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Why Do Lie-Catchers Fail? A Lens Model Meta-Analysis of Human Lie Judgments

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Decades of research has shown that people are poor at detecting lies. Two explanations for this finding have been proposed. First, it has been suggested that lie detection is inaccurate because people rely on invalid cues when judging deception. Second, it has been suggested that lack of valid cues to deception limits accuracy. A series of 4 meta-analyses tested these hypotheses with the framework of Brunswik's (1952) lens model. Meta-Analysis 1 investigated perceived cues to deception by correlating 66 behavioral cues in 153 samples with deception judgments. People strongly associate deception with impressions of incompetence ($r = .59$) and ambivalence ($r = .49$). Contrary to self-reports, eye contact is only weakly correlated with deception judgments ($r = -.15$). Cues to perceived deception were then compared with cues to actual deception. The results show a substantial covariation between the 2 sets of cues ($r = .59$ in Meta-Analysis 2, $r = .72$ in Meta-Analysis 3). Finally, in Meta-Analysis 4, a lens model analysis revealed a very strong matching between behaviorally based predictions of deception and behaviorally based predictions of perceived deception. In conclusion, contrary to previous assumptions, people rarely rely on the wrong cues. Instead, limitations in lie detection accuracy are mainly attributable to weaknesses in behavioral cues to deception. The results suggest that intuitive notions about deception are more accurate than explicit knowledge and that lie detection is more readily improved by increasing behavioral differences between liars and truth tellers than by informing lie-catchers of valid cues to deception.

Keywords: deception judgments, subjective cues to deception, Brunswik's lens model

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Human deception and its detection have long been of interest to psychologists. Social psychological research has established that lying is a common feature of everyday social interactions (Cole, 2001; Jensen, Arnett, Feldman, & Cauffman, 2004; see Serota, Levine, & Boster, 2010, for a qualification of this finding): People tell both self-oriented lies (e.g., to enhance socially desirable traits and to escape punishment for transgressions) and other-oriented lies (e.g., to protect others' feelings from being hurt and to protect social relationships; DePaulo & Kashy, 1998; DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996). Lying is thus an important interpersonal phenomenon that serves the purpose of regulating social life (Vrij, 2008). Deception has also attracted the attention of applied psychologists because interpersonal judgments of credibility play an important role in several domains, including the legal system (Granhag & Strömwall, 2004; Vrij, 2008).

One of the major findings from this research is that people are poor at detecting lies: A meta-analysis of 206 studies showed an average hit rate of 54%, which is hardly impressive given that chance performance is 50% (Bond & DePaulo, 2006). Why is lie detection prone to error? In the literature, two explanations have been proposed (e.g., Vrij, 2008). First, it has been suggested that naïve lie detection is inaccurate because people have a false stereotype about the characteristics of deceptive behavior and therefore base their judgments on cues that are invalid. This hypothesis (which we may call the *wrong subjective cue hypothesis*) implies that errors in lie judgments are attributable to limitations in social perception and impression formation and that lie detection would be improved if perceivers relied on a different set of cues. Second, meta-analyses of cues to deception show that behavioral differences between truth tellers and liars are minute at best (DePaulo et al., 2003; see also Sporer & Schwandt, 2006, 2007). In other words, there is no Pinocchio's nose—no behavioral sign that always accompanies deception (Vrij, 2008). Because the behavioral differences between liars and truth tellers are small, perceivers have little diagnostic material to rely on when attempting to establish veracity. This view (which we may call the *weak objective cue hypothesis*) suggests that the limitations of lie detection reside in the judgment task itself. In this article, we employ Brunswik's lens model to understand judgments of veracity (Brunswik, 1952; Hursch, Hammond, & Hursch, 1964). Brunswik's (1952) lens model is a conceptual framework for studying human predictions of criteria that are probabilistically

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related to cues (e.g., a physician making an assessment of the likelihood that a patient has cancer on the basis of the patient's symptoms, a teacher's assessment of a student's scholastic abilities based on the student's performances in class, or a manager's judgment of job candidates on the basis of their behavior; Karelaia & Hogarth, 2008). We draw on the available empirical data to conduct a series of meta-analyses of judgment achievement as defined by the lens model equation (Kaufmann & Athanasou, 2009). As we shall see, the lens model offers an analytic framework that lets us put the two hypothesized explanations to a quantitative test, by allowing for a statistical decomposition of inaccuracy in lie detection in two components reflecting (a) limitations in the naïve use of cues to deception and (b) lack of validity of objective cues to deception. In order to fully develop the rationale for the current study, we provide an overview of the main features of research on deception, after which we turn to the application of the lens model to deception judgments.

Major Findings in Deception Research

Most research on deception is laboratory-based. In this research, participants, typically college students, provide truthful or deliberately false statements (e.g., by purposefully distorting their attitudes or events that they have witnessed or participated in). The statements are subjected to various analyses including coding of verbal and nonverbal characteristics. This allows for the mapping of *objective cues* to deception—behavioral characteristics that differ as a function of veracity. Also, the videotaped statements are typically shown to other participants serving as lie-catchers who are asked to make judgments about the veracity of the statements they have seen. Across hundreds of such studies, people average 54% correct judgments, when guessing would yield 50% correct. Meta-analyses show that accuracy rates do not vary greatly from one setting to another (Bond & DePaulo, 2006) and that individuals barely differ from one another in the ability to detect deceit (Bond & DePaulo, 2008). Contrary to common expectations (Garrido, Masip, & Herrero, 2004), presumed lie experts who routinely assess credibility in their professional life do not perform better than lay judges do (Bond & DePaulo, 2006). In sum, that lie detection is a near-chance enterprise is a robust finding emerging from decades of systematic research.

Subjective Versus Objective Cues to Deception

What is the reason for the near-chance performance of human lie detection? To explain lack of accuracy, researchers have attempted to map the decision making of lie-catchers by studying *subjective cues* to deception (Strömwall, Granhag, & Hartwig, 2004). These are behaviors that are perceived by observers as signs of deception. The most commonly employed method to study subjective cues to deception is the survey approach, in which people are asked to self-report on their beliefs about deceptive behavior (Akehurst, Köhnken, Vrij, & Bull, 1996; Strömwall & Granhag, 2003; Vrij & Semin, 1996; for a different approach, see Zuckerman, Koestner, & Driver, 1981). In most of these studies, respondents were provided with a list of verbal and nonverbal behaviors and asked how, if at all, these behaviors are related to deception (e.g., L. H. Colwell, Miller, Miller, & Lyons, 2006; Lakhani & Taylor, 2003; Taylor & Hick, 2007). In most studies, people are provided with a list of common subjective and objective cues to deception, to investigate whether people express support for subjective cues and whether they reject objective cues. In addition to this closed-ended approach, some studies have employed an open-ended approach in which respondents are asked what behavioral cues they associate with deception. Another way of mapping subjective cues to deception is to ask lie-catchers in laboratory studies to self-report the basis for their veracity judgment (e.g., "I thought the person was lying because she was stuttering"; see Strömwall et al., 2004).

The results from self-report studies on subjective cues to deception are remarkably consistent. Most commonly, people report the belief that gaze aversion is indicative of deception. A worldwide study surveyed beliefs about cues to deception in 58 countries and found that in 51 of these, the belief in a link between gaze behavior and deception was the most frequently reported (Global Deception Research Team, 2006). People also report that increased body movements, fidgeting, and posture changes are associated with deceit, as well as a higher pitched voice and speech errors. This pattern suggests that people expect liars to experience nervousness and discomfort and that this nervousness is evident in behavior (Vrij & Semin, 1996). However, there is a methodological limitation to these studies that prevents us from concluding that people make lie judgments based on these criteria: We cannot be certain that the behaviors people report explicitly are those that best capture their actual decision-making strategies (Nisbett & Wilson, 1977). As impression formation is partly automatic and implicit (Bargh & Chartrand, 1999; Fiske & Taylor, 2008), it is quite possible that people are unaware of the basis for their veracity assessments and that self-reports reflect an explicit, conscious stereotype of deceptive behavior that has little impact on actual decision making. As we shall see, applying the lens model to deception judgments allows us to go beyond self-reports to assess the actual behavioral criteria that predict judgments of deception.

Do liars behave consistently with people's notions of deceptive behavior? Expressed differently, is there an overlap between subjective beliefs about deceptive behavior and actual objective cues to deception? Analyses of verbal and nonverbal behavior of liars and truth tellers show that cues to deception are scarce and that many subjective cues are unrelated to deception. A meta-analysis covering 120 studies and 158 cues to deception showed that most behaviors are only weakly related to deception, if at all (DePaulo et al., 2003; see also DePaulo & Morris, 2004). Gaze aversion is not a valid indicator of deception. The simple heuristic that liars are more nervous is not supported by the meta-analysis because many indicators of nervousness, such as fidgeting, blushing or speech disturbances, are not systematically linked to deception. The meta-analysis does suggest that liars might be more tense, possibly as a function of operating under a heavier self-regulatory burden: Their pupils are more dilated and their pitch of voice is higher (DePaulo et al., 2003). The results also suggest that there might be some verbal differences between liars and truth tellers: Liars talk for a shorter time and include fewer details, compared with truth tellers. Also, liars' stories make less sense in that their stories are somewhat less plausible and less logically structured.

