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Contextualizing interviews to detect verbal cues to truths and deceit

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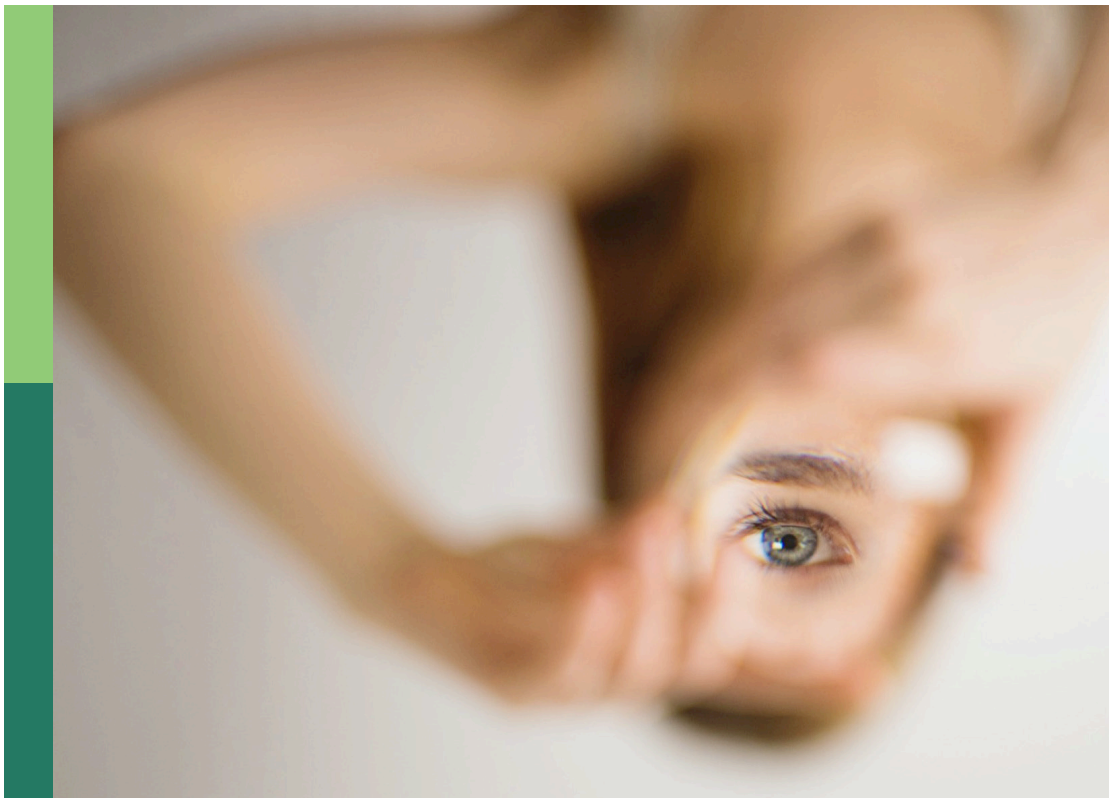

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Contextualizing interviews to detect verbal cues to truths and deceit

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Table of contents

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Editorial: Contextualizing interviews to detect verbal cues to truths and deceit

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Editorial on the Research Topic
Contextualizing interviews to detect verbal cues to truths and deceit

Lie detection in forensic interviews is often based on verbal cues, non-verbal cues, or a combination of verbal and non-verbal cues. Scientific evidence unveiled that verbal cues are more diagnostic than non-verbal cues (DePaulo et al., 2003), so research in the field has mostly shifted focus from non-verbal to verbal lie detection (Vrij et al., 2019). The majority of the tested verbal cues are cues to truthfulness. For example, it has been established that truth tellers provide more detailed (Amado et al., 2016), plausible (Vrij et al., 2021a), and verifiable information (Palena et al., 2021) than lie tellers. However, verbal cues to deceit (i.e., those which occur more among lie tellers than truth tellers), are rarely examined. This is important because practitioners look for cues that are present rather than cues that are absent (Vrij et al., 2023). For example, it is easier to look at the presence of justifications than at the absence of justifications when assessing suspect veracity. That said, there are some cues to deceit that have been examined, including common knowledge details and self-handicapping strategies (Vrij et al., 2021b) and cognitive processes (Masip et al., 2005). Thus, one aim of this Research Topic was to encourage the testing of more verbal cues, and ideally to identify more verbal cues to deceit.

