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ORIGINAL PAPER

Behavioral Indicators of Deception and Associated Mental States: Scientific Myths and Realities

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Abstract
We suggest a reconsideration of broad and sweeping claims that research has demonstrated that nonverbal behavior (NVB) are not indicators of deception. We reexamine several methodological characteristics of a seminal meta-analysis that is often cited as non-evidence and caution the field from drawing overgeneralized conclusions about the role of NVB as indicators of deception based on that reexamination. We review studies since then that have provided ample evidence for NVB to provide such information, and then offer additional considerations about this topic to provide additional context. Our views are based on the nature of evolved human communication mechanisms, the complexity of mental contents, and differences between unconscious and conscious mediation of behavior and words.

Keywords Deception · Veracity · Nonverbal behavior · Facial expressions of emotion

The notion that cues to deception exist in body language and nonverbal behavior (NVB) has a long history in philosophy, folklore, and behavioral science. This history has a rich but checkered past, with proponents and opponents on all sides of many issues, from theory to the existence of signals to applicability. In recent years, a number of authors have argued against the claim that behavioral indicators of deception exist (e.g., Patterson et al., 2023; Vrij et al., 2019). For example, Patterson and colleagues (2023) concluded:

> "Research evaluating the use of bodily movements to detect deception has turned up either null or minimal results. Literature reviews and meta-analyses show that facial microexpressions are infrequent, and inferences about them readily lead to both false negatives and false positives (Burgoon, 2018; DePaulo et al., 2003; Hartwig & Bond, 2011). Studies intended to be about deception per se often missed the mark precisely because they did not take into account the contextual factors that led to stress and

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ambivalence in their participants, signs of which were mislabeled 'deception'." (pp. 14–15).

Likewise, Vrij and colleagues (2019) asserted that, "We conclude that the relationship between nonverbal cues and deception is faint and unreliable (e.g., DePaulo & Morris, 2004)" (p. 302).

These and other reviews over the past two decades in this genre cite as their primary source of non-evidence a landmark meta-analysis published two decades ago by DePaulo and colleagues (2003). That study reported an amazing amount of work; the authors assembled hundreds of studies, extracting 1,338 estimates of 158 behavioral cues and statistically analyzing whether each differentiated truths from lies. Their conclusions were indeed underwhelming:

> "…liars are less forthcoming than truth tellers, and they tell less compelling tales. They also make a more negative impression and are more tense. Their stories include fewer ordinary imperfections and unusual contents. However, many behaviors showed no discernible links, or only weak links, to deceit" (DePaulo et al., 2003, p. 74).

Given the findings, there is no wonder that many have concluded that there is little evidence for nonverbal behavior as indicators of lying.

At the same time, we wonder whether the baby should be thrown out with the bathwater in drawing such broad and sweeping conclusions, especially given the literature that has been published since that meta-analysis. Here, we take a closer look at that meta-analysis to get a more precise handle on what may be a more balanced interpretation of their findings given the methodology employed in the meta-analysis, and then briefly review work conducted since that meta-analysis.

Another Look at the DePaulo et al. (2003) Meta-Analysis

As with any study, the devil's always in the details because findings from any study are limited by the parameters of what was done and the decisions researchers made about them. Thus, to get a better understanding of the meta-analysis's findings and the claims made about them, here we dig deeper into what was done methodologically. Our read leads us to three characteristics of the methodology employed:

The methodological contexts in the studies included in the meta-analysis were limited

The types of lies and situations that were studied were often detached from real-life contexts in which stakes are involved. Most studies in the meta-analysis involved lies in low stakes scenarios conducted in relatively less emotional laboratory settings where participants with no prior motivations were assigned to tell the truth or lie about something without consequences, i.e., rewards or punishments for being believed. Other studies involved participants by themselves who were instructed to suppress their feelings or pain. Very few, if any, studies involved an interaction in which one person had to tell the truth or lie about a memory (e.g., witnessing or committing a crime) or a malicious intention (e.g., to commit an act of malfeasance in the future) to someone else whom the first person believed would

make judgments about the veracity of the statements and where there were consequences for such determinations. Thus, the methodological contexts in the studies included in DePaulo et al.'s (2003) meta-analysis were removed from situations for which the application of behavioral indicators may be of interest, such as investigative interviews, hiring interviews, checkpoint scenarios, and the like.[1]

