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Lie Detection from Multiple Cues: A Meta-analysis

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Summary: Despite the importance of judgments of veracity in many settings, research suggests that it is difficult to detect lies. In this meta-analysis, we assess the detectability of lies from constellations of multiple cues, with a particular focus on whether lie detectability increases as the conditions approach real-life, forensic settings, as some critics of laboratory research have argued. We synthesized 144 samples, including 9380 liars and truth tellers providing a total of 26,866 messages. We examined the accuracy with which deception could be predicted on the basis of multiple behavioral cues and to what extent lie detectability was moderated by the motivation of the sender, the presence of strong emotion, the content of the lie, the context in which the lie was told, and the demographics of the senders. The findings show that lies can be detected with nearly 70% accuracy. This level of detectability is stable across settings. Copyright © 2014 John Wiley & Sons, Ltd.

Lying is a topic of long-standing interest to scholars. Philosophers have discussed the moral status of deception for centuries and arrived at widely different conclusions (for a contemporary perspective, see Bok, 1999). Regardless of its ethics, social psychological research has established that lying is a common phenomenon of social life. Despite the methodological difficulties of establishing the prevalence of deception in everyday life, research findings consistently demonstrate that lies occur on a daily basis (Cole, 2001; DePaulo & Kashy, 1998; DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996; Jensen, Arnett, Feldman, & Cauffman, 2004; but see Serota, Levine, & Boster, 2010).

The typical everyday lie is trivial, and its detection has few repercussions beyond the parties involved. However, in some contexts, accurate judgments of veracity are paramount. Most prominently, the justice system faces the constant problem of distinguishing between truth and falsehood. In this setting, mistaking lies for truth (as well as the opposite error) can have serious consequences not only for the parties involved but also for the wider society (Granhag & Strömwall, 2004).

Researchers have invested efforts in examining deception and its detection, yielding a substantial body of research on deception and its detection (for an overview of this research, see Vrij, 2008). Most of this research is laboratory based, meaning that participants, typically college students, are randomly asked to tell the truth or lie. The content of these statements differ from study to study: sometimes participants provide statements about their opinions, attitudes or feelings about a given topic, while at other times they provide truthful or purposefully distorted narratives about events they have witnessed or participated in. One of the major findings from this literature is that the behavioral traces of deception are faint (DePaulo et al., 2003). In other words, there is no Pinocchio's nose—a behavioral sign that systematically accompanies deception. In a large-scale meta-analysis covering the available research on behavioral indicators of deception, 158 cues were examined. Out of these 158 cues, the majority were not related to deception. The behaviors that did show a systematic link to deception were in general only weakly related to lying (see also Sporer & Schwandt, 2007). Consistent with the finding that cues to deception are weak, meta-analyses of human lie detection ability show that people obtain a lie detection accuracy rate only marginally higher than what can be expected by chance alone, a finding that holds true for lay people and presume lie experts like law enforcement professionals alike (Bond & DePaulo, 2006, 2008, see also Hartwig & Bond, 2011).

In sum, a large body of research points to the conclusion that lies are barely evident in behavior. This is a troubling conclusion, particularly for the legal system that operates on the assumption that it is possible to separate truthful from deceptive messages (Granhag & Strömwall, 2004).

The generalizability of deception research to legal settings

The conclusion of deception research has not been received without criticism. A consistent source of concern has been the external validity of this research, that is, the possibility of generalizing from the laboratory-based deception paradigms to other settings, including the legal system (Miller & Stiff, 1993). More specifically, the argument has been made that it may be premature to generalize from laboratory-based studies in which participants, typically college students, are randomly assigned to lie or tell the truth about a given topic, without personal investments in the lie they are telling, and without significant penalties for failing to convince the receiver that they are honest. Both legal professionals (e.g., Horvath, Jayne, & Buckley, 1994) and deception scholars have raised this criticism (e.g., Frank & Svetieva, 2012). For example, Buckley (2012) states that deception research conducted in laboratory settings do not produce practically helpful results, for several reasons. Among the concerns Buckley lists is the lack of motivation of subjects in these studies to be believed or to avoid detection. Buckley states that when researchers 'attempt to design studies that more closely approximate the conditions of real life' (p. 126), the detectability of lies increases. O'Sullivan, Frank, Hurley, and Tiwana (2009) go even further by labeling the near-chance hit rate in lie detection accuracy a 'mistaken conclusion' (p. 530). In line with Buckley

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(2012), they argue that 'the lie or truth being told must be sufficiently important, consequential or motivating to stimulate [cues to deception] in the target' (p. 531) and hence dismiss much of the existing laboratory research as having any bearing on deception in forensic settings.

Behind these methodological concerns lies a theoretical argument, which we may call *the leakage hypothesis* (Porter, ten Brinke, & Wallace, 2012). This notion holds that if liars are sufficiently concerned about the content of their lie and the consequences of failing to convince, cues to deception will emerge and lies will be more readily detected. The leakage hypothesis can be traced to Darwin (1872), who believed that deliberate inhibition of strong emotion would be difficult to accomplish. In this vein, Frank and Ekman (1997) argued that lies told under higher stakes condition (compared to the typical laboratory study) would be more detectable. They stated that 'the presence of high stakes is central to liars feeling strong emotion when lying. It is the presence of these emotions, such as guilt, fear of being caught, and disgust, that can betray the liar's deception when they are leaked through nonverbal behaviors such as facial expressions […] or voice tone' (p. 1430).

The role of motivation in lying and truth telling

The leakage hypothesis is at least partly based on reasoning about the role of motivation in the perpetration of deception. That is, it is founded on the idea that motivation to successfully deceive may be counterproductive: the more pressure liars are facing to act convincingly, the worse their performance may be. This notion is referred to as the motivational impairment effect. Several studies have examined the effect of motivation in deception (for an overview of general theories of 'choking under pressure', see DeCaro, Thomas, Albert, & Beilock, 2011). In one of the earliest studies of lying in which motivation was experimentally manipulated, Krauss (1981) found that more motivated senders were less able to convince observers than their less motivated counterparts—evidence of a motivational impairment effect. In another laboratory study on motivated liars, DePaulo, Lanier, and Davis (1983) predicted and found that the effect of motivation depended on the modality in which the senders were shown: Lies told by motivated senders were less readily detected when only verbal behavior was available. In contrast, when nonverbal cues were available, lies told by motivated senders were more readily detected compared to lies told by less motivated senders. A similar finding based on different manipulations of motivation was obtained by DePaulo, Stone, and Lassiter (1985; see also DePaulo, Kirkendol, Tang, & O'Brien, 1988; DePaulo, LeMay, & Epstein, 1991). Taken together, their results are in line with the claim by Frank and Ekman (1997) that more motivated liars betray themselves via nonverbal channels.