Caso et al. experimentally examined verbal cues to truthfulness and deceit across different lie types. Italian participants said the truth or provided an outright or embedded lie about a past experience. Truthful accounts included significantly more complications than outright—but not embedded—lies which contrasted with previous findings in the United Kingdom (UK; Verigin et al., 2020).

Dunbar et al. examined cues to truthfulness and deceit in job interviews. The experiment was run online in groups of 4 or 5. Participants read the profile of one of five candidates and then presented a summary of the profile to the group for deliberation. Two participants were allocated to be deceivers and were given a low quality resume that they had to recommend. Truth tellers were given a high or a medium quality resume. Deceivers' speech was more complex than that of truth tellers. Further, when detected, deceivers were perceived as more untrustworthy than truth tellers.

Verbal cues cannot be isolated from context as some cues can be diagnostic in certain contexts but not in others (Markowitz and Hancock, 2022). Thus, another aim of this Research Topic was to understand the diagnosticity of verbal cues in different contexts. Given that the existing literature has tested samples in Western countries (e.g., the United States and the UK; Denault et al., 2022), some of the contributions in this issue were from countries/cultures which were rarely—if ever—tested.

In two experiments, Tache et al. examined verbal cues to truthfulness and deceit in individualistic and collectivistic cultures in the UK. Participants responded to expected and unexpected questions about an intended trip (Experiment 1) or to a sketch and timeline request about a past event (Experiment 2). Cultural differences but not veracity differences emerged in both experiments implying caution when generalizing across cultures.

Verbal cues can differ depending on the interviewee's language (Taylor et al., 2014). Thus, Dando et al. examined verbal cues of British and South Asian participants who spoke in their first or second language. The findings largely converged with previous research with a lie bias emerging when judging non-native speakers.

Instead of looking at cross-cultural contexts, Bagnall et al. looked at clinical differences between autistic and non-autistic adults who lied or told the truth about a virtual burglary scenario. Autistic and non-autistic truth tellers differed on extricating (verifiable) information but not on investigation-relevant information and statement-evidence consistency suggesting commonalities between the clinical samples.

Sergi et al. tested differences between truth tellers and lie tellers on individual characteristics (memory and impulsiveness) and Reality Monitoring verbal cues (realism, clarity, reconstructability). Self-reported poor memory and impulsivity were associated with more lying. Also, truth tellers' stories sounded more realistic, clear, and reconstructive than those of lie tellers.

Dykstra et al. examined verbal cues among maltreated and non-maltreated children. Children were coached to either conceal (lie tellers) or not (truth tellers) a transgression. More first-person plural pronouns and cognitive mechanism terms and less syntactically complex reports were diagnostic of lie telling. Maltreated children used more affect and negation terms and fewer words and complex statements than non-maltreated children but the two groups did not differ on veracity cues.

Rather than examining verbal cues, Zanette et al. asked judges to assess the veracity of children's statements according to race (Black vs. White). Participants in a crowdsourcing platform viewed a vignette and photo of a White or Black child who was interviewed about a transgression. White children were rated as lie tellers more than Black children which suggested a truth bias toward Black children. Internal motivation to not appear prejudiced, especially among White adults, moderated these effects.

The Research Topic also includes two survey studies that examined meta-cognitive processes in different contexts. In one of the studies, Tabata and Vrij asked Japanese participants an open question on strategies they use when lying. The self-reports resulted in 13 strategies which largely converged with previous findings with different samples. In another study, Junger et al. examined perceptions of (near) victims of fraud on how to reduce fraud victimization. For near victims of fraud, knowledge about fraud reduced victimization approximately half of the time. Actual victims of fraud self-reported that had they sought more information or paid more attention, victimization may have been prevented. Higher proportion of near victims than of actual victims suggested a lie bias in fraud settings.

In two review and opinion papers, Markowitz et al. and Levine argued that context matters as much as—if not more than—verbal cues. The two papers, however, differed in how they framed the utility of context for facilitating lie detection. Markowitz et al. extended their original "Contextual Organization of Language and Deception (COLD) framework" to explain contextual aspects (namely psychological dynamics, pragmatic goals, genre conventions, individual differences, situational opportunities, and interpersonal characteristics) that affect deceptive language and verbal cues. The authors recommended incorporating these aspects in research designs. In his opinion paper, Levine reasoned that lie detection should be based on content (e.g., background knowledge of the information that is being assessed, interview dynamics, etc.) rather than on cues or demeanor, because knowing content leads to more appropriate questioning and thus to better assessments.

