Pitfalls and Opportunities in Nonverbal and Verbal Lie Detection

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Summary

The question of whether discernible differences exist between liars and truth tellers has interested professional lie detectors and laypersons for centuries. In this article we discuss whether people can detect lies when observing someone's nonverbal behavior or analyzing someone's speech. An article about detecting lies by observing nonverbal and verbal cues is over-due. Scientific journals regularly publish overviews of research articles regarding nonverbal and verbal cues to deception, but they offer no explicit guidance about what lie detectors should do and should avoid doing to catch liars. We will present such guidance in the present article.

The article consists of two parts. The first section focuses on pitfalls to avoid and outlines the major factors that lead to failures in catching liars. Sixteen reasons are clustered into three categories: (a) a lack of motivation to detect lies (because accepting a fabrication might sometimes be more tolerable or pleasant than understanding the truth), (b) difficulties associated with lie detection, and (c) common errors made by lie detectors. We will argue that the absence of nonverbal and verbal cues uniquely related to deceit (akin Pinocchio's growing nose), the existence of typically small differences between truth tellers and liars, and the fact that liars actively try to appear credible contribute to making lie detection a difficult task. Other factors that add to difficulty is that lies are often embedded in truths, that lie detectors often do not receive adequate feedback about their judgments and therefore cannot learn from their mistakes, and that some methods to detect lies violate conversation rules and are therefore difficult to apply in real life. The final factor to be discussed in this category is that some people are just very good liars.

The common errors lie detectors make that we have identified are examining the wrong cues (in part, because professionals are taught these wrong cues); placing too great an emphasis on nonverbal cues (in part, because training encourages such emphasis); tending to too-readily interpret certain behaviors, particularly signs of nervousness, as diagnostic of deception; placing too great an emphasis on simplistic rules of thumb; and neglecting inter- and intrapersonal differences. We also discuss two final errors: that many interview strategies advocated by police manuals can impair lie detection, and that professionals tend to overestimate their ability to detect deceit.

The second section of this article discusses opportunities for maximizing one's chances of detecting lies and elaborates strategies for improving one's lie-detection skills. Within this section, we first provide five recommendations for avoiding the common errors in detecting lies that we identified earlier in the article. Next, we discuss a relatively recent wave of innovative lie-detection research that goes one step further and introduces novel interview styles aimed at eliciting and enhancing verbal and nonverbal differences between liars and truth tellers by exploiting their different psychological states. In this part of the article, we encourage lie detectors to use an information-gathering approach rather than an accusatory approach and to ask liars questions that they have not anticipated. We also encourage lie detectors to ask temporal questions—questions related to the particular time the interviewee claims to have been at a certain location—when a scripted answer (e.g., "I went to the gym") is expected. For attempts to detect lying about opinions, we introduce the devil's advocate approach, in which investigators first ask interviewees to argue in favor of their personal view and then ask them to argue against their personal view. The technique is based on the principle that it is easier for people to come up with arguments in favor than against their personal view. For situations in which investigators possess potentially incriminating information about a suspect, the "strategic use of evidence" technique is introduced. In this technique, interviewees are encouraged to discuss their activities, including those related to the incriminating information, while being unaware that the interviewer possesses this information. The final technique we discuss is the "imposing cognitive load" approach. Here, the assumption is that lying is often more difficult than truth telling. Investigators could increase the differences in cognitive load that truth

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tellers and liars experience by introducing mentally taxing interventions that impose additional cognitive demand. If people normally require more cognitive resources to lie than to tell the truth, they will have fewer cognitive resources left over to address these mentally taxing interventions when lying than when truth telling. We discuss two ways to impose cognitive load on interviewees during interviews: asking them to tell their stories in reverse order and asking them to maintain eye contact with the interviewer.

We conclude the article by outlining future research directions. We argue that research is needed that examines (a) the differences between truth tellers and liars when they discuss their future activities (intentions) rather than their past activities, (b) lies told by actual suspects in high-stakes situations rather than by university students in laboratory settings, and (c) lies told by a group of suspects (networks) rather than individuals. An additional line of fruitful and important research is to examine the strategies used by truth tellers and liars when they are interviewed. As we will argue in the present article, effective lie-detection interview techniques take advantage of the distinctive psychological processes of truth tellers and liars, and obtaining insight into these processes is thus vital for developing effective lie-detection interview tools.

Introduction

"Deception entered Western thought in a telling guise when the author of *Genesis* placed a serpent in the Garden of Eden. By lying, the serpent enticed Eve into committing the original sin" (C.F. Bond & DePaulo, 2006, p. 214). Lying has always posed a moral problem. For example, St. Augustine believed that every lie is a sin, and Aristotle and Kant expressed similar views. In contrast, Machiavelli highly praised deceit in the service of self (Bok, 1989; C.F. Bond & DePaulo). The nature of lying is two-pronged, and how we feel about deception depends on the reason for telling the lie (Seiter, Bruschke, & Bai, 2002). Most lies are told for psychological reasons, and people do not feel bad about telling these kinds of lies. We do not relish having to express all of our thoughts (e.g., "I find that woman more attractive than my own partner.") and thus, we would rather lie. Instead of always showing our true selves, we prefer to censor ourselves so that we are perceived by others in a positive light. We tell psychological lies for a number of reasons: to protect ourselves, to avoid tension and conflict in social interactions, and to minimize hurt feelings and ill will (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996).

However, sometimes the situation is different, such as when people really would like to know the truth; these situations can arise during activities such as watching the evening news or interviewing a candidate for employment. For example, a viewer may want to know whether a politician's denial of involvement in a bribery scandal is really the truth; a teacher may want to know whether a student has cheated during the exam he or she aced; a mother may want to know whether her daughter really has finished her homework; the potential buyer of a used car wants to know whether the vehicle is really as good as the salesperson says; an interviewer may want to know whether the candidate is indeed as capable as he or she claims; a customs officer may want to know whether the traveler really has nothing to declare; an airport security officer wants to know whether the passenger really has no harmful intent when entering the aircraft; and a police detective wants to know whether a suspect's alibi is reliable. Successfully detecting lies in situations such as these would benefit individuals and the society as a whole.

For centuries, the question of whether discernable differences exist between liars and truth tellers has interested practitioners and laypersons (Trovillo, 1939). Throughout history, people have assumed that lying is accompanied by physiological activity in the liar's body. For example, in 1000 B.C., the Chinese forced suspected liars to chew rice powder and then spit it out. If the resultant powder was dry, then the person was judged to have been lying (Kleinmuntz & Szucko, 1984). There was a physiological basis for this assumption. Liars were assumed to fear being caught, and fear is associated with decreased salivation and a dry mouth (Ford, 2006). Nowadays, technology is used to measure physiological (and neurological) reactions—particularly the polygraph; voice-stress analyzers; electroencephalograms (EEG); and most recently, functional magnetic resonance imaging (fMRI). The promotion of such tools can be aggressive. For example, companies have begun to offer fMRI deception-detection services to investigators. Two companies—Cephos Corporation in Massachusetts and No Lie MRI, Inc. in California—claim to know with at least 90% accuracy whether a subject is telling the truth (Stix, 2008). However, a very small number of published studies have examined brain function during deception, and such claims lack strong empirical foundation (Greely & Illes, 2007; Porter & ten Brinke, 2010; Spence, 2008; Wolpe, Foster, & Langleben, 2005). Specifically, Spence (2008) points to problems with replication, large individual brain differences, and no clear brain regions associated with truth telling. Also, brain activity when lying varies depending on the situation. Ganis, Kosslyn, Stose, Thompson, and Yurgelun-Todd (2003) found that telling spontaneous lies corresponds to activation in different brain areas than does telling rehearsed lies; feeling strongly about the topic under investigation and the negative consequences of getting caught also corresponds to different brain activity than feeling less strong.

In this article, we neither discuss physiological or neurological cues to deceit nor focus on lie-detection tools that use equipment. Rather, we focus on an individual's overt nonverbal behavior or speech that human perceivers can discern without the aid of equipment. Further, we address whether people can detect lies when observing someone's nonverbal behavior or when analyzing someone's speech. This technique—observation—is the most common form of lie detection; in many situations, technologies that are used to measure physiological or neurological cues are unavailable or are not possible to implement.

In our view, research on lie detection through observations of nonverbal and verbal cues is overdue. Scientific journals

regularly publish overviews of research articles regarding nonverbal and verbal cues of deception (for recent examples, see DePaulo et al., 2003; Masip, Sporer, Garrido, & Herrero, 2005; Sporer & Schwandt, 2006, 2007; Vrij, 2005). These meta-analyses provide valuable information about how liars behave and the stories they tell, but they offer no explicit guidance about what lie detectors should do and avoid doing in order to detect deception.

This article consists of two sections. The first section focuses on pitfalls to avoid and outlines the major factors that lead to failures in detecting liars: We cluster 16 reasons into three categories (Vrij, 2007, 2008a): (a) a lack of motivation to detect lies, (b) difficulties associated with lie detection, and (c) common errors made by lie detectors. Discussing pitfalls is important because it provides insight into how lie detectors can improve their performance (e.g., by recognizing common biases and by avoiding common judgment errors). The second section of this article discusses opportunities for maximizing one's chances of detecting lies and elaborates on strategies for improving one's lie-detection skills. In this section, we first provide five recommendations for avoiding common errors in detecting lies. These recommendations are firmly based in a rich body of psychological research over the past few decades. Next, we discuss a relatively recent wave of innovative lie-detection research that goes one step further by introducing novel interview styles aimed at eliciting and enhancing verbal and nonverbal differences between liars and truth tellers by exploiting their different psychological states. The recommendations are relevant in varied walks of life, from the individual level (e.g., "Is my partner really working late to meet a deadline?") to the societal level (e.g., "Can we trust this informant when he claims that he can disclose information about an active terrorist cell in London?").

Before we discuss the common pitfalls associated with lie detection, three issues merit attention: (a) a definition of *deception*, (b) the underlying premises of verbal and nonverbal cues to deception and its detection, and (c) research methods used in deception research.

Defining *deception* is not a straightforward task. Deception has been studied through the lens of varied disciplines, including psychiatry, linguistics, and philosophy; and accordingly, diverse definitions have been offered (Granhag & Strömwall, 2004). In the present context, we deem Vrij's (2008a, p. 15) definition of *deception* to be sufficient: "*a successful or unsuccessful attempt, without forewarning, to create in another a belief which the communicator considers to be untrue.*" It is important to note that lying is an intentional act and that misremembering is not the same as lying.

Researchers have proposed different theoretical approaches to predict which verbal and nonverbal cues to deception may occur, particularly Ekman and Friesen's (1969) leakage and deception cues approach; Zuckerman, DePaulo, and Rosenthal's (1981) multifactor model; Ekman's (1985/2001) emotion approach; Buller and Burgoon's (1996) interpersonal deception theory; and DePaulo's self-presentational perspective (DePaulo, 1992; DePaulo et al., 2003). These approaches have three elements in common that have influenced verbal and nonverbal lie detection: the notion that, compared with truth tellers, liars (a) may experience stronger emotions (particularly fear, as a result of detection apprehension), (b) may experience higher levels of cognitive load, and (c) are inclined to use more and different strategies to make a convincing impression on others.

Traditionally, verbal and nonverbal lie detection has focused on the difference in emotions that liars and truth tellers experience. Ekman's (1985/2001) analysis of microexpressions is a prime example, but also lie-detection techniques promoted in police manuals are primarily based on the notion that liars are more concerned and nervous than truth tellers (Vrij & Granhag, 2007). The approach has limitations. First, experiencing emotions is not the sole domain of liars: Truth tellers can experience the same emotions, particularly if they know that they are scrutinized and/or are afraid of not being believed (e.g., see our later discussion of the Othello error). If emotional displays or cues of nervousness per se do not reliably distinguish between truth tellers and liars, the next step is to ask questions that will elicit such cues in liars but not in truth tellers or, alternatively, that will enhance such cues more in liars than in truth tellers. No such questioning technique exists to date, and it is doubtful that it can ever be developed (National Research Council, 2003). For the latter reason, in more recent lie-detection studies, researchers have concentrated on cognitive load. The premise here is that lying is mentally more taxing than truth telling. This approach shares one limitation with the emotion approach. Cues of cognitive load are not the sole domain of liars either; truth tellers also may have to think hard, and therefore they may display cues of being mentally taxed. However, unlike the emotion approach, interview protocols that elicit and enhance cues of cognitive load more in liars than in truth tellers can be developed, making it possible to discriminate between the two. We elaborate on this concept later in the "Exploiting the Differential Mental Processes of Truth Tellers and Liars" section. The same section also discusses another strain of recent lie-detection research that aims to exploit the fact that liars use more and different strategies to avoid detection than do truth tellers. In sum, in verbal and nonverbal lie detection, the emphasis has moved in recent years from emotion-based lie-detection techniques to cognitive-load lie-detection techniques that focus on liars' and truth tellers' different psychological states and take their differential strategies into account.

We base our analysis of pitfalls and opportunities in nonverbal and verbal lie detection on scientific research. In studies in which researchers have examined nonverbal and verbal cues to deception, trained raters watch video footage or analyze transcripts of such footage of truth tellers and liars. They analyze with particular coding systems the frequency of occurrence or duration of various nonverbal and verbal cues displayed by truth tellers and liars (e.g., all sorts of movements, eye contact, smiles, pauses, amount of detail, type of detail, contradictions) and compare the truthful and deceptive responses. There are two types of studies—those conducted in the field

and those conducted in the laboratory. In real-life studies, typically called "field studies," video footage of real-life settings, such as police–suspect interviews, is analyzed (Mann, Vrij, & Bull, 2002). In laboratory studies, video footage and/ or transcripts of participants who were instructed by researchers to tell the truth or lie for the purpose of the experiment are analyzed. Field studies probably have greater appeal because they are realistic. However, conducting field studies is problematic, particularly in establishing the *ground truth*— researchers can analyze only the responses known to be true or false. To establish this ground truth satisfactorily, independent case facts, such as medical evidence, material evidence, DNA evidence, or reliable eyewitnesses, are needed. Unfortunately, such facts are often unavailable. In laboratory studies, researchers (a) ask participants (mostly college students) to tell the truth or lie and (b) measure their nonverbal and verbal responses during both activities. In the studies published to date, participants have told the truth or lied about many different topics—a film they had just seen, possession of a certain object in their pocket, their involvement in the disappearance of some money, the number of dots that appeared on a screen, their feelings about certain people, or their opinions about controversial issues. More recently, researchers have introduced scenarios that better reflect forensic real-life situations. In a study by Hartwig, Granhag, Strömwall, and Kronkvist (2006), participants were sent to a shop to buy a product (truth tellers) or steal a wallet (liars) and were interviewed about the alleged shop visit. In a study by Vrij, Leal, Mann, and Granhag (in press), participants were sent to receive a package at a certain location and deliver it somewhere else and were then interviewed about this mission (liars had to hide the details of what they did). In study by Strömwall, Granhag, and Jonsson (2003), participants (a) were sent to a restaurant to have lunch (truth tellers) or (b) committed a mock crime (liars) and were asked to pretend that they had had lunch in a restaurant. And in a study by Vrij, Granhag, Mann, and Leal (in press), passengers at an international airport were asked to tell the truth or lie about their forthcoming trip. The advantage of laboratory studies is that researchers can establish the ground truth. However, laboratory studies have limitations. In such studies, participants do not choose to lie, but rather they are instructed to do so by the experimenter, meaning that lying is condoned. Another restriction is that the stakes (negative consequences of being caught or positive consequences of being believed) are never really high (Ekman, 1985/2001; Malone & DePaulo, 2001; Miller & Stiff, 1993). To raise the stakes in laboratory experiments, participants have been offered money if they succeed in lying (Vrij, Akehurst, Soukara, & Bull, 2002; Vrij, Edward, & Bull, 2001). In other studies, participants are told that they will be observed by their peers, who will judge their sincerity (DePaulo, Stone, & Lassiter, 1985), or told that being a good liar is an important indicator of being successful in a future career (DePaulo, Lanier, & Davis, 1983). Such studies provide useful examples of how people behave when they lie in daily life, because most of the lies people tell are low-stakes lies (DePaulo et al., 1996).