An example of the importance of this point was made previously by Frank and Svetieva (2012, p. 132):

> "The meta-analysis … showed that two behaviors associated with fear—nervousness and voice tension—produce significant overall effect sizes ($d=0.27$ and $d=0.26$). When DePaulo et al. (2003) separated the studies that featured high and low motivation (a good, though imperfect approximation for high and low stakes) they reported statistically significant larger effect sizes for high motivation ($d=0.35$ for nervous/tense, and $d=0.59$ for voice frequency/pitch) than low motivation (which were statistically 0)… Thus as research studies more closely approximate the multiple variable high stakes inherent in forensic contexts, the effect sizes for discriminating liars and truth tellers rise accordingly."

NVB were examined singly and not in combination with other NVB

In the meta-analysis, behavior that were examined were analyzed singly, regardless of whether multiple behaviors were assessed in the original studies. For example, in their description of the meta-analysis, Vrij et al. (2019) stated:

> "DePaulo et al. (2003) published the most comprehensive meta-analysis of cues to deception to date. It included 116 studies examining 158 cues, of which 102 could be considered nonverbal (vocal or visual). There were 50 cues that were examined in at least six studies, and since they give the most compelling results (DePaulo et al., 2003), we focus on these. Significant findings emerged for 14 of the 50 cues … The largest effect size, $d=0.55$, was found for verbal and vocal immediacy and the lowest, $d=0.12$, for facial pleasantness. Ten of the 14 cues … have a nonverbal element, and the average effect size for these nine cues is $d=0.26$. Given that 35 of the 50 cues were (at least in part) nonverbal cues and that a large majority of them (25 out of 35, or 71%) did not show any relationship with deception, we conclude that the relationship between nonverbal cues and deception is faint and unreliable (e.g., DePaulo & Morris 2004)." (pp. 302–303).

There is nothing incorrect about analyzing behavior singly as doing so was necessary to maintain statistical independence and to explore the unique nature of each behavior; and the findings from the analyses certainly made a strong contribution to the literature because of prior claims made about individual behavior. However, this attribute of their analysis should logically limit interpretations about NVB as possible sources of deception cues to the individual behavior coded in their analyses.

[1] Hartwig and Bond (2014) conducted a meta-analysis and concluded that contextual issues such as those we raise here did not affect the ability for NVB to differentiate truthtellers from liars. Their meta-analysis, however, focused on an analysis of multiple NVB cues in a multi-channel, multimodal approach, which is different than what DePaulo et al. (2003) did and which we discuss more below.

Studies of facial expressions of emotion were limited

In the meta-analysis (DePaulo et al., 2003), there were much fewer studies examining face compared to other NVB channels, and most did not involve direct measurement of facial behavior that were subsequently classified into known emotion categories (which would allow for identification and interpretations of facial expressions of emotion). For example, the actual codes for facial behavior analyzed in the meta-analysis included facial expressiveness, facial pleasantness, brow lowering, sneers, undifferentiated smiling, lip corner pull, eye muscles, face changes, relaxed face, brow raise, lip stretch, eyelids tight, eyelids droop, duration of facial expression, and facial reaction time. These were either ambiguous or unrelated to facial configurations associated with known emotion categories.

Again, what was done in the meta-analysis was not incorrect; but making interpretations of facial expressions of emotion as not differentiating veracity and deception may not be empirically justified given the types of facial behavior assessed in the studies included in the meta-analysis and how they were organized for analysis.

Relatedly, claims have been made that there is no scientific evidence that microexpressions are clues to deception, with citation of DePaulo et al.'s (2003) meta-analysis. The problem with such claims is that there were no studies published in peer-reviewed journals testing microexpressions at the time of that writing. Thus, making such claims and citing the DePaulo et al. (2003) meta-analysis as the source to justify the claim may not be correct. Subsequent studies did indeed test microexpressions as possible indicators of deception, and we review them below.