It is not our intention to provide a comprehensive overview of the available research on deception and its detection. For such overviews, we direct the reader to recent meta-analyses by DePaulo et al. (2003) and Bond and DePaulo (2006) and the comprehensive review by Vrij (2008). The important point is that research suggests two plausible explanations for why lie-catching often fails. First, self-reports suggest a mismatch between subjective and objective cues to deception, meaning that people consistently report relying on behaviors that are unrelated to deception. Second, behavioral coding of lies and truths in laboratory research suggests that there is a scarcity of objective cues to deception, making the judgment task intrinsically error prone. How do we know which of these explanations fits the data best? The fact that there is no answer to this question in the available literature suggests that despite the vast body of empirical research, judgments of deception are poorly understood. We aim to enhance understanding by employing the lens model originally outlined by Brunswik (1952), a method of analysis that has proven fruitful for understanding human judgments in a wide range of areas (Hogarth & Karelaia, 2007; Juslin, 2000; Karelaia & Hogarth, 2008; Kaufmann & Athanasou, 2009). In contrast to previous research in which researchers have studied either the characteristics of deceptive and truthful behavior or the characteristics of judgments of deception, employing the lens model allows us to study the interplay between the characteristics of the judgment task and perceiver performance (e.g., Juslin, 2000). A few previous studies have employed the lens model to study judgments of deception (Fiedler & Walka, 1993; Sporer, 2007; Sporer & Kupper, 1995). We build on and extend this work by offering a synthesis of the available literature on deception judgments using the framework of the lens model. We aim to address three main questions. First, what cues do people use when judging deception (Meta-Analysis 1)? Second, is there a lack of overlap between subjective and objective cues to deception (Meta-analyses 2 and 3)? Third, is inaccuracy mainly due to incorrect decision-making strategies or lack of valid cues to deception (Meta-Analysis 4)?

Brunswik's Lens Model

Within the theoretical framework of probabilistic functionalism, Egon Brunswik (Brunswik, 1952; Petrinovich, 1979) proposed a model to understand processes of human perception. The basic assumption of probabilistic functionalism is that people exist in an uncertain environment and that judgments and inferences about the environment are therefore made on the basis of probabilistic data (Brunswik, 1943, 1952; Hammond, 1996). Judgments of a criterion are made on the basis of cues with different ecological validities, where ecological validity is the correlation between the cue and the distal variable to be predicted (Hursch, Hammond, & Hursch, 1964). Also, cues differ in their use by a perceiver, where cue utilization can be represented by the correlation between the cue and the inference drawn by the perceiver. A person's achievement or accuracy can be captured by the correlation between the inference drawn and the distal variable. Since the lens model was proposed, it has been expanded to capture not only perceptual judgments but also a variety of cognitive processes including learning (Summers & Hammond, 1966), clinical inference (Hammond, Hursch, & Todd, 1964), interpersonal perception (Hammond, Wilkins, & Todd, 1966), and personality attributions (DeGroot & Gooty, 2009).

A main advantage of the lens model is its ability to model judgment accuracy by taking into account both the decision maker and the decision-making task. In the words of Karelaia and Hogarth (2008, p. 404), "The simple beauty of Brunswik's lens model lies in recognizing that the person's judgment and the criterion being predicted can be thought of as two separate functions of cues available in the environment of the decision." From this, it follows that the accuracy of a person's judgment will be a function of the extent to which the criterion can be predicted from a set of cues, as well as to what extent the cues used by a perceiver overlap with the cues that predict the criterion. To illustrate this, consider a musician who plays the same tune repeatedly but attempts to convey different emotions (e.g., anger, sadness, happiness) each time the song is played (see Juslin, 2000). How well can a listener judge what emotion the musician is attempting to convey? The judgment achievement of the listener (i.e., the correlation between the performer's intention and the listener's judgment) will, according to the lens model, be a function of the following: First, to what extent are there valid cues to the performer's intended emotion in the tune being played? Second, to what extent can the perceiver's judgment be reliably predicted from cues? Third, to what extent does the set of cues utilized by a perceiver to judge emotional expression match those actually indicative of the performer's emotion? The lens model thus decomposes judgment inaccuracy in components reflecting (a) lack of validity in objective cues to emotions in the tune being played and (b) lack of overlap between objective cues to emotion and subjective use of cues to predict emotion on the basis of the tune being played. The lens model can therefore provide both descriptive information to understand judgment accuracy, and prescriptive information about how judgment accuracy can be improved (Hogarth & Karelaia, 2007). For a thorough discussion of the lens model, see Cooksey (1996).

A Lens Model of Deception Judgments

Let us now employ the reasoning outlined above to understand accuracy in judgments of deception. In the current article, we do not measure lie detection accuracy as percentage correct. Instead, we measure accuracy in terms of a Pearson product–moment correlation coefficient—the correlation between actual deception and judgments of deception. For present purposes, this correlational metric is superior to percentage correct. Unlike percentage correct, it can accommodate results from the many studies of deception in which participants render their judgments of truthful and deceptive messages on Likert scales. The correlational metric is also necessary for the implementation of a lens model of deception judgments, as is now explained.

A lens model of judgments of deception incorporates a communicator, behavioral cues, and a judge (see Figure 1). The communicator appears at the left of the figure, and cues appear in the middle. The communicator will either lie or tell the truth, and the communicator's behaviors may function as cues indicating his or her deceptiveness. Atop the line going from the communicator to each cue, we would hope to place a *validity coefficient*—a statistical measure of the extent (and direction) of the relation between the communicator's deceptiveness and that cue. Suppose, for example, that the cue at the top of the figure is the amount of detail in the communicator's message. We have some idea of the validity of that measure as a cue to deceptiveness. An earlier meta-analysis by DePaulo et al. (2003) reveals a correlation between deceptiveness and number of details of −.20, with truthful messages being more detailed than deceptive ones. The DePaulo et al. (2003)

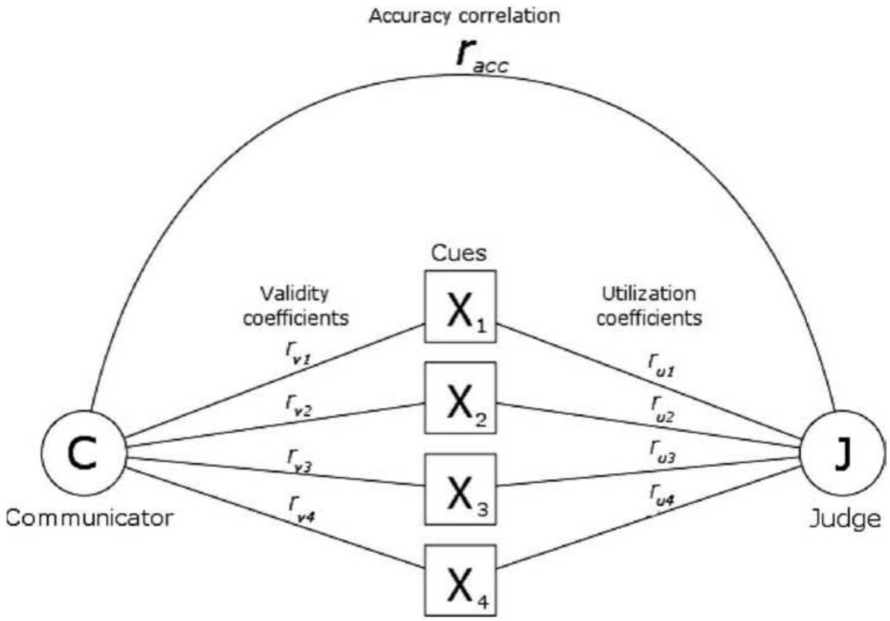

Figure 1. The communicator (C) is displayed to the left, and the judge (J) is displayed to the right. Behavioral cues (X) appear in the middle of the figure. Each cue is related to deception by a validity coefficient (r_v) and to deception judgments by a utilization coefficient (r_u), each represented by a Pearson's *r*. For example, assume that the cue at the top of the figure, X_1 is the number of details in a communicator's message. A previous meta-analysis by B. M. DePaulo et al. (2003) revealed a correlation between deceptiveness and number of details (r_v) of $-.20$, with truthful messages being more detailed than deceptive ones. In Meta-Analysis 1, we find that the number of details is associated with deception judgments with $r_u = -.37$, suggesting that judges (correctly) infer deception from a lack of details. Generally, the accuracy of the judge (i.e., the correlation between the judgment of deception and actual deception, represented in the figure by r_{acc}) will, according to the lens model, be a function of the following: First, to what extent are there valid cues to deception (the left side of the figure)? Second, to what extent can the perceiver's judgment be reliably predicted from cues (the right side of the figure)? Third, to what extent does the set of cues utilized by a perceiver to judge deception match those actually indicative of deception (the matching between the left and right side of the figure)?

meta-analysis provides correlation coefficients for 158 potential cues to deception. We draw on these earlier meta-analytic data to implement the left-hand side of our lens model.

The naïve detection of deception involves not just the communicator, it also involves a judge. In attempting to uncover deceit, judges attend to cues. From certain of those cues, they infer deception; from others, veracity. This process of decoding communicator behavior appears on the right-hand side of Figure 1. There we have a judge, as well as lines emanating from cues toward that judge. Our goal is to place atop each line a *utilization coefficient*—that is, a measure of the extent and direction of the relation between a cue and a judges' tendency to infer that the communicator is being deceptive. Again, suppose that the cue at the top of the figure is the number of details in a communicator's message. As reported below, perceivers tend to infer truthfulness from detailed communications; in fact, the relevant *r* with perceived deceptiveness is $-.37$. The similarity between this decoding coefficient (of $-.37$) and the corresponding encoding coefficient (of $-.20$) would suggest that perceivers enhance their accuracy in detecting deception insofar as they rely on message details as a judgment cue. More generally, accuracies (and inaccuracies) in naïve lie detection reflect the correspondence (and noncorrespondence) between the validity of particular deception cues and their utilization by judges.