However, suspects in police interviews, smugglers at airports, corrupt politicians in conversations with suspicious journalists, and husbands who cheat on their wives all tell high-stakes lies. In an attempt to create examples of such lies, some researchers have raised the stakes further in laboratory studies. For example, participants in Frank and Ekman's (1997) experiment were given the opportunity to "steal" US $50. If they could convince the interviewer that they had not taken the money, they could keep all of it. If they took the money and the interviewer judged them as lying, they had to return the US $50 and they would also lose their US $10-per-hour participation fee. Moreover, some participants faced an additional punishment if they were found to be lying. They were told that they would have to sit on a cold, metal chair inside a cramped, darkened room ominously labeled "XXX," where they would have to endure anything from 10 to 40 randomly sequenced 110-decibel starting blasts of white noise over the course of 1 hour.

A study such as the one just mentioned raises ethical concerns. Yet, even apart from this concern, one might argue that the stakes in such a study do not compete with the stakes in some real-life situations. Providing even larger incentives to participants is always possible. For example, participants in Frank and Ekman's (1997) study could have been offered US $500 instead of US $50 if they succeed in convincing the interviewer that they are telling the truth. Introducing severe punishments for those who fail to convince the interviewer that they are telling the truth is, however, not possible, because university ethics committees will not approve such experiments. Also, punishments are never realistic, and participants may be aware of it. Ethical guidelines require researchers to inform participants before participation that they are free to withdraw from the study at any time. Hence, when participants are threatened with having to enter a dark room to face white noise for 1 hour, as in Frank and Ekman's study, they will realize that they are actually free to leave. In other words, it may not be possible to introduce truly high-stakes settings in laboratory experiments, and thus, examining how liars behave in high-stake real-life situations is often the only option (Barrett, 2005; Riggio, 1994).

In a typical lie-detection study, observers (often undergraduate students, but sometimes professionals such as police officers or police detectives) are shown short video fragments of people they do not know who are either telling the truth or lying. The fragments the observers have to judge are typically derived from the studies that have been discussed in the previous paragraph. The observers are asked to indicate after each fragment whether the person (often called the *sender*) was telling the truth or lying. Typically, half of the senders are truth tellers, and half are liars. (The observers are typically not informed what percentage will be truth tellers and liars, because this may result in them deliberately trying to achieve an equal number of truth and lie responses.) In such a study, simply guessing whether the sender spoke the truth or lied would result in correctly classifying 50% of the truths (truth accuracy rate) and 50% of the lies (lie accuracy rate),

resulting in a total accuracy rate (truth and lie accuracy rate combined) of 50%.

In lie-detection studies, observers are typically not given any background information about the senders and their statements, so the only source of information available to them is the senders' nonverbal and verbal behavior. (Exceptions are the "Strategic Use of Evidence" studies, which are discussed later in this article.) Such a situation is not typical of lie-detection in real life. In their study, Park, Levine, McCornack, Morrisson, and Ferrara (2002) asked college students (a) to recall an instance in their life in which they had detected that another person had lied to them and (b) to report how they had discovered the lie. Participants detected less than 2% of the lies by relying exclusively on the liars' nonverbal behavior or speech content at the time the lies were told. More commonly, participants discovered the lies through information from third parties (38%), physical evidence (23%), and confessions (14%). More than 80% of the lies were detected 1 hour or more after they were told, and 40% were detected more than a week later.

Pitfalls in Lie Detection

Lack of motivation to catch liars: The ostrich effect

Lies often remain undetected because people do not attempt to uncover the truth (Ekman, 1985/2001), a phenomenon labeled the *ostrich effect* (Vrij, 2008a). A fabrication might sometimes be more tolerable or pleasant than the truth for the message recipient, rendering ignorance the preferred option. For example, why bother trying to discover whether mendacious compliments about one's body shape, hairstyle, dress sense, or achievements are truthful?

For this reason, the ostrich effect extends to more serious lies, which thus also remain undiscovered. For example, Betty Currie, who was former U.S. President Bill Clinton's secretary, tried to avoid learning details of the relationship between the President and Monica Lewinsky (Vrij, 2008a). Indeed, rather than gain anything from knowing the truth, she would have been put in the difficult position of having to decide what to do with such knowledge. Not knowing what to do when having learned the truth may also be the reason why some people overlook evidence for possible infidelity by their romantic partners, instead remaining in denial (Feldman & Cauffman, 1999). If an individual discovers that his or her partner is having an affair, this discovery could create a difficult situation for the betrayed spouse. For example, there is the risk of the cheating partner leaving the betrayed spouse if confronted with the evidence. If they also have children, the betrayed spouse may feel that marital dissolution is undesirable because of its effect on their children. In such situations, it is worthwhile to engage defense mechanisms such as denial in order to avoid acknowledging the truth. In brief, even though the solution may be worse than the problem, ignorance can be bliss.

Difficulty of lie detection: Absence of Pinocchio's growing nose

In the classic tale *The Adventures of Pinocchio*, Pinocchio's nose grew larger each time he lied, but it was unaltered each time he spoke the truth, so his growing nose was a reliable cue to deceit. The meta-analyses that have been published to date have made clear that there are no nonverbal and verbal cues uniquely related to deceit. In other words, reliable cues to deception akin to Pinocchio's growing nose do not exist (DePaulo et al., 2003; Masip et al., 2005; Sporer & Schwandt, 2006, 2007; Vrij, 2005). The fact that there is no single cue that lie detectors can consistently rely upon makes lie detection inherently difficult.

The meta-analyses further reveal that the majority of the nonverbal and verbal cues that researchers typically examine in deception studies are not related to deception at all. For example, in DePaulo et al.'s (2003) meta-analysis—the most extensive one to date—the researchers investigated 158 cues, of which 118 (75%) showed no association with deception at all (including cues people often associated with lying, such as gaze aversion, postural shifts, pauses, and self-references). Many cues that were found to be to some extent related to deception were often examined sporadically, and it is important for researchers to replicate those cues' diagnostic value before drawing conclusions.

Subtle differences

Another difficulty that lie detectors face is that any behavioral differences between truth tellers and liars are typically small. For example, in DePaulo et al.'s (2003) meta-analysis, 14 of the 50 (28%) cues that had been examined in six or more deception studies revealed a significant association with deception, including liars who provided fewer details and less plausible answers than did truth tellers, and liars who made fewer illustrators (i.e., hand movements that accompany speech and illustrate it) than did truth tellers. However, the average effect size of the relation of the various behaviors with deception was only $d = .25$, which is considered to be a small or modest effect (Cohen, 1977). Because these relationships are modest, police manuals that describe nonverbal and verbal cues of deceit are misleading. Although such manuals often offer brief warnings about the unreliability of cues to deception, those caveats are easily lost in the ensuing detailed and enthusiastic descriptions of how behavior and speech differs between truth tellers and liars (see also Moston, 1992). Those descriptions are sometimes accompanied by photographs demonstrating "truthful forward posture" and "deceptive adaptor behaviors" (Inbau, Reid, Buckley, & Jayne, 2001, pp. 145, 149), thereby suggesting that (a) reliable cues to deception do exist and (b) the differences between truth tellers and liars are substantial and therefore easy to spot. Nevertheless, no scientific research supports these promises: Cues to deception are generally unreliable and faint.

The fact that cues to deception are unreliable and faint aligns with the previous contention that *emotions* and *cognitive load*—two main indicators of deception—can be displayed by both liars and truth tellers. A more promising picture may emerge when interviewers attempt to elicit and enhance cues to deceit. Such studies—discussed later in this article—are scarce and have only recently been conducted; in fact, none of these were published before 2003, the year that DePaulo et al.'s meta-analyses was published.

Countermeasures

A further complication for lie detectors is that liars—particularly those communicating high-stakes lies—often deliberately attempt to appear credible in order to avoid detection; strategies to achieve this goal are called *countermeasures*. A verbal veracity assessment tool widely used by professional lie catchers is statement validity assessment. Statement validity assessments are accepted as evidence in some North American courts (Ruby & Brigham, 1997) and in criminal courts in several West European countries, including Austria, Germany, Sweden, Switzerland, and The Netherlands (Köhnken, 2002, 2004). The statement validity assessment originates from Sweden (Trankell, 1972) and Germany (Arntzen, 1970, 1982, 1983; Undeutsch, 1967, 1982, 1984, 1989) and has been designed to determine the credibility of child witnesses' testimonies in trials for sexual offenses. The core phase of the statement validity assessment is criteria-based content analysis, a list of 19 criteria thought to be more present in truthful accounts than in false ones (including mentioning space and time, replication of conversation, recall of interactions, unexpected complications, and accounts of mental state; for recent statement validity assessment reviews, see Vrij, 2005, 2008a). However, children (and adults) who learn how criteria-based content analysis works can tell stories that sound plausible to experts in using such analysis (Caso, Vrij, Mann, & de Leo, 2006; Joffe & Yuille, 1992; Vrij et al., 2002, Vrij, Akehurst, Soukara, & Bull, 2004b; Vrij, Kneller, & Mann, 2000). Thus, it is possible to become a "sophisticated" liar by using knowledge-based countermeasures.

Liars may further realize that observers pay attention to their behavioral reactions to ascertain their truthfulness. Liars therefore may attempt to control behavior that could betray their lies (Buller & Burgoon, 1996; Burgoon & Buller, 1994; Burgoon, Buller, Floyd, & Grandpre, 1996; Burgoon, Buller, White, Afifi, & Buslig, 1999; Krauss, 1981). In particular, they may avoid exhibiting behaviors they believe will create a dishonest impression, instead trying to display behaviors they believe will make them appear credible (Hocking & Leathers, 1980; Leary & Kowalski, 1990). Gaze aversion and grooming gestures are among the behaviors most widely believed to signal deceptive behavior (see subsequent section), and liars therefore may avoid displaying them. They appear to be successful in avoiding displaying them because gaze aversion and grooming gestures are unrelated to deception (DePaulo et al., 2003).

Embedded lies

Another difficulty that lie detectors face is that lies are often embedded in truths. That is, rather than telling a blatant lie that is entirely untruthful, liars tend more to change specific vital details in an otherwise truthful story. Thus, when a man wants to conceal his illicit activities on, say, a Tuesday night, he could give details of what he really did on Monday night. Thus, most of the statement is truthful, with only a tiny, but vital, lie (e.g., having committed infidelity or murder) embedded (in this case, by omission or denial). Criminal suspects often tell such embedded lies (see Hartwig, Granhag, & Strömwall, 2007; Porter & Yuille, 1995; Strömwall, Granhag, & Landström, 2007). In a similar vein, when examining false identities adopted by criminals, Wang, Chen, and Atabakhsh (2004) found that such fraudsters typically alter only a small portion of their original identity.

Noncriminals who lie often use a similar embedded-lies strategy (DePaulo et al., 2003; Turner, Edgley, & Olmstead, 1975); this has also been demonstrated in experimental research. For example, in Bell and DePaulo's (1996) experiment, art students asked participants their views on a student's work. When the participants disliked the work, they sometimes overstated the specific elements they favored (e.g., the colors used in the painting) and understated what they disliked. In this lie strategy, most of what the participants said was truthful.

Embedded lies hamper the use of statement validity assessments and other verbal veracity assessment tools such as reality monitoring, because they typically examine the quantity and quality of details in a statement (Masip et al., 2005; Vrij, 2005). Lies that are embedded in predominantly truthful statements may be rich in high-quality details typically associated with credible statements, which could give the lie detector the erroneous impression that the statement is truthful. Lie detectors who focus on nonverbal behavior may make a similar mistake if the deceptive element of a liar's story remains unnoticed (e.g., *when* the person went to the gym) and if they overattend the truthful part instead (e.g., *what* the person did at the gym).

No adequate feedback

Another complication in lie detection is that lie detectors often do not receive adequate feedback about their judgments and therefore cannot learn from their mistakes. For feedback to be helpful, it should be provided frequently, reliably, and immediately. Thus, observers should be informed immediately after every interaction with another person whether that person was lying. They could then learn how liars truly behave and what they really say and incorporate such knowledge into improved lie-catching strategies. However, adequate feedback is often unavailable (DePaulo & Kirkendol, 1989). People often never discover that they have been lied to, or such knowledge is gained long after the interaction (Park et al., 2002). In many cases of wrongful conviction, the police and/or judge only find out their credibility assessment errors years or decades after they occur. By the time they learn that they

attributed honesty to a deceptive person or vice versa, it is too late for them to make meaningful changes to their decision-making strategies.

Customs officers also face feedback problems (DePaulo & Pfeifer, 1986). Part of their jobs is to detect smugglers among travelers. From the numerous passengers they decide not to search, they virtually get no feedback at all. Some of them may be smugglers, but once the officers let them pass unsearched, they will almost never find out that they made a mistake. They may not even get adequate feedback from the people they do search. Among the latter may be smugglers whose illegal goods remain undetected despite a search.

Violation of conversation rules

As we show in the "Exploiting the Different Mental Processes of Truth Tellers and Liars" section of this review, the act of lying becomes increasingly difficult when the lie detector asks further probing questions that follow an initial free recall by the target (Toris & DePaulo, 1984; Vrij, 2008a).[1] However, probes in daily-life conversations can violate social norms, being seen as inappropriate, strange, or impolite. Conversation partners may object to requests such as "Could you elaborate on that?" and "Could you repeat what you just said?" and may even end the conversation.

Further, although focusing on a speaker's body movements could benefit the lie detector because the speaker may reveal signs of deceit (DePaulo et al., 2003; Sporer & Schwandt, 2007), such movement scanning would seem strange and inappropriate in daily-life situations. Conversation rules dictate that a listener should look into a speaker's eyes, but the eyes themselves generally do not reveal reliable information about deception (DePaulo et al.; Sporer & Schwandt). Therefore, these conversation rules (i.e., discourage probing questions and maintain eye gaze) can hamper lie detection.