However, the effect of motivation might not be as clear-cut as the above results suggest. In their meta-analysis on accuracy in lie judgments, Bond and DePaulo (2006) conducted a between-study comparison of low-motivation and high-motivation research on deception. Note that the latter category included lies told under extremely high levels of motivations (e.g., statements given by serious crime suspects in police interrogations). In this analysis, there was no effect of motivation on the detectability of lies. However, there was an effect on the judgment bias of receivers: More motivated senders appeared more deceptive, regardless of whether they were lying or telling the truth. Moreover, this effect was most apparent in modality where the senders' nonverbal behavior was available to the receiver (for a possible explanation of this effect, see Bond & DePaulo, 2006).

In conclusion, based on the literature on motivational impairment effects and performance pressure, it seems plausible that motivation may play a role in people's ability to tell convincing lies. However, as our review shows, the results from studies on motivated senders are mixed: Some experimental studies show modality-specific impairments in deceptive performance due to motivation (e.g., DePaulo et al., 1983), but meta-analytic comparisons between studies involving both laboratory-based lies and real-life, high-stake lies paint a picture in which both liars and truth tellers fall may prey to the motivational impairment effects. If both liars and truth tellers appear more deceptive under high-stake conditions, the ability to distinguish between truths and lies might not be improved by higher levels of motivation. Because of the mixed results, it appears that further clarification on the role of motivation in deceptive and truthful displays is warranted. In this study, we turn to the accumulated literature on deception in order to provide such clarification.

Aims of the present study

One of the goals of our paper is to address the concern about limited external validity in deception research. More specifically, we set out to investigate whether the concern from critics is valid. That is, are lies indeed more detectable as the condition under which they are told more closely approximate real-life, forensic settings? To answer this question, we conducted a meta-analysis of lie detectability across condition. There are two possible outcomes of our analysis. First, it may be that there are indeed moderators to the detectability of lies, such that lies are more (or less) readily detected under some circumstances. If the leakage hypothesis is valid, we should find variables that moderate lie detectability, in particular relating to motivational and emotional elements of the situation in which the lie is told. Second, it may be that the detectability of lies is stable across conditions. Either outcome has important implications. If the first outcome is obtained and we find that lies are more detectable under more realistic circumstances, researchers who focus on lie detection in legal settings ought to invest effort in developing and adopting more externally valid paradigms. If the second outcome is obtained, it would suggest that the criticism about limited generalizability of deception research is at least partly unfounded and that the conclusions from deception research cannot be readily dismissed as a laboratory artifact.

Measuring lie detectability

How detectable are lies? Researchers have approached this question with two forms of evidence. Some have mapped behavioral differences between liars and truth tellers. These studies have examined individual cues to deception. The

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most comprehensive synthesis of such research to date was offered in the form of a meta-analysis by DePaulo and colleagues (2003). This meta-analysis assessed the validity of 158 potential cues to deception, such as eye contact, smiling, and verbal–nonverbal consistency. Although this information is useful, it does not inform us about the overall detectability of lies. That is, a single-cue analysis does not tell us with what degree of accuracy lies can be detected on the basis of overall displays of behavior, displays that consist of multiple cues. Second, research has examined human ability to distinguish true from deceptive statements. Bond and DePaulo (2006) offered a meta-analysis of lie detection accuracy and found that people can barely detect one another's lies; indeed, the average lie–truth discrimination rate across hundreds of studies is roughly 54%, when 50% would be obtained by chance. Estimates of this latter kind are useful in that they illuminate the accuracy rates obtained by human observers. However, they do not reveal the objective detectability of lies. In theory, it is possible that lies can be accurately detected from multicue behavior displays but that observers do not make optimal use of the evidence.

In this paper, we examine the detectability of deception in a different way. We examine the degree to which deception can be predicted from multiple behavioral cues, which adds a new metric to the body of meta-analyses on deception. An additional advantage of the current review is that it provides a straightforward and readily interpreted metric of lie detectability; that is, a percentage accuracy with which deception can be predicted on the basis of behavioral displays.

Since our primary focus is on the extent to which lie detectability generalizes across conditions, we selected a number of moderator variables that have been singled out by critics as relevant for the detectability of deception (Buckley, 2012; Feeley & deTurck, 1998; Frank, 2005; Hartwig, 2011, Inbau, Reid, Buckley, & Jayne, 2001; O'Sullivan et al., 2009). In particular, we examined the detectability of lies as a function of whether the sender was a student or a nonstudent, whether they were motivated to be believed, and whether the statement was accompanied by strong emotion.

METHOD

Literature search procedures

For our database, we sought all available studies that had yielded a statistical prediction of deception from two or more cues. To locate relevant studies, we conducted computer-based searches of Psychological Abstracts, PsycInfo, PsycLit, Communication and Mass Media Complete, ProQuest Dissertations and Theses, WorldCat, and Google through February of 2014 using the keywords deception, deceit, and lie detection. We searched the Social Sciences Citation Index for papers that cited key references, scoured relevant convention programs, examined reference lists from previous reviews (DePaulo et al., 2003; 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 the prediction of deception from multiple cues. To be included in this review, a document had to report a statistical measure of the extent of predictability of deception from two or more cues. The cues had to be selected on a priori nonstatistical grounds. We did not include in our review results from machine learning, support machine vector, or other nonstatistical algorithms for predicting deception. For an example of the latter, see Chen (2010). We excluded results from stepwise regression procedures. These would overstate the predictability of deception, as Thompson (1995) explains.

Following Zuckerman, DePaulo, and Rosenthal (1981), we define deception as 'an act that is intended to foster in another person a belief that which the deceiver considers to be false.' We excluded studies of phenomena that are distinct from deception. We did not include in our review studies of memories for imagined events, unless participants were told to represent the imagined events as real. Similarly, we did not include in our review studies of memories for suggested events, unless the memory reports under study were conscious lies. We also excluded lies that were told in imagined, hypothetical situations.