The issue also features a bibliometric review of the research on investigative interviews. Denault and Talwar first provided a rich account of the history of coercive criminal interrogations and their evolution to ethical investigative interviews. This was followed by a listing of the top: journals, academic institutions, countries in which the research is published, research areas, publishing authors, keywords, and cited articles in the field. The authors then critically reviewed the context.

In conclusion, the issue showed that context is important and that there are times when verbal cues vary across contexts. However, other papers demonstrated that some verbal cues can be diagnostic across certain contexts. Thus, while different samples exhibit deception differently, researchers and practitioners can still look at stable cues and build on them when developing novel research or when assessing veracity.

Author contributions

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Content, context, cues, and demeanor in deception detection

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Introduction

Knowing the truth matters. Therefore, improving truth and deception detection is a worthy scholarly endeavor with important applications throughout society.

A large but fragmented literature exists on the topic of deception detection spanning a variety of academic disciplines (Vrij, 2008; Levine, 2020; Denault et al., 2022). Much of the research has an applied focus, aiming to improve lie detection in a particular setting or genre such as criminal investigation, fraud prevention, or political disinformation.

The need for improved lie detection is urgent and real. Research has shown that people generally over-estimate their lie detection ability (DePaulo et al., 1997) and that people are poor lie detectors (Bond and DePaulo, 2006).

Contemporary approaches to lie detection often involve trying to isolate cues associated with honesty and deception. I call these approaches "cue theories" (Levine, 2020). The core idea underlying the cue theories is that the observation of the right cues under the right conditions can probabilistically improve lie detection. I doubt the diagnostic value of cues in assessing the veracity of specific instances of communication. This, however, is an argument I make elsewhere (Levine, 2018, 2020). Here, I focus on some conception distinctions relevant to the current topic from a communication perspective.

Definitions and distinctions

Different authors sometimes use the same words to mean different things. For example, some of the "cues" listed in the DePaulo et al. (2003) meta-analysis would not be cues according to my definition. As I think of them, cues are specific observable behaviors. They can be nonverbal, such as gaze aversion, finger movements, or speech errors, or they can be verbal such as the number of details or type of pronouns. Cues can be counted, timed, or otherwise objectively measured. They can be expressed in quantities.

Cues, however, do not travel alone. During segments of communication, cues are highly intercorrelated with other cues (Levine et al., 2011). This is also how they are perceived. Statistically, treating cues as if they are independent from one another (e.g., as in a lens model; Hartwig and Bond, 2011) potentially violates statistical assumptions and risks spurious interpretations of results. Pragmatically, training communicators to focus

on specific behaviors might lead to tunnel vision and be disruptive to conversational flow (see Vrij et al., 2022 for additional concerns).

I call constellations of inter-correlated cues "demeanor" (Levine et al., 2011). Perceptions of confidence, friendliness, extroversion, and authenticity are examples of demeanors one can give off. Various demeanors can be quantitatively scaled either as clusters of coded cues used to create an index, or as global impressions by observers. Interestingly, in DePaulo et al.'s (2003) meta-analysis, four out the top five most diagnostic indicators were demeanors (immediacy, discrepant, uncertain, nervous) and only one was a cue (details). Nevertheless, I argue that demeanors lead to systematic and predictable errors in human veracity judgments because there are a substantial number of individual communicators whose demeanors are "mismatched" with their internal states (Levine et al., 2011). For example, an honest person on the autism spectrum might come off as deceptive because of their demeanor (Lim et al., 2021).

Both cues and demeanor can be further distinguished from communication content. Content involves the meaning of what is said. Content is not a cue. It can't be counted. Meanings are fundamentally qualitative in nature. Further, meanings can be highly contextual. Hall (1976) famously advanced the idea of high and low context communication. In low context communication, one needs only to know the language to understand. High context communication, however, requires background knowledge to understand. An example is satire. To understand satire, you must know what is being satirized.

Details provide an example of my distinction between cues and content. Just counting the number of details in a verbal account is a cue. Verifiable details (Nahari et al., 2014; Verschuere et al., 2021) have an element of content to them, but they are still counted and are thus also a cue. It does not matter what the detail is; only if it is a detail, and if it is, in principle, subject to being checked or not. In contrast, when viewing details as communication content, we consider what each of the details are. Do they make sense given the context? How do the fit with other known details? Any detail or set of details may or may not be diagnostic of honesty-deceit depending on what the detail means in the context in which it is provided and how it fits with other knowledge.