Given the three points above, we contend that a better conclusion of the findings from the seminal DePaulo et al. (2003) meta-analysis is this: Few, if any, single NVB differentiated truthtellers from liars in low stakes lies or when suppressing emotions, feelings, or pain when no one else is around.

Research Since the DePaulo et al. (2003) Meta-Analysis

Deception Research on Multi-channel, Multi-Modal NVB

Although we certainly understand analyzing NVB singly and separately from each other as a research methodology or in a meta-analysis, doing so in fact may not capture the nature and function of NVB vis-à-vis cognition and emotion in social interactions. NVB are part of a total communication package that occurs across multiple channels, with or without words, and across time. This view is based on the neural wiring that connects thoughts and feelings to the NVB system, the blending of cognitions and emotions at any one time and across time, the fact that people verbalize only a portion of their mental contents, and the fact that different mental states map onto different NVB channels (refer to Matsumoto & Wilson, 2023, for extended discussion).

Thus, examining whether multiple NVB across channels (i.e., a multimodal approach) differentiates truths from lies (and other mental states) makes more sense. In fact, some studies in DePaulo et al.'s (2003) meta-analysis did assess and analyze multiple NVB and produced promising results. For example, Fiedler and Walka (1993) reported a Multiple $R = 0.83$ differentiating truths from lies using seven NVB channels. Pennebaker and Chew (1985) predicted deception at 85% classification accuracy rates using multiple channels.

Koper and Sahlman (1991) reported a canonical $R = 0.76$ using discriminant analysis including multiple NVB channels. But as mentioned above, the behavior analyzed in these studies were separated and examined singly.

Because most people verbalize only a portion of their mental contents and because different mental states map onto different NVB channels, a multimodal approach may be especially useful in deception research, as truthful vs. deceptive signaling can occur in multiple channels and ways. Emotionally, a fear of being caught, or guilt or even thrill about lying, may be betrayed by face or voice; nervousness may be betrayed by voice and body. Cognitively, obfuscation, fabrication, or omission in words may be betrayed by voice and gesture; lies about emotions and sensations experienced about an incident can range from anger or fear to shame or glee (cf, see the Reality Monitoring perspective; Johnson, 1988; Johnson & Raye, 1981). A myriad of possibilities in cognitions and emotions combined with NVB system complexity to signal them suggests that analysis of single NVB channels will underestimate the potential for the NVB system to differentiate truthtellers and liars (and other mental states), but analysis of NVB clusters across multiple channels may be better.

Since the publication of the DePaulo et al. (2003) paper, many studies have reexamined the role of NVB as clues to veracity and deception using a broader, multimodal, multichannel approach, and have demonstrated that NVB can differentiate truthtellers and liars fairly well when clusters of NVB are examined across multiple channels (Abouelenien et al., 2014; Abouelenien et al., 2017; Burzo et al., 2018; Davis et al., 2005; Diana et al., 2015; Dunbar et al., 2014; Duran et al., 2013; Jensen et al., 2010; Matsumoto & Hwang, 2018a, 2020; Meservy et al., 2005; Meservy et al., 2005a, 2005b; Perez-Rosas et al., 2015; Vrij et al., 2006; Vrij et al., 2000; Wright Whelan et al., 2014; Yu et al., 2015). A meta-analysis examining NVB clusters reported that lies were detected with nearly 68% accuracy across settings and concluded, "The higher accuracy rates obtained here suggest that signals of deception are manifested in constellations rather than single cues" (Hartwig & Bond, 2014, p. 667).[2]

This perspective better explains what has been found in the literature. Examinations of single NVB in low stakes contexts may sometimes produce positive findings and sometimes not, which is what DePaulo et al.'s (2003) meta-analysis reported. Examinations of multiple NVB across channels should better perform better, which is what available studies have reported. The evidence to date, therefore, indicates that multiple NVB across channels differentiate truths from lies. This view is based on the neural wiring that connect thoughts and feelings, the blending of cognitions and emotions at any one time and across time, the fact that people verbalize only portions of their mental contents, and that different mental states map onto different NVB channels.