As possible cues to deception, we included any behavior of the senders, any impression that the senders conveyed, and any aspect of the senders' demeanor or physical appearance. We did not, however, use as cues to deception ratings or questionnaire responses that had been produced by the senders. We did not include as cues to deception autonomic or physiological measures. We did not use as a cue to deception observers' explicit judgments of deception—deception judgments having recently been summarized by Bond and DePaulo (2006).

Samples of interest

Our unit of analysis was the sample of senders (i.e., liars and truth tellers). Sometimes more than one multicue analysis of deception was reported for the same sample of senders. In those cases, we used results from the analysis that was most fully reported. If an author fully reported several multicue analyses of deception on the same group of senders, we averaged the results of those analyses.

Variables coded from each report

From each report, we coded as many of the following variables as possible: (a) the number of lie/truth tellers, (b) senders' student status, (c) mean age of senders, (d) percentage of female senders, (e) the number of cues from which deception was predicted, (f) percentage of visible, written, speech content, vocal, and impression cues, (g) motivation to lie, (h) social setting of the lie, (i) deception medium, (j) strong emotion accompanying the lie, (k) affective content of the lie, and (l) a statistical measure of the accuracy with which deception could be predicted.

Let us explain these variables. The number of liars and truth tellers was coded from each report. We also noted the senders' student status. Many of the senders in this literature

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are students. We distinguished students from nonstudents. We noted the mean age of the senders and the percentage of female senders, when these were reported. We noted the number of cues from which deception was predicted and noted the percentage of those cues that were visible, written, speech content, vocal, and impression. By impression cues, we mean a global impression that the sender conveyed, like nervousness. We noted participants' motivation to lie, distinguishing high motivation, moderate motivation, and no special motivation (beyond an experimental instruction). We noted the social setting of the lie—in particular, whether the lie was delivered as a monologue, in response to an experimental prompt, whether it was told in an interview setting, or whether it was told in the context of an unscripted interaction. We noted the deception medium, distinguishing lies that were told face-to-face from other lies. We noted whether the lie was accompanied by strong emotion and whether the lie concerned the liar's feelings, attitudes, or opinions, as opposed to facts.

RESULTS

We found 125 documents that satisfied our criteria. For a listing, see APPENDIX A. Of these documents, 92 were published and 33 were unpublished. The earliest document was dated 1973, and the most recent was dated 2014. Half of these documents were written after 2005. These documents reported multicue analyses of deception on 144 independent sender samples. Those samples include 9411 lie and truth tellers. In the typical study, each participant sent a single message, and the message was either a lie or a truth. However, in some studies, each participant sent multiple messages. In all, we coded results on the multicue prediction of deception in 26,866 messages.

Characteristics of the research literature

Having coded a number of variables from each report, we can offer a statistical summary of this research literature. See Table 1. The number of senders in these studies varied widely. There was a study of lies and truths told by a single liar. At the opposite extreme, there was a study of 366 liars and truth tellers. The lie and truth tellers had a mean age of 23.30, and 52.77% of them were female. In each of these studies, deception was predicted from two or more cues. The number of cues entering into these analyses ranged from 2 to a high of 255.[1] In attempting to predict deception, researchers most often used speech content cues. They predicted deception from visible and written cues more often than vocal or impression cues.

The second author coded a number of categorical variables from each report. To assess the reliability of his coding, the variables were independently coded by a second rater in a sample of 20 documents chosen randomly from the 125 in our database. The two codings of these 20 documents were compared, and results on percentage agreement appear in the lower half of Table 1. As noted there, interrater agreement ranged from 90% (on motivation of the lie) to 100% (on several variables). The second author's codings are used in Table 1 and in the analyses below.

The lower half of Table 1 reveals several aspects of this literature. Although the senders in this literature are usually students, over 40% are not. Although research participants usually have no strong motivation to succeed at lying, they are highly motivated in 16 samples. Most of the highly motivated lies were told to cover up a crime, and a few were false allegations of sexual abuse. All of the highly motivated lies were told spontaneously, in the liar's natural setting—typically a criminal investigation.

Measuring the predictability of deception

Our goal is to quantify the extent to which deception can be predicted from two or more cues. We measured the predictability of deception by the multiple correlation coefficient between deception and these cues. We coded 144 values of R—one for the multicue prediction of deception in each of 144 samples of lie and truth tellers. Figure 1 shows these values of R in a stem-and-leaf display. The values range from .01 to .87. For predicting deception from two or more behaviors, the median R is .48. The values of R at the first and third quartile are .37 and .70, respectively.

We subjected each multiple correlation coefficient to a Fisher's R-to-Z transformation, cumulated values of Z_R with standard precision-weighted random effects methods, and then back-transformed our statistical results to the metric of R before reporting them. For statistical details, see APPENDIX B. A listing of data from the 144 samples appears in APPENDIX C.

Meta-analysis indicates that deception can be predicted to a significantly better degree in some samples than others, homogeneity $Q(143) = 299.58$, $p < .0001$. By a weighted estimator, the overall variance in Z_R is .22, and the true variance is .14. Sampling error accounts for 38.07% of the overall variance in the predictability of deception across these 144 samples, and true variance accounts for the remaining 61.93%. Our random-effects point estimate of the predictability of deception from multiple cues is $R = .52$, 95% confidence interval = .49 to .56. This corresponds to a weighted mean $Z_R = 1.16$; true standard deviation in $Z_R = .37$.

We wondered whether artifacts could explain the levels of lie detection observed in this research literature. Random-effects analyses suggest they cannot. Deception is neither more nor less detectable in published studies than unpublished studies, $Q(1) = .09$, *n.s.* Lie detection is not significantly related to the number of senders in a study or the date of the study, $Q(1) = 1.75$ and 1.18, respectively, *n.s.* These factors should be irrelevant, and they are. It is also noteworthy that

[1] Enos (2009) predicted deception from 255 features of speech in a corpus of 8406 utterances. This interesting data set is unusual in several respects. The abnormally large number of utterances showed a statistical interdependence, having come from a sample of only 32 speakers. The analyses we report in the text include data from the study by Enos (2009). Supplementary analyses, not reported, were based on a data set from which the results in Enos (2009) were excluded. The latter yielded results very similar to those we report in the text. For example, from a database that includes Enos (2009), we estimate in the text an R of .523 for the relationship between deception and multiple cues. Excluding Enos (2009), we would estimate this relationship as $R = .528$. As in the entire data set we analyze in the text, it is also true in a data set that excludes Enos (2009)—motivation has no significant effect on the predictability of deception (in the Enos-censored data set, $Q(2) = 1.57$, n.s.).