Good liars

A final factor contributing to the complexity of lie detection is that some people are proficient liars. Although surprisingly little research has addressed the features of a good liar, we believe six features may be especially important. The best liars are those individuals (a) whose natural behavior disarms suspicion; (b) who do not find it cognitively difficult to lie; (c) who do not experience emotions such as fear, guilt, or delight when they are lying; (d) who are good actors and who display a seemingly honest demeanor; (e) whose attractiveness may lead to an inference of virtue and honesty; and/or (f) who are "good psychologists."

Regarding the first feature of the proficient deceiver—natural behavior—certain behavioral patterns are associated with honesty and likability. Such behavioral patterns include gaze directed to a conversation partner, smiling, head nodding, leaning forward, direct body orientation, posture mirroring, uncrossed arms, articulate gesturing, moderate speaking rates, a lack of "ums" and "ers," and vocal variety (Buller & Aune,

1988; Ekman, 1985/2001; Tickle-Degnen & Rosenthal, 1990). Some people show such demeanor naturally even when they are lying (e.g., *natural performers*; Ekman, 1997). Natural performers are likely to be good liars because their natural behavior is likely to allay suspicion. Former U.S. President Bill Clinton was blessed with this characteristic, being naturally warm and engaging, and he was able to tell lies that were highly convincing to his audience. To illustrate, he received a standing ovation in response to his assertive denial of having sexual relations with Monica Lewinsky.

Second, effective liars find the act of telling lies to be cognitively unchallenging. They may plan their statements and behavior well in advance of the lie, and this rehearsal probably facilitates the ease of deception. Although it is obvious that liars should prepare a story that sounds plausible, this task is difficult for many people. Vrij and Mann (2001b) described five cases in which people who were suspected of having killed one of their relatives and initially denied having done so. Some of the individuals described made serious mistakes when they planned their stories, which made it easy to discern that they probably were hiding the truth. For example, one individual reported being knocked unconscious for 10 hours, but medical professionals determined that this scenario was impossible. Even liars who are typically well prepared can face unexpected situations that require an explanation. For example, a wife may confront her husband with the telephone number and address of a woman—unknown to her—that she found in his pocket; or a police detective may tell a suspect that he was seen by a witness at the scene of crime directly after it occurred. To lie successfully in these or similar situations, the liar needs a convincing and plausible answer. To spontaneously invent a plausible answer is probably too difficult for many liars, but original thinkers who are mentally creative may be successful in dealing with such immediate cognitive demands.

Third, liars differ in the emotions they experience while communicating a lie. One job applicant may feel guilty or anxious when exaggerating his or her qualifications, whereas another may not. One suspect may experience extreme anxiety when presenting a false alibi, whereas another suspect may remain calm. One student may feel excitement when sensing that the teacher believes his or her excuse for being late (referred to as *duping delight*), whereas another may feel trepidation and guilt. Deceiving others is made easier if the liar does not experience feelings of guilt, fear, or delight, because in that case, no emotional behavior needs to be suppressed. An absence of emotions during deception can be related to (a) an absence of remorse concerning a specific incident (e.g., defrauding a wealthy corporation), (b) being practiced at and feeling confident when lying, or (c) a lack of emotion in general. Psychopathic individuals, for example, have a profound emotional impairment and, accordingly, they experience little fear or remorse, even when telling a high-stakes lie (e.g., Hare, 2006; Porter & Woodworth, 2007). Moreover, people with a powerful imagination and the capacity to believe what they are saying are unlikely to experience guilt or fear. Sometimes such people can come to develop a false belief in their original lies

after the passage of time and are thus not, strictly speaking, lying (e.g., Pickel, 2004).

Fourth, although natural performers and those who experience little cognitive load or emotions when lying make the best liars, those who can effectively mask signs of cognitive load and emotions and concurrently display behavior that appears credible probably also make good liars. This feat requires good acting skills. If such individuals are not natural performers, their lies may raise suspicion, and they should adapt themselves adequately to disarm this suspicion. The sooner they adapt themselves, the more chance they have of successfully disarming suspicion. It is thus crucial to notice suspicion quickly, which requires good decoding skills.

Fifth, elements of physical appearance can promote effective lying. For example, attractiveness and characteristics of faces can lead to inferences of trustworthiness that facilitate the liar's success (e.g., Porter, England, Juodis, ten Brinke, & Wilson, 2008; Porter, Gustaw, & ten Brinke, 2010).

Last, good liars probably also have good insight into another person's thought processes. They have a sense of what other people want to hear and how to convey it persuasively. In that respect, successful lying could be related to emotional intelligence. However, we are not aware of research that has examined this phenomenon (for in-depth discussions of factors that make people good liars, see Vrij, 2008a; Vrij, Granhag, & Mann, in press).

Common Errors Made by Lie Detectors

People fail to catch liars not only because they are unmotivated to catch them or because the lie-detection task is difficult but also because they make systematic errors in the evaluation process. We believe that eight common errors can be identified, which we examine in this section.

Examining the wrong cues

There are widespread beliefs about how people behave and what they say when they lie. Overwhelmingly, both laypersons and professional lie catchers expect liars to act nervously; exhibiting gaze aversion ("liars look away") and displaying grooming gestures ("liars fidget") are among the most popular beliefs (Strömwall, Granhag, & Hartwig, 2004; Taylor & Hick, 2007; The Global Deception Team, 2006; Vrij, 2008a; Vrij, Akehurst, & Knight, 2006).[2] Charles F. Bond conducted an ambitious "beliefs about cues to deception" project that he published under the name *The Global Deception Team*. The team consisted of an international group of researchers from 58 countries, each collecting data from 20 male and 20 female adult residents of his or her country. The participants were asked to write down their response to the question, "How can you tell when people are lying?" The respondents mentioned 103 different beliefs, 9 of which were given by more than 15% of the participants. One cue in particular was prevalent: gaze aversion. People overwhelmingly asserted that liars avert their gaze, and 64% of the participants expressed this belief.

Gaze aversion was the most frequently mentioned belief about deception behavior in 51 out of 58 countries. Gaze aversion showed the lowest prevalence in the United Arab Emirates, where it was mentioned by 20% of the participants, making it the eighth most prevalent belief in that country.

Despite their overwhelming endorsement internationally, cues such as gaze aversion and grooming gestures are not reliable cues to deception (DePaulo et al., 2003; Sporer & Schwandt, 2007). Nonetheless, police and other legal professionals are encouraged to use such incorrect cues in detecting lies (Johnson, 2006a, 2006b). For example, in their influential police manual, Inbau et al. (2001)[3] advocated several nonverbal cues as being diagnostic of deception, including avoiding eye contact and grooming gestures, as well as cues such as frequent posture changes, placing hands over mouth or eyes, and lack of illustrators. Of these cues, only a decrease in illustrators has been found empirically to be associated with deception (e.g., DePaulo et al.). Thus, it is not surprising that, in a lie-detection study in which police officers viewed video fragments of suspects telling the truth or lying during their interviews, there was an inverse relation between (a) the endorsement of the lie cues promoted in the Inbau et al. manual and (b) the ability to distinguish suspects' truths and lies (Mann, Vrij, & Bull, 2004). In another study, college students who had been trained in the behavioral cues described by Inbau et al. performed worse on a subsequent lie-detection test than did untrained participants (Kassin & Fong, 1999). Police manuals often advise investigators to pay attention to signs of nervousness when attempting to detect deceit (Vrij & Granhag, 2007), advice that could easily lead to Othello errors (see subsequent section).

How do such false beliefs about lying develop? One likely contributing factor is moral reasoning. The stereotypical but sometimes incorrect view is that lying is "bad" (Backbier, Hoogstraten, & Meerum Terwogt-Kouwenhoven, 1997; Bok, 1989; DePaulo, 2004; DePaulo et al., 1996; Kowalski, Walker, Wilkinson, Queen, & Sharp, 2003; Robinson, 1994; Schweitzer, Hershey, & Bradlow, 2006). C.F. Bond argued that the prominent lying/gaze-aversion myth fits well with this lying-is-bad stereotype (The Global Deception Team, 2006). Because people often avert their gaze when they feel ashamed, they should do so, it is assumed, when engaging in the reprehensible act of lying (DePaulo et al., 2003). Moreover, because lying is bad, liars should feel nervous about the potential for getting caught, and they should exhibit signs of anxiety such as avoiding eye contact, increased fidgeting, and moving around. Because the association of lying and immorality is taught early in life, children as young as 5 to 6 years of age already associate gaze aversion and limb movements with deception (Rotenberg & Sullivan, 2003).

After such stereotypical beliefs are established, they persist for several reasons, including *illusory correlations*, or the perception of associations that do not exist, develop, strengthen, and cause observers to distort their information processing. For example, in Levine, Asada, and Park's (2006) intriguing experiment, observers who were led to believe that someone

was lying subsequently overestimated the amount of gaze aversion that the supposed liar had actually displayed. A second factor is the phenomenon of *confirmation bias*, a tendency to seek information that confirms existing beliefs (Darley & Gross, 1983); in this case, overattending to observations supposedly validates the relation between lying and gaze aversion/ nervousness. Third, when people make observations that could disconfirm a false belief, they often disregard or downplay it instead of interpreting the new evidence properly, a phenomenon called *belief perseverance* (C.A. Anderson, Lepper, & Ross, 1980). Researchers have found such phenomena to influence flawed deception detection and evaluation of evidence in legal cases more generally (Porter, Gustaw, & ten Brinke, 2010). Fourth, after observers form a strong opinion that makes sense to them, they often create further reasons to support their view (Strömwall et al., 2004). In fact, an opinion is often strengthened by merely thinking about the topic (Tesser, 1978). Fifth, as previously mentioned, people typically receive inadequate feedback about the validity of their lie-detection judgments, disallowing effective learning and improvements with experience. Ironically, effective learning opportunities may be available to seasoned criminal offenders more so than to legal decision makers. Offenders probably need to lie frequently and effectively in order to succeed in their criminal careers (e.g., Porter & Woodworth, 2007), and they receive frequent and often immediate feedback on whether their attempts to lie are successful. Accordingly, offenders have more correct views about cues to deception than do laypersons and professional lie catchers (Strömwall et al., 2004; Vrij & Semin, 1996). For example, the erroneous stereotypical view that liars increase their movements is not common among offenders (Vrij & Semin).

The combination of how incorrect beliefs originate and why they last could explain the advocacy of such beliefs in many police manuals. These views are based on subjective impressions about verbal and nonverbal behavior displayed by suspects during police interviews rather than on empirical research. Psychological research and theory suggest that these impressions can easily become distorted. Our advice to authors of police manuals, therefore, is to base their writing on science and not subjective impressions.

Overemphasis on nonverbal cues

In a minority of cases, observers rely on speech content when they attempt to detect deceit. This may occur for example with observers who are knowledgeable about the facts that are discussed by the target person. In such cases, the observer typically focuses on the narrative and compares his or her knowledge with the story the target person provides (e.g., Reinhard, Sporer, & Marksteiner, 2009). Second, observers occasionally have access to more than one statement—multiple statements from the same person or statements from different people—and thus focus on the level of consistency between the statements (Granhag & Strömwall, 1999, 2000a, 2000b, 2001; Strömwall & Granhag, 2005, 2007; Strömwall, Granhag, &

Jonsson, 2003). Also, observers may rely on verbal cues when they are distinctive, particularly when a statement appears to be against the self-interest of the storyteller (Noller, 1985), such as a confession.

When the observer possesses no factual information, has no statements for comparison, and when the speech content is not distinctive, observers are inclined to pay greater attention to nonverbal behavior than to verbal behavior. For example, Mann et al. (2004) showed 99 British police officers 54 videotaped fragments of police interviews with individuals who were suspected of rape, arson, or murder. The officers were asked to make veracity judgments following each fragment and to report the cues on which they based their decisions. The majority of the cues reported (78%) were nonverbal (also see Porter, Woodworth, & Birt, 2000). Also, when observers notice that someone's nonverbal behavior and speech content are discrepant, they typically rely on the nonverbal channel. For example, a job applicant with a reserved demeanor who claims to be enthusiastic about the job will be perceived as less keen about it than he or she reports (DePaulo, Rosenthal, Eisenstat, Rogers, & Finkelstein, 1978; Hale & Stiff, 1990; Zuckerman, Driver, & Koestner, 1982; Zuckerman, Speigel, DePaulo, & Rosenthal, 1982).

Lie detectors pay so much attention to nonverbal behavior for several reasons. First, people are used to making inferences from nonverbal behavior, including facial expressions. By observing behavior alone, people draw, with reasonable accuracy, many conclusions about other people, including their personality traits (e.g., extraversion, sociability), masculinity, femininity, or sexual orientation. From behavior, it is also possible to discern information about status, dominance, romantic involvement, and relationship potential (Ambady, Bernieri, & Richeson, 2000), and women are able to accurately rate men's interest in infants based only on viewing their faces (Roney, Hanson, Durante, & Maestripieri, 2006). Observing only 5 seconds of a stranger's behavior can result in reasonably reliable inference of psychopathic personality, characterized by callousness, manipulation, and persistent antisocial behavior (Fowler, Lilienfeld, & Patrick, 2009). Observers may even be unaware of the specific nonverbal behavior that guides their evaluations of credibility. In the Canadian case *R. v. Lifchus* (1997), Justice Cory noted:

> It may be that the juror is unable to point to the precise aspect of the witness's demeanor which was found to be suspicious...
> A juror should not be made to feel that the overall, perhaps intangible, effect of a witness's demeanor cannot be taken into consideration in the assessment of credibility.

Second, expectancies about the truthfulness of a person may influence the observer's attention. For example, analyses of police interviews in England showed that the police interviewers were "certain" of the suspect's guilt before interviewing him or her in 73% of the cases (Moston, Stephenson, & Williamson, 1992). Saul M. Kassin (2005, p. 216), who had asked numerous American police officers whether they are

concerned that their persuasive interrogation methods may evoke false confessions, reported that the most common reply is "No, because I do not interrogate innocent people." When lying is expected, police officers may have little interest in listening to a suspect's flat denials and prefer to look at bodily signs to confirm deceit (Millar & Millar, 1998).

Third, formulating and asking the best questions in some contexts, particularly suspect interviews, can be a cognitively taxing task. Concurrent attempts to detect deceit during these interviews may further increase the cognitive demands on the interviewers (Patterson, 1995, 2006). Accordingly, interviewers may be inclined to detect deceit via nonverbal channels, because the processing of nonverbal cues requires fewer cognitive resources than the processing of verbal cues (Reinhard & Sporer, 2008).