Plausibility is a second example. Unlike DePaulo et al. (2003) and Vrij et al. (2020), I do not think of plausibility as a cue, but rather as a scalable attribute of content (understanding what is said in context and then assessing its typicality or probability of occurrence). Further, as an aspect of communication content, meaningfully assessing plausibility is different for low and high context communication and depends on the relevant contextual knowledge of the person assessing plausibility.

A deep understanding of context is required for assessing content in high-context communication. For example, consider the results of a deception detection article reporting 36% accuracy. Obviously, that is poor accuracy (a low context reading requiring little prior knowledge). But how plausible is it? I know, for example, that it is three standard deviations below the meta-analytic mean (Bond and DePaulo, 2006), and that there are few theoretical mechanisms that produce below-chance accuracy. Knowing the literature contextualizes the claim. As this example illustrates, assessments of plausibility can vary depending on the knowledge and expertise of those doing the assessment.

Thus, when I think of context, I am not just thinking in terms of categories of situations or applications (e.g., investigative police interviewing vs. political journalism). Nor do I think about context as fact-checking and plausibility (cf. Vrij et al., 2020) which I see as potentially diagnostic aspects of communication content. Context involves what someone needs to know to understand and make sense out of what is said, and to think critically about content. Amongst other things, it involves knowing what was said in prior and subsequent utterances, the specifics of the situation in which the communication occurs, the personal backgrounds of the communicators, their idiosyncrasies, and the (sub-)culture(s) of the communicators. Thus, having knowledge of communication context is an enabling factor (moderator) for fact-checking or assessing the plausibility of communication content. Fact-checking and plausibility assessment require context, but they are not types of contexts.

Application

My opinion regarding interviewing to assess veracity (besides building rapport and asking non-leading open-ended questions; both good practices in my opinion) is that it is wise to ignore cues and demeanor (cf. Masip and Herrero, 2015). Confident, friendly, extroverts who provide detailed accounts are not always honest. Similarly, people with poor memories or nonobvious cognitive impairments might be honest. As a personal example, I lack visual memory. I cannot honestly give you a visually detailed description of a true event I witnessed. I am also dyslexic. When I transpose things, the correct interpretation may be as a sign of dyslexia, but you would know that unless you asked or you knew me well enough to know.

Instead, I advocate careful listening to communication content. Understand that content in context—the deeper and richer the contextualization, the better. Then, apply critical thinking. The more that is known about the context, the more potentially valuable communication content becomes (Blair et al., 2010; Reinhard et al., 2011). Interviewers should avoid going into interviews cold. My advice is to investigate first and then interview. Not only does this make the strategic use of evidence possible (Hartwig et al., 2006), but it also provides more context. Having context enables asking the right questions as well as a better understanding of the answers. Good questions prompt answers that can be fact checked or

evaluated for plausibility. If verifiable details are provided, check them (Blair et al., 2018). For details that are not yet checkable, perhaps additional evidence with be uncovered over time. Assess plausibility based on contextual knowledge, and revisit and update evaluations of plausibility as new information is acquired. Unlike cues, plausibility is not a static, stable, or fixed quality of a message. It changes depending on what else is known. Think of veracity assessment as an ongoing process, not a fixed or one-time judgment.

Conclusion

Useful distinctions can be made between cues, demeanors, and communication content. Understanding communication content requires knowledge of context, especially in high-context communication. A richer and deeper understanding of communication-specific context unlocks the utility of communication content in distinguishing honest and deceptive statements.

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TL conceptualized and wrote this essay.

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Maltreated and non-maltreated children's truthful and dishonest reports: Linguistic and syntactic differences

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Introduction: Adults are typically poor judges of the veracity of statements, requiring the need for alternative methods for detecting lies. One alternative method to human lie-detectors is using computer-based linguistic analysis which may present a more reliable method for detecting dishonesty. Moreover, while previous research has examined linguistic differences between typically developing children's and adults' truthful and dishonest reports, no study to date has examined whether maltreated children exhibit different linguistic cues to dishonesty. Thus, the current study examined maltreated and nonmaltreated children's linguistic and syntactic cues to children's truthful and dishonest reports.