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Table 1. Characteristics of the research literature

Quantitative variables				
Variable	k	Min	Max	Mean
Number of liars	144	1	366	64.14
Mean age of liars	88	5.50	62.95	22.43
Percent female liars	127	0	100	52.77
Number of cues	144	2	255	10.57
Percent visible cues	144	0	100	20.18
Percent written cues	144	0	100	14.18
Percent speech content cues	144	0	100	48.26
Percent vocal cues	144	0	100	10.83
Percent impression cues	144	0	100	6.55

Categorical variables		
Variable	# (%) of liar samples	Percent coding agreement
Liar's demographic background		95%
Student	85 (59%)	
Other	59 (41%)	
Motivation to lie		90%
High motivation	16 (11%)	
Moderate motivation	41 (29%)	
No motivation	86 (60%)	
Social setting		100%
Monologue	46 (32%)	
Interview	87 (60%)	
Interaction	11 (8%)	
Deception medium		100%
Face-to-face	88 (61%)	
Other	56 (39%)	
Affective state		95%
Strong emotion	28 (19%)	
No strong emotion	116 (81%)	
Content of lie		100%
Lie about feelings	23 (16%)	
Lie about facts	121 (84%)	

lie detection is not significantly related to the number of cues from detection is attempted, $Q(1) = .33$, *n.s.* The relative proportion of visible, written, speech content, vocal, and impression cues from which a lie is predicted does not influence its detectability; for the combined impact of the latter, $Q(4) = 4.67$, *n.s.*

.0	8
.1	05589
.2	0235557788
.3	0022222222333555666667888999
.4	00122222233344444445555556667888
.5	00123334445555777
.6	0233345556667778889
.7	00011133346677777889
.8	11222335779
.9	00233

Figure 1. *R* for multicue lie detection in 144 samples: A stem-and-leaf display

Moderation of lie detection

With random-effects techniques, we examined lie detection in various subsets of the research literature. We assessed the impact on lie detection of senders' motivation to lie, senders' demographic background, the social setting of the lie, the medium of deception, emotion accompanying the lie, and affective content of the lie. Relevant results appear in Table 2. For each subset of the research literature in the table, we list an R for lie detection—in particular, the R corresponding to a weighted mean Fisher's Z_R for the effect in question. Also listed is a Q-statistic to test for the significance of each moderator variable.

Our results are easy to summarize. Many of the factors in Table 2 might be expected to affect detection. However, none of them have a statistically significant effect. Highly motivated and unmotivated lies, lies told by students and nonstudents, and lies about feelings and lies about facts—all of these lies are equally detectable, meta-analytic evidence suggests. Neither face-to-face lies nor lies accompanied by strong emotion are especially easy or especially hard to detect. In every subset of the literature we examined, lies were detected with an R of between .48 and .56.

There is special interest in lies that are highly motivated. Thus, it is of interest to note that there is no significant difference in the detectability of high-motivation lies and other lies, $Q(1) = .30$, *n.s.*

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Table 2. Predictability of deception in subsets of the research literature

Variable	R	Q
Liar's demographic background		2.23 (*n.s.*)
Student	.50	
Other	.55	
Motivation to lie		2.31 (*n.s.*)
High motivation	.55	
Moderate motivation	.48	
No motivation	.54	
Social setting		.16 (*n.s.*)
Monologue	.52	
Interview	.52	
Interaction	.54	
Deception medium		.22 (*n.s.*)
Face-to-face	.53	
Other	.51	
Affective state		1.36 (*n.s.*)
Strong emotion	.55	
No strong emotion	.51	
Content of lie		.08 (*n.s.*)
Lie about feelings	.56	
Lie about facts	.52	

N.s. indicates non-significance.

In principle, lie detection might be moderated by a combination of factors. To assess this possibility, we conducted a meta-regression. Here we simultaneously predicted the Z_R for lie detection in a sample from all of the factors in Table 2—liar's motivation, student status, social setting, medium of the lie, accompanying emotion, and affective content of the lie. The combined effect of all six factors was not statistically significant, $Q(8) = 7.51$, *n.s.* Motivation had no incremental effect on lie detection, partialling the other five factors, $Q(2) = 2.49$, *n.s.*

Lie detection from multiple cues versus a single cue

In the studies under consideration, deception was predicted from multiple cues. One wonders whether lies can be better detected from multiple cues than a single cue. Perhaps in most studies, a single cue carries the bulk of the predictability of deception, and other cues contribute little. To assess this possibility, we examined the studies in our database for correlations between deception and individual deception cues. We noted, within the 114 samples where we could find it, the strongest r between deception and any of the cues from which deception was predicted. By random-effects methods, our cross-study estimate of this maximum r was .43. Recall that our random-effects estimate of lie detection from multiple cues yielded $R = .52$. Although deception can be better detected from multiple cues than a single cue, the strongest cue contributes a lot.

Stability of lie detection

Levels of lie detection vary across samples, as we noted above, in a way that produces an estimate of the true standard deviation in $Z_R = .37$ for a weighted mean $Z_R = 1.16$. We wondered how this level of variability compared to the variability of results in other research literatures. To assess this question, we needed normative comparison values. Richard, Bond, and Stokes-Zoota (2003) summarized meta-analyses of research in social psychology. For each of 355 social psychological research literatures, they estimated a mean effect size as well as a true standard deviation in effect sizes across the samples in that research literature.

For present purposes, we will be using as a standardized index of variability the coefficient of variation. It is defined as a ratio: the ratio of (1) the true standard deviation in effect sizes across the samples in a research literature, divided by (2) the mean effect size in that literature. The higher the value of the coefficient of variation, the less stable an effect, relative to the mean.

We noted the coefficient of variation for each of the 355 social psychological research literatures cumulated by Richard, Bond, and Stokes-Zoota. Those 355 coefficients of variation ranged widely; however, the median coefficient of variability was .79. Here we analyzed lie detection in 144 samples to find a coefficient of variation of .32 (i.e., .37/1.16). Thus, multicue lie detection is less variable across studies than a typical social psychological effect. Indeed, it is more stable from sample to sample than the effects in 300 of 355 social psychological research literatures summarized by Richard, Bond, and Stokes-Zoota.