Fourth, the preference for nonverbal behaviors as indicators of deception may result from training, which encourages such an emphasis. For example, police training manuals place greater emphasis on nonverbal cues than on speech-content cues as cues to deceit (for a review of visual cues mentioned in police manuals, see Vrij & Granhag, 2007). This nonverbal dominance is further emphasized with explicit statements. For example, Inbau et al. (2001) stated in their widely used training manual that "as much as 70 percent of a message communicated between persons occurs at the nonverbal level" (p. 143). Popular books by academics may also promote a reliance on nonverbal behaviors in catching liars. For example, in Paul Ekman's (1985/2001) book *Telling Lies: Clues to Deceit in the Marketplace, Politics and Marriage*, there is much greater attention to nonverbal cues of deception than to speech-related ones. Although this was probably justified when the first edition of the book was published in 1985, the past 25 years have witnessed the generation of a large body of speech-related deception research, particularly concerning criteria-based content analysis (for reviews, see Vrij, 2005, 2008a) and reality monitoring (for reviews, see Masip et al., 2005; Sporer, 2004; Vrij, 2008a).

This overemphasis on nonverbal cues to deception is problematic. Meta-analyses of verbal and nonverbal cues of deception have shown that many speech-related cues are more diagnostic of deception than are nonverbal cues (DePaulo et al., 2003; Vrij, 2008a). In addition, observers who pay sole attention to nonverbal cues are less accurate in discriminating truths and lies than are those who consider speech content (C.F. Bond & DePaulo, 2006; Burgoon, Blair, & Strom, 2008; Lindholm, 2008). In addition, paying attention to visual cues may encourage a lie bias, or tendency to judge someone to be a liar (C.F. Bond & DePaulo). An explanation for this is that people have stereotypical beliefs about the behavior of liars (e.g., gaze aversion, fidgeting) rather than of truth tellers (The Global Deception Team, 2006; Strömwall et al., 2004; Vrij et al., 2006). In other words, people can judge deception based on the presence of some cues, but they need to judge truthfulness based on the absence of some cues. People normally respond to the presence of a signal rather than to the absence of a signal. A lie bias heightens the risk of false suspicion, even

conviction, of innocent suspects (Kassin, 2008a, 2008b; Kassin, Appleby, & Torkildson-Perillo, 2010; Kassin & Gudjonsson, 2004).

The Othello error

A common error in lie detection is to too readily interpret certain behaviors, particularly signs of nervousness, as diagnostic of deception. A common mistake for lie detectors is the failure to consider that truth tellers (e.g., an innocent suspect or defendant) can be as nervous as liars. Truth tellers can be nervous as a result of being accused of wrongdoing or as a result of fear of not being believed, because they too could face negative consequences if they are not believed (C.F. Bond & Fahey, 1987; Ofshe & Leo, 1997). The misinterpretation of signs of nervousness in truth tellers as signs of deceit is referred to as the *Othello error* by deception researchers (Ekman, 1985/2001), based on Shakespeare's character. Othello falsely accuses his wife Desdemona of infidelity, and he tells her to confess because he is going to kill her for her treachery. When Desdemona asks Othello to summon Cassio (her alleged lover) so that he can testify her innocence, Othello tells her that he has already murdered Cassio. Realizing that she cannot prove her innocence, Desdemona reacts with an emotional outburst, which Othello misinterprets as a sign of her infidelity. The Othello error is particularly problematic in attempting to identify high-stakes lies because of the observer's sense of urgency and a host of powerful cognitive biases that contribute to tunnel-vision decision making (see Porter & ten Brinke, 2009).

The use of heuristics

Instead of carefully scrutinizing someone's responses in evaluating his or her credibility, observers may rely on general decision rules (Fiedler & Walka, 1993). Person-perception researchers have observed that this can be an effective way for observers with limited time and attentional resources to deal with complex environments or demands (Albrechtsen, Meissner, & Susa, 2009; Macrae & Bodenhausen, 2001). However, general decision rules, or *heuristic*s, can easily lead to systematic errors in decision making (Burgoon et al., 2008).

In the subsequent section, we review some heuristics that may lead to systematic errors when trying to detect deception. It should be noted, however, that there is a relatively recent wave of research that has challenged the view that relying on heuristics is necessarily bad. For example, since the mid-1990s, research has provided empirical support that the use of certain heuristics in certain contexts leads to effective, accurate decisions (Gigerenzer, Todd, & the ABC Research Group, 1999). Detecting deception can be a complex endeavor. Sometimes, observers have little time or information to formulate an informed decision, and they must rely on heuristics (consider, for example, a bank clerk confronted by a robber with one hand in his or her pocket and claiming to have a gun). The question then is *which* heuristics to use and which to avoid. Deception researchers have focused considerable attention on

problematic heuristics but little on potentially effective heuristics.

Several heuristics that are commonly used in assessing credibility can be identified. Because people encounter more truthful than deceptive messages in their daily lives, they assume that most behavior that they encounter is associated with honesty (i.e., the *availability heuristic*, O'Sullivan, Ekman, & Friesen, 1988), in stark contrast with the bias evidenced by police officers. A related heuristic is the *anchoring heuristic* (Elaad, 2003), referring to the tendency to make insufficient adjustments from an initial value or assessment (the anchor) resulting in a final decision that is biased toward this value. Thus, if observers are preoccupied in thinking that someone is telling the truth, they will make insufficient adjustments when contrasting evidence emerges. It has further been argued that as romantic relationships become more intimate, partners develop a strong tendency to judge the other as truthful, the so-called *relational truth-bias heuristic* (D.E. Anderson, Ansfield, & DePaulo, 1999; Stiff, Kim, & Ramesh, 1992). An opposite anchoring problem has been observed in the legal system. According to dangerous decisions theory (Porter, Gustaw, et al., 2010; Porter & ten Brinke, 2009), the reading of a suspect's or defendant's face and emotional expressions (the anchor) plays a powerful role in influencing decisions concerning his or her honesty. This theory predicts that the human brain makes instantaneous inferences about trustworthiness that influence various aspects of interpersonal evaluation, including those about credibility and culpability. For example, jurors make strong but often inaccurate intuitive judgments of a defendant's general trustworthiness quickly upon seeing his or her face for the first time, with this initial intuitive assessment having a substantial influence on the manner in which the credibility of ensuing information from and about the individual is interpreted (Bar, Neta, & Linz, 2006; Porter et al., 2008; Todorov, 2008).

The *probing heuristic* (Levine & McCornack, 1996a, 1996b, 2001) refers to observers' tendency to believe a source more after the source has been probed. Guided by the belief that probing is an effective lie-detection strategy, the source is more likely to be believed if probing does not result in clear signs of deceit (and it often will not). The *representativeness heuristic* (Stiff et al., 1989) refers to the tendency to evaluate a particular reaction as an example of a broader category. In the present context, it could explain people's inclination to interpret nervous behaviors as signs of deceit. The *consistency heuristic* refers to the tendency to judge consecutive consistent statements as being truthful and consecutive statements that are inconsistent as being deceptive (Granhag & Strömwall, 2000a, 200b). The *expectancy violation heuristic* (Vrij, 2004) refers to the tendency to judge reactions that seem odd according to conversation norms and have a low base rate (e.g., keeping the eyes closed, or conversely, staring intently during a conversation) as being deceptive. According to the *falsifiability heuristic*, messages that that are easily falsifiable via reality checks appear less credible than messages that are not easily falsifiable, such as feelings, preferences, attitudes, and opinions (Fiedler & Walka, 1993).

The *facial appearance heuristic* (Vrij, 2004) refers to the tendency to judge people with attractive, symmetrical faces or baby-faced appearances as honest, and people with certain facial characteristics suggesting anger and unkindness as dishonest (Porter, England, Juodis, ten Brinke, & Wilson, 2008). Willis and Todorov (2006) found that observers infer the trustworthiness of others almost instantaneously upon seeing the face (100 milliseconds of exposure) and do so with a high level of confidence. Yet, Porter et al. (2008) found that observers were unable to discriminate philanthropists from felons featured in the television program *America's Most Wanted* despite believing that they "knew" who were the most and least trustworthy. Similarly, there are some faces that people agree look like that of a rapist, robber, or murderer (R. Bull & McAlpine, 1998; Dumas & Testé, 2006), which will influence the observer's assessment of honesty concerning the alleged offense.

The *visual cue primacy heuristic* (e.g., Burgoon et al., 2008; Stiff et al., 1989) refers to a tendency to assign primacy to visual information when attempting to detect deceit. Last, we add to this list the *single cue heuristic*, the oversimplified belief that all liars under all circumstances can be identified via single clear-cut cues. The belief that "liars look away" is probably the most popular example in this category (the *gaze aversion heuristic*; The Global Deception Team, 2006; Porter & ten Brinke, 2010).

Neglect of interpersonal differences

Obviously, there are large individual differences in people's behavior and speech (DePaulo & Friedman, 1998). Some people typically make many movements, others do not; some people are eloquent, others are not; some people show large variations in physiological responses, others do not, and so on. Although verbal lie-detection tools such as statement validity assessments attempt to control for these interpersonal behavioral differences via a validity checklist (Vrij, 2005, 2008a), assessing the impact of these individual differences remains a difficult task. Take, for example, controlling for *susceptibility to suggestion*, one of the factors appearing on the checklist. Some interviewees are more prone to an interviewers' suggestions than are others. The danger of suggestibility is that a suggestible person may be inclined to provide information that confirms the interviewer's expectations but that, in fact, is inaccurate. If the suggestible person is aware that the information that he or she provides is inaccurate, he or she is lying. Accordingly, Yuille (1988) and Landry and Brigham (1992) have recommended asking the interviewee a few misleading questions at the end of the interview to assess his or her susceptibility to suggestion. Because asking such questions about central information could harm the statement (it could contaminate someone's memory; Loftus, 2005; Loftus & Palmer, 1974; Porter, Yuille, & Lehman, 1999), Yuille (1988) recommends focusing on peripheral information (e.g., "When you were with your sister, which friend was also there, Claire or Sarah?" when the

interviewer is aware that there was no friend present). However, being restricted to asking questions about peripheral information is problematic because interviewees show more resistance to suggestibility for central aspects of an event than for peripheral aspects of an event (Dalton & Daneman, 2006; Goodman, Rudy, Bottoms, & Aman, 1990; Porter, Spencer, & Birt, 2003), and they are more resistant to suggestibility for stressful events, most likely the central information, than for less stressful events, most likely the peripheral information (Davies, 1991; Porter & Peace, 2007). Therefore, insight into interviewees' suggestibility for peripheral parts of the event cannot be effectively used to draw conclusions about their suggestibility for core events.

Nonetheless, professionals using statement validity assessments at least attempt to control for individual differences. Often, observers do not make such attempts when evaluating behavioral responses (Vrij, 2008a). Accordingly, people whose natural behavior looks "suspicious" (e.g., they are fidgety) run the risk of being falsely accused of lying. The literature provides examples of nervous-looking people whose nervousness led to being falsely accused. For example, in Florida, Tom Sawyer was interrogated for 16 hours regarding a sexual assault and murder and was issued threats, after which he gave a confession that likely was false. He became a prime suspect because he appeared embarrassed and his face flushed during an initial interview in which he denied involvement in the crime (Meissner & Kassin, 2002). In a notorious Canadian case, 14-year-old Steven Truscott was falsely convicted for the 1959 rape and murder of Lynn Harpur. In an initial interview with the suspect, inspector Graham observed that Truscott acted nervously and described him as a "lying, sexual deviant," initiating a process of tunnel vision that led to the boy's conviction and death sentence, later overturned (Porter & ten Brinke, 2009).

The tendency to interpret nervous behaviors as suspicious without taking individual differences into account puts several groups of people at risk, including introverted individuals and people who are socially anxious. The social clumsiness of introverts and the impression of tension, nervousness, or fear that is naturally given off by socially anxious individuals (DePaulo, Epstein, & LeMay, 1990; Riggio, Tucker, & Throck-morton, 1988; Schlenker & Leary, 1982) may be interpreted by observers as indicators of deception.

Errors are also easily made when people of different ethnic backgrounds or cultures interact, because behaviors naturally displayed by members of one ethnic group or culture may appear suspicious to members of another ethnic group or culture. Nonverbal behavior is culturally mediated. For example, Black Americans display more gaze aversion than do White Americans (Johnson, 2006a, 2006b; LaFrance & Mayo, 1976, 1978), and people from Turkey and Morocco who are living in the Netherlands show more gaze aversion than do native Dutch people (Van Rossum, 1998; Vrij, Dragt, & Koppelaar, 1992). It thus appears that looking into the eyes of the conversation partner is typical Caucasian behavior that is often not displayed by non-Caucasian individuals. Differences in culture

contribute to this effect. Looking into the eyes of a conversation partner is regarded as polite in Western cultures but is considered to be rude in several other cultures such as, for example, Japan (Vrij & Winkel, 1991; Vrij, Winkel, & Koppelaar, 1991; Winkel & Vrij, 1990). Many groups of Aboriginals in Canada suppress expressions of their emotions, and such apparent flat affect may be considered inconsistent with the context at hand, and it may be interpreted as a sign of deception or lack of remorse by decision makers (Porter & ten Brinke, 2009). Brant (1993, p. 261) observed that most Caucasian Canadians see "people who do not provide direct eye contact . . . as being shifty, devious, dishonest, crooks, slippery, untrustworthy, etc." In contrast, most Aboriginal cultures in Canada consider direct, sustained eye contact as rude, hostile, and intrusive. That is, the Aboriginal custom of avoiding eye contact as a sign of respect may easily be interpreted as an indication of deception by non-Aboriginal observers, including members of the judiciary.

Researchers have found other culturally determined differences in nonverbal behavior. For example, in the Netherlands, an experiment examining the nonverbal behavioral patterns of native Dutch Caucasian and Black Surinamese residents (citizens originated from Suriname, a former Dutch colony, but now living in the Netherlands) revealed large behavioral differences between the two groups, regardless of whether they were telling the truth or lying. Surinamese people made more speech disturbances, exhibited more gaze aversion, smiled more, and made more self-adaptors (e.g., fidgeting) and illustrators whether lying or not (Vrij & Winkel, 1991). In the United States, Johnson (2006a, 2006b) reviewed 120 videotaped police–citizen interactions of a noncriminal nature. The findings replicated those of Vrij and Winkel (1991) in that Blacks displayed more gaze aversion, smiling, and hand gestures than did Whites.

This means that observers need to be careful in cross-cultural interactions and should interpret the nonverbal behaviors displayed by senders of a different ethnic origin in light of cultural differences (Ruby & Brigham, 1997; Vrij, 2008a). Experimental research has demonstrated that this does not always happen and that cross-cultural nonverbal communication errors occur. That is, nonverbal behavioral patterns that are typical for an ethnic group are interpreted by Caucasian observers as signs of deception (Vrij & Winkel, 1992, 1994). It is important to note that these issues are relevant not only for police investigators, but also for professionals working in the immigration service (Granhag, Strömwall, & Hartwig, 2005).