[2] To be sure, examining multiple NVB as predictors of any mental state will produce better fitting models than examining single NVB because of the larger number of predictors, raising reasonable concerns about increased Type I error. This problem is compounded when sample sizes do not have sufficient power and findings based on many multivariate procedures are optimized for individual data sets, which leads to concerns about replicability and generalizability. Some procedures exist to mitigate but not necessarily eliminate such concerns (e.g., recomputing analyses using randomized data). Matsumoto and Wilson (2023) discuss this and other methodological issues associated with examinations of multiple NVB.

Studies with Interactional Contexts

As mentioned earlier, one limitation of the studies included in the DePaulo et al. (2003) meta-analysis was that very few, if any, studies involved an interaction in which one person had to tell the truth or lie about a memory (e.g., what the participant did or did not do or witnessed) or an intention (e.g., to commit an act of malfeasance in the future) to someone whom the first person believed would make judgments about the veracity of the statements and with consequences for not being believed. One reason why the findings reported above using multichannel, multimodal NVB approaches have emerged is that many of those studies involved such scenarios. These studies were likely motivated by an increased interest in deception cues in investigative contexts after 9/11, which produced studies with different methodological contexts than those included in the DePaulo et al. (2003) meta-analysis.

Patterson et al. (2023) astutely raised an important concern about such contexts, however. They stated that:

> "Most detection-of deception contexts are likely to engender stress in both the innocent and the guilty, and it is crucial to remember, consistent with Trivers's (2011) cautions, that any indications of stress can be interpreted in multiple ways. People may be stressed not because they are lying but because they fear being accused of it (rightly or wrongly), resent the fact that they are suspected of it, or are simply fraught at being put on the spot about it." (p. 12).

In fact, we have also found in our research that both truthtellers and liars have reported elevated emotions in moderate-stakes, mock-crime experiments (Matsumoto & Hwang, 2018a, 2020). Although elevated emotions in liars are expected and what has been found, truthtellers in such situations also experience cognitive and emotional loads because they may be worried that they are not believed, resulting in elevated emotions in them as well, which is also what has been found. In the studies cited above, for example, one study reported no differences between them in their emotional elevations (Matsumoto & Hwang, 2018a) while the other did (Matsumoto & Hwang, 2020). Thus, we agree that truthtellers and liars can both have elevated stress, which we would interpret as elevated emotional reactions. But to the extent that both truthtellers and liars experience "stress," any differences between them could not be attributable to such stress because stress does not confound their condition differences.

Additionally, a clean way to address this important issue is to conduct within-subject analyses, where truthtellers and liars serve as their own control and respond to questions to which they can tell the truth and others to which they can lie, and in which condition differences in stress could not confound comparisons between truthtellers and liars. We describe such a comparison in the section immediately below.

Regardless, we consider the issue concerning stress as a possible confound in studies of behavioral indicators of deception, and in application, as an important one methodologically and practically, and urge researchers to engage methodological attempts to assess and then mitigate such effects in their studies, and to temper interpretations accordingly when appropriate to do so.

Facial Expressions of Emotion and Microexpressions

As mentioned above, no study in DePaulo et al.'s (2003) seminal meta-analysis actually measured facial movements, classified them into known emotion categories, and tested

whether they differentiated veracity from deception. There were, in fact, two studies included in the meta-analysis that did so but were not analyzed for the ability of facial expressions of emotion to differentiate truth from deception. One study demonstrated that different types of smiles differentiated truths from lies (Ekman et al., 1988); another using the same source records but adding other NVB measures (voice and gesture data) also reported positive findings for facial expressions of emotions (Ekman et al., 1991).

After the meta-analysis was published, other studies have examined moderate to high stakes lies in the presence of others and measured facial expressions of emotion. These studies invariably have demonstrated that facial expressions of emotion differentiate truthtellers from liars (Matsumoto & Hwang, 2018a, 2020; ten Brinke & Porter, 2012; ten Brinke et al., 2012a, 2012b). Thus, the available evidence is this: when people commit lies in meaningful situations (i.e., when stakes are involved), and when facial expressions of emotion are actually measured, facial expressions of emotion can differentiate truthtellers from liars.