Alternative metrics

The multicue analyses of deception in our database capitalize on chance. The analyst knows whether a given message is a lie or truth and develops with this knowledge an optimal combination of cues to reconstruct what is known. This results in a raw multiple correlation coefficient (R), which we have cumulated to learn that in a typical study, actual deception correlates .52 with deception, as predicted from multiple cues. Although this R may hold some interest, there is greater interest in how well deception could be predicted, if the analyst developed a prediction equation from one set of messages and applied it to a second set of messages. By substituting mean values for R, N, and p into Equation B5, we get an estimate of this cross-validity coefficient: $R_c = .42$. Thus, if one took an equation developed in this research literature for predicting deception and applied that equation to a new lies and truths, one could expect a correlation of .42 between the new deceptions and the cross-sample predictions of deception.

We sought to determine the percentage lie–truth detection one could achieve from multiple cues. We converted our cross-validity coefficient of .42 to a standardized mean difference via Equation (BB7) to find that lies and truths differ by .93 standard deviations, in the cross-sample context. Under the assumptions detailed in the appendix, this implies that equations developed in this research literature for predicting deception could achieve 67.86% accuracy, if applied to new lies and truths.

DISCUSSION

In this paper, we examined the detectability of lies from behavioral evidence. We sought to quantify the objective detectability of lies, when detection was attempted from multiple cues—not merely a single cue. We also examined

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the external validity of deception research by examining a variety of moderator variables that have been argued to be relevant for the degree to which lies can be detected.

As described above, a consistent concern about laboratory research is that senders receive little or no motivation to succeed in convincing the receiver. Critics have argued that if liars are motivated, their lies will be more readily detected. Related to this argument is the notion that lies accompanied by strong emotion will be more easily detected. We call this reasoning the leakage hypothesis. To illustrate this idea, ten Brinke, Porter, and Baker (2012) recently wrote: '…the powerful motivation to look credible, coupled with the complexity of creating and maintaining a consequential lie, may lead to greater leakage of behavioral signals and likelihood of detection in high-stakes contexts' (p. 412). Because the empirical literature has provided mixed results (e.g., Bond & DePaulo, 2006; DePaulo et al., 1983), we conducted a meta-analytic test by examining lie detectability as a function of motivation. The findings from the analysis do not provide support for the leakage hypothesis. Instead, the results suggest that lies are equally detectable when the sender is unmotivated as when they are highly motivated.

Also, we examined lie detectability when the statement was accompanied by strong emotion. For example, in some studies, people provided statements during criminal investigations or legal proceedings; in other studies, they described traumatic experiences, negative life events, and important autobiographical events. We considered these statements to involve strong emotion. Moderator analyses showed that lies of this kind were no more (or less) detectable than lies of a more trivial nature.

In addition to motivation and the presence of emotion, we also examined the effect of a number of other variables that have been singled out as relevant for lie detection. The results show that lies told by nonstudents were as detectable as those told by students. We do not find this particularly surprising. Even though some scholars have criticized the disproportionate use of college students in deception research (e.g., O'Sullivan, 2009), no compelling theoretical argument has been proposed in support of this criticism. That is, it has not been made clear why college students would differ from nonstudents in terms of deceptive behavior.

We found no effect of the setting in which the lie was told—lie detectability was similar when the lie was told as a monologue, during a social interaction, and in the context of an interview. This fails to support the concern voiced by Buckley (2012). Regarding this null effect, it is worth pointing out that due to limitations in sample numbers, we did not make a distinction between different types of interview. However, a wave of recent research shows that cues to deception can be elicited through various forms of strategic interviewing; that is, methods designed to produce different behavioral responses from liars and truth tellers (Colwell, Hiscock-Anisman, Memon, Taylor, & Prewett, 2007; Hartwig, Granhag, Strömwall, & Vrij, 2005; Levine, Shaw, & Shulman 2010; Vrij et al., 2009). This line of research typically shows that if senders are interviewed in strategic ways, cues to deception tend to become more pronounced (e.g., Vrij et al., 2009). In light of this research, it is possible that we would have observed some variation in lie detectability within the interview category, had we been able to conduct a more fine-grained analysis comparing different forms of interviews.

In our analysis, lies could typically be predicted with a cross-valid accuracy rate over 67%. As discussed previously, meta-analyses of human lie detection accuracy show that people achieve hit rates around 54% (Bond & DePaulo, 2006, 2008). The higher accuracy rates obtained here suggest that signals of deception are manifested in constellations rather than single cues. A reader might wonder whether this higher accuracy rate could be obtained by human observers as well. It should be noted that humans face a more difficult task than the statistical algorithms employed in the literature under consideration. In fact, the statistical approach can be applied only in situations where a large number of lies and truths are told under similar situations, and the ground truth of those statements is known. Cues to deception are then scored, and a statistical model is fit to the data after the fact. Thus, the hit rates obtained here are based on different circumstances than those faced by naïve observers.

Leakage versus context overshadowing

Overall, our results suggest that the findings from deception research are not laboratory artifacts—the detectability of deception remains stable across a variety of situational variables. How can this be explained? One possible explanation is that situational factors have a comparable impact on liars and truth tellers. For example, in a situation where the motivation to be perceived as credible is high for liar (e.g., a police interrogation), the motivation for truth teller is in all likelihood equally high. In line with the reasoning of the self-presentational perspective (e.g., DePaulo et al., 2003), to the extent that the consequences of failing to convince are similar, liars and truth tellers may experience similar psychological processes. In a related vein, Vrij (2006) argued that the context may have a similar effect on liars and truth tellers and that the effect of this context may overshadow any effects of veracity. Thus, while the leakage hypothesis focuses mainly on the experience of liars in an arousing context, the *context overshadowing hypothesis* takes the setting and its possible effect on truth tellers into account as well. This context overshadowing effect may well explain the lack of moderating variables in this meta-analysis: If the context has comparable effects on liars and truth tellers, lie detectability should remain stable across conditions.

Implications

These results ought to offer some comfort for deception scholars who focus on lie detection in forensic settings. Critics of the deception literature often raise the concern that common paradigms suffer from limited generalizability. Our meta-analysis does not provide support for this concern: The primary finding of our analysis is that lie detectability remains stable across contexts. Notably, the finding on external validity mirrors those of meta-analyses that have compared laboratory research to field research in other domains. For example, Anderson, Lindsay, and Bushman (1999) compared laboratory and field research on a wide variety of psychological topics, including aggression, helping, memory, and depression and concluded that there was a substantial degree of correspondence between findings obtained in the laboratory and the

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field. Of course, we do not mean to imply that lie detection researchers should proceed without concern for the external validity of the paradigms they employ. Compared to the laboratory-based literature, the body of work on real-life, high-stake lies is still small. However, when designing externally valid paradigms, we believe that researchers should focus their attention on those variables for which there is a sound theoretical basis to expect moderating effects.