Neglect of intrapersonal variations

Different people respond differently not only in the same situation (*inter*personal differences), but also in different contexts (*intra*personal differences). Neglecting or underestimating intrapersonal differences is another error that lie catchers make. In police interviews, detectives are advised to examine a suspect's natural, truthful behavior during the small talk preceding the interview and to compare this behavior with the behavior

shown by the suspect during the actual interview. Differences in behavior could then be interpreted as "significant" (Inbau et al., 2001). This approach is also used and advocated by researchers (Frank, Yarbrough, & Ekman, 2006; Hirsch & Wolf, 2001). Although the approach sounds appealing, it is conducive to forming incorrect judgments because it is based on an incongruent comparison. Engaging in small talk and discussing the crime itself are fundamentally different situations. Small-talk conversations are low-stakes situations in which the suspect's responses are unlikely to have any negative consequences. In contrast, the core investigative elements of the interview are high-stakes situations in which the suspect's reactions and responses are critical. Therefore, it is not surprising that both guilty and innocent suspects tend to show different behaviors during small talk compared to during the actual interview (Vrij, 1995). This problematic issue also plagues the control-question polygraph test, because it is difficult to come up with control questions that are as significant as the key questions concerning the crime (National Research Council, 2003). The tendency to neglect or underestimate the importance of intrapersonal differences is an error that not only lie detectors make; it is a well-known error in social perception and relates to the fundamental attribution error (Ross, 1977).

Existing interview techniques

Many interview strategies advocated by police manuals can impair lie detection. For example, police detectives are sometimes advised to confront suspects at the beginning of the interview with the evidence they have previously in their investigation (Hartwig et al., 2006; Leo, 1996). This tactic is designed to show suspects that it is fruitless to remain silent and that they are better off confessing. Experimental research has revealed that this interview style hampers lie detection (Hartwig, Granhag, Strömwall, & Vrij, 2005). One of the problems liars can face is ignorance about the level of knowledge held by the observer. This makes it difficult to know what they can say without assuming the risk of offering statements that are contradictory with known facts. If police officers promptly disclose their knowledge, they reduce the uncertainty for deceptive suspects and may inadvertently facilitate the ease of lying. Disclosing evidence early on provides liars with the opportunity to change their stories and to give an innocent explanation for the evidence.

Another misguided strategy from an informed lie-detection perspective is to accuse someone of lying. This affords deceptive suspects the ideal opportunity to "escape" from the interview situation by saying that they will no longer cooperate with the investigation, claiming that further cooperation is futile because they are not believed anyway. Also, accusing someone of lying may elicit the same responses in liars and truth tellers. That is, both suspects correctly accused of lying and those wrongly accused of lying may become afraid of not being believed (Ofshe & Leo, 1997). Because of that fear, both groups may show the same nervous responses (C.F. Bond & Fahey, 1987).

Overconfidence in lie-detection skills

The final error that we will highlight is that professional lie catchers tend to overestimate their ability to detect deceit. Research has consistently shown that when professional lie catchers and laypersons are compared, professionals are more confident in their veracity judgments but are no more accurate (DePaulo & Pfeifer, 1986; Garrido, Masip, & Herrero, 2004; Kassin, Meissner, & Norwick, 2005; Meissner & Kassin, 2002). This tendency to overconfidence is not unique to police officers but is common among many groups of professionals in carrying out their job duties (Allwood & Granhag, 1999). Further, some research has suggested that more experienced professional lie catchers are more confident in their credibility-assessment abilities than are their less experienced counterparts but that they are no more accurate (e.g., Porter et al., 2000).

The overconfidence could, in part, be explained by overzealous promotion of lie-detection tools by those with commercial interests. No lie-detection tool used to date that is based on analyzing nonverbal and verbal behavior is accurate—far from it (Vrij, 2008a). Despite the fallibility of those tests, Paul Ekman, an American emeritus professor of psychology who has specialized in nonverbal cues to deceit, said in an interview with *The New York Times* (Henig, 2006) that his system of lie detection can be taught to anyone, with an accuracy of more than 95%. However, there is no published study that supports this claim. In a similar vein, one of the interview techniques discussed in detail in Inbau et al.'s (2001) manual is the behavior analysis interview. The authors claimed that interviewers specifically trained and experienced in behavior analysis assessment can correctly identify the truthfulness of a person 85% of the time. However, conclusive evidence to support this claim is lacking (Blair & Kooi, 2004; Horvath, Jayne, & Buckley, 1994; Vrij, Mann, & Fisher, 2006a; Vrij, Mann, Kristen, & Fisher, 2007).

Confidence in lie detection is not related to accuracy. In a meta-analysis of the confidence–accuracy relation that included 18 samples, the relation appeared to be virtually non-existent ($r = .04$), not differing significantly from zero (DePaulo, Charlton, Cooper, Lindsay, & Muhlenbruck, 1997). Such a low correlation between confidence and accuracy is not unique for veracity judgments; other areas of cognitive performance, such as eyewitness identification, reveal a similar pattern (Sporer, Penrod, Read, & Cutler, 1995).

High confidence in one's ability to catch liars can be harmful when the confidence is unjustified (Kalbfleisch, 1992). High confidence often results in making quick decisions on the basis of limited information (Levine & McCornack, 1992; Lord, Ross, & Lepper, 1979), or tunnel vision (Porter & ten Brinke, 2010). In addition, high confidence may make investigators attempt to detect lies via demeanor alone and not search for physical evidence (Colwell, Miller, Lyons, & Miller, 2006). High confidence also is likely to reduce motivation to learn more about lie detection, because investigators may consider themselves already experts in the area. An unwillingness to learn more about lie detection is obviously undesirable, given professional lie catchers' typically low performance at the task

(C.F. Bond & DePaulo, 2006; Vrij, 2008a). Regarding this performance, Vrij reviewed 28 lie-detection studies with professionals (e.g., police officers, police detectives, parole officers) as lie detectors. On average, these professionals correctly classified 56% of liars and 56% of truth tellers, whereas 50% could be expected by chance alone. A lively discussion about the existence of individual differences in the ability to detect deceit has recently emerged.[4]

Overconfidence is a problem not only when it comes to one's general ability to detect lies but also when it leads to serious problems in an individual veracity assessment. For example, overconfidence in assessing a denying (but guilty) suspect as a truth teller will result in the suspect being released, and it provides opportunities for the suspect to commit more crimes. In addition, if a police detective is confident that a suspect is lying, he or she may subject the suspect to persuasive interrogation techniques in order to obtain a confession. This can harm innocent suspects in particular. Kassin, Goldstein, and Savitsky (2003) found that when innocent suspects are mistakenly identified as guilty, an interrogation style that is even more coercive than those experienced by guilty suspects can occur. That is, interrogators who do not believe the innocent suspect's denials are inclined to double their efforts to elicit a confession (Kassin et al.).

Opportunities in Lie Detection

Avoiding the errors

Avoid examining the wrong cues and pay attention to the more diagnostic verbal and nonverbal cues to deceit. As previously discussed, observers often base their veracity decisions on cues that are not diagnostic of deception. Thus, it sounds plausible that observers may become better at discriminating truths and lies if they are taught to pay attention instead to deception cues that are more diagnostic. Several training studies have addressed this issue, and these are reviewed in detail by Frank and Feeley (2003) and Vrij (2008a).

In all extant training studies, observers have been exposed to short videotaped or audiotaped interviews with a number of people who were telling either truths or lies. Generally, 1 of 3 procedures was used. Some studies have used a *focusing* procedure in which observers are asked to pay attention to specific cues and ignore others. Other studies have used an *information* procedure in which observers receive information about the actual relation between certain behaviors and deception. Yet other studies have used an *outcome feedback* procedure in which each time observers made a decision, they are informed about the accuracy of that decision. In all three types of procedures, the performance of these trained participants is then compared with the performance of untrained and uninformed (control) participants.

Most studies have revealed that trained observers are better at distinguishing between truths and lies than are control observers, regardless of the training method used. However, these improvements have typically been small. On average, the

control observers detected 53.4% of the truths and lies correctly, and the trained observers 57.66%. In other words, people can, to a limited extent, be trained to become better lie detectors.

The training studies have revealed two more outcomes that are worth discussing. First, Levine, Feeley, McCornack, Hughes, and Harms's (2005) experiment included bogus training groups that were taught cues that are *not* diagnostic cues to deception. They found that sometimes these bogus training groups performed better than the control groups, suggesting that the simple act of training, rather than the content of the training, may improve accuracy. In alignment with this, Porter, Woodworth, McCabe, and Peace (2007) found that the provision of *any* feedback (accurate or inaccurate) following deception judgments had a positive, albeit modest, influence on deception detection. It could be that the trained observers assessed the messages more critically than the control observers (Levine et al., 2005). Alternatively, training may make observers more motivated to perform well (Hartwig & Bond, 2010).

Other studies have showed worse performance by trained observers than by control observers. For example, when Kassin and Fong (1999) trained observers to examine the cues taught by the Inbau group as reported in their manual (Inbau et al., 2001), the observers performed worse than their untrained counterparts. In other studies where it was found that training impaired lie detection (Köhnken, 1987; Vrij, 1994; Vrij & Graham, 1997), the observers were police officers rather than undergraduate students. Vrij and Graham found that the students performed better as a result of the information they received, whereas police officers performed worse after having received the same information. We can only speculate as to why police officers do not appear to benefit from the provision of such information. One explanation is that the information confuses them (see also Köhnken). Perhaps the information Vrij and Graham gave about the relation between personality traits and deceptive behavior was beyond the grasp of the police officers who are probably not familiar with personality theories. The student observers in their experiment were psychology students and hence familiar with personality theories (albeit not with the relation between personality traits and deception). A second explanation is that police officers refused to use the information provided because it contradicted their own beliefs. For example, in Vrij's (1994) study, the observers were told that liars typically show a decrease in hand and finger movements, whereas police officers typically assume that an increase in hand and finger movements indicates deception. Perhaps the officers refused to accept the information provided by an outsider (the experimenter) and continued to rely on their own experience and beliefs instead.

The small improvements found in research may not necessarily reflect the true potential of teaching people to detect deceit. The training programs were typically brief and sometimes lasted no more than 15 minutes. Longer, more intensive training sessions such as the ones used in Porter et al.'s (2000) study (2-day training: pretraining vs. posttraining, 40.4% vs. 76.7%)

and in Porter, Juodis, ten Brinke, Klein, and Wilson's (2010) study (2-hour training: pretraining vs. posttraining, 51.2% vs. 60.7%) achieved greater success. The training programs also did not address the complex nature of lie detection. For example, in studies using the information procedure, observers were taught a set of cues that liars may display. This approach is limited because not all liars will show these specific sets of cues. Moreover, in all of these studies, the observers were exposed to low-stakes truths and lies, and low-stakes situations do not provide much opportunity to detect deception. It could thus be possible that training has larger effects if observers are given more sophisticated training and are exposed to truths and lies told in high-stakes situations.

We believe, however, that training programs as described in this section will never yield high accuracy rates. The limitation of these programs is that trainees are restricted to passive observation of truth tellers and liars. Such a method is limited because cues of deception are faint and unreliable. We therefore see more potential in training programs that teach trainees to actively *elicit* or *enhance* diagnostic cues to deception. In the section on "Exploiting the Different Mental Processes of Truth Tellers and Liars," we present interview styles designed to achieve this.

Avoid relying on nonverbal cues only. Research addressing the individual strategies of lie detectors has indicated that detecting truths and lies becomes more successful when speech content is taken into account. Mann et al. (2004) showed 99 police officers 54 videotaped fragments of police interviews with murderers, rapists, and arsonists and found that good lie detectors reported to have relied upon verbal cues (e.g., vague reply, contradictions in story) more often than did poor lie detectors. In addition, there was an inverse relation between the number of visual cues reported to have been relied upon (e.g., gaze aversion, posture, movements) and accuracy. In particular, police officers who mentioned that liars look away and fidget achieved the poorest scores. In other words, those who listened carefully to what suspects had to say were better lie detectors than those who concentrated on suspects' nonverbal behavior.

D.E. Anderson, DePaulo, Ansfield, Tickle, and Green (1999) and Feeley and Young (2000) found a positive relation between the number of vocal cues that participants reported to have relied upon (e.g., speech errors, speech fillers, pauses, voice) and accuracy. In a study in which participants attempted to detect truths and lies told by a convicted murderer, participants who mentioned gaze aversion and fidgeting as cues to deceit achieved the lowest accuracy scores (Vrij & Mann, 2001a). Also, Porter et al. (2007) found that the more visual cues the participants reported, the worse their ability to distinguish truths and lies. In summary, all of these studies showed that in order to detect lies, listening carefully to what is said is necessary and that merely paying attention to behavior impairs lie detection.

Another body of research suggests that a "holistic" approach to detecting deception may be ideal. Ekman and

O'Sullivan (1991) found that participants who reported to have relied upon both vocal/verbal and visual cues obtained higher accuracy rates than did participants who reported to have relied upon only vocal/verbal or visual cues. This is supported by experimental research in which the nonverbal and verbal cues of truth tellers and liars were examined. That research has demonstrated that the best classifications of truths and lies are made when both sets of cues are taken into account (Porter & Yuille, 1996; Porter et al., 1999; Vrij, Akehurst, Soukara, & Bull, 2004a; Vrij, Edward, Roberts, & Bull, 2000; Vrij, Evans, Akehurst, & Mann, 2004). Thus, attendance to multiple cues from words and the visual channel should provide the lie catcher with better ammunition for the task at hand (Porter & ten Brinke, 2010).

Observers can pay attention to nonverbal behavior and speech simultaneously in three different ways, which all enhance lie detection. First, observers could take into account both nonverbal and verbal cues without looking at the relation between the two sets of cues. This was the case in the previously discussed research. Second, observers could examine nonverbal behavior in relation to speech content, an approach common in communication research (Bavelas & Chovil, 2006; Bavelas, Chovil, Coates, & Roe, 1995; Bavelas & Gerwing, 2007; P. Bull, 2009; Freedman, 1972; Kendon, 1994, 2004; McNeill, 1985, 1992) but often ignored by deception researchers. A recent experiment showed the potential of this approach (Caso, Maricchiolo, Bonaiuto, Vrij, & Mann, 2006). When the entire interview was taken into account, truth tellers and liars displayed a similar number of illustrators. Differences did emerge between truth tellers and liars only when specific types of illustrators were examined when answering specific questions. Third, observers could examine mismatches between nonverbal behavior and speech content (Ekman, 1985/2001; Ekman & O'Sullivan, 2006). Thus, a person who makes a head shake while agreeing to cooperate may not actually be as cooperative as he or she wants to appear. Thus, although a perfectly reliable cue to deception does not exist, the combination of attention to changes in nonverbal/ body language, verbal, and facial channels—ideally videotaped to permit review and systematic analysis—can provide the basis for an informed opinion about credibility as long as it is backed by other evidence (Porter & ten Brinke, 2010).

However, mistakes are easily made. For example, some people display clear signs of distress when they talk about a negative event they have experienced, whereas others do not (Burgess, 1985; Burgess & Homstrom, 1974; Vrij & Fischer, 1995). Thus, the varying communication styles represent a personality factor (Littman & Szewczyk, 1983). However, observers, including police detectives, typically believe that absence of distress during an interview about an upsetting event is a valid indicator of deceit (Greuel, 1992). As a result, different emotional displays have a differential effect on the perceived credibility of complainants, and emotional victims are more readily believed than victims who report their experience in a controlled manner (Baldry & Winkel, 1998; Baldry, Winkel, & Enthoven, 1997; Bollingmo, Wessel, Sandvold, Eilertsen,

& Magnussen, 2009; Bothwell & Jalil, 1992; Kaufmann, Drevland, Wessel, Overskeid, & Magnussen, 2003; Vrij & Fischer, 1997; Wessel, Drevland, Eilertsen, & Magnussen, 2006; Winkel & Koppelaar, 1991).