With regard to microexpressions, as mentioned above, there were no studies published in a peer-reviewed journal that tested microexpressions in deceptive situations. The first studies to do so occurred after the meta-analysis was published. Patterson et al. (2023) correctly reported on these studies:

> "These developments transpired years before the first independent targeted investigations of microexpressions and deceit (Porter et al., 2012; Porter & ten Brinke, 2008; ten Brinke & Porter, 2012; ten Brinke et al., 2012a, 2012b). Porter, ten Brinke, and colleagues had participants view slides of various emotional-related stimuli while facing a camera that recorded their facial behavior, with instructions to "falsify," "simulate," or be "genuine." Matsumoto and Hwang (2018a, b) summarized these studies as showing (a) that microexpressions are quite rare, occurring in only 2% of all expressions (Porter & ten Brinke, 2008); (b) that the studies did not distinguish genuine from feigned remorse (ten Brinke et al., 2012a, 2012b); and (c) that the studies did not separate truthful from deceitful individuals regardless of stimulus intensity (Porter et al., 2012). The final result stood even when judges were shown internationally televised videos of people pleading for the return of missing relatives, with half the pleaders having actually murdered the relatives themselves (ten Brinke & Porter, 2012)" (p. 14).

The Matsumoto and Hwang (2018b) study cited in the quote, however, was not described fully. To be sure, the first studies to test microexpressions and deception produced equivocal results (Porter & ten Brinke, 2008; Porter et al., 2012). In those studies, microexpressions were measured at 1/25th of a second (or 0.04 s) based on previous claims that were not empirically verified. Matsumoto and Hwang (2018b) raised questions about whether microexpressions actually occur at 1/25th s in real life and assessed microexpressions at ≤ 0.20, ≤ 0.30, ≤ 0.40, and ≤ 0.50 in brief, checkpoint interviews in which individuals with or without malicious intent had to tell the truth or lie to an interviewer.[3] Microexpressions less than 0.20 s occurred very infrequently, which was consistent with the notion that microexpressions do not occur less than 1/25th (0.04) s.[4] Microexpressions ≤ 0.30,

[3] Microexpressions were operationalized as expressions occurring ≤ .50 s based on previous findings documenting the timing of normal, spontaneous facial expressions of emotion occurring between .67 and 4.00 s (Ekman & Fridlund, 1987; Ekman et al., 1980; Ekman et al., 1998; Frank et al., 1993).

[4] Other studies that also examined microexpressions expressed at less than .20 s also produced suggestive but equivocal results concerning the ability for microexpressions to differentiate truthtellers from liars (ten Brinke et al., 2012a, 2012b).

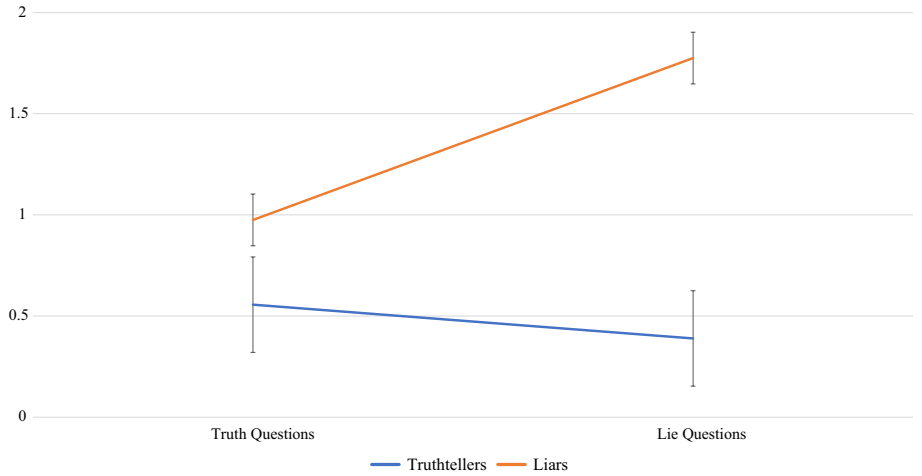

Fig. 1 Changes in combined negative facial expressions of emotion by question type and veracity condition. Truthtellers decrease in their negative facial expressions while liars increase from truthful questions to lie questions. Source: Matsumoto and Hwang (2018b). *Note*: Error bars are SEs. The Y-axis refers to combined number of coded negative facial expressions of emotions (i.e., combined frequencies of anger, contempt, disgust, fear, and sad expressions)