In a discussion of high-stake lies, Porter and ten Brinke (2010) suggested that high-stake lies might manifest themselves qualitatively rather than quantitatively different. That is, they propose that high-stake lies might be associated with different cues than lies told under lower-stake circumstances. Since our focus was not on the type of cues displayed during deception under different condition but on the detectability of those lies, this question is outside the scope of our investigation. However, the possibility raised by these authors is interesting, and we encourage future research to explore it.

Beyond the research community, these results have implications for practitioners. The conclusions from the scientific literature on deception detection are routinely dismissed on the basis of limited generalizability. Perhaps the resistance to accept the findings from this body of work is partly motivated: The conclusion that lies are difficult to detect is problematic in a domain where credibility judgments are central. Our analysis of the accumulated literature suggests that the dismissal of research findings on these grounds is empirically unwarranted. Across a variety of moderator variables that relate to external validity, lie detectability remains stable. We make a plea to practitioners who question the validity of deception to take the findings of our meta-analysis into account and to temper their concerns about artificiality in the dominant research methodologies.

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APPENDIX A
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APPENDIX B
Details of coding and analysis

For each sample of senders, we extracted a statistical measure of the extent of predictability of deception. In this literature, authors report various types of statistical analyses: discriminant analyses, logistic regressions, MANOVAs and ordinary multiple regressions. We included results from all of these analyses.

Coding the multiple correlation coefficient

We were interested in the multiple correlation coefficient between deception and cues that researchers had used to predict deception. We sought to express every effect in this literature as an R.

In 15 of the 144 sender samples, results on the statistical prediction of deception were not fully reported. In those cases, they were imputed. Imputations were made in the following way. If a result was said to be 'not significant' with no further information, we used the null distribution of a test statistic to impute a value of R. In particular, we examined all of the values of the relevant F-ratio that would be nonsignificant at the specified alpha level (or at $p = .05$, if no alpha level was reported) and found the value of the F at the median of this censored distribution. That median F was converted to an R, and it is our imputed R. Similarly, if an author reported that an F-ratio was less than 1, we found the median of all Fs in that range. This was converted to an R and is our imputed R.

In 13 of the 144 multicue analyses of deception, an author reported percentage lie detection and percentage truth detection but no R. In these cases, we imputed a value of R. To do so, we began by assuming that predicted deception scores for lies form a normal distribution, as do predicted deception scores for truths. We assumed that these two distributions have equal variance. Under this equal-variance binormal model, the standardized mean difference between the two distributions is

$$d = Z(h) - Z(f) \tag{B1}$$

where $Z(x)$ is the value in a standard normal distribution below which a proportion of x cases fall, h is the proportion of lies detected and f is the proportion of truths incorrectly classified as lies. See Wickens (2001, p. 24).We then found the corresponding multiple correlation coefficient via

$$R = \frac{d}{\left[\left(4 + d^2\right)\right]^{.5}} \tag{B2}$$

See Lipsey and Wilson (2001, p. 62), keeping in mind that R is the ordinary Pearson product-moment correlation between deception and predicted deception.

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Fisher's *Z* transformation

A search of the literature (e.g., Cooper, Hedges, & Valentine, 2009) reveals no standard method for the meta-analysis of multiple correlation coefficients. Fortunately, an existing method can be adapted. It has become standard to cumulate correlation coefficients with a Fisher's Z transformation of r (Lipsey & Wilson, 2001, p. 63). Olkin and Finn (1995, p. 162) describe a Z transformation for the multiple correlation coefficient

$$Z_R = \log\left[\frac{1+R}{1-R}\right] \tag{B3}$$

where log denotes the natural logarithm.

Olkin and Finn note that the variance of this Z transform is

$$\mathrm{Var}(Z_R) = \frac{16}{N} \tag{B4}$$

To cumulate multiple correlation coefficients on the predictability of deception, we input the Z transform in Equation (B3) and the variance expression in Equation (B4) into standard formulas for effect-size meta-analysis. For the latter, see Lipsey and Wilson (2001).

Metrics for the predictability of deception

As a measure of the association between deception and cues to deception, the multiple correlation coefficient has some limitations. R cannot be less than zero. Moreover, the R obtained for the predictability of deception is a sample of lie and truth tellers is not a fair estimate of how well deception could be predicted in a second sample, if the prediction equation from the first sample were used.

We wondered about the generalizability of our results. In particular, we hoped to estimate a cross-validity coefficient from this literature—the R one might typically obtain if one took a multicue equation for predicting deception from this research literature and applied it to a new sample of lie and truth tellers. We symbolize this cross-validity coefficient R_c. With the Browne-1 formula in Yin and Fan (2001, pp. 210, 215), we compute

$$\mathrm{R_c} = \left\{\frac{(N-p-3)T^2+T}{(N-2p-2)T+p}\right\}^{.5} \tag{B5}$$

where N is the number of lie and truth tellers and p is the number of cues from which deception is predicted and $T = 1–(1-R^2)[(N-1)/(N-p-1)]$

We also report results on percentage lie–truth detection from multiple cues. We converted our summary cross-validity coefficient to percentage lie–truth detection in the following way. We found the standardized mean difference corresponding to this R_c via

$$d = \frac{2R_c}{\left(1-{R_c}^2\right)^{.5}} \tag{B6}$$

See Lipsey and Wilson (2001, p. 63).

We then adopted an equal-variance binormal model of predicted deception scores, as in Equation (B1) above. For purposes of determining percentage accuracy, we set a criterion that was equidistant from the lie distribution and the truth distribution. Given this model, we computed the resulting percentage lie–truth detection via

$$\%\,\mathrm{LT\ detection} = \mathrm{pnorm}\,(d/2) \tag{B7}$$

where pnorm(x) is the percentage of cases in a standard normal distribution below the value x. See Wickens (2001, chapter 2).