Another relevant point relating to the potential for misinterpretation by the lie catcher concerns facial expressions. Ekman has long argued that deceptive emotional information is betrayed (leaked) by *microexpressions*, fleeting but complete facial expressions that are thought to reveal the felt emotion during emotional concealment and are suppressed within 1/5th to 1/25th of a second (Ekman, 1985/2001). This idea has enjoyed increasing popularity in the media (Henig, 2006) and scientific community (Schubert, 2006), despite being backed by little empirical research. Porter and ten Brinke (2008) conducted the first thorough investigation of facial expressions associated with genuine and deceptive emotions. Participants viewed disgusting, sad, frightening, happy, and neutral images, responding to each with a genuine emotion or a deceptive one, by either *masking*, replacing one emotion with another, or *simulating*, creating an emotional expression in a neutral state, while being judged by "blind" observers. The researchers analyzed each 1/30-second frame (104,550 frames in 697 expressions) for the presence of the muscle actions of the universal expressions and for the presence of microexpressions. Their findings indicated that emotional expressions inconsistent with the intended display did occur more frequently in the masked condition than in the genuine or simulated conditions. All participants showed such predicted "leakage" on at least one attempt at faking an emotion. However, Porter and ten Brinke found only a small number of partial (lower or upper face) microexpressions. Although some of the microexpressions betrayed the hidden emotion, they sometimes occurred during genuine expressions. The leakage was typically longer and more salient than Ekman had predicted. As such, the lie catcher should attend to the expressions that are inconsistent with what is being said or with the context, but he or she should be cognizant that these expressions can be meaningless. Therefore, when lie detectors believe that there is a mismatch between someone's nonverbal behavior and speech content, they should be careful about how to interpret it. A final judgment that the person is lying should not be made too quickly, and alternative explanations should be considered. In this context, some researchers refer to these cues as "hotspots" deserving further attention rather than as being necessarily indicative of lying (Frank et al., 2006, p. 234). There is a serious risk that nonverbal hotspots are too easily interpreted as lies. In that context, we underline Porter and ten Brinke's (2010) conclusion that nonverbal cues only assist investigators who are informed about the complex relations between behavior and deceit.

Avoid the Othello error: Consider alternative explanations when interpreting cues of emotions and cognitive load. As previously mentioned, the *Othello error* refers to mistakenly interpreting signs of nervousness as cues to deceit. The difficulty that lie detectors face is that both liars and truth

tellers may display signs of emotions and/or nervousness in high-stakes situations. Consider the distress one must feel to be falsely accused by the police of having committed a serious crime or by a partner about having had an affair. Emotion cues may not conclusively demonstrate that someone is lying, and the lie detector should thus be cautious in interpreting such cues as signs of deceit. Instead, in interpreting emotional responses, the lie detector should consider questions such as the following: "Is my questioning likely to evoke emotions in the respondent, regardless of whether he or she is guilty?" "Is the present situation likely to evoke emotions in the respondent anyway?" And "Is this person the type who is likely to be emotional in this situation anyway?" (Ekman, 1985/2001).

In theory, another cluster of cues could betray deception—cues associated with having to think hard (labeled *cognitive load*; Buller & Burgoon, 1996; DePaulo et al., 2003; Ekman, 1985/2001; Vrij, 2008a). For example, Porter and ten Brinke (2008) found that when participants worked hard to neutralize an emotion (e.g., maintaining a neutral expression when viewing a horrific accident scene), their blink rate lowered relative to when they expressed a genuine emotion (e.g., showing fear or horror when viewing the same scene). A decrease in blink rate is a sign of cognitive load (Bageley & Manelis, 1979). In forensic settings, however, such cues are not solely exhibited by liars; truth tellers may have to think hard while answering questions in a cognitively and emotionally complex context. Again, in interpreting cues of cognitive load, the lie detector should ask him- or herself the same kinds of questions as when interpreting signs of emotions, such as "Is my questioning likely to evoke cognitive load in the respondent, regardless of whether he or she is guilty?"

Avoid relying on heuristics and rely on multiple cues in a flexible manner. As previously discussed, deception research has revealed that no single behavioral or verbal cue is uniquely related to deception. In other words, there is no giveaway clue like Pinocchio's nose. Instead, different people show different cues to deception in a given situation (i.e., interpersonal differences) and the same person shows different cues to deception on different occasions (i.e., intrapersonal differences). Therefore, it is inappropriate to use fixed decision rules on the basis of heuristics such as "liars look away" when attempting to detect deceit. In fact, research has demonstrated that people who focus on single nonverbal or verbal cues are typically poor lie detectors (Mann et al., 2004; Vrij & Mann, 2001a). Instead, it is better to make veracity assessments on the basis of multiple cues (Ekman, O'Sullivan, Friesen, & Scherer, 1991; Porter & ten Brinke, 2010; Vrij et al., 2004a; Vrij, Edward, et al., 2000; Vrij & Mann, 2004). However, even such clusters of cues do not fit all liars; they also do not fit a particular liar in all situations. In other words, fixed decision rules that include multiple cues are not satisfactory either. Instead, better accuracy rates are achieved by using flexible decision rules that include multiple cues (Ekman & O'Sullivan, 1991; Ekman, O'Sullivan, & Frank, 1999; Mann et al., 2004; Vrij, 2008a).

Take into account inter- and intrapersonal differences and pay attention to deviations from a person's honest reactions in similar situations: The comparable truth. Lie detectors should take inter- and intrapersonal differences into account when making veracity judgments. Therefore, the relevant question for the lie detector to ask is whether the nonverbal behavior and speech patterns displayed by a person differ from this person's known behavior when delivering truthful responses. As discussed earlier, we advise police detectives to examine a suspect's natural truthful behavior during the small-talk preceding the interview and to compare this behavior with the behavior displayed by the suspect during the actual interview. This approach is prone to incorrect judgments, because engaging in small talk and discussing the crime are two fundamentally different situations. For this technique to work, it is essential that the known truthful response (e.g., baseline response) is made under similar conditions to the response under investigation, labeled the comparable truth (Vrij, 2008a). People react differently in formal settings (e.g., during a selection interview) than in informal settings (e.g., when at home with the family). According to Vrij (2006), they also react differently when they are accused of wrongdoing (e.g., situation during the actual interview) than when they are unchallenged (e.g., situation during small talk), and they respond differently in high-stakes situations than in low-stakes situations (Porter & ten Brinke, 2010; Vrij, 1995). In addition, people show different behaviors when they are interviewed by different people (Vrij & Winkel, 1991). Behavior is also topic related: People respond differently when discussing a topic that embarrasses them than they do when discussing a neutral topic (Kleinke, 1986), and they respond differently when discussing a topic that they care about or is important to them than they do when discussing a topic with which they have less personal involvement (Davis & Hadiks, 1995; Matarazzo, Wiens, Jackson, & Manaugh, 1970). Last, people's behavior sometimes varies over time in the same interview (Buller & Burgoon, 1996; Burgoon et al., 1999; Stiff, Corman, Krizek, & Snider, 1994; White & Burgoon, 2001), or, if they are interviewed on more than one occasion, changes may occur over repeated interviews (Granhag & Strömwall, 2002). Therefore, when lie detectors wish to compare a person's given nonverbal response with his or her truthful nonverbal response, they need to make sure that the given and truthful responses are taken from the same interview setting, that the person talks about similar topics in the given and truthful parts, and that these topics are discussed within a short period of time.

Vrij and Mann (2001a) provided an example of how the comparable-truth technique could be used. During a videotaped real-life police interview, a man suspected and later convicted of murder was asked to describe his activities during a particular day. The murder suspect described his activities during the morning (went to work), afternoon (visited a market) and evening (visited a neighbor). Detailed analyses of the videotape revealed a sudden change in behavior as soon as he began to describe his activities during the afternoon and evening. A possible reason for this variation may have been that he was lying, a view supported by the evidence. Police investigators could confirm his story with regard to his morning activities, but they revealed that his statement about the afternoon and evening was fabricated. In reality, he met the victim in the afternoon and killed her later that day. In this case, we were able to make a good comparison. The man described a seemingly normal day, and there are no good reasons why different behaviors would emerge while describing different parts of that day.

The comparable-truth technique has inevitable shortcomings, and mistakes will still be made with its application. The main problem is that it is difficult to rule out that the observed nonverbal and verbal differences are caused by factors other than deceit. Open-mindedness when interpreting the differences in behavior and speech is thus crucial. Also, differences between the baseline behavior and speech and the behavior and speech under investigation may be subtle and therefore difficult to spot. Last, an absence of behavioral and speech-related differences between the baseline behavior and speech and those under investigation does not necessarily mean that the person is telling the truth.

Exploiting the different mental processes of truth tellers and liars

The first five guidelines share one feature: They all aim to examine and interpret more carefully the nonverbal and verbal cues displayed by liars. And they have one serious limitation: The cues that lie detectors are encouraged to examine and interpret are faint and unreliable. In this section we discuss a fundamentally different approach to nonverbal and verbal lie detection: to elicit more, more blatant, and more reliable cues to deceit. We achieve this aim by exploiting the different psychological states of truth tellers and liars via two different approaches. The first approach, *strategic questioning*, uses specific questions that elicit the most differential responses between truth tellers and liars. The second, *imposing cognitive load*, makes the interview setting more difficult for interviewees. We argue that this affects liars more than truth tellers, thereby resulting in more and more blatant differences between the two. Both approaches require interviewees to talk. Interviewees can be encouraged to talk via an information-gathering interview style, as discussed in the subsequent section.[5]

Use an information-gathering interview style. The police commonly use two types of interview styles: information–gathering and accusatory (Moston & Engelberg, 1993). In the information–gathering style, interviewers ask suspects to give detailed statements about their activities through open questions (e.g., "What did you do yesterday between 3 p.m. and 4 p.m.?" "You just mentioned that you went to the gym; who else was there?"). By comparison, in the accusatory style, interviewers confront suspects with accusations (e.g., "Your reactions make me think that you are hiding something from me."). Information-gathering interviews encourage suspects to talk, whereas accusatory interviews often yield short denials

(e.g., "I am not hiding anything"). Therefore, information-gathering interviews typically elicit more information about an event and result in longer responses than do accusatory interviews (Fisher, Brennan, & McCauley, 2002; Vrij, Mann, & Fisher, 2006b; Vrij et al., 2007).

An information-gathering interview style is desirable for lie-detection purposes for several reasons. A good lie-detection strategy is to check the factual information provided by an alleged liar with the available evidence. The provision of a high quantity of details, most likely to result from an information-gathering interview, permits more opportunities for the lie detector to identify inconsistencies and contradictions between the answer and available evidence. Second, information-gathering interviews result in more nonverbal cues to deceit than do accusatory interviews (Vrij, 2006), because longer stories afford more opportunities for nonverbal cues to deception to be displayed (DePaulo et al., 2003). In addition, being accused of wrongdoing (i.e., accusatory interview style) is likely to affect the behavior of both truth tellers and liars in a similar way, and the accusation can have a stronger effect on someone's nonverbal behavior than the act of lying itself (C.F. Bond & Fahey, 1987; Ofshe & Leo, 1997). Consequently, differences in nonverbal behavior between truth tellers and liars are overshadowed by the effects of the accusation.

The third advantage of conducting an information-gathering interview is that it also results in more verbal cues to deceit (Vrij et al., 2007). Longer stories afford more opportunities for verbal cues of deceit to occur, because words are the carriers of such cues. A criteria-based content analysis, for example, requires the availability of a story and is not possible with an outright denial. Fourth, information-gathering interviewing does not involve accusing suspects of any wrongdoing or other tactics designed to cause distress. It could be a safeguard against false confessions that can occur with coercive interview styles aimed at creating duress/distress (Gudjonsson, 2003; Kassin, Appleby, & Torkildson-Perillo, 2010). Fifth, veracity judgments in accusatory interviews are made with more confidence than are those in information-gathering interviews (Vrij et al., 2007), potentially leading to tunnel vision. If lie detectors monitor their confidence and do not become overzealous (which is known to impair lie-detection accuracy; Porter et al., 2007), they are more likely to defer making such conclusive judgments and gather more evidence (see also Levine & McCornack, 1992).

Although the information-gathering interview is a good start in discriminating truth and deceit, that approach alone is not sufficient to elicit diagnostic cues to deception (Granhag & Vrij, 2010; Vrij & Granhag, 2007). More sophisticated strategies incorporated within the information-gathering interview are needed and are discussed in the remaining part of this review.

The strategic-questioning approach: Ask unanticipated questions.
A consistent finding in deception literature is that, when possible, liars prepare themselves for anticipated interviews (Granhag, Andersson, Strömwall, & Hartwig, 2004;

Granhag, Strömwall, & Jonsson, 2003; Hartwig et al., 2007; Vrij et al., 2009). The act of planning and rehearsing a story can lead to vulnerabilities that investigators can consider. Rehearsal leads to overly scripted responses. One of the criteria of criteria-based content analysis with the greatest support in assessing credibility is unstructured reproduction (supported in at least 50% of relevant studies; see Vrij, 2008a). Truthful accounts tend to be more unstructured and less chronological than rehearsed deceptive accounts, which tend to be overly scripted and chronological (e.g., "I did this ... then this happened ... then I did this," and so on). A liar wants to keep his or her story straight (impression management) and will memorize the details of the story in order (Porter & ten Brinke, 2010).

Further, the effectiveness of a liar's planning strategy is limited, because it can only work when liars correctly anticipate the questions that will be asked. Investigators can exploit this limitation by asking questions that liars do not anticipate (e.g., spatial questions) or by asking questions in a format that liars do not anticipate (e.g., drawings).

In an empirical test of the unanticipated-questions technique, liars and truth tellers were interviewed individually about having lunch together at a restaurant (Vrij et al., 2009). Although the pairs of truth tellers did not have lunch together, the liars were instructed to pretend that they had. All pairs were given the opportunity to prepare for the interview. The interviewer asked typical opening questions that the interviewees later said they had anticipated (e.g., "What did you do in the restaurant?"), followed by questions about spatial details (e.g., "In relation to the front door and where you sat, where were the closest diners?") and temporal details (e.g., "Who finished their food first, you or your friend?") that the interviewees said they had not anticipated. Further, they were asked to draw the layout of the restaurant (unanticipated). On the basis of the overlap in responses to the anticipated opening questions between the individuals, the liars and truth tellers could not be classified at a level above chance. However, on the basis of the responses in the unanticipated questions, up to 80% of pairs of liars and truth tellers could be correctly classified, particularly when assessing drawings (i.e., the drawings were less alike for the pairs of liars than they were for the truth tellers). In summary, asking unanticipated questions about central topics leads to identifiable betrayals among liars.

Asking unanticipated questions can also be effective when assessing individual interviewees rather than pairs of interviewees. An interviewer could ask the same question twice in the same or different interviews. When liars have not anticipated the question, they have to fabricate an answer on the spot. A liar's memory of this fabricated answer may be more unstable than a truth teller's memory of the actual event. Therefore, liars may contradict themselves more than truth tellers may (Fisher, Vrij, & Leins, in press). This approach probably works best if the questions require detailed answers given in different formats. Truth tellers will have encoded the topic of investigation along more dimensions than will liars. As a result, compared with liars, truth tellers should be able to recall the event more flexibly (along more dimensions). Thus, the question "How old

are you?" followed by the question "What is your date of birth?" is more difficult to answer for liars than for truth tellers and results in longer latency periods in liars (Walczyk et al., 2005). In addition, when asked to verbally describe and sketch the layout of a restaurant, truth tellers' verbal answers and drawings show more overlap than do those of liars (Leins, Fisher, Vrij, Leal, & Mann, in press).

Another experiment showed further promise for the use of drawings as a lie-detection tool (Vrij, Leal, et al., 2010). The researchers sent 31 participants on a mission that included picking up a decoder from one agent and delivering it to a second agent. After delivering the decoder to the second agent, the participants were asked to (a) verbally describe what they had seen at the location where they had received the decoder and (b) sketch what they had seen at that location. Half of the participants were told to answer with a lie and half were told to answer with the truth. The liars were requested to pretend to have been on a different mission in which they received the decoder at a different location from a different agent. The results indicated that the drawings were more useful for lie detection than were the verbal accounts. Only 2 of 16 liars (12.5%) included the pretend agent from whom they claimed to have received the decoder in their drawing, whereas 12 of 15 truth tellers (80%) sketched the real agent from whom they had received the decoder. In their verbal descriptions, again 2 of 16 liars (12.5%) mentioned the pretend agent from whom they claimed to have received the decoder, whereas 8 of 15 truth tellers (53%) did mention the real agent. There are two possible reasons why liars were inclined to omit the pretend agent from the sketch and verbal description. First, since there was no actual agent present at the location they claimed to have received the decoder, they forgot to add an agent to their drawings and descriptions. Second, liars may be reluctant to include people in their drawings or verbal descriptions because it might trigger further questions about who those people actually were.

Why did more truth tellers sketch the agent (80%) than verbally described the agent (53%)? It may be hypothesized that after sketching the stable elements, the truth tellers may have noticed that the agent was missing from the drawing. After narrating the stable elements of the location, however, truth tellers will have been less aware of this omission because of difficulties in building a mental picture of a location on the basis of narratives. Future research could examine this hypothesis.

In a related vein, Liu et al. (2010) asked half of a group of children (10–12 years of age) to tell the truth about a self-experienced event and the other half to lie about such an event. The researchers found that lying children were more willing to answer odd questions (e.g., "Can you remember what you had in your left pocket when being stung by the bee?") than were truth-telling children, whereas no difference was found in the willingness to answer standard questions. Hence, asking unanticipated questions elicited a cue to deception (i.e., increased willingness to answer the impossible questions). The finding can be explained by acknowledging that the lying children had to *act* to appear honest, whereas truth-telling children did not have to do this. Liu et al. speculated that liars were afraid that

an "I don't know" answer would sound suspicious. Hence, merely acting in an honest manner might result in some actions that are more rarely seen among those who are truly honest.

The strategic questioning approach: Ask temporal questions when suspecting a scripted answer. A good strategy for liars is to provide a story that is, in fact, true, but that happened at a different time than the time of interest (see the earlier section on embedded lies). For example, a guilty male suspect who denies involvement in a crime could claim that he was at the gym when the crime took place. If he is indeed familiar with the gym, he can now truthfully recall an experience there, describe its layout, the equipment that he uses there, and so on. The only fabricated part in this story is the time he was there. Lie detectors should be aware of this lying strategy. Questions about the layout of the gym and activities occurring are not necessarily effective because they enable liars to relate true experiences. Instead, questions should be asked that are specifically related to the particular time that the interviewee claims to have been where they say they were. For example, the interviewer could ask time-related questions about key events, such as which instructor was working at the time he or she claims to have visited the gym, who else was present, and so forth.

The specific question approach: The devil's advocate approach. Verbal lie-detection tools (such as statement validity assessments) are designed to distinguish between truths and lies when people describe events that they claim to have experienced. As a result, many assessment criteria focus on perceptual detail to examine what people report having seen, heard, felt, or smelled during these events. However, people lie not only about their experiences but also about their opinions. Determining the veracity of such conceptual representations may not be important in typical police suspect interviews because these are mainly concerned with detecting lies about transgressions. However, it can be important in many security settings such as, for example, when deciding whether an informant is (a) indeed as much anti-Taliban or against Muslim fundamentalism as he or she claims or (b) truly entering the United Kingdom or the United States solely for the purpose of university study. Incorrect veracity judgments can do irreparable harm in such situations, as demonstrated by the loss of seven CIA agents in Afghanistan on December 30, 2009. The CIA agents were killed via a suicide attack by a man they thought was going to give them information about Taliban and Al-Qaeda targets in Pakistan's tribal areas. The CIA agents had used polygraph tests to check the man's sincerity and were aware that he had posted extreme anti-American views on the Internet. However, it was decided that the views he had expressed were part of a good cover, and the possibility that they were his real views was discounted (Leal, Vrij, Mann, & Fisher, 2010).

The devil's advocate lie-detection tool was developed to detect truths and lies in expressing opinions. Interviewees are first asked an opinion-eliciting question that induces them to

argue in favor of their personal view ("What are your reasons for supporting the Americans in the war in Afghanistan?"). This is followed by a question that asks participants to argue against their personal view ("Playing devil's advocate, is there anything you can say against the involvement of the Americans in Afghanistan?").

People normally think more deeply about, and hence are likely to be more able to generate reasons that support rather than oppose their beliefs and opinions (Ajzen, 2001; Darley & Gross, 1983; Waenke & Bless, 2000). Therefore, truth tellers are likely to provide more information in their responses to the opinion-eliciting question than to the devil's advocate question. This pattern is unlikely to to be found in liars because, for them, the devil's advocate question is more compatible with their beliefs than is the opinion-eliciting question. In an experiment testing the devil's advocate approach (Leal et al., 2010), truth tellers' opinion-eliciting answers were longer than their devil's advocate answers. Also, observers judged that the truth tellers' opinion-eliciting answers sounded more immediate and plausible and revealed more emotional involvement than did their devil's advocate answers. No clear differences emerged in liars' answers to the two types of question. On the basis of these differences in speech content, 86% of truth tellers and 79% of liars were correctly classified.

The specific question approach: The strategic use of evidence. Guilty suspects (i.e., liars) and innocent suspects (i.e., truth tellers) enter police interviews in a different mental state (Granhag & Hartwig, 2008; Porter & Yuille, 1995). A guilty suspects will have unique knowledge about the crime, and this information, if it becomes known to the interviewer, will make it obvious that they are the perpetrator. A liar's main concern will be to ensure that the interviewer does not gain knowledge of their actions at the time of the crime. In contrast, innocent suspects face the opposite problem, fearing that the interviewer will not come to know what the suspect did at the time of the crime. Research has shown that these different mental states result in different strategies for liars and truth tellers (Colwell et al., 2006; Granhag & Strömwall, 2002; Granhag, Strömwall, & Hartwig, 2007; Hartwig et al., 2007; Strömwall et al., 2007). Guilty suspects are inclined to use avoidance strategies (e.g., in a free recall, avoid mentioning where they were at a certain place at a certain time) or denial strategies (e.g., denying to be at a certain place at a certain time when directly asked). In contrast, innocent suspects neither avoid nor escape but are forthcoming and tell the truth like it happened (Granhag & Hartwig, 2008).

The strategic-use-of-evidence (SUE) technique addresses how interviewers can consider these different strategies that guilty and innocent suspects use when they possess potentially incriminating information about a suspect (Granhag et al., 2007; Hartwig et al., 2006). Suppose that a man who left his briefcase in a bookstore on top of a box of stationery returns to find that his wallet has been stolen from the briefcase. Further suppose that the police found fingerprints on the briefcase that did not belong to the owner but did belong to another customer who had visited the bookshop. This makes the customer a suspect but not necessarily the culprit; perhaps the customer moved the briefcase to look in the box of stationery. In such circumstances, the police need to interview the suspect to find out the truth.

The first step of the SUE technique is to ask the suspect to describe his or her activities (in this example, to describe his or her activities in the bookshop) but not to reveal the fingerprint evidence. It is more likely that truth tellers will mention the briefcase than will liars. Truth tellers have nothing to hide and will recall what had happened, and this includes touching the briefcase; liars do not wish to associate themselves with the crime they have committed and thus distance themselves from the briefcase. However, not mentioning touching the briefcase still does not establish guilt, because truth tellers may simply have forgotten to mention this minor detail. In the second phase of the SUE technique, the questioning phase, the interviewer asks questions, including those involving the briefcase, without revealing the incriminating fingerprint evidence. There is a chance that a liar will deny having touched the briefcase and will thereby contradict the evidence known to the lie detector. A truth teller would be more likely to reveal that he or she had moved the briefcase. The third phase of the SUE technique is to reveal the evidence and ask the suspect to explain any contradictions between their account and the evidence. Here, it should be noted that some contradictions may be caused by factors other than deceit such as, for example, a truth teller discussing an event in the distant past may simply misremember some details. Hence, not every contradiction is a clear-cut sign of deception.

Hartwig et al. (2006) tested the SUE technique in their experiment, using the stolen wallet scenario previously mentioned. Swedish police trainees interviewed the mock suspects. Half of the interviewers were trained how to use the SUE technique before the experiment and were asked to use this technique in the subsequent interview. The other half of the interviewers did not receive training and were instructed to interview the suspects in the manner of their own choice. The untrained interviewers obtained a 56.1% accuracy rate, which is similar to that typically found in nonverbal and verbal deception-detection research (C.F. Bond & DePaulo, 2006; Vrij, 2008a). SUE-trained interviewers, however, obtained an 85.4% accuracy rate. It appeared that guilty suspects contradicted the evidence more than did innocent suspects, but more important is that they did so particularly when they were interviewed by SUE-trained interviewers.

The SUE technique differs from traditional police interviews in an important way. Traditionally, the police are inclined to present the evidence (e.g., "Your fingerprints have been found on the briefcase") at the beginning of the interview (Hartwig et al., 2006; Leo, 1996). As we mentioned earlier, the traditional police technique is limited because it gives the guilty suspects the opportunity to fabricate a story that is consistent with the evidence. The delayed disclosure of evidence approach has other benefits. First, it encourages interviewers to not show suspicion and enter the interview with an open

mind. Once people have made up their minds about the veracity of a message, they have the tendency to interpret additional information in such a way that it supports their decision (see the dangerous decisions theory previously discussed). As a result, after making up their minds, lie detectors run the risk of failing to notice further important information or of misinterpreting such information. Second, revealing suspicions may make truth tellers feel uncomfortable and this may result in the *Othello error*, the erroneous decision to interpret such nerves as a sign of guilt. Third, suspiciousness may also result in escape routes for liars. For example, it could result in them refusing to talk any longer (e.g., "Why should I speak to you? You don't believe me anyway!").

Imposing cognitive load. As discussed earlier, deception theories postulate that liars may be more nervous and may have to think harder than truth tellers. However, research has shown that liars often do not display cues of nervousness and cognitive load and that cues to deception are typically faint and unreliable. But can interviewers go one step further? Are there interview techniques that elicit and enhance differences in nervousness or cognitive load? Together with the National Research Council (2003), we do not think that questions can be asked that will necessarily raise more concern in liars than in truth tellers; thus none of the interventions that we will now discuss aim to raise concern in interviewees. But research has demonstrated that it is possible to enhance differences in cognitive load between truth tellers and liars (Vrij et al., 2008; Vrij, Mann, Leal, & Fisher, 2010), so this is the aim of the following interventions.

Lying can be more cognitively demanding than truth telling for six reasons. First, formulating a lie itself may be cognitively demanding. A liar needs to invent a story and must monitor his or her fabrication so that it is plausible and adheres to everything observers would know or might find out. In addition, liars must remember what they have said to whom in order to maintain consistency. Liars should also avoid making slips of the tongue, while refraining from providing new leads (Vrij, 2008a).

A second aspect of lying that adds to mental load is the fact that liars are typically less likely than truth tellers to take their credibility for granted (DePaulo et al., 2003; Kassin, 2005; Kassin, Appleby, & Torkildson-Perillo, 2010; Kassin & Gudjonsson, 2004; Kassin & Norwick, 2004). Truth tellers typically assume that their innocence shines through (Granhag et al., 2007; Kassin; Kassin et al., 2009; Kassin & Gudjonsson; Kassin & Norwick; Vrij, Mann, & Fisher, 2006b), which could be explained with the *illusion of transparency* (Gilovich, Savitsky, & Medvec, 1998), the belief that one's inner feelings will manifest themselves on the outside, and *belief in a just world* (Lerner, 1980), the belief that people will get what they deserve, and deserve what they get. Liars will be more inclined than truth tellers to monitor and control their demeanor in order to appear honest to the lie detector (DePaulo & Kirkendol, 1989), and such monitoring and controlling is cognitively demanding (Baumeister, 1998). For example, the guilty suspect

may experience powerful emotions (e.g., fear, remorse, anger, or even excitement) that must be hidden or faked, and that may differ from those of the truth teller (Porter & ten Brinke, 2010). Consider a woman publicly pleading for the safe return of her partner who, in reality, she has murdered (see also Vrij & Mann, 2001b). She must monitor her body language and emotional expressions while keeping the details of the story straight. A high level of cognitive load accompanies high-stakes deception.

Third, because liars do not take credibility for granted, they may monitor *interviewers'* reactions more carefully in order to assess whether their lies appear to be successful (Buller & Burgoon, 1996; Schweitzer, Brodt, & Croson, 2002). Carefully monitoring an interviewer also requires cognitive resources.

Fourth, liars may be preoccupied by the task of reminding themselves to act and role play (DePaulo et al., 2003), which requires extra cognitive effort. Fifth, liars have to suppress the truth while they are lying, and this is also cognitively demanding (Spence et al., 2001). Last, while activation of the truth often happens automatically, activation of a lie is more intentional and deliberate, and thus it requires mental effort (Gilbert, 1991; Walczyk, Roper, Seemann, & Humphrey, 2003; Walczyk et al., 2005).

A lie detector could exploit the differential levels of cognitive load that truth tellers and liars experience, in order to discriminate more effectively between them. Liars who require more cognitive resources than truth tellers for the act of storytelling will have fewer cognitive resources left over than truth tellers will. This makes liars vulnerable, and so if cognitive demand is further raised—which could be achieved by making additional requests—liars may not be as good as truth tellers in coping with these additional requests.

One way to impose cognitive load on interviewees is by asking them to tell their stories in reverse order. This increases cognitive load because (a) it runs counter to the natural forward-order coding of sequentially occurring events (Gilbert & Fisher, 2006; Kahana, 1996) and (b) it disrupts reconstructing events from a schema (Geiselman & Callot, 1990). In one experiment, half of the liars and truth tellers were requested to recall their stories in reverse order, whereas no instruction was given to the other half of the participants (Vrij et al., 2008). More cues to deceit emerged in this reverse-order condition than in the control condition. More important is that observers who watched these videotaped interviews could distinguish between truths and lies better in the reverse-order condition than in the control condition. In the control condition, only 42% of the lies were correctly classified, well below what is found in a typical lie-detection experiment, suggesting that the lie-detection task in this experiment was particularly difficult. Yet, in the experimental condition, 60% of the lies were correctly classified, slightly more than what is typically found in lie-detection research.

Another way to increase cognitive load is by instructing interviewees to maintain eye contact with the interviewer (Beattie, 1981). When people have to concentrate on telling their stories, which is likely when they are requested to recall

what has happened, they are inclined to look every now and then away from their conversation partner (typically to a motionless point), because maintaining eye contact with the conversation partner is distracting (Doherty-Sneddon, Bruce, Bonner, Longbotham, & Doyle, 2002; Doherty-Sneddon & Phelps, 2005; Glenberg, Schroeder, & Robertson, 1998). When interviewees are instructed to maintain eye contact continuously, their concentration on telling their stories is therefore likely to be hampered, and, because lying is more mentally taxing than truth telling, this should impair the storytelling of liars more than the storytelling of truth tellers. In one experiment, half of the liars and truth tellers were requested to maintain eye contact with the interviewer continuously throughout the interview, whereas no instruction was given to the other half of the participants (Vrij, Mann, Leal, & Fisher, 2010). It was again found that more cues to deceit emerged in the eye-contact condition than in the control condition and that observers who watched these videotaped interviews could discriminate between truths and lies only in the eye-contact condition.

An experiment with children reveals a third type of additional request that can be made to increase a liar's cognitive load: asking event-irrelevant questions (Quas, Davis, Goodman, & Myers, 2007). Children played individually with a male confederate who touched each child twice on their stomach, nose, and neck. In the subsequent interview, children were asked to tell the truth or lie when asked questions about the touching. They also were asked a series of questions about the event that were unrelated to body touch and were asked to answer those questions truthfully. The children who lied about the body touch answered these unrelated questions less accurately than did the children who told the truth about the body touch. Quas et al. argued that remembering and rehearsing the lie required cognitive resources and that by devoting their resources to the lie, children had difficulty in conducting an adequate memory search for other event details.

Future Research Directions

Although the nonverbal and verbal deception-detection literature is extensive, several important issues still remain to be addressed. We acknowledge four issues that we believe are fruitful and important avenues for future research. First, although much research has aimed at discriminating between truths and lies about past actions, virtually no research has been conducted on distinguishing between truths and lies about future actions (intentions). This is remarkable considering the frequency and importance of situations calling for assessments of whether a person is lying or truth telling about his or her intentions (e.g., stated reasons for crossing a border, for example). Consider the would-be 911 terrorists, smiling and chatting politely with airport staff while perhaps covertly feeling intense hatred and contempt toward their intended targets, as well as fear of discovery and/or death. Is it possible to identify such individuals by their behavior or responses to specific questions? The societal value of being able to detect planned but

not-yet-committed illegal actions (criminal intentions) is thus obvious (Granhag, 2010).

Deception research about intentions has commenced with the publication of three experimental studies (Granhag & Knieps, in press; Vrij, Granhag, Mann, & Leal, in press; Vrij, Leal, Mann, et al., in press). The pattern that emerges from these experiments is that deceptive intentions are associated with different cues to deceit than are deceptive descriptions of past activities. For example, research on past activities has shown that typically liars are less detailed than truth tellers (DePaulo et al., 2003; Vrij, 2005, 2008a), whereas no difference in detail emerged in any of the deceptive-intention experiments so far. One aspect that often makes truth tellers' stories about past activities more detailed than liars' stories is that there is a wealth of perceptual details that truth tellers have experienced during these past activities that they can recall (if they still remember them). In contrast, when discussing their intentions about a forthcoming activity, truth tellers have not yet experienced anything, and this restricts the amount of detail in their recall of intentions.

Some differences between truthful and deceptive intentions emerged. First, truthful intentions sounded more plausible than did deceptive intentions (Vrij, Granhag, Mann, & Leal, in press; Vrij, Leal, Mann, et al., in press), and truthful and deceptive intentions were associated with different mental images (Granhag & Kniep, in press). Participants who told the truth about their intentions agreed more frequently that planning their future actions evoked mental images than did participants who lied about their intentions. In addition, liars who claimed to have activated a mental image during the planning phase provided verbal descriptions of the most dominant mental image that were less rich in detail than those of the truth tellers. Those findings align with the concept of episodic future thought. In brief, episodic future thought represents the ability to mentally preexperience a one-time personal event that may occur in the future (Schacter & Addis, 2007). People who make up a plan for a future event that they intend to execute seem to activate a more concrete (detailed) mental image of the upcoming scenario than do those who adopt a plan that they do not intend to execute (Watanabe, 2005).

A second line of research that needs greater attention is work with real populations, such as actual suspects, and high-stakes lies. In fact, only three studies of high-stakes lies with actual suspects have been conducted (Mann et al., 2002; Vrij & Mann, 2001a, 2001b). Porter and ten Brinke (2010) argue that there may be qualitative and quantitative variations in the behavioral manifestations of lies of minor consequence versus those of major consequence. Although high-stakes lies may be harder for liars to tell, their behavioral signs are neither obvious (i.e., police perform just above chance when trying to identify them; Vrij & Mann, 2001b) and may simply not be more extreme than those of lower-stakes lies.

A third line of research that merits attention is lying by networks. Most deception research addresses individual truth tellers and liars, but criminals often act in pairs or larger groups. Research could focus on the development of interview tools

that can successfully discriminate between pairs of truth tellers and pairs of liars. Probably the dominant interview strategy to date is to interview each member of the group individually and compare the answers they give. If the members give consistent answers, they are considered truth tellers; if they give contradicting answers, they are considered liars. This strategy is limited, because it appears to ignore the fact that liars tend to prepare their alibis together, and therefore they are likely to give the same answers when asked about these alibis. The strategy works, however, if questions are asked that the liars have not anticipated, because in that case they cannot give their prepared answers (Vrij et al., 2009). Thus, examining contradictions could work, but only with answers to unanticipated questions. There is no evidence that professionals make this crucial distinction between anticipated and unanticipated questions when they interview multiple suspects.

A fourth line of fruitful and important research is examining the strategies used by truth tellers and liars when they are interviewed. As we have argued here, effective lie-detection interview techniques take advantage of the distinctive psychological processes and requirements of truth tellers and liars. To design such interview strategies, we need further insight into truth tellers' and liars' strategies through research. For example, research has shown that verbal cues are typically more diagnostic cues to deceit than are nonverbal cues (DePaulo et al., 2003; Vrij, 2008a, 2008b), and truth tellers' and liars' strategies can explain this. In one study, truth tellers and liars were found to use different verbal strategies (Vrij, Mann, Leal, & Granhag, 2010). Truth tellers were mainly concerned with telling what had happened. In contrast, liars were preparing their answers to possible questions. Liars further decided not to give too much detail, because providing details increases the chance of saying something that the interviewer knows to be untrue. The result of these different verbal strategies is that truth tellers' stories are likely to be more detailed than those of liars; research by DePaulo et al. (2003) and Vrij (2008a) supports this idea. Although truth tellers and liars in these studies did use different verbal strategies, they used the same nonverbal strategies. Both truth tellers and liars believed that signs of nervousness would appear suspicious. They therefore decided that they would try to suppress displaying signs of nervousness during the interview. The fact that truth tellers and liars employ different verbal strategies but the same nonverbal strategies (a finding also obtained by Hartwig, Granhag, Strömwall, & Doering, 2010) may explain, in part, why verbal cues to deceit are often more diagnostic than are nonverbal cues to deceit.

Conclusion

We have presented an overview of pitfalls and opportunities in nonverbal and verbal lie detection. We presented 16 pitfalls and clustered them into three categories: (a) a lack of motivation to detect lies, (b) difficulties associated with lie detection, and (c) common errors made by lie detectors. We believe that the most important point to take home is that nonverbal and verbal

cues to deception are ordinarily faint and unreliable. This makes lie detection a difficult task, as there is no nonverbal or verbal cue that lie detectors can truly rely upon.

We also discussed 11 guidelines to improve lie detection. First, we presented 5 guidelines aimed at avoiding common errors made in nonverbal and verbal lie detection. This has been the focus of research for a considerable period of time. We then discussed 6 guidelines aimed at creating more cues and more blatant and reliable cues to deception by exploiting truth tellers' and liars' distinctive psychological states. This has been the focus of recent research. We believe that the success of the traditional methods to improve lie detection is seriously hampered by the fact that cues are typically faint and unreliable. The recently introduced methods attempt to tackle exactly this problem, and, as we have demonstrated, are doing so with success. We encourage lie detectors to become actively engaged in exploiting truth tellers' and liars' different mental processes. This should not be restricted to police–suspect interviews, the topic of investigation in many deception experiments. It could equally be used in a variety of settings, including an intelligence context for the identification and apprehension of individuals with criminal intent. It may even be used for detecting lies told in the courtroom. We encourage researchers to focus their efforts on this line of innovative and promising lie-detection research.

Endnotes

1. Not all probing questions facilitate lie detection. In many earlier studies examining the effect of questioning, probes such as "I don't understand this, could you please explain this to me?" (neutral probes); "I do believe you, but I don't understand this. How is it possible that...?" (positive probes); or "I don't believe you, are you trying to fool me?" (negative probes) were used. Intuitively, one might think that such probes make truth detection and lie detection easier: The liar is forced to continue to speak and give more information; and the more liars speak and the more information they give, the greater the possibility that they will make mistakes and give their lies away, either via verbal cues (by contradicting themselves or by saying something which an observer knows is incorrect) or via nonverbal cues. However, several studies have shown that these types of probing do not increase accuracy but tend to lead to judging the other as being truthful (G.D. Bond, Malloy, Thompson, Arias, & Nunn, 2004; Buller, Comstock, Aune, & Strzyzewski, 1989; Buller, Strzyzewski, & Comstock, 1991; Levine & McCornack, 2001; Stiff & Miller, 1986). This is called the *probing heuristic* (Levine, Park, & McCornack, 1999). The type of probing (negative, neutral, or positive) is irrelevant; all types of probing yield the same effect and benefit liars. In the "Exploiting the Different Mental Processes of Truth Tellers and Liars" section of this review, we discuss successful probing questions.

2. Note that when people overwhelmingly say that liars avert their gaze, it does not mean that they always rely on gaze aversion when they attempt to detect deceit. For example, Vrij (1993) correlated the behaviors displayed by the videotaped liars and truth tellers (e.g., gaze behavior, smiling, different types of movements, stutters) with the veracity judgments made by the police detectives

who observed these videotapes. The gaze patterns displayed by the liars and truth tellers did not predict the police detectives' veracity judgments in this particular study, whereas smiling (people who smiled less were perceived as more suspicious) and movements (people who moved their arms and hands more were perceived as more suspicious) did. In a meta-analysis of such studies, Hartwig and Bond (2010) found a correlation of $r = .27$ between averting gaze and veracity judgements (people who avert their gaze are perceived as more suspicious). Although this correlation was significant, it was somewhat lower than some other correlations. The cues that had the strongest relation with veracity judgments were incompetence ($r = -.54$) and ambivalence ($r = .51$). People who appear incompetent and/or ambivalent are judged as deceptive.

3. There are many interrogation manuals, and they are highly similar to each other (Vrij & Granhag, 2007). We mainly focus on the Inbau et al. (2001) manual, because this manual is commonly used by police and military interrogators and hence is highly influential (Gudjonsson, 2003).

4. Throughout the years, the Ekman group in particular has claimed that individual differences in the ability to detect deceit exist. They first reported that some groups of professionals (e.g., The Secret Service) are better lie detectors than other groups (Ekman & O'Sullivan, 1991; Ekman, O'Sullivan, & Frank, 1999). Later they reported that they had identified some individuals with extraordinarily good skills in lie detection, the so-called wizards (O'Sullivan & Ekman, 2004). Charles F. Bond has challenged these findings, arguing that individual differences are minute (Bond & DePaulo, 2008). Regarding the group differences, C.F. Bond (2008) noticed that a draft manuscript from Ekman et al.'s 1999 article, circulated in 1997, differed from the final 1999 article and that not all the findings reported in the 1997 draft were included in the 1999 article. Because the findings in 1999 were more in alignment with Ekman et al.'s argument about the superiority of certain groups in lie detection than the findings in the 1997 draft, C.F. Bond (2008) suspected manipulation and believed that Ekman and colleagues avoided reporting the findings that went against their general conclusion. Ekman, O'Sullivan, and Frank (2008) denied manipulation. They reported that after 1997, they tested additional groups of participants but that these new groups did not complete all the lie-detection tests that the earlier groups had completed. In their 1999 article, they only reported the results for the lie-detection tests that were completed by all the groups. Regarding their findings, Bond and Uysal (2007) reasoned that the number of wizards that were identified was so low (15 out of 13,000 people who were tested) that they could have emerged as wizards just by chance. However, O'Sullivan (2007) argued that subsequent follow-up testing has demonstrated that these wizards were true wizards. More important for this article is whether wizards use clearly identifiable strategies. If so, it would mean that others could learn from them. The Ekman group has not published detailed data about the strategies used by their wizards to date, but G.D. Bond (2009) has. In his wizard project, G.D. Bond started with 234 lie detectors and identified two wizards. Via eye-tracking equipment he determined the locations the two wizards looked at when making their veracity decisions. The two experts used different strategies: One wizard looked more at the face area, whereas the other looked more at the arm/torso area. In summary, if wizards exist, it is so far unclear what makes them wizards. O'Sullivan and colleagues further claimed that truth and lie detection becomes easier when there is more at stake for the truth tellers and liars (O'Sullivan, 2008; O'Sullivan, Frank, Hurley, & Tiwana, in press). This claim has been supported by experimental research (DePaulo, Blank, Swaim, & Hairfield, 1992; DePaulo, Kirkendol, Tang, & O'Brien, 1988; DePaulo, Lanier, & Davis, 1983; DePaulo, LeMay, & Epstein, 1991; DePaulo, Stone, & Lassiter, 1985; Lane & DePaulo, 1999; Vrij, 2000; Vrij, Harden, Terry, Edward, & Bull, 2001).

5. Many of these guidelines require interviewees to talk. We believe that interviewees are generally willing to talk even in situations in which such willingness may be less expected, such as in police interviews. In their analysis of 1,067 audiotaped police interviews, Moston, Stephenson, and Williamson (1993) found that only 5% of suspects remained silent.

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