0.40 and 0.50 s occurred more frequently and did differentiate truthtellers from liars. Moreover, when compared to the same individuals' baselines (i.e., questions of which there was no need to lie), microexpressions significantly increased in liars but not truthtellers (Fig. 1), which addresses Patterson and colleague's (2023) astute concern of stress for both truthtellers and liars (because individuals serve as their own controls in the same context). Thus, the available evidence to date indicates that microexpressions occur from around 0.30 s and differentiate truths from lies.

Additional Considerations

Here, we discuss three issues that we believe should be considered when deliberating scientific evidence for NVB as potential indicators of deception.

What's an Indicator?

The first issue concerns the meaning of "indicator." Instead of referring to behavioral cues, signs, signals, or clues to deceit, we prefer to refer to them as indicators, that is, as pointers to something. The question is, to what do the behavior point? We believe that indicators are signals of cognition or emotion that give additional clues as to what an individual is thinking and feeling beyond the content of the words spoken. Those cognitions or emotions may or may not be relevant to the specific topic of interest for which an interviewer is attempting to determine veracity or deception (although one could argue that because they are not spoken they are a form of deception). That is, indicators do not guarantee that a lie has been told, an idea described years previously (Ekman, 1985, 2009). Showing anger, for example, when saying kind words about someone may refer to the fact that the speaker is

angry at the question, the person posing the question, to something else altogether, or is in fact lying. Indicators point to the fact that there is something else in the mind of the speaker other than the content of the words.

Some may argue that this is precisely why NVB cannot be used as signs of deception. The same concern exists, however, when considering linguistic cues to deception, such as different types of details, spontaneous corrections, slips of the tongue, inconsistencies in statements, or illogical statements, all of which are some of the "cognitive cues" to deception that are supposedly more valid than nonverbal cues (Vrij, 2019; Vrij et al., 2019).[5] Like NVB, none of these in and of themselves can be considered a one-to-one sign of deception; instead, they are also indicators that point to the fact that there is something else in the mind of the speaker other than the content of the words, and that opens the door to further investigation. Thus, the same logic to argue against behavioral indicators of deception cannot be ignored when making claims about such cognitive cues.

Relatedly, we agree that contextual factors such as stress may produce behavioral indicators. But they can produce cognitive indicators as well. In either case, interviewers who are attempting to ferret truth can use indicators as signals to obtain more information, ask more questions, or further conversation in order to determine relevance to a topic of interest and make better determinations of veracity. Thus, the notion that because there is no one-to-one correspondence between a behavior or even a cluster of behavior and deception means that nonverbal behavior analysis is meaningless may be based on a false premise of the nature of the meaning of behavior.[6]

NVB are also Important Indicators of other Mental States besides Deception that can be useful in Contexts where Possible Deception is being Detected

NVB can signal many meaningful landmarks of different mental states beyond veracity and deception, all of which can be useful to interviewers, investigators, and other contexts in which possible deception is being detected. These include specific, discrete emotions portrayed in facial expressions (Matsumoto et al., 2008); gestures illustrative of speech or emblematic content (Cartmill & Goldin-Meadow, 2016; Iverson & Goldin-Meadow, 1998); vocal cues related to pitch, intensity, response latencies, or silence (Frank et al., 2013; Scott & McGettigan, 2016), and the like. Although there have been debates about the ability of NVB as cues to deception, there is relatively less debate about the correspondence between NVB and other mental states, and identifying these behaviors can provide

[5] As with NVB, abundant caution should be applied when considering the diagnosticity of cognitive cues to deception. For instance, in discussing a review of these cues by Vrij and Granhag (2012), Frank and Svetieva (2012) wrote (p. 132):

"The accuracy results for the studies cited by V&G are not very different from accuracy levels reported in the traditional deception literature. For example, the 'telling the story backward' technique produced 58% overall accuracy, versus 46% for the control (Vrij et al., 2008); asking a person to 'look you in the eye' was not diagnostic when judges saw audiovisual presentations of the lies and truths, but was diagnostic when judges heard audio only presentations—but again that difference was meek—54% versus 50% (Vrij et al., 2010). Likewise, when asked to draw an image related to things seen by a truth teller but not a liar, the unanticipated questions showed no discriminability between liars and truth tellers in their spoken accounts, although the drawings they produced of the scene were strongly diagnostic (over 80%; Vrij et al., 2009)".

[6] The notion of a one-to-one correspondence between a behavioral indicator of deception itself may be a straw-person ala Pinocchio. Our position is that such indicators exist but none with a one-to-one correspondence with veracity or deception.

additional insights to people's mindsets. When produced with words, NVB can complement, supplement, qualify, and contradict words; even without words, NVB can provide additional insights about people's mental states without them talking (Cartmill & Goldin-Meadow, 2016; Matsumoto et al., 2013). Identifying these types of mental states through unspoken behavioral signals can provide important contextual information about the mental contents of an individual, regardless of whether they are cues to deception or not at the time of their occurrence.

NVB can be Ambiguous

Because of the complexity of the neurophysiological system that produces NVB, the fact that multiple cognitions and emotions exist in the mind at any one time, and that people will select only a portion from those multiple cognitions and emotions what to verbalize, messages signaled by NVB may be diffuse, rapid, weak, and malleable to ever-changing contexts and mental states. Moreover, in many cases, the same anatomical structures are used for multiple functions. Facial movements, for instance, can signal emotions, emblems, speech illustration, eating, talking, breathing, physical effort, and idiosyncrasies (Matsumoto et al., 2008). Thus, NVB can be ambiguous, producing weak signals that can hinder theoretical development, signature discovery, and deception detection (and may have contributed to contradictory findings in the past).

Conclusion

We have suggested a reconsideration of broad and sweeping claims that nonverbal behavior are not indicators of deception. Above, we have shown that a close examination of the seminal DePaulo et al. (2003) meta-analysis would caution the field from drawing overgeneralized conclusions about the role of NVB as deception indicators, and that many studies since then have provided ample evidence for NVB to provide such information. At the same time, NVB are not a panacea; they are sometimes ambiguous signals and there is no one-to-one correspondence between a particular NVB and deception. Individuals leveraging NVB as potential sources of deception need to do so with ample caution.

Moreover, perspectives about NVB don't negate the importance of cognitive cues to deception. Both should collectively be considered in situations in which individuals need to make determinations of veracity or deception because both are part of a total communication package in which humans have evolved to use (Matsumoto & Wilson, 2023). Negating one large source of cues to promote another borders on rigid dichotomous thinking, and human nature may not fall into such dichotomies. And just as is true for NVB, there is no one-to-one correspondence between words, phrases, or other cognitive cues and deception, and individuals leveraging them need to do so with ample caution as well.

No indicator, whether behavioral or not will always be a sign of deception, given the evolved human communication mechanisms, the complexity of mental contents, and differences between unconscious and conscious mediation of behavior and words (Matsumoto & Wilson, 2023). And none of what we have suggested speaks against the effectiveness of various, evidence based interviewing strategies and tactics (Meissner, 2021), the importance of other sources of information, or strategically using evidence (Hartwig et al., 2005;

Luke et al., 2013) on deception detection. Our message is simple: Let's not throw the baby out with the bath water with regard to behavioral indicators of mental states, including deception.

Author contributions Both authors discussed the content of the paper. The first author then created the first draft of the paper, and both authors subsequently contributed equally to the revision of the manuscript to final.

Declarations

Conflict of interest The author(s) are employees of Humintell, a company that engages in research and training related to behavioral indicators of mental states and deception.

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