increases one's belief in success and timely project completion (Sanna & Schwarz, 2004). The same holds for professional market analysts, who become more confident in their predictions the more they try to think of reasons for why their predictions may be wrong (Kadous, Krische, & Sedor, 2006). These backfire effects are observed even though people can successfully list many reasons, highlighting again that the metacognitive experience trumps the implications of accessible content. Once the informational value of the metacognitive experience is undermined through misattribution manipulations (e.g., Sanna et al., 2002a), the otherwise observed pattern reverses and recalling many reasons for why one might be wrong does attenuate or eliminate the respective bias.

In sum, the highly recommended debiasing strategy of "thinking of the opposite" backfires when the opposite is difficult to bring to mind. Unfortunately, this is quite likely – if "the opposite" came to mind easily, the bias would not emerge to begin with. Thinking of the opposite does attenuate bias when it is experienced as easy or when the informational value of experienced difficulty is called into question. As a result, it is easier to debias judgment by asking people to think of *one* reason for why they might be wrong than to think of many.

JUDGMENTS OF LIKING AND PREFERENCE

The metacognitive judgments reviewed in the preceding sections reflect theory-driven inferences from the subjective experience that a mental operation was easy or difficult. However, ease of processing is also experienced as pleasant and elicits a positive affective reaction that can be captured with psychophysiological measures (e.g., Harmon-Jones & Allen, 1996; Winkielman & Cacioppo, 2001) as well as self-report (Monahan et al., 2000). The elicited affect, in turn, can itself serve as a basis of judgment, providing an alternative pathway for fluency effects that is particularly relevant to judgments of valence, liking, and preference (for a discussion, see Winkielman et al., 2003).

Repetition and Other Fluency Variables

In his classic demonstration of the mere exposure effect, Zajonc (1968) showed that repeated exposure to a neutral stimulus results in more positive evaluations, consistent with Titchener's (1910) observation that familiar stimuli elicit a "warm glow" (for reviews, see Bornstein, 1989; Zajonc, 1998). Several researchers attributed this influence of repeated exposure to increased processing fluency (e.g., Jacoby et al., 1989; Seamon, Brody & Kauff, 1983), which suggests that *any* variable that facilitates fluent processing should similarly enhance evaluation, even with a single exposure. Empirically, this is

the case (for a review, see Reber et al., 2004). In an initial demonstration, Reber and colleagues (1998) presented participants with slightly degraded pictures of everyday objects and manipulated processing fluency through a preceding visual prime that matched or mismatched the target stimulus. Matching visual primes facilitated fast object identification (an objective indicator of fluency) and elicited more positive object evaluations. Similarly, Lee and Labroo (2004) observed that consumers evaluated ketchup more favorably when they were previously exposed to a closely related product (mayonnaise) rather than an unrelated one. Such findings indicate that incidental variables that improve the fluency with which a target stimulus can be processed enhance stimulus evaluation. Numerous other variables produce parallel effects, from figure-ground contrast and presentation duration (e.g., Reber et al. 1998) to the prototypicality of the stimulus itself (e.g., Winkielman et al., 2006; for a review, see Halberstadt, 2006). Moreover, the influence of many variables addressed in the psychology of aesthetics (Arnheim, 1974), including figural goodness, symmetry, and information density, can be traced to the mediating role of processing fluency, which gave rise to a metacognitive theory of aesthetic pleasure that assigns a central role to the perceiver's processing dynamics (Reber et al., 2004).

The Role of Familiarity

Several factors are likely to contribute to the hedonic marking of processing fluency. They include the rewarding implications of the experience that one is making progress on a task; the adaptive value of fast stimulus identification (Winkielman, Schwarz, & Nowak, 2002); and a biologically adaptive preference for familiar stimuli, complemented by caution in dealing with novel and potentially harmful ones (Zajonc, 1968, 1998). To date, the assumed preference for familiar stimuli has received most attention and support.

Potentially harmful novel stimuli should seem particularly threatening, and familiar stimuli particularly comforting, when one's current situation is problematic rather than benign. Supporting this prediction, De Vries and colleagues (2010) found that being in a sad mood increased the size of mere exposure and prototypicality effects, whereas being in a happy mood reduced it. Consistent with previous research (Schwarz, 1990, 2002), participants' sad mood presumably signaled a problematic environment that enhanced their appreciation of familiar and safe stimuli, whereas a happy mood signaled a benign environment that allowed for the exploration of novel objects. It is also worth noting that the relationship between perceived familiarity and affective response is bi-directional: stimuli that evoke a positive affective response are judged more familiar, even when fluency of processing is controlled for (Monin, 2003), and illusions of familiarity can be elicited through incidental positive affect (Garcia-Marques & Mackie, 2001; Phaf & Rooteveel, 2005).

FROM THE DYNAMICS OF THINKING TO ATTRIBUTES OF THE WORLD

The metacognitive judgments reviewed so far were primarily self-related and pertained to one's own knowledge and preferences. However, the informational value of processing fluency and its accompanying affect goes beyond these assessments. By using lay theories of mental processes as a bridging rule, people can also use their own metacognitive experiences to draw inferences about attributes of the external world, as already seen in the parallels between the metacognitive processes involved in evaluating the validity of one's own beliefs and the validity of arguments made by others.

Inferences from Ease of Recall and Thought Generation

A particularly familiar example is Tversky and Kahneman's (1973) availability heuristic, which holds that people infer higher frequency and probability when recall is easy rather than difficult. These inferences reflect the (correct) assumption that the more exemplars exist, the easier it is to bring some to mind. Accordingly, people report that they use their bicycles more often after the easy task of recalling only a few instances than after the difficult task of recalling many instances (Aarts & Dijksterhuis, 1999). They also rate themselves as more assertive after recalling few rather than many of their own assertive behaviors (Schwarz et al., 1991) and consider an event more likely the more reasons they generate for why it might *not* occur (Sanna et al., 2002a,b). Throughout, their inferences are opposite to the implications of recalled content, indicating that the judgments are based on their metacognitive experience rather than on the amount of information brought to mind. If the informational value of the metacognitive experience is called into question through (mis)attribution manipulations, people turn to the amount of recall as the more diagnostic input, which reverses the otherwise observed pattern (e.g, Novemsky et al., 2007; Schwarz et al., 1991).

Other lay theories of memory reflect the numerous other variables that can influence ease of recall, from the temporal distance of an event to its personal importance, one's own expertise in the content domain, or the attention the topic received in the media. Indeed, experienced ease or difficulty of recall can influence judgments of any of these characteristics, depending on the question asked (for reviews, see Alter & Oppenheimer, 2009; Schwarz, 2010).

Inferences from Processing Fluency

Similarly, the fluency with which new information can be processed can inform a wide range of judgments. For example, people misread the difficulty of reading as indicative of the difficulty of doing and infer that an exercise routine will take longer and flow less naturally when its description is printed in a difficult to read font (e.g, Mistral) rather than an easy to read one (e.g., Arial). As a result of these differential task inferences, a mere shift in print font can influence people's willingness to engage in a task (Song & Schwarz, 2008b) and their appreciation of services that will complete the task for them (Thompson & Chandon-Ince, 2013).

Fluency experiences are particularly influential in domains where the apparent familiarity of a stimulus is a useful input. One of these domains is risk perception – if a stimulus is familiar and elicits no negative memories, it presumably hasn't hurt us in the past (Zajonc, 1968). Accordingly, Song and Schwarz (2009) observed that ostensible food additives were perceived as less hazardous when their names were difficult (e.g., Fluthractnip) rather than easy (e.g., Magnalroxate) to pronounce. Moreover, the effect of ease of pronunciation on risk ratings was mediated by the perceived novelty of the stimuli. Highlighting the real-world implications of this fluency-familiarity-risk link, Alter and Oppenheimer (2006) found that initial public offerings on the New York Stock Exchange provided a higher return on investment when their ticker symbol was easy (e.g., KAR) rather than difficult to pronounce (e.g., RDO). In addition to the mediating role of perceived familiarity (Song & Schwarz, 2009), intuitive assessments of risk may be further affected by perceivers' positive affective response to fluently processed stimuli (Winkielman & Cacioppo, 2001), consistent with the observation of mood effects on judgment of risk (e.g., Johnson & Tversky, 1983) and the beneficial influence of sunny weather on the stock market (e.g., Hirshleifer & Schumway, 2003). To date, few attempts have been made to separate the relative contributions of different pathways in this domain.

Perceived familiarity is also an important input in judgments of fame and innovation – people one has never heard of are probably not famous and things that seem familiar are probably not novel. Accordingly, manipulations that facilitate fluent processing increase judgments of fame (Jacoby et al., 1989), whereas manipulations that impair fluent processing decrease judgments of fame (Strack & Neumann, 2000). Similarly, a product seems more innovative when it feels unfamiliar because it is described in hard to read print font (Cho & Schwarz, 2006).

As these examples illustrate, people use information gleaned from the dynamics of their own information processing to draw inferences about the world, not merely inferences about their own thoughts. At the heart of these inferences are lay theories of mental processes that allow perceivers to move from their own mental experience to its plausible external cause; because there is usually more than one plausible cause, these inferences are highly malleable and context sensitive (Schwarz, 2010).

DETECTING AND CORRECTING POTENTIAL BIASES

Human judgment is subject to many biases that arise from a variety of sources, including reliance on heuristics (for reviews, see Gilovich, Griffin, & Kahneman, 2002; Nisbett & Ross, 1980), motivated reasoning (for a review, see Kunda, 1999), self-enhancement (for a review see, Dunning, 2005), and stereotyping (for a review, see Schneider, 2004). People are aware of the existence of biases and see them clearly in others – but rarely in themselves (Pronin, 2007). Instead, they view their own perceptions of the world as an unbiased reflection of reality and consider those who don't share their view as either ill informed or ill intentioned (Ross & Ward, 1996). This section first addresses this asymmetry and summarizes the little that is currently known about the detection of bias in one's own thoughts; it then turns to people's strategies for avoiding or correcting potential bias once they suspect it.

Naïve Realism and Bias Detection

Most biases arise from influences of which the person is not consciously aware (Bargh, 1997; Bargh & Chartrand, 1999; Kunda, 1999), including the influence of contextual variables and goals on knowledge accessibility, selective sampling of information, and reliance on simplifying knowledge structures and heuristics. The automaticity of these influences has two important implications. First, the mental process itself cannot be monitored introspectively (Nisbett & Wilson, 1977; Wilson & Brekke, 1994). Instead, people only become aware of a potential influence when the respective influence variable is highly salient or their attention is explicitly drawn to it. For example, incidental exposure to trait concepts influences impression formation unless the priming episode is very blatant (Martin, 1986) or people are reminded of the context in which they were exposed to the primes (Strack et al., 1993); otherwise, the primed concepts guide encoding and impression formation without introspective insight into their influence. Second, automatic influences occur without effort and difficulty (Bargh, 1997); this fluency of the process makes the resulting judgment particularly compelling, as seen in earlier sections. As a result, introspective insight into one's own biases is difficult to achieve and one's own perception of the world appears as a direct and unbiased reflection of reality (Ross & Ward, 1996). Note, however, that high confidence in one's own perceptions is less likely when the thought process is disfluent. This suggests that disfluency may facilitate awareness of a potentially biasing influence, which is consistent with findings bearing on the detection of misleading elements of messages (e.g., Song & Schwarz, 2008)

and awaits systematic investigation.

Whereas people tend to rely on introspective monitoring to detect potential biases in their own thoughts, this strategy is not applicable to detecting bias in others'. Whatever may be going on in others' minds is not introspectively accessible to observers, who need to attend to knowledge about the actor and the context to infer what the person may be thinking; this increases the likelihood that potentially biasing influences are noticed (Pronin, 2007). Even when no bias is immediately apparent, this inference process is likely to be somewhat disfluent, which hurts the perceived validity of the actor's thoughts and invites further consideration of potential bias. These metacognitive processes contribute to the general observation that people find their own view of the world more compelling than others' views; they therefore tend to infer bias in others whenever they arrive at different judgments (for reviews, see Pronin, Gilovich, & Ross, 2004; Ross & Ward, 1996).

Given people's very limited insight into their own biases, almost all studies of mental correction rely on manipulations that either draw people's attention to an unwanted potential influence or even specify its likely direction. To which extent the correction efforts prompted by such manipulations are representative of spontaneous correction attempts in daily life is unknown (for a discussion, see Martin & Stapel, 1998). One case of spontaneous correction was reported by Oppenheimer (2004), who asked people to judge the frequency of family names. When the name was highly familiar (e.g., the participant's own name or the names of Presidents Bush and Clinton), participants underestimated its actual frequency, reflecting an unprompted correction guided by a lay understanding of the accessibility-frequency link. However, this insight resulted in an overcorrection, that is, a bias in the opposite direction.

Strategies of Mental Correction

When people suspect that some variable may influence them in unwanted ways, they have several options to address this concern (for reviews, see Strack & Hannover, 1996; Wegener, Silva, Petty, & Garcia-Marques, 2012; Wilson & Brekke, 1994; Wilson, Centerbar, & Brekke, 2002). First, with sufficient insight and foresight, they can avoid exposure to the potentially biasing variable. For example, instructors can grade student papers without knowing who their author is, thus avoiding an influence of gender, race, past interactions, and many other variables. Although exposure avoidance is the most reliable way to contamination avoidance, people tend to recommend it more to others than to employ it for themselves, consistent with their perception that others are more vulnerable to biasing influences. Second, when multiple inputs are available to arrive at a judgment, it is possible to attenuate the impact of questionable information by focusing on other inputs instead. Theoretically, this can be successful when other information is easily available and the questionable information does not color its interpretation. To date, this possibility has not been systematically tested, in part because the conditions for its success are difficult to instantiate. Instead, third, chances are that the questionable information is not independent of other information one has about the target and hence colors other potential inputs. For example, learning from a colleague that a job candidate just received a major grant may result in more favorable perceptions of the studies she presents. When it later turns out that the colleague was mistaken and the information about the grant pertained to someone else, correction is fraught with uncertainty because one cannot confidently determine whether, and to what extent, the grant information influenced the perception of other attributes, nor which attributes this were.

Empirically, the most likely outcome is that perceivers overcorrect their judgment and evaluate the candidate more negatively than would have been the case without the erroneous grant information. This reflects that perceivers may exclude too many potentially influenced positive perceptions from their mental representation of the candidate, resulting in a less favorable representation (Martin, 1986); in addition, they may use the excluded attributes in constructing a standard (a person with a great grant) against which the candidate is evaluated, resulting in a higher standard that further impairs evaluation (Schwarz & Bless, 1992).

In addition, fourth, people may try to suppress the potentially biasing information to make sure that it does not come to mind. Thought suppression is effortful, requires considerable resources and motivation, and involves a monitoring process that has the ironic effect of increasing the accessibility of the suppressed information once the suppression effort ceases (Wegner, 1992, 1994). As a result, previously suppressed information often exerts increased influence later on (for a review, see Wenzlaff & Wegner, 2000), although such rebound effects are less pronounced for people who are highly practiced at suppressing the respective thoughts (e.g., Monteith, Spicer, & Tooman, 1998).

The four correction strategies discussed so far share that they involve changes in the mental representation of the target that presumably serves as a basis of judgment. These changes, and their effects on judgment, can be conceptualized in terms of the inclusion/exclusion model of mental construal that predicts the emergence of assimilation and contrast effects as a function of information accessibility and a set of metacognitive assessments that guide information use (Bless & Schwarz, 2010). Other correction strategies aim to adjust the final judgment without involving changes in the mental representation underlying that judgment; they can be thought of as strategies of response correction (Strack, 1992; Strack & Hannover, 1996; Wegener & Petty, 1995, 1997). Specifically, people who become aware of a likely bias may ask themselves, "What would my judgment be without this unwanted influence?" They may then draw on applicable lay theories of judgment to infer the likely direction and size of the influence and adjust their judgment accordingly. In principle, this strategy can be successful when the person (i) recognizes an actual source of bias and (ii) the likely direction of influence as well as (iii) the size of this influence. These conditions may rarely be satisfied. In fact, researchers who study theory-driven corrections need to rely on manipulations that clearly identify the variable and explicitly instruct participants to avoid its influence (e.g., Wegner & Petty, 1995, 1997). When this is done, people do correct away from the perceived bias, as requested; but without such instructions, they fail to notice the biasing influence, unless it is very blatant, and hence fail to correct for it (Stapel, Martin, & Schwarz, 1998). In addition, people sometimes perceive bias where none is, resulting in unnecessary corrections that introduce bias where none was (e.g., Wegener & Petty, 1995).

To date, research into the detection and correction of bias has proceeded independently of work that addresses how people evaluate the validity of information. As seen in that section, metacognitive experiences play a key role in truth assessment and the detection of misleading information, which is closely related to the perception of possible unwanted influences on one's judgment. Future research may fruitfully link these lines of work and test the role of (dis)fluency in bias detection and correction.

Coda

Bringing a metacognitive perspective to traditional issues of social judgment, recent social cognition research has shed new light on familiar issues of human judgment, from assessments of the informational value of a given input to the identification and correction of possible biases. The lessons learned highlight the context sensitive interplay of declarative and experiential information and illustrate that we cannot understand human cognition without considering the subjective experiences that accompany the thought process (cf. Schwarz, 2010). The emerging picture paints a decidedly mixed portrait of the sophistication of human judgment. On the sophisticated side, people monitor their own thought processes and attend to declarative information as well as to the dynamics of their own information processing as relevant inputs. The inferences they draw from their metacognitive experiences are guided by lay theories of cognition that are usually correct and compatible with the results of psychological research. On the less sophisticated side, people are insensitive to where their metacognitive experiences come from. Unless their attention is explicitly drawn to it, they routinely fail to recognize the influence of incidental variables (from print fonts and figure-ground contrast to rhyme) and proceed to bring their experience to bear on the task at hand. As a result, the same metacognitive processes are implicated in feasts of insight and disasters of gullability.

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