APPENDIX C

Multiple-cue prediction of deception in 144 samples

Authors	Date	R	N	Motivation	Student	Setting	Medium	Emotion	Content
Adams	2002	0.54	60	2	0	0	0	1	0
Akehurst, Köhnken, and Hofer	2001	0.53	66	0	0	1	1	0	0
Akehurst, Manton, and Quandte	2011	0.39	31	2	0	1	1	1	0
Anderson	1999	0.93	50	0	1	0	0	0	1
Ansarra et al.	in press	0.45	60	1	1	1	1	0	0
Bachenko, Fitzpatrick, and Schonwetter	2008	0.55	275	2	0	2	0	1	0
Barnier, Sharman, McKay, and Sporer	2005	0.25	180	0	1	0	0	0	0
Biland, Py, Allione, Demarchi, and Abric	2008	0.65	30	0	0	2	1	0	1
Black	1993	0.73	154	0	0	0	0	0	0
Blandon-Gitlin	2005	0.47	51	0	1	1	1	0	0
Blandon-Gitlin, Pezkek, Rogers, and Brodie	2005	0.32	94	0	0	1	1	0	0
Bond	2006	0.44	40	0	0	0	0	0	0
Bond and Lee	2005	0.70	152	0	0	0	0	0	0
Bond, Omar, Mahmoud, and Bonser	1990	0.43	60	0	1	0	0	0	1
Bond, Thomas, and Paulsen	2004	0.44	48	0	1	0	0	0	1
Bradford	2006	0.42	72	0	1	0	0	0	0
Bradford	2006	0.57	34	0	1	0	0	0	0
Bradford	2006	0.77	60	0	1	0	0	0	0
Buller and Aune	1987	0.23	130	0	1	1	1	0	0

(*Continues*)

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Appendix C. (Continued)

Authors	Date	*R*	*N*	Motivation	Student	Setting	Medium	Emotion	Content
Buller, Burgoon, Buslig, and Roiger	1996	0.53	110	0	1	2	1	0	1
Burgoon, Buller, Guerrero, Afifi, and Feldman	1996	0.85	40	0	0	1	1	0	0
Burgoon et al.	1996	0.90	66	0	0	1	1	0	0
Caso, Vrij, Mann, and De Leo	2006	0.67	128	0	1	1	1	0	0
Castillo	2011	0.39	180	0	1	1	1	0	0
Cole	2010	0.78	51	0	1	1	1	0	0
Colwell, Hiscock-Anisman, Memon, Rochel, and Colwell	2007	0.40	58	0	0	1	1	0	0
Colwell, Hiscock-Anisman, Memon, Rochel, et al.	2007	0.63	131	1	1	1	1	0	0
Colwell, Hiscock-Anisman, and Memon	2002	0.67	136	0	0	1	1	0	0
Colwell, Hiscock-Anisman, Memon, Taylor, and Prewett	2007	0.74	38	1	1	1	1	0	0
Cornetto	2001	0.41	148	0	1	2	0	0	0
Dana-Kirby	1997	0.20	252	1	1	1	1	0	0
Dana-Kirby	1997	0.33	22	2	0	1	1	1	0
Dana-Kirby	1997	0.90	315	1	0	1	1	0	0
DePaulo, Rosenthal, Rosenkrantz, and Green	1982	0.48	40	0	1	0	0	0	1
DePaulo et al.	1982	0.57	40	0	1	0	0	0	1
Dulaney	1981	0.68	20	1	1	1	1	0	0
Ekman, O’Sullivan, Friesen, and Scherer	1991	0.70	31	1	1	1	1	1	1
Enos	2009	0.38	8406	1	1	1	1	0	0
Evans and Michael	2013	0.92	55	0	0	1	1	0	0
Evans, Michael, Meissner, and Brandon	2013	0.81	46	0	1	1	1	0	0
Evans et al.	2013	0.89	93	0	1	1	1	0	0
Feldman, Devin-Sheehan, and Allen	1978	0.60	48	0	0	2	1	0	1
Fieldler and Walka	1993	0.83	40	0	1	0	0	0	0
Frank	1989	0.22	336	1	1	1	1	0	0
Fugita, Hogrebe, and Wexley	1980	0.37	40	0	1	1	1	0	1
Fuller, Biros, and Wilson	2009	0.46	366	2	0	0	0	1	0
Gagnon	1975	0.73	32	1	1	0	0	0	1
Gnisci, Caso, and Vrij	2010	0.69	158	0	1	1	1	1	1
Godert, Gamer, Rill, and Vossel	2005	0.81	68	1	0	1	1	0	0
Granhag and Strömwall	2002	0.87	24	0	1	1	1	0	0
Granhag, Strömwall, and Landström	2006	0.65	80	0	0	1	1	0	0
Griffith	2011	0.36	134	0	1	1	1	0	1
Gross and Levenson	1993	0.53	85	0	1	0	0	1	1
Heilveil and Muehleman	1981	0.44	130	0	1	1	1	0	0
Hemsley	1977	0.83	80	0	1	1	1	0	0
Hiscock-Anisman, Colwell, Hazelett, and Morgan	2011	0.71	36	1	0	1	1	0	0
Hocking and Leathers	1980	0.68	16	1	1	1	1	0	0
Holderness	2013	0.50	36	1	1	2	1	1	0
Horvath	1973	0.77	96	1	0	1	1	1	0
Horvath, Jayne, and Buckley	1994	0.64	60	2	0	1	1	1	0
Humpherys, Moffitt, Burns, Burgoon, and Felix	2011	0.32	202	2	0	0	0	1	0
Joffe	1992	0.28	43	0	0	1	1	0	0
Joffe	1992	0.77	50	0	0	1	1	0	0
Jones and Bennell	2007	0.55	66	0	0	0	0	0	0
Klaver, Lee, and Hart	2007	0.32	45	0	0	0	0	1	0
Kohnken, Schimossek, Aschermann, and Hofer	1995	0.82	59	0	0	1	1	0	0
Koper and Sahlman	1991	0.76	165	2	0	0	0	1	0
Kraut	1978	0.33	106	0	1	1	1	0	0
Kraut and Poe	1980	0.54	62	1	0	1	1	0	0
Lamb et al.	1997	0.38	89	2	0	1	1	1	0
Lancaster, Vrij, Hope, and Waller	2013	0.43	80	0	1	1	1	0	0
Landry and Brigham	1992	0.48	64	0	1	0	0	1	1
Landstrom and Granhag	2008	0.15	256	0	0	1	1	0	0
Landstrom, Granhag, and Hartwig	2005	0.32	122	1	1	1	1	0	0
Leal, Vrij, Mann, and Fisher	2011	0.35	31	1	0	1	1	0	0
Levine et al.	2011	0.42	104	1	1	1	1	0	0
Levine et al.	2011	0.57	20	1	1	1	1	0	0
Luria and Rosenblum	2009	0.42	34	0	1	0	0	0	0
Mann, Vrij, and Bull	2002	0.82	16	2	0	1	1	1	0
Marshall and Alison	2006	0.71	172	0	0	2	0	1	0
Masip, Bethencourt, Lucas, Sanchez-San Segundo, and Herrero	2010	0.18	78	0	1	0	0	0	0
Memon, Fraser, Colwell, Odinot, and Mestroberadino	2010	0.50	60	0	1	1	1	0	0
Merckelbach	2004	0.35	38	0	1	0	0	0	0
Meservy	2007	0.36	60	1	1	1	1	0	0
Michael	2013	0.77	10	1	1	0	0	0	0
Michael	2013	0.82	10	1	1	0	0	0	0

(*Continues*)

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Appendix C. (Continued)

Authors	Date	R	N	Motivation	Student	Setting	Medium	Emotion	Content
Nahari, Vrij, and Fisher	2012	0.48	41	0	1	1	0	0	0
Peace	2006	0.71	181	0	1	0	0	1	1
Porter and ten Brinke	2008	0.44	41	0	1	0	0	0	1
Porter, Doucette, Woodworth, Earle, and MacNeil	2008	0.51	65	0	0	0	0	0	0
Porter, Peace, and Emmett	2007	0.28	125	0	1	0	0	1	1
Porter, Yuille, and Lehman	1999	0.68	75	1	1	1	1	1	1
Potamkin	1982	0.78	20	1	0	0	0	0	1
Qin, Burgoon, Blair, and Nunamaker	2005	0.15	172	1	1	1	0	0	0
Rassin and van der Sleen	2005	0.65	41	2	0	1	1	1	0
Riggio and Friedman	1983	0.54	63	0	1	0	0	0	0
Roberts and Lamb	2010	0.32	48	2	0	1	1	1	0
Roberts and Lamb	2010	0.45	31	2	0	1	1	1	0
Ruby and Brigham	1998	0.38	714	0	0	0	0	0	0
Ruby and Brigham	1998	0.44	714	0	1	0	0	0	0
Santtila, Roppola, and Niemi	1999	0.46	68	0	0	0	0	0	0
Schelleman-Offermans and Merckelbach	2010	0.36	60	0	1	0	0	0	0
Scherer, Feldstein, Bond, and Rosenthal	1985	0.1	112	1	1	1	1	1	1
Simons, Ellgring, and Pasqualini	2003	0.3	44	0	0	0	0	0	0
Sporer	1997	0.45	80	0	1	0	0	0	0
Sporer and Kupper	1995	0.44	200	0	1	0	0	0	0
Strömwall and Granhag	2005	0.77	44	0	0	1	1	0	0
Strömwall, Bengtsson, Leander, and Granhag	2004	0.40	88	0	0	1	1	0	0
Strömwall, Hartwig, and Granhag	2006	0.42	30	1	1	1	1	0	0
Suckle-Nelson et al.	2010	0.63	83	0	0	1	1	0	0
Svetiera	2010	0.42	132	1	0	1	1	0	0
ten Brinke and Porter	2012	0.44	52	2	1	0	0	1	0
ten Brinke, McDonald, Porter, and O'Conner	2012	0.39	31	0	1	0	0	0	1
Toma and Hancock	2010	0.32	80	1	0	0	0	0	0
Toomey	2013	0.45	80	1	0	1	1	0	0
Tornquist	2002	0.62	76	0	1	0	0	0	0
Tye, Amato, Honts, Devitt, and Peters	1999	0.73	28	1	0	1	1	0	0
Villar	2011	0.27	150	0	1	1	1	0	0
Vrij	1995	0.55	64	1	1	1	1	0	0
Vrij	2000	0.66	58	1	1	1	1	0	0
Vrij	2006	0.66	35	1	1	1	1	0	0
Vrij and Mann	2001	0.93	6	2	0	1	1	1	0
Vrij and Winkel	1991	0.25	92	0	0	1	1	0	0
Vrij, Akehurst, Soukara, and Bull	2004	0.25	54	1	0	1	1	0	0
Vrij et al.	2004	0.33	35	1	0	1	1	0	0
Vrij et al.	2004	0.36	55	1	0	1	1	0	0
Vrij et al.	2004	0.45	52	1	1	1	1	0	0
Vrij, Edward, Roberts, and Bull	2000	0.66	73	1	1	1	1	0	0
Vrij, Leal, Mann, and Granhag	in press	0.79	31	1	0	1	1	0	0
Vrij, Mann, Kristen, and Fisher	2007	0.08	120	1	1	1	1	0	0
Walczyk et al.	2012	0.46	128	0	1	1	1	0	0
Walczyk, Mahoney, Doverspike, and Griffith-Ross	2009	0.52	88	0	1	1	1	0	0
Walczyk et al.	2009	0.55	90	0	1	1	1	0	0
Warmelink, Vrij, Mann, and Granhag	2013	0.27	84	0	1	1	1	0	0
Warmelink et al.	2013	0.30	86	0	0	1	1	0	0
Werdin	2011	0.67	37	1	1	1	0	0	0
Whelan, Wagstaff, and Wheatcroft	2013	0.63	32	2	0	0	0	1	0
Yuval	2003	0.35	120	1	1	1	1	0	0
Zhou and Zhang	2004	0.70	9	0	1	2	0	0	0
Zhou and Zhang	2006	0.76	12	0	1	2	0	0	0
Zhou and Zhang	2006	0.87	16	0	1	2	0	0	0
Zhou, Burgoon, Twitchell, Qin, and Nunamaker	2004	0.19	52	0	1	2	0	0	0
Zhou et al.	2004	0.32	60	0	1	2	0	0	0

Note: R = Correlation coefficient for predicting deception from multiple cues, N = Sample size for R, Motivation = Senders's motivation (0 = None, 1 = Moderate, 2 = High), Student = Sender's Student Status (1 = Liar is a Student, 0 = Liar is not a Student), Setting = Social Setting of the Lie (0 = Monologue, 1 = Interview, 2 = Interaction), Medium = Medium in which Lie was told (1 = Face-to-Face, 0 = Other), Emotion = Does Strong Emotion Accompany the Lie? (1 = Yes, 0 = No), and Content = Affective Content of the Lie (0 = Lie Concerns Facts, 1 = Lie Concerns Feelings).

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