Methods: Nine- to 12-year-olds, half of whom were maltreated, played a computer game with a confederate: half of the children experienced a transgression (i.e., playing a forbidden game and crashing the computer) and were coached to conceal it, and half of the children experienced no transgression (i.e., simply played a computer game). All children were then interviewed about the event. The current study utilized automated linguistic and syntactic analysis software to compare children's truthful reports (no transgression occurred) with dishonest reports.

Results and Discussion: Results indicated that maltreated and non-maltreated children did not differ in their indicators of dishonesty. Dishonest reporters used more first-person plural pronouns and cognitive mechanism terms and had less syntactically complex reports compared to truthful reporters. Finally, first-personal plural pronouns, cognitive mechanism terms, and syntactic complexity accurately classified (74.2%) the veracity of children's reports. The current findings present a new indicator of dishonesty (syntactic complexity) and suggest that indicators from typically developing populations may apply to maltreated children when coaching occurred.

KEYWORDS

lie detection, maltreatment, verbal cues, linguistic, syntax, deception

Introduction

The ability to identify children who are dishonest about or reluctant to disclose negative experiences has important implications in forensic contexts. For example, failing to identify children who conceal maltreatment can lead to a child being left in a harmful environment. This can lead to further abuse, resulting in negative developmental outcomes including internalizing and externalizing problems (Vilariño et al., 2022). Establishing markers of dishonesty in cases where a child may be concealing some details while falsifying others may assist in providing a tool for professionals to identify cases that may require further investigation. One potential method for identifying dishonesty is assessing verbal differences in honest and dishonest reports. In fact, previous research suggests that verbal cues may be more reliable and accurate than non-verbal cues when attempting to detect children's dishonest reports, given that truth-and lie-tellers do not differ on many non-verbal cues to deception (e.g., eye movement, body language; Talwar and Lee, 2002). While progress has been made in identifying verbal markers of deception with typically developing children, no study to date has examined whether these markers are also relevant for maltreated children. Given that maltreated children often experience delays in language development (Rogosch et al., 1995; Geeraert et al., 2004) they may exhibit different verbal cues than their typically developing peers. Thus, the aim of the current study was to examine linguistic and syntactic cues to dishonesty (when children are coached to falsify details to conceal a transgression) in maltreated and non-maltreated children's reports of an adult interaction.

Current research examining linguistic cues to dishonesty with children has primarily utilized paradigms in which children provide reports of a true event as well as a false event after being coached by a parent or researcher. These reports are then compared for linguistic cues that can be used to differentiate the veracity of the statements (Bruck et al., 2002; Evans et al., 2012; Brunet et al., 2013; Williams et al., 2014; Talwar et al., 2018). For example, Evans et al. (2012) and Saykaly et al. (2013) had children play a game with an experimenter where stickers were placed on the child's body (e.g., their arm). The children were also coached by a parent to falsely report playing an additional game they had *not* played. As such, these studies compared children's reports of a true experience to fully fabricated reports. However, when being dishonest children may not always completely falsify an event; they may falsify some details to conceal true aspects of the event. There may be different cues to dishonesty when children are coached to conceal only a portion of a true event by providing false information instead, such as a transgression that occurs within the event. Such reports are distinct in several important ways. First, children's dishonesty is motivated by a desire to avoid a negative consequence of a transgression, rather than providing a story about a neutral event without consequence. Second, children are only told to be dishonest regarding a *portion* of the event; they can reveal some details but must monitor their reports to withhold the details that must be concealed. While they are monitoring what to conceal, they must also provide the coached falsified details. The increased complexity of this task as well as the motivation behind it may lead to different linguistic or syntactic patterns. Importantly, being able to detect instances when children falsify some details to conceal a transgression would be particularly useful for interviewing children about serious events, such as maltreatment.

Linguistic cues to children's dishonesty

According to the Activation-Decision-Construction-Action Theory (ADCAT; Walczyk and Fargerson, 2019) telling a lie is a cognitively demanding task, making it difficult to conceal potential markers to deception. First, when a question is asked, working memory is activated to hold the truth in the mind. If the decision to lie is made, the lie-teller must inhibit the truth and construct a plausible alternative response. During the construction of the lie, theory of mind is required to understand the recipient's knowledge or belief to construct a believable lie. Finally, the action stage involves providing the constructed lie to the recipient while monitoring any verbal or non-verbal cues that might reveal the lie (Walczyk et al., 2003, 2009, 2014). Given the many cognitive abilities at work while lying, children may find it difficult to monitor verbal cues that may reveal their lie. Below we review the relevant literature on linguistic differences between children's honest and deceptive reports.