Within this lens model framework, accuracies in human lie detection can be statistically decomposed. To explain the decomposition, we must introduce some notation. Suppose that we have data on a number of potential deception cues. Suppose we enter those cue variables into a multiple regression equation and use them to predict communicator deceptiveness. Call our measure of deceptiveness *D*. The resulting regression equation would yield a statistical prediction of deceptiveness for each communicator (call the predictions D'), and these predictions would be more (or less) accurate. One measure of their accuracy is the Pearson product–moment correlation between actual deceptiveness and statistical predictions of deceptiveness (that is, between D and D'). Call this correlation coefficient R_{Dec}. It indicates the overall predictability of deception from our set of behavioral cues.

Given appropriate data, we could set up a multiple regression equation for predicting judgments of communicator deceptiveness from the same behavioral cues. Let us call our measure of perceived deceptiveness *P*. Our regression equation would yield a prediction of deception judgment for each communicator. Let us call these predictions P' and measure their accuracy by their correlation with actual judgments. The resulting correlation, which we denote R_{Per}, reflects the predictability of deception *judgments* from a set of behavioral cues. Finally, it is of interest to compare statistical predictions of deception with the corresponding predictions of perceived deception. If behaviorally based predictions of deception perfectly matched behaviorally based predictions of deception judgment, the two sets of predictions would correlate +1. If there was a perfect mismatch between the two sets of predictions, they would correlate –1. More generally, a quantification of accuracy in the lens model depends on the so-called *matching index*—the correlation coefficient between cue-based predictions of deception and cue-based predictions of deception judgment. Call this matching index G.

For purposes of the lens model, we measure the accuracy of deception judgments by a Pearson product–moment correlation coefficient—the r between judgments of deception and actual deception. Call this accuracy correlation r_{acc}. If we can assume that errors in predicting deception are uncorrelated with errors in predicting deception judgment, lie detection accuracy can be expressed as the product of three factors (Tucker, 1964):

$$r_{\mathrm{acc}} = R_{\mathrm{Dec}} \times R_{\mathrm{Per}} \times G. \quad (1)$$

Thus, the accuracy of lie detection is the product of (a) the predictability of a communicator's deceptiveness from behavioral cues, (b) the predictability of a communicator's perceived deceptiveness from behavior cues, and (c) the matching of cue-based predictions of deception with cue-based predictions of apparent deception. To implement this lens model, we began by collecting meta-analytic data on cues to deception judgment. These data are of interest in their own right because there is no comprehensive up-to-date synthesis of behavioral correlates of lie judgments in the accumulated literature.

Meta-Analysis 1: Cues to Perceived Deception

The purpose of Meta-Analysis 1 is to identify behaviors that covary with the degree to which a communicator is perceived as deceptive. We do not assume that participants can accurately report on the bases of their deception judgments—rather, the accuracy of this reporting is a question to be empirically addressed. For the identification of objective correlates of perceived deceptiveness, we consider studies in which people make judgments of the veracity of a set of communicators and correlate a communicator's perceived deceptiveness with various aspects of the communicator's demeanor, speech, or behavior. To this date, a number of such reviews have been conducted. Here we consider several of those reviews.

Zuckerman, DePaulo, and Rosenthal (1981) examined 13 studies on behaviors associated with perceived deception. These studies yielded data on the relation between deception judgments and 10 distinct behaviors that might be used to form those judgments. Eight of the 10 behaviors in the studies were significantly related to deception judgments. Deception was most strongly inferred from high vocal pitch and from slow speech, each relation yielding $r = .32$. Along with a companion meta-analysis, this review indicated that behaviors are more strongly associated with perceived deception than actual deception.

In an unpublished master's thesis, Malone (2001) assessed results on cues to perceived deception from 69 independent samples. These yielded data on the relation between deception judgments and 136 potential judgment cues. Meta-analysis revealed that many of the cues were in fact significantly related to deception judgments. The strongest results indicated that judges attribute deception to communicators who appear indifferent and unintelligent, each relation yielding $r = .56$. More generally, hesitant, fidgety communicators are judged to be deceptive; positive, consistent, forthcoming communicators are judged to be truthful (Malone, 2001). From a nonquantitative analysis, Malone concluded that there is some overlap and some divergence between these cues to deception judgment and cues to actual deception.

From a tabulation of significant and nonsignificant correlations in 48 studies, Vrij (2008) drew conclusions about 26 behavioral cues to perceived deception. Vrij (2008) concluded that people infer deception from signs of nervousness, like speech errors, pauses, and gaze aversion. They also infer deception from odd behaviors, like excessive eye contact and abnormal response latencies.

Although these earlier reviews have been informative, they do not reflect all of the evidence on cues to perceived deception. Malone's (2001) thesis offers the most comprehensive literature review to date. Unfortunately, his effort is unpublished, and it draws conclusions from only 69 samples of senders. Here, we identify cues to perceived deception from a larger database.

Method

Literature search procedures. To locate relevant studies, we conducted computer-based searches of *Psychological Abstracts, PsycInfo, PsycLit, Communication Abstracts, Dissertation Abstracts International, WorldCat,* and Google using the keywords *deception, deceit,* and *lie detection*. We searched the *Social Sciences Citation Index* for articles that cited key references (e.g., B. M. DePaulo & Rosenthal, 1979), examined reference lists from previous reviews (Bond & DePaulo, 2006; DePaulo et al., 2003; Malone, 2001; Vrij, 2008), and reviewed the references cited in every article we found.

Criteria for inclusion of studies. Our goal was to summarize all English-language reports of original research on cues to judgment of deception available prior to January 2011. To be included in this review, a document had to report the relation between judgments of deception and at least one cue. For purposes of implementing this criterion, we construed judgments of deception broadly, to include the percentage of receivers who inferred that a sender was lying (rather than telling the truth), the rating of a sender on a multipoint scale of deceptiveness, and the ratings of the sender's honesty, trustworthiness, and believability. However, we did not include in this review judgments of affect, even if the affect being judged had been falsified. Although we included studies in which children served as senders of truthful and deceptive messages, we did not include studies in which people under 16 years old served as receivers—leaving to developmental psychologists the task of understanding children's deception judgments.

As possible cues to deception judgment, we included any behavior of the person being judged, any impression of the person conveyed, and any aspect of the person's demeanor or physical appearance. We did not consider situational factors as cues to deception judgment—the impact of situational factors on deception judgments having recently been summarized by Bond and DePaulo (2006). We uncovered 128 documents that satisfied our inclusion criteria.

Several features of this literature deserve comment. First, a number of these documents reported more than one study of cues to deception judgment. Second, there were a number of cases in which a given sample of senders was judged by more than one sample of receivers. For purposes of the current meta-analysis, the unit of aggregation is the sender sample. Our analyses extract one set of cue–judgment correlations from each independent sample of senders—aggregating across multiple groups of receivers, when necessary. From this literature, we extracted 153 independent sender samples.

In these studies, researchers reported results on the relation of deception judgments to 81 different cues. Fifteen of the cues were examined in only one sample of senders (information about these are available from the first author). These were excluded from the present study. The remaining 66 cues appear at the left of Table 1. Seventy-five of the 81 cues appeared in an earlier meta-analysis of cues to deception by DePaulo et al. (2003) and are more fully described there. The six additional cues appear at the bottom of Table 1.

Variables coded from each report. From each report, we coded as many of the following variables as possible: (a) number of senders, (b) number of receivers, (c) an accuracy correlation, (d) at least one cue–judgment correlation, (e) an N for the cue–judgment correlation, (f) the number of cue–judgment correlations, and (g) a multiple-cue correlation for judgments. We coded the *number of senders* and *number of receivers* from each document. From each document that allowed it, we computed an *accuracy correlation*—that is, a Pearson product–moment correlation coefficient between deception and judgments of deception. We also computed at least one cue–judgment correlation—that is, a Pearson product–moment correlation between deception judgments and scores on a potential cue to deception judgment. Often, the unit for the cue–judgment correlation was a statement. In this case, a positive correlation implies that the more of the cue that was exhibited during a statement, the more likely the statement was to be judged deceptive. In other cases, each sender made multiple statements, and sender was the unit of analysis for the cue–judgment correlation. In this case, a positive correlation would imply that the more of a cue the sender exhibited, the more deceptive she or he was judged to be. We noted the number of cases on which the judgment–cue correlation was based. This was either the number of statements or the number of senders.

Results

Characteristics of the literature. We found 128 documents that satisfied our criteria. Of these documents, 107 were published and 21 were unpublished. The earliest document was dated 1964, and the latest was dated 2010. Searching through these documents, we found 153 independent sender samples. These documents included a total of 4,638 senders and 18,837 receivers. In the median study, 88 receivers judged the veracity of 16 senders. Researchers reported 531 cue–judgment correlations—that is, Pearson product–moment correlations between deception judgments and a cue to those judgments. In 43 cases (that is, 8.1% of the 531), a researcher stated that the relation between perceived deception and a cue was not significant, without reporting anything more. We treated these as $r = 0$. In all other cases, we analyzed the reported correlation coefficients.

In 57 of the 153 sender samples, receivers classified participants' statements as either lies or truths; in 36 samples, receivers rated veracity on multipoint scales; in 35 samples, participants rated senders' honesty; and in 25 samples, they rated senders on an honesty-related attribute (e.g., trustworthiness). Senders were treated in one of three ways. In *deception experiments*, senders were required to lie or tell the truth on an experimenter-specified topic. In *cue experiments*, senders were required to exhibit (or not exhibit) a particular behavior. In *observational studies*, senders received no experimental instructions before having their veracity judged. Deception experiments, cue experiments, and observational studies contributed 72, 56, and 25 sender samples to the current database, respectively.

Judgment cues. From these data, we abstracted 81 distinct judgment cues, aggregated data for each cue within sender sample, converted the 531 Pearson product–moment correlations to Fisher's Z transforms, and cumulated the Fisher's Zs for each cue with random-effects techniques[1] (Lipsey & Wilson, 2001). We coded each judgment–cue correlation as positive if perceivers inferred deception from more of the cue and coded it as negative if perceivers inferred deception from less of the cue. Table 1 displays relevant results for the 66 cues that had been studied in more than one sample. Appearing on each line of the table are an identification number for the cue from Appendix A in an earlier review by DePaulo and colleagues (2003), the name of the cue, the number of samples in which that cue was studied, a Pearson r corresponding to the mean weighted Fisher's Z for the relation of that cue to perceived deception, a 95% confidence interval (CI) for that mean relation (expressed in terms of r), and a between-samples true standard deviation in the population correlation coefficient for the relation between the cue and perceived deception.

As is indicated in the table, 41 of 66 cues (that is, 62.12%) have a statistically significant relation to perceived deception, at a per-cue alpha-level of .05. In light of the large number of cues being assessed, it should also be mentioned that 27 of 66 cues have a statistically significant relation to perceived deception at a more stringent per-cue alpha level of .001. Of the 66 cues, 21 have relations with perceived deception that vary significantly across samples at $p < .001$.

Deception judgments are more strongly related to some cues than to others. Of the 66 cues in Table 1, two have a Pearson product–moment correlation with a perceived deception that equals or exceeds .50, in absolute value. As these strongest correlations indicate, people who appear incompetent are judged to be deceptive, as are people whose statements do not place events within their context. Eleven other cues have relations with perceived deception that yield absolute rs between .40 and .50. These indicate that people are judged to be deceptive if they fidget with objects, sound uncertain, and appear ambivalent or indifferent. They are judged to be truthful if they sound immediate, if their face

[1] We also conducted a fixed-effects meta-analysis on these data and obtained similar results.

Table 1
Cues to Perceived Deception and Actual Deception

ID	Cue name	k_{Per}	N_{Per}	r_{Per}	95% CI		σ_ρ	k_{Dec}	N_{Dec}	r_{Dec}
1	Response length	19	1,299	−.12*	−.22	−.02	.18	49	1812	−.04
4	Details	5	676	−.37**	−.51	−.21	.16	24	883	−.20
5	Sensory information	3	340	−.35	−.67	.08	.38	4	135	−.24
8	Block access to information (e.g., refusal to discuss certain topics)	11	1,840	.33**	.18	.47	.25	5	219	.10
9	Response latency	16	1,002	.18*	.06	.29	.20	32	1330	−.02
10	Speech rate	15	745	−.21*	−.35	−.06	.24	23	806	.07
12	Plausibility	11	1,103	−.47**	−.57	−.35	.21	9	395	−.11
13	Logical structure	7	563	−.34**	−.45	−.22	.12	6	223	−.16
14	Ambivalent (communication seems internally inconsistent or discrepant)	7	502	.49**	.23	.69	.41	7	243	.19
15	Involved	5	622	−.42**	−.59	−.21	.23	6	214	.05
16	Verbal and vocal involvement	5	362	−.33**	−.47	−.18	.14	7	384	−.09
17	Expressive face	6	701	−.18*	−.33	−.02	.17	3	251	.04
18	Illustrators	9	430	.03	−.23	.29	.36	16	834	−.05
19	Verbal immediacy (e.g., the use of active voice and present tense)	2	104	.11	−.09	.30	.00	3	117	−.16
22	Self references (e.g., use of personal pronouns)	11	648	−.18*	−.33	−.03	.23	12	595	−.01
23	Mutual references (references to themselves and others)	2	120	.22	−.12	.51	.20	5	275	−.11
24	Other references (references to others, e.g., use of third person pronouns)	3	168	.24*	.00	.45	.16	6	264	.09
25	Vocal immediacy (impressions of directness)	13	2,224	−.44**	−.54	−.33	.22	7	373	−.30
27	Eye contact	19	1,178	−.15**	−.21	−.08	.05	32	1491	.00
28	Gaze aversion	5	202	.28**	.13	.41	.06	6	411	.05
31	Vocal uncertainty (impressions of uncertainty and insecurity, lack of assertiveness)	10	826	.43**	.28	.56	.25	10	329	.14
34	Shrugging	6	382	−.16*	−.27	−.04	.07	6	321	.02
35	Non-ah disturbances (e.g., stutters, grammatical errors, false starts)	8	376	.09	−.05	.22	.11	17	751	.01
37	Unfilled pauses (periods of silence)	13	718	.27**	.12	.40	.22	15	655	.01
38	Ah disturbances	14	692	.22**	.15	.29	.00	16	805	.03
40	Total disturbances (ah and non-ah speech disturbances)	11	832	.09*	.02	.16	.02	7	283	−.05
42	Non fluent (miscellaneous speech disturbances)	9	845	.25**	.10	.37	.19	8	144	.19
43	Active body	3	58	−.10	−.36	.18	.00	4	214	.02
44	Postural shifts	12	574	.09*	.00	.18	.04	29	1214	.02
45	Head movements	9	417	−.08	−.23	.07	.16	14	536	−.02
46	Hand gestures	10	452	−.18**	−.28	−.07	.07	29	951	−.01
47	Arm movements	2	232	.37**	.26	.48	.00	3	52	−.19
48	Foot/leg movements	5	138	.14	−.04	.30	.00	28	857	−.07
49	Friendly	13	987	−.35**	−.46	−.23	.00	6	216	−.18
50	Cooperative	14	1,018	−.41**	−.54	−.25	.29	3	222	−.32
51	Attractive	20	1,528	−.25**	−.33	−.16	.16	6	84	−.02
52	Negative statements	9	496	.05	−.16	.26	.29	9	397	.10
53	Pleasant voice	2	175	−.31**	−.44	−.17	.00	4	325	−.04
54	Pleasant face	6	370	−.44**	−.60	−.25	.22	13	635	−.05
55	Head nodding	5	291	−.01	−.13	.10	.00	16	752	.01
58	Smiling	21	1,422	−.02	−.15	.10	.26	27	1313	.00
61	Nervous	15	1,208	.30**	.17	.42	.24	16	571	.12
63	Pitch	5	298	.07	−.16	.29	.22	12	294	.14
64	Relaxed posture	2	109	−.22	−.69	.38	.43	13	488	−.15
66	Blinking	8	372	.14*	.03	.25	.01	17	850	.03
67	Object fidgeting	2	130	.49	−.24	.86	.52	5	420	−.02
68	Self-fidgeting	11	630	.01	−.13	.15	.15	18	991	.00
69	Facial fidgeting	3	164	.18	−.19	.50	.27	7	444	.04
70	Fidgeting	9	489	.03	−.12	.17	.16	14	495	.04
75	Self-deprecating (e.g., unfavorable, self-incriminating details)	4	335	−.08	−.36	.22	.27	3	64	.07
76	Embedding (placing events within its spatial and temporal context)	2	292	−.50	−.84	.12	.47	6	159	−.23
84	Behavior segments (perceived number of behavioral units)	3	294	.00	−.22	.21	.16	1	54	−.23
87	Realistic	2	388	−.47**	−.69	−.18	.23	1	40	−.21
90	Indifferent (speaker seems unconcerned)	3	127	.42*	.26	.56	.00	2	100	.45
91	Not spontaneous (statement seems planned or rehearsed)	2	175	.48*	.11	.74	.29	2	46	.19
92	Thinking hard	4	257	.31**	.19	.42	.00	1	8	.29

(*table continues*)

Table 1 (*continued*)

ID	Cue name	k_{Per}	N_{Per}	r_{Per}	95% CI		σ_ρ	k_{Dec}	N_{Dec}	r_{Dec}
93	Serious (speaker seems formal)	4	175	−.30	−.55	.01	.27	4	23	.00
115	Competent	6	536	−.59**	−.75	−.36	.32	3	90	−.02
116	Ingratiating	2	133	−.26*	−.41	−.09	.00	4	64	.00
134	Admit responsibility	2	96	.09	−.21	.37	.15	2	123	.16
	Nonverbal deception pose (communicator enacts typical nonverbal deception cues)	12	2,139	.38**	.34	.42	.04			
	Verb deception pose (communicator enacts typical verbal deception cues)	10	1,885	.35**	.22	.46	.21			
	Messy clothes	2	102	.37	−.11	.71	.32			
	Weird behaviors	7	293	.29*	.05	.50	.25			
	Foreign language	5	184	−.19	−.57	.26	.45			
	Baby face	14	1,441	−.37*	−.49	−.24	.23			

Note. ID refers to the identification number in Appendix A of B. M. DePaulo et al. (2003). For a further description of the cues, see that appendix. Positive entries imply that more of the cue is associated with deception or perceived deception. The six last cues in the Table were not included in the meta-analysis by B. M. DePaulo et al. (2003), hence the missing data on ID number, k_{Dec}, N_{Dec} and r_{Dec}. k_{Per} = Number of studies that examined the association between perceived deception and the cue; N_{Per} = Number of lie-/truth-tellers in those studies; r_{Per} = r corresponding to the mean Fisher's Zr for the association between perceived deception and the cue; 95% CI = a 95% confidence interval for the population correlation coefficient between perceived deception and the cue; σ_ρ = the square root of the true variance of the population correlation coefficient between perceived deception and the cue; k_{Dec} = Number of studies that examined the association between actual deception and the cue; N_{Dec} = Number of lie-/truth-tellers in those studies; r_{Dec} = r corresponding to the mean Fisher's Zr for the association between actual deception and the cue.
* $p < .05$ (at which relation differs significantly from 0). ** $p < .001$ (at which relation differs from 0).

appears pleasant, if they are cooperative and involved, and if their statements seem plausible, realistic, and spontaneous.

For purposes of establishing benchmarks for stronger and weaker cues to deception judgment, we noted the absolute value of the r corresponding to each judgment–cue mean weighted Fisher's Z. Across all the cues in Table 1, the median absolute r is .25; the absolute rs at the first and third quartile are .11 and 39.

Let us compare certain cues to deception judgment with people's self-reported beliefs about deception. As mentioned earlier, the most commonly self-reported cue is gaze aversion.

Table 1 displays cue–judgment correlations for two variables related to this belief. Consistent with the belief that liars "can't look you in the eye," people are likely to be judged deceptive if they avoid eye contact and avert gaze (for the relation of these two variables to perceived deception, rs $= -.15$ and .28, respectively). The modest size of these correlations is, however, noteworthy. Eye contact has a weaker relation to deception judgments than most of the cues in Table 1—the median cue yielding an absolute $r =$ .25. Although gaze aversion is a somewhat stronger cue to deception judgments, it is still weaker than 30 of the judgment cues in Table 1.

Meta-Analysis 2: Cues to Perceived and Actual Deception

In Meta-Analysis 2, we sought to test the wrong subjective cue hypothesis. From Meta-Analysis 1, we had data on a large number of cues to perceived deception; in a second meta-analysis, we sought to compare them with cues to actual deception. For data on the latter, we turned to work by DePaulo et al. (2003). The wrong subjective cue hypothesis would be discredited if we obtain a strong positive correlation between the two sets of cues.

Method

For comparison with cues to perceived deception, we sought actual cues to deception. Hereafter, we call the former *judgment cues* and the latter *deception cues.* We were interested in any variable that had been studied as a judgment cue in more than one sample and that had also been studied as an actual deception cue in more than one sample. We found 57 such cues. For purposes of comparing judgment cues with deception cues, it was necessary that the strength of the two types of cues be expressed in the same statistical metric. In Meta-Analysis 1, we expressed the strength of judgment cues in terms of Pearson product–moment correlations, whereas in their earlier meta-analysis DePaulo et al. (2003) expressed the strength of deception cues in terms of a standardized mean difference. DePaulo et al. (2003) graciously supplied us with their study-by-study data. For the present work, we transformed each standardized mean difference in the DePaulo et al. (2003) database to a Pearson product–moment correlation coefficient. We then transformed each r to a Fisher's Z, cumulated the Zs with standard methods, then back-transformed the weighted mean Fisher's Z to an r—precisely as we had for judgment cues in Meta-Analysis 1. For the resulting actual deception cue correlations, see the rightmost column of Table 1. Again, these data were collected by DePaulo et al. (2003). Positive correlations imply that people display more of the cue when lying than when telling the truth.[2]

[2] The entries in Table 1 are simple correlation coefficients, not standardized multiple regression coefficients. In examining the table, readers may properly regard each r_{Per} and each r_{Dec} as utilization and validity coefficients for a lens model that predicts deception from a single cue. Thus, for judging deception from response length ($r_{Per} = -.12$ and $r_{Dec} = -.04$). These do not represent utilization and validity coefficients for response length, in a lens model that predicts deception from all 66 cues in Table 1. As meta-analysts, we cannot determine the latter multicue utilization and validity coefficients because the required multiple regression results are not reported in this literature. For some results on multicue lens models of deception, see Meta-Analysis 4.

Results

We were especially interested in those attributes that had been examined in more than one sample as a cue to perceived deception and in more than one sample as a cue to actual deception. For each of those 57 cues, we compared a mean weighted Fisher's Z for the relation of the cue to perceived deception with a mean weighted Fisher's Z for the relation of that cue to deception. Correlating these Fisher's Zs across cues, it is evident that the relation of a cue to deception is positively associated with its relation to perceived deception ($r = .59$). Although the correlation between deception cues and judgment cues is not perfect, it is positive and substantial in size. The correlation between actual deception cues and judgment cues is much larger, for example, than the correlation between deception judgments and deception itself. Again, the latter typically yields $r = .21$. The wrong subjective cue hypothesis would not have predicted such a close correspondence between deception cues and judgment cues.

Kraut (1980) was the first to suggest that behaviors are more strongly related to perceived deception than actual deception. To assess this claim, we compared two absolute values for each of 57 cues—the absolute mean weighted Fisher's Zr for the association of that cue to deception and the absolute mean weighted Fisher's Zr for the cue's association to perceived deception. Averaging across the cues, the mean absolute Fisher's Zr for the association of cues to deception is .09, and the mean absolute Fisher's Zr for the association of cues to judgments of deception is .25. By an unweighted test with cue as the unit of the analysis, these means differ significantly, $t(56) = 8.22$, $p < .001$. Thus, it is true that behaviors are more strongly related to judgments of deception than to actual deception.

We compared the relation of each cue to deception with its relation to perceived deception—comparing, in particular, the two relevant weighted mean Fisher's Zrs. We set a per-cue two-tailed alpha-level of .05. Results show that for 22 of the 57 cues (that is, 38.59%), the two relations are significantly different. Inspecting means that it is apparent that all 22 significant differences are ones in which the judgment cue is stronger than the deception cue.

We examined data from the 22 cues that have a significantly different relation to actual deception than to perceived deception. Examination showed that 14 of those cues had the same directional relation to actual deception and perceived deception. None of the remaining eight cues had a statistically significant relation to deception at $p < .05$. There is no evidence here that perceivers infer deception from truth cues or infer truthfulness from deception cues.

As noted above, there is a general tendency for cues to be more strongly related to perceived deception than actual deception. In fact, the results above indicate that the mean absolute Zr for perceived deception is 2.77 times as large as the mean absolute Zr for actual deception (those values being .25 and .09). We wondered whether this general size difference could explain the 22 statistically significant differences between cues to actual deception and to perceived deception. To assess this possibility, we noted the mean weighted Fisher's Zrs for the relevant 22 judgment–cue correlations and divided each of these values by 2.77 (the ratio of the mean absolute relation between cues to perceived deception and cues to actual deception). We then tested for the differences between the relation between a cue and deception with this deflated measure of the relation between that cue and perceived deception—the deflation offsetting a general tendency for judges' cue utilization coefficients to exceed validity coefficients. Although we found 22 significant differences between cues to actual deception and cues to perceived deception in the raw analyses above, this second analysis revealed only one significant difference at $p < .05$, for the cue arm movements. With this one exception, differences between cues to deception and to perceived deception are not cue-specific. Rather, they reflect a general tendency for judges' utilization coefficients to be larger than validity coefficients.

Meta-Analysis 3: Within-Study Evidence

Meta-Analysis 2 revealed a strong positive correlation between cues to actual deception and cues to perceived deception. This correlation seems to discredit the wrong subjective cue hypothesis. Before rejecting that hypothesis, however, we must acknowledge one of the features of Meta-Analysis 2. It incorporated data from all studies of actual deception cues and judgment cues. Many of the studies of deception cues did not provide data on deception judgments. Thus, our data on judgment cues came from one set of studies, and our data on deception cues came from another set of studies. The two sets of studies differ in unknown ways, and these differences complicate any interpretation of the meta-analytic results we have reported. For a controlled comparison of actual deception cues and judgment cues, we sought within-study evidence—hoping to review all results to date from researchers who had assessed both actual deception cues and judgment cues in the very same study.

Method

We sought studies in which researchers had measured both cues to actual deception and cues to deception judgment. Planning to correlate the two sets of cues within each study, we restricted attention to instances in which a researcher had reported correlations among deception and three or more cues, as well as correlations among perceived deception and those same cues on the same set of senders. From the studies uncovered for Meta-Analysis 1, we found 25 such sender samples. They included a total of 1,422 senders and judgments of those senders made by a total of 2,250 individuals. From each of these samples, we converted each Pearson's r for a deception cue or judgment cue to a Fisher's Zr. Then we correlated the Zrs for actual deception cues with the Zrs for judgment cues. This resulted in a cross-cue Pearson's r. It assesses the relation between actual deception cues and judgment cues within a particular sample.