One goal when lying is to distance the self from the lie, resulting in the observed reduction of first-person pronouns in adults' dishonest statements (Hauch et al., 2015). However, studies examining linguistic cues to children's dishonesty have found children's lies tend to include *more* self-references (first-person pronouns) compared to truthful statements (Brunet et al., 2013; Williams et al., 2014; Talwar et al., 2018). Importantly, previous research often examines total self-references as a combination of singular (e.g., I, me) and plural (e.g., we, our) pronouns (Brunet et al., 2013; Talwar et al., 2018). Williams et al. (2014) parsed apart these findings by examining singular and plural pronouns separately and found that children who were coached to fabricate stories about events (e.g., sports, parties) used more first-person *plural* pronouns than those who truthfully reported; they did not find differences in the use of singular pronouns. One possible explanation for this increase in first-person plural pronouns in particular when being dishonest may be that children are attempting to disperse blame or responsibility (Talwar et al., 2004; Evans et al., 2021) for the dishonest statement or actions. This may be particularly relevant when children are coached, or a transgression has occurred.

Another theoretical difference between reports of true and fabricated events is the processes used to provide the report. The Reality Monitoring approach to deception detection stipulates that there are different processes that govern reports of truly experienced events compared to fabricated ones. Specifically, truly experienced events are formed based on external experiences and

information, while untrue events are internally formulated based on thoughts or cognition. Given this, reports of these events should contain information that demonstrates these processes (Johnson and Raye, 1981). Specifically, recalling true experiences should theoretically rely on external memory attributes, such as sensory and affective processes, because the description is based on real memories of places, events, and emotions (Vrij et al., 2004; Strömwall and Granhag, 2005). In contrast, reporting an untrue event may contain more internal memory attributes, such as cognitive information; thus, the language used to fabricate information may contain more cognitive and fewer sensory and affective words. In adults, using the reality monitoring criteria has been found to effectively differentiate between true and fabricated reports (Vrij et al., 2000; Granhag et al., 2001; Oberlader et al., 2016); however, some of the individual scales, such as affective information, have not been found to uniquely differentiate true and false reports (DePaulo et al., 2003; Masip et al., 2005; Gancedo et al., 2021).

Despite findings that affective and cognitive information may not uniquely identify dishonest reports in adults, previous research examining children's language suggests that the presence of cognitive or affective words may differ in true and false reports. Children tend to use more cognitive terms in dishonest than truthful statements (Vrij et al., 2004; Williams et al., 2014; Talwar et al., 2018), which supports the notion that lying relies more heavily on internal memory attributes such as cognitive processes. Additionally, research with children supports the idea that reports of true memories rely on external memory attributes to describe true experiences; children tend to use more affect (emotion) words when describing true events compared to false ones (Masip et al., 2005; Williams et al., 2014). In fact, Williams et al. (2014) found that 4-to 7-year-old children who provided false reports about typically occurring events (e.g., sports, birthday parties) used fewer positive and negative emotion words compared to children who told the truth. However, contrary evidence suggests that children may use emotion words when being dishonest, but may lack the ability to describe emotions that are relevant to the event they are lying about; for example, children's false reports about a serious injury contained more positive emotion words than truthful reports (e.g., breaking a bone; Warren et al., 2018).

The final three word types of interest (tentative, exclusion, and negation terms) have either not been found to differ or have not yet been examined in studies exploring linguistic differences in children's truthful and dishonest reports. While adult lie-tellers have been shown to use *fewer* tentative (Hauch et al., 2015) and exclusion terms (Newman et al., 2003; Bond and Lee, 2005; Schelleman-Offermans and Merckelbach, 2010; Hauch et al., 2015), studies examining exclusion terms in children's reports have failed to find significant differences (Brunet et al., 2013; Williams et al., 2014). Tentative terms may be avoided by lie-tellers because they suggest that the lie-teller is not confident about their narrative. Similarly, exclusion words (e.g., but, except, and without) may suggest that the lie-teller is presenting conflicting information and, thus, are also avoided. Adults have been found to use more negation terms when lying compared to telling the truth (Ali and Levine, 2008; Hancock et al., 2008; Hauch et al., 2015). This may also be the case among children as they may use negation terms to ensure the interviewer that nothing bad happened, particularly when being dishonest to conceal a transgression (e.g., "*Nothing* bad happened" or "He did that *without* me"). However, negation terms have not yet been examined in children's reports.

Syntactic cues to dishonesty

In addition to the linguistic features of a report, the number of words and syntactic complexity (range and sophistication of the structures that make up sentences; Van Valin, 2001; Ortega, 2003) may also help identify children's dishonesty or reluctance to disclose. There is some evidence that both adult and child lie-tellers tend to keep their story simple and ambiguous to avoid leaking incriminating details (Vrij et al., 2010; Gongola et al., 2021). If they provide less information, it is easier to maintain the lie across questions or time. However, previous research has found inconsistent support for whether children's reports differ in length (word count); some studies find that lie-tellers' reports are shorter than truth-tellers' reports (Brunet et al., 2013), while others find no difference (Evans et al., 2012; Saykaly et al., 2013). Importantly, Brunet et al. (2013) asked children to provide truthful or fabricated reports of a stressful event (i.e., true or fabricated reports of being bullied), without being coached, and found that truth-tellers' reports were longer than lie-tellers'. In contrast, the studies that found no differences between truthful and fabricated reports included parental coaching. Thus, coaching may enable children to provide enough information to match the length of their report to truth-tellers, though this pattern has not yet been examined in the context of lying to conceal a transgression. Further investigation is required to more completely understand the influence of coaching on the length of children's dishonest reports specifically when they have been coached to falsify and conceal details to cover a transgression.

Another cue that may be influenced by the cognitive load of deception is the syntactic complexity of sentence structures. The syntactic sentence structure refers to the rules that govern the ways in which words are arranged within a sentence in a given language (Van Valin, 2001; Ortega, 2003). Previous research has yet to examine (in adults or children) whether the complexity of sentence structure within a report is an indicator of deception. As previously mentioned, lie-telling is a cognitively demanding task for young children (Walczyk et al., 2003, 2009); this complexity may require cognitive resources that limit lie-tellers' abilities to produce more complex sentence structure. This may be especially true for children as they require greater cognitive resources to employ the cognitive functions involved in lie-telling, leaving less resources available for syntactic complexity. Truth-tellers, by comparison, only need to focus on conveying the relevant information. Because they do not need to

focus on the additional tasks of inhibiting the truth and fabricating plausible details, truth-tellers may use more complex sentence structure in their reports. Furthermore, like the overall length of the report, it is possible that coaching may reduce some of the cognitive load that children experience when dishonestly reporting on an event, and therefore lie-tellers may be able to match their syntax to that of truthful reports when coached.

Maltreatment

The limited research exploring linguistic cues to dishonesty has solely focused on typically developing populations. However, the linguistic cues used to identify dishonesty with typically developing children may not apply to other populations, such as maltreated children, who tend to exhibit delays in language development (Rogosch et al., 1995; Geeraert et al., 2004). Compared to their non-maltreated peers, maltreated children learn fewer words (Coster et al., 1989; Beeghly and Cicchetti, 1994) and exhibit poorer performance on measures of expressive language (for meta-analysis see Sylvestre et al., 2016). Furthermore, there is evidence beginning in early childhood that maltreated children produce less complex utterances compared to non-maltreated children (Coster et al., 1989; Beeghly and Cicchetti, 1994; Eigsti and Cicchetti, 2004). Thus, even with coaching, maltreated children may not exhibit the same linguistic patterns between truthful and dishonest reports as their peers due to delayed language development.

Honesty promotion

While identifying dishonesty is one method for ensuring reluctant children are identified, another method is to support children in truthfully reporting their experiences. To date, there are several honesty promotion techniques that have been shown to be useful to encourage children to provide truthful reports of transgressions including the putative confession (Lyon et al., 2014; Rush et al., 2017; Cleveland et al., 2018; Quas et al., 2018; Evans and Lyon, 2019). The putative confession involves the interviewer telling the child that their co-transgressor has already told the interviewer everything that happened and wants the child to tell the truth. Across numerous studies, this technique has been found to be effective in increasing honesty with children 4-to 10-years of age (Lyon et al., 2014; Rush et al., 2017; Stolzenberg et al., 2017; Quas et al., 2018; McWilliams et al., 2021). While this method encourages honesty, it may also influence the language children use within their reports. Specifically, children's cognitive load is increased by this statement because the child not only needs to provide a report, but also has to think about what their co-transgressor may have reported. This increased monitoring may be more cognitively taxing and influence the linguistic and syntactic makeup of children's reports.