Results

Over the 25 sender samples, correlations for the relation between actual deception cues and judgment cues varied widely. The maximum cross-cue r was .97, and the minimum was $-.68$. Twenty-two of the 25 cross-cue correlations were positive. The median correlation was .54. To combine these cross-cue correlations, we began by converting each r to a Fisher's Zr, then applied standard random-effects meta-analytic methods. In these aggregated within-study results, the more strongly a cue is associated with deception, the more strongly it is associated with perceived deception (mean weighted $Zr = .90$). The corresponding Pearson's r is .72, 95% CI [.70, .74].

For 22 of these samples, we also had a measure of judges' accuracy in discriminating lies from truths. We expressed judge accuracy as a correlation coefficient then converted this r to a Fisher's Zr. The stronger the positive relation between deception cues and judgment cues in a study, the greater is judges' accuracy in that study (for the correlation between the two sets of Zrs, $r = .60$). As the lens model shows, the accuracy of a deception judgment will increase if perceivers use cues that in fact reflect deceit.

Within each of 25 sender samples, we also noted the means of two sets of absolute Fisher's Zrs—one set indexing the relations of various cues to actual deception and the other set indexing the relations of those cues to perceived deception. Averaging across the 25 sender samples, we find that the mean absolute Fisher's Zr for the relation of a behavior to deception is .17, and the mean absolute Fisher's Zr for the relation of a behavior to perceived deception is .27. As was evident in the cross-study comparison, these within-study means indicate that perceivers' coefficients for utilizing cues to deception are larger than the validity coefficients for the cues, $t(24) = 3.89$, $p < .005$.

Perhaps our averaging of all cues to deception is misguided. Perhaps perceivers intuit the behavior that is most strongly related to deception in a particular situation and base their judgments in that situation on this optimal cue. Averaging across 25 sender samples, the mean of the maximum absolute Fisher's Zr between any cue and deception is .39, whereas the corresponding mean of the maximum absolute Fisher's Zr between any cue and perceived deception is .61. By standard unweighted methods, this is a significant difference, $t(24) = 3.72$, $p < .005$. Thus, the validity of the optimal cue is lower than the largest utilization coefficient of any cue. As usual, cues are more strongly related to judgments of deception than to deception itself.

Meta-Analysis 4: Multiple Cues

The purpose of Meta-Analysis 4 is to investigate whether inaccuracy in lie judgments is mainly due to incorrect decision-making strategies or due to a lack of valid cues to deception and to establish the matching of cue-based predictions of deception with predictions of deception judgments. In the analyses discussed so far, it is assumed that perceivers judge deception from a single cue. Single-cue lens analyses are implicit in the correlation coefficients of Table 1. Perhaps perceivers do not judge deception from a single cue. Perhaps they judge it from multiple cues, and deception gives rise to multiple cues. In that case, the correlation coefficients of Table 1 would not be appropriate validity and utilization coefficients.

As mentioned above, lens model analysis reveals that the correlation coefficient between actual deception and perceived deception is the sum of two terms, one of which involves the correlation between errors in predicting a sender's deceptiveness and that same sender's perceived deceptiveness. Assuming that these error terms are uncorrelated, the correlation between actual deception and perceived deception is the product of three factors: R_{Dec}, R_{Per}, and G, where R_{Dec} is the multiple R for predicting deception from cues, R_{Per} is the multiple R for predicting perceived deception from those same cues, and G is the correlation between predictions of senders' deception from cues and predictions of their perceived deception from those same cues. In order to use the multiple-cue lens model for deception, it is necessary to estimate these three factors: R_{Dec}, R_{Per}, and G. Let us do so.

Method

We sought studies in which deception had been predicted from two or more cues. We searched for statistical analyses that made these predictions and reported a statistic correlating predicted deception with actual deception. Some authors reported discriminant analyses; others reported logistic regressions, and still others reported ordinary multiple regressions. We sought results from all three kinds of analyses, as long as two conditions were met. First, we required that the variables used to predict deception be chosen on a priori nonstatistical grounds. We did not use results from stepwise analyses or analyses that chose as predictors of deception only those variables that had shown a significant univariate relation to deception. Such analyses would overstate the relation between deception and deception cues, as Thompson (1995) explains. Second, we required that the researcher report (or that we could determine) an adjusted (or shrunken) multiple correlation coefficient for the predictability of deception from cues. We used these same criteria in searching for analyses that predicted perceived deception from two or more cues.

We found 59 multiple-cue predictions of deception that satisfied our criteria. These represented predictions of deception by 3,428 senders. From each of the 59 sender samples, we coded a multiple correlation coefficient (an R) for predicting deception from two or more cues—defining each R_{Dec} as the square root of an adjusted (or shrunken) R^2.

We found 30 multiple-cue predictions of perceived deception that satisfied the criteria. These represented data from 1,178 senders and 3,497 judges. From each of the 30 sender samples, we again coded R_{Per} as the square root of an adjusted (or shrunken) R^2.

Results and Discussion

For predicting actual deception from multiple cues, the median R_{Dec} is .46. The interquartile range is .24 to .65. The number of cues entering into these Rs ranges from 2 to 38. Across the 59 multiple correlation coefficients, there is no relation between the magnitude of an R_{Dec} and the number of cues entering into it ($r = .03$, *ns*).

For a meta-analytic approach to combining multiple correlation coefficients, we used methods suggested by Konishi (1981). We began by applying a Fisher's Zr transformation to each R_{Dec} and weighting it by N-p-1, where N is the number of senders and p is the number of cues from which deception was predicted. We then computed a mean inverse-variance weighted Fisher's Zr and back-transformed it to an R. For predicting deception from two or more cues, the R corresponding to the mean of 59 weighted Fisher's Zrs is .36, 95% CI [.33, .38].

We were also interested in the prediction of perceived deception from multiple cues. The median R_{Per} is .61. The interquartile range is .46 to .67. The number of cues entering into these multiple Rs ranges from 2 to 16 and is uncorrelated with the magnitude of the Rs ($r = -.03$, *ns*).

As in the analysis above, we converted each R_{Per} to a Fisher's Zr and weighted it by N-p-1. For predicting perceived deception from two or more cues, the R corresponding to the mean of 30 weighted Fisher's Zrs is .63, 95% CI [.60, .65]. From multiple cues, it is easier to predict perceived deception than deception. This is apparent in the multiple correlation coefficients we have reported. Moreover, this difference in multiple correlation coefficients is consistent with some results reported above, in which individual behaviors correlate more strongly with perceived deception than actual deception.

The typical relation between actual deception and perceived deception yields an accuracy of $r = .21$ (Bond & DePaulo, 2006). As shown by the meta-analytic estimates above, deception can be predicted from two or more cues to a degree that typically yields $R_{Dec} = .34$. Multiple-cue predictions of deception judgment typically yield $R_{Per} = .61$. We cannot calculate G from individual studies. However, by manipulating Equation 1, above, in the manner suggested by Stenson (1974), we infer that

$$G = r_{acc}/[(R_{Dec})(R_{Per})] = .21/[(.36)(.63)] = .93. \quad (2)$$

Thus, behaviorally based predictions of deception are very strongly correlated with behaviorally based predictions of perceived deception ($r = .93$),[3] and the accuracy of deception judgments can be quantitatively decomposed as

$$r_{acc} = R_{Dec} \times R_{Per} \times G \text{ (from above).} \quad (3)$$

$$.21 = .36 \times .63 \times .93.$$

As we can see in this equation, the accuracy of deception judgments is most constrained by the lack of valid behavioral cues to deception, less constrained by judges' unreliability in using those cues, and unconstrained by the matching of behaviorally based predictions of deception with predictions of deception judgment.

For purposes of comparison, it may be useful to describe the results of lens model analyses in other domains. Karelaia and Hogarth (2008) summarized lens model analyses of human judgments of many attributes other than deception. Across 249 studies, they found an average accuracy coefficient of .56, much higher than the .21 accuracy correlation in judgments of deception. They found that environmental criteria could be predicted by cues with an average multiple of $R = .80$ and that human judgments of the criterion could be predicted by those cues with an average multiple of $R = .81$. The first is much higher than the .36 predictability of deception, and the second is somewhat higher than the .63 predictability of perceived deception. Finally, Karelaia and Hogarth (2008) found that statistical predictions of environmental criteria correlated .80 with statistical predictions of judgments of those criteria. Thus, the matching of deception with deception judgments ($r = .93$) is higher than the matching of other criteria with human judgments of those criteria.

General Discussion

The purpose of this work was to shed new light on deception and its detection by analyzing judgments of veracity using Brunswik's (1952) lens model. In particular, we test the validity of the hypotheses that (a) lie judgments are often inaccurate due to incorrect cue reliance of lie-catchers and (b) lie judgments are often inaccurate due to lack of valid cues to deception. Our goal was to generate new knowledge about naïve lie detection in two ways. First, by analyzing judgments of deception using the lens model, we offer new descriptive information about the characteristics of lie judgments and why they often fail. This is a question of basic importance for the theoretical understanding of interpersonal perception in general and deception judgments in particular. Second, by quantifying the constraints on accuracy imposed by the strategies of the perceiver and by the difficulty of the judgment task, we can offer some prescriptive information about how accuracy in deception detection can be increased. This is a question of importance for applied psychology because veracity assessments are critical in a number of settings.

Cues to Deception Judgments

As discussed earlier, the available research typically employs self-reports to tap the decision-making strategies people employ when attempting to establish veracity (Global Deception Research Team, 2006). Deception scholars have noted that self-reports might not offer entirely valid information about actual decision making because people may have limited insight into their own cognitive processes (e.g., Strömwall, Granhag, & Hartwig, 2004). Still, only a few studies have attempted to go beyond self-reports to establish the actual correlates of deception judgments (Bond et al., 1992; Desforges & Lee, 1995; Ruback & Hopper, 1986; Vrij, 1993), and to this date, there is no quantitative overview of these studies. The prevailing notion in the literature is that false stereotypes about deceptive behavior are main contributors to the failure of lie judgments to reach hit rates substantially above chance levels (Park, Levine, McCornack, Morrison, & Ferrara, 2002).

The results of this meta-analysis contrast with past research in important ways. In general, the analysis shows that actual correlates of deception judgments differ from those that people report. In particular, the robust finding from surveys that people associate deception with lack of eye contact receives little support. Eye contact is a weaker judgment cue than most of the 66 cues in Meta-Analysis 1, and gaze aversion is weaker than 30 cues in the same meta-analysis. Other common self-reported cues to deception are body movements and fidgeting (Akehurst et al., 1996; Strömwall & Granhag, 2003). Similar to the findings on eye behavior, it seems that the link between these behaviors and deception judgments is weaker than previously thought. Although the relation

[3] With this estimate, it is assumed that there is no correlation between two error terms—the error from a model predicting deception from cues and the error from a model predicting deception judgments from those same cues. It is possible that these errors are correlated. To our knowledge, no correlation between these error terms has ever been reported in the literature on deception judgment. In the absence of any information about the correlation between error terms in judgments of deception, let us draw on a meta-analysis of 204 lens model studies by Karelaia and Hogarth (2008). There, a 95% CI for the mean estimate of the correlation among lens-model error terms was .02–.06. Plugging these values into the relevant lens model equation (along with values we computed from the deception detection literature), one would infer that cue-based predictions of deception correlate positively with cue-based predictions of deception judgment, with a value of the correlation coefficient between .73 and .86. We urge future researchers to fit lens models to their data on deception judgments and to report correlations between cue-based predictions of deception and cue-based predictions of deception judgment.

between arm movements and deception judgments is moderate, the relation to postural shifts is weak, as is the link to head, hand, and foot/leg movements and fidgeting. Among the strongest correlates of deception judgments emerging from this meta-analysis are that people are judged as deceptive when they appear incompetent and ambivalent, and when the statement is implausible and lacks spontaneity. These cues are not commonly reported in studies employing the self-report method (Strömwall, Granhag, & Hartwig, 2004). These results suggest that the behaviors people actually rely on when judging veracity differ markedly from the stereotype previously thought to influence much of lie-catchers' decision making.

Even though these results might be surprising, they are consistent with research on cognitive processes demonstrating that self-knowledge about beliefs, motives, and judgments is often inaccurate (Fiske & Taylor, 2008; G. A. Miller, 1962; Neisser, 1967; Nisbett & Ross, 1980). This research suggests that when asked to account for their attributions and judgments, people may rely on a priori theories rather than actual insight into their thought processes simply because these processes might be inaccessible (Nisbett & Wilson, 1977). Such an a priori theory could be the common sense notion that liars experience guilt, shame, and nervousness and that these emotions are evident in nonverbal behaviors such as gaze aversion and fidgeting (Bond & DePaulo, 2006). It is plausible that this naïve theory is a product of deliberate reasoning produced in response to a question about one's beliefs but that actual decision making is driven by intuitive, implicit cognitive processes that lie partly outside the realm of conscious awareness (Gigerenzer, 2007).

If people do not base their judgments on the explicit stereotype of liars as nervous and guilt-stricken, what are the implicit theories that actually lie behind judgments of deception? Inspecting the meta-analytic pattern on cues to deception judgments, it seems that people are likely to judge communicators as deceptive if they provide implausible, illogical accounts with few details, particularly few sensory details. This is similar to predictions from theoretical frameworks on self-experienced versus imagined events that have been employed to study verbal differences between fabricated and truthful accounts (Johnson & Raye, 1981; Sporer, 2004). One way to interpret our finding is that people might be intuitively in tune with what these frameworks call "reality criteria." Speculatively, a lifetime of exposure to statements (most of them likely to be truthful) might serve to create an intuitive feeling for the characteristics of self-experienced events.

The results suggest that people seem deceptive if they sound uncertain and appear indifferent and ambivalent. This fits with one of the main predictions from the self-presentational perspective (DePaulo, 1992; DePaulo et al., 2003), which states that deceptive accounts might be less embraced by communicators than are truthful ones for several reasons: Liars might lack familiarity with the domain they are describing, and they might have less emotional investment in the claims they are making. Also, awareness of the risk of being disproven might give rise to ambiguous and vague statements (Vrij, 2008). In sum, with regard to both verbal content and nonverbal behavior, people's cue reliance seems reasonably in line with what actually characterizes deception.

The overall pattern, that implicit notions about deceptive behavior are more accurate than explicit ones, is supported by research on what is referred to as indirect deception detection (Vrij, Edward, & Bull, 2001). This research shows that people might perceive and process deceptive and truthful statements differently in ways that explicit measurements may not pick up on (Anderson, 1999; DePaulo & Morris, 2004; Anderson, DePaulo, Ansfield, Tickle, & Green, 1999; DePaulo, Jordan, Irvine, & Laser, 1982; DePaulo, Rosenthal, Green, & Rosenkrantz, 1982; Hurd & Noller, 1988). For example, a meta-analysis on the relation between accuracy and confidence in deception judgments showed that people were more confident when they saw a truthful statement than when they saw a deceptive one, regardless of what explicit veracity judgment they made (DePaulo et al., 1997). A study on deception detection in close relations showed that even though explicit veracity judgments were not accurate, judges reported feeling more suspicious when watching a deceptive statement than when watching a truthful statement (Anderson, DePaulo, & Ansfield, 2002). It might be fruitful in the future for researchers to further explore the relation between explicit and implicit processes in deception judgments. For example, research could investigate the effects of increasing perceivers' reliance on intuitive impressions of veracity (e.g., by asking judges to make decisions under cognitive load), with the expectation that this might increase judgment accuracy (see Albrechtsen, Meissner, & Susa, 2009). However, it is not likely that the improvement would be substantial, given our finding that weaknesses in the validity of cues to deception constrain accuracy.

It is worth noting that the strongest cues to deception judgments are not single behaviors but global impressions, such as ambivalence. It is plausible that such impressions consist of a variety of more minute behavioral changes, possibly on both verbal and nonverbal levels. However, to our knowledge, no study has attempted to examine the components of these impressions. Given the finding from DePaulo et al. (2003) that global impressions are stronger cues to deception than individual cues, and our finding that such impressions are the best predictors of deception judgment, we encourage future research to explore the behavioral components of these impressions further.

It is possible that cue reliance is not uniform across all groups and settings. For example, legal professionals (e.g., customs and police officers) and lay people might differ in the cues on which they base their judgments. On the basis of previous research (e.g., Bond & DePaulo, 2006), we do not expect that legal professionals will outperform lay judges. Speculatively, due to the salience of deception judgments in the life of legal professionals, the conscious stereotype of liars as fidgety and gaze aversive may become chronically accessible (Fiske & Taylor, 2008). If this is true, legal professionals' cue reliance should be more similar to the pattern obtained using the self-report method (and less accurate). As we did not investigate moderator variables in the current study, we encourage future research to explore this and other variables possibly moderating cue reliance.

Judgment Cues Versus Deception Cues: Testing the Wrong Subjective Cue Hypothesis

The first meta-analysis does not provide support for the wrong subjective cue hypothesis. To subject the wrong subjective cue hypothesis to a quantitative test, we conducted a second meta-analysis in which we compared cues to deception judgments (judgment cues) with behavioral cues to deception (deception cues). The wrong subjective cue hypothesis predicts a discrepancy between judgment cues and deception cues, implying that people rely on cues that are either unrelated to deception or related to deception in the opposite direction of their expectations. Meta-Analysis 2 does not provide support for this prediction. In fact, at least four interrelated pieces of evidence counter to the wrong subjective cue hypothesis emerged from our analyses. First, we found a strong positive correlation between judgment cues and deception cues. The more strongly a cue is related to deception, the more likely people are to rely on that cue when judging veracity. The relation is not perfect but is much stronger than would be predicted from the premise of the wrong subjective cue hypothesis. Second, of the more than 50 cues investigated, only slightly more than a third showed significant discrepancies between judgment cues and deception cues. Third, when judgment cues did differ from deception cues, it was typically the case that the judgment cue matched the deception cue in its directional relation to deception but that the magnitude of the judgment cue was larger than that of the deception cue. For only eight out of 57 cues did people rely on a behavior that was unrelated to deception, and for no behavior did we observe a directional error (i.e., that judges associated more of a particular behavior with deception when the case was that communicators displayed less of it when lying, or the other way around). This suggests that people are rarely inaccurate about the relation between a given behavior and veracity—in cases in which judgment cues differed from deception cues, the error was most frequently due to judges' overestimation of the magnitude of the relation rather than outright misconceptions about the relation between a behavior and deception. Fourth, a lens model analysis revealed a very strong matching (r = .93) between behaviorally based predictions of deception and behaviorally based predictions of perceived deception.

In light of these findings, we believe the argument that people are misinformed about cues to deception ought to be revised. The claim is true in the sense that people's explicit notions about deception are largely inaccurate and reflects a stereotype not supported by research on objective behavioral differences. However, when mapping the behaviors that actually covary with judgments of deception, a different picture is revealed. People seem intuitively in tune with the characteristics of deceptive behavior. Rarely do people overestimate the extent of an individual behavioral link to deception and even more rarely do people rely on cues that are unrelated to veracity. In conclusion, it seems people's intuitive notions about cues to deception are far less flawed than previously thought.

Implications

Our analysis provides new information about why lie-catchers often fail. In explaining the lack of accuracy, deception scholars have operated on the assumption that reliance on incorrect heuristics about deceptive processes limits judgment accuracy. In line with this assumption, a common recommendation on how to improve judgment accuracy has been that observers ought to shift their reliance on invalid cues such as gaze aversion, fidgeting and posture shifts to cues that have been found to be more valid based on the scientific literature (Vrij, 2008). Our results suggest that both the descriptive and prescriptive conclusions about judgment performance ought to be qualified. Starting with the descriptive aspect, the analyses of cues to deception judgments in Meta-Analyses 1–3 show that observers do not in general rely on the wrong cues to deception. The discrepancy between our results on subjective cues to deception is interesting for two reasons. First, the results indicate that self-reports do not offer valid information about the true nature of lie-catchers' decision making. This implies that if researchers wish to map lie-catchers' judgments, they ought to study actual performance, not self-reports about performance. Second, the discrepancy between self-reported judgment cues and actual judgment cues informs our basic understanding of processes of deception detection by suggesting that deception judgments are largely driven by intuitions that may be inaccessible to the conscious mind. People do not seem to know what behaviors they use when judging veracity. The behaviors they claim to use are largely inaccurate, but the behaviors they actually rely on show a substantial overlap with objective cues to deception. Simply put, intuition outperforms explicit notions about deception.

With regard to prescriptive implications, the results provide new information about how judgment achievement can be improved. The results from Meta-Analysis 4 suggest that lack of validity in cues to deception degrade judgment performance more strongly than improper cue reliance. This suggests that the best way to improve judgment achievement is to increase behavioral differences between liars and truth tellers rather than to educate perceivers about actual objective cues to deception. To be fair, in explaining deception detection inaccuracy, scholars have consistently highlighted the stable finding that cues to deception are scarce and weak. Nevertheless, attempts to improve deception detection performance have until recently almost exclusively focused on altering the strategies used by perceivers to detect deception. A number of studies have been conducted with the purpose of training observers to make more accurate judgments by either informing them of actual cues to deception, by providing outcome feedback about their performance, or both (Frank & Feeley, 2003). Such attempts to improve judgment accuracy have shown either no effects of training or only minor improvement. Our results provide a new explanation for why such training programs have largely failed: Informing lie-catchers of objective cues to deception might be ineffective not because judges are immune to education but also because their use of cues to deception already largely overlaps with actual cues to deception. Feedback could be a way to improve intuitive cue reliance further, but our results indicate that in order to substantially improve performance, it might be more fruitful to manipulate the decision-making task than to manipulate the decision-making strategies of lie-catchers. In line with our claim that training observers to rely on different cues might not be the optimal way to increase performance, one study showed that perceivers' performance was slightly enhanced by both bogus training (in cues that are not actually related to deception) and training in actual cues to deception (Levine, Feeley, McCornack, Hughes, & Harms, 2005). This suggests that to the extent that training in valid cues to deception is effective at all, it might be the act of training itself rather than its content that is responsible for improvements in performance, possibly by creating more motivated lie-catchers. Future research aiming to improve judgments through cue information should first establish empirically that judges indeed rely on the wrong cues. On the basis of our results, such incorrect cue reliance seems quite unlikely.

Eliciting Valid Cues to Deception

If lie detection accuracy is more strongly degraded by limitations in behavioral indicators of deception, it makes sense to attempt to increase behavioral differences between liars and truth tellers in order to improve the chances of accurate deception judgments. Recently, several lines of research have taken on this task with promising results. This research has largely focused on how to elicit valid cues to deception in interactional settings, most typically interviews (Levine, Shaw, & Shulman, 2010; Vrij et al., 2009). First, researchers drawing on the theoretical notion that lying might be more cognitively demanding than truth telling have attempted to increase cues to deception by imposing further cognitive load on targets. The idea is that liars would be more hampered by such cognitively demanding tasks because their resources are already preoccupied with the cognitive challenge of lying. In one study, liars and truth tellers were asked to tell the story in reverse order. Cues to deception were more pronounced when the story was told in reverse order, and lie-catchers were more accurate when judging these statements, compared with the control condition (in which the statement was told in chronological order, Vrij et al., 2008).

Based on similar premises postulating cognitive differences between liars and truth tellers, a second line of research has focused on the possibility of eliciting cues to deception by using the available case information strategically. This research capitalizes on the fact that liars and truth tellers have different verbal strategies, in particular when they are unaware of the information held by the lie-catcher (Hartwig, Granhag, & Strömwall, 2007). Using a mock theft paradigm in which both liars and truth tellers touched a briefcase (from which liars then stole a wallet), Hartwig, Granhag, Strömwall, and Vrij (2005) found that when the information that their fingerprints had been found on the briefcase was disclosed in the beginning of the interview, liars and truth tellers both gave plausible explanations for being in contact with the briefcase (e.g., that they just moved it while looking for something). Lie-catchers could not distinguish between these true and false denials. In contrast, when the information was strategically withheld and the interviewer posed questions about it (e.g., 'Did you see or touch a briefcase?'), verbal cues such as implausibility appeared as liars often proposed denials that violated the known information (e.g., by saying they were not close to the briefcase).

A third approach drawing on cognitive differences between liars and truth tellers is the ACID approach, outlined and studied by K. Colwell, Hiscock-Anisman, Memon, Taylor, and Prewett (2007). In this approach, targets are questioned using an interview style inspired by the Cognitive Interview (CI). CI was developed to improve the accuracy and completeness of memory reports and uses mnemonic techniques based on cognitive psychology. The ACID approach uses such mnemonics with the assumption that they will enhance verbal differences between liars and truth tellers. Mnemonics may provide richer details from truth tellers (for whom they serve as cues to recall) by probing for specific details while increasing the challenges for liars who might have difficulties fabricating (or lack the willingness to fabricate) information in response to these probes. In line with expectations, research has shown that cues to deception become more pronounced when liars and truth tellers are questioned with this approach.

Our results have implications for lie detection in the real world. The findings suggest that people who wish to make accurate judgments of credibility in everyday life or as part of their professions (e.g., customs officers, police officers and other legal professionals) may benefit from learning about methods to increase cues to deception through interviewing methods such as those outlined above. That is, rather than learning about the characteristics of deceptive behavior, real world lie-catchers may want to educate themselves about methods to actively elicit cues to deception.

Concluding Remarks

We believe this study offers new and intriguing information about deception of both theoretical and practical importance. First, our results suggest the novel conclusion that lie-catchers' intuitive notions about cues to deception are reasonably accurate. People's explicit theories about deceptive behavior seem to exert little influence over actual decision making, suggesting that implicit processes not only play a role but might even be dominant in forming impressions about veracity. This finding fits with a wave of social cognition research showing that processing of social information is often driven by automatic rather than controlled processes (Bargh, 1997; Bargh & Chartrand, 1999). Such research shows that automaticity in processing might emerge as a function of practice, also referred to as proceduralization (Fiske & Taylor, 2008). Given the frequency of honesty judgments in everyday life (DePaulo & Kashy, 1998), automaticity in veracity assessments makes theoretical sense.

How is it possible that intuitive notions about cues to deception overlap to such a large extent with actual behavioral cues to deception? Previous research has suggested that lack of feedback about the actual veracity of communicators might prevent learning proper rules from experience (Granhag, Andersson, Strömwall, & Hartwig, 2004; Hartwig, Granhag, Strömwall, & Andersson, 2004; Hogarth, 2001; Vrij & Semin, 1996). Given that the current study shows that actual decision making is less flawed than previously thought, we might have to reinterpret the role of feedback in deception judgments. Speculatively, people might receive feedback about veracity often enough (perhaps through sources of information not often captured by the typical laboratory paradigm, see Park et al., 2002) to shape proper intuitions about deceptive demeanor. Whether such feedback is indeed the explanation for judges' cue reliance is a question for future research.

We do not challenge the robust conclusion that deception detection is often inaccurate. However, we challenge the explanation proposed in previous research by demonstrating that the case for the wrong subjective cue hypothesis in the accumulated literature is quite weak. Lens model analyses show that the strongest constraint on performance is the lack of valid behavioral indicators of deception rather than incorrect cue reliance. That behavioral differences between liars and truth tellers are minute is not surprising given two factors: First, people lie frequently in everyday life and are therefore likely to be skilled as a function of practice (Vrij, 2008). Second, as emphasized by the self-presentational perspective on deception, convincing another that one is telling the truth entails similar tasks for deceptive and truthful communicators. Both share the motivation to create a credible impression and both will engage in deliberate efforts to create such an impression

(DePaulo et al., 2003). However, that cues to deception are scarce is not necessarily a universal fact. Perhaps liars in the majority of the laboratory research conducted so far are not facing enough of a challenge to give rise to valid behavioral differences. In most of these studies, people are asked to provide a statement with no risk of being challenged about particular details and no risk of being disproven by external information. New research has shown that it is possible to increase cues to deception by interventions based on the theoretical assumption that under certain circumstances, deceptive statements might be more cognitively demanding to produce. Our results support these efforts by suggesting that creating stronger behavioral cues to deception is the key to improve the accuracy of lie judgments.

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