The current study

The current study examined linguistic and syntactic cues to 9- to 12-year-old maltreated and non-maltreated children's dishonest reports to conceal a transgression, as well as the potential influence of the putative confession on those reports. Specifically, we examined whether truthful and dishonest reporters differed in linguistic and syntactic cues. Additionally, we examined whether the linguistic and syntactic cues differed based on honesty promotion technique (the putative confession vs. no honesty promotion) technique, age, and maltreatment status. The present study used a forensically relevant paradigm where children were involved in a co-transgression with an adult and were coached to conceal it.

To identify potential markers of dishonesty, truthful reporters ($n = 164$) were compared to dishonest reporters (who lied about the transgression; $n = 84$). Linguist Inquiry Word Count (LIWC; Pennebaker et al., 2001) software was used to analyze the frequency of singular (e.g., I, me) and plural (e.g., we, our) first-person pronouns, cognitive mechanism terms (e.g., cause, know, and ought), affect terms (e.g., happy, worry, and sad), tentative terms (e.g., maybe, perhaps, and guess), exclusive terms (e.g., but, without, and exclude), and negations (e.g., no, not, and never), as well as the overall word count. Connexor Machinese Syntax Software (Samuelsson and Voutilainen, 1997) was used to analyze the syntactic structure of each sentence in children's reports.

Hypotheses

Honesty

The first set of predictions focused on linguistic differences between truthful and dishonest reporters. First, it was predicted that compared to truthful reporters, dishonest reporters would use more first-person pronouns (examined singular and plural; Brunet et al., 2013; Williams et al., 2014; Talwar et al., 2018) and cognitive mechanism terms (H1; Williams et al., 2014; Talwar et al., 2018). Second, it was predicted that compared to truthful reporters, dishonest reporters would use fewer affect terms (negative and positive emotion words; Masip et al., 2005; Williams et al., 2014), tentative terms (Hauch et al., 2015), and exclusive terms (H2; Newman et al., 2003; Bond and Lee, 2005; Schelleman-Offermans and Merckelbach, 2010; Hauch et al., 2015). Finally, it was predicted that compared to truthful reporters, dishonest reporters would use more negations (H3; Ali and Levine, 2008; Hancock et al., 2008; Hauch et al., 2015).

The second set of predictions examined differences in the length and complexity of truthful and dishonest reporters. First, it was predicted that dishonest reporters would provide significantly shorter reports than truthful reporters (i.e., higher word count, H4; Vrij, 2005; Brunet et al., 2013). Second, while previous research has not yet examined syntactic complexity as an indicator of dishonesty, we expected honest reports to be more complex, while dishonest reporters' reports would be less complex

due to the greater cognitive load associated with lie-telling (H5; Walczyk and Fargerson, 2019).

Importantly, dishonest reporters received coaching regarding details about the game they were supposed to play. Research has shown that linguistic differences tend to disappear when children receive coaching (e.g., first-person pronouns, cognitive mechanism terms; Talwar et al., 2018). However, this has not yet been examined in maltreated samples. We examined the possibility that the linguistic differences between coached dishonest reporters and truthful reporters described above may only emerge in the maltreated sample (H6). The language delays experienced by maltreated children may make it more difficult for coaching to eliminate or minimize linguistic differences between true and false reports.

Developmental differences

We also examined developmental differences among the indications of interest, beginning with age differences. There is limited evidence that young children use more emotion words in their reports (Williams et al., 2014), thus we predicted we might also find that younger children use more emotion words than older children (H7). Furthermore, we expected that older children's reports would be longer and more syntactically complex than younger children's reports (H8). No other age differences were predicted for linguistic or syntactic differences as there has been no support for such predictions in previous findings in our participants' age range.

Given that maltreatment is related to delayed language development (Rogosch et al., 1995; Geeraert et al., 2004; Sylvestre et al., 2016), we expected maltreated children would provide shorter reports and use significantly less complex syntactic structure compared to non-maltreated children (H9).

Honesty promotion

Tentative, exclusive, and negation terms in particular may be influenced by the putative confession. Children who believe their co-transgressor told the interviewer about the transgression may be uncertain about what details to provide. Thus, they may be more likely to use tentative and exclusive terms in their report. Additionally, they may be even more adamant that they are not to blame for the transgression and may be more likely to use more negation terms to avoid blame (Honesty Promotion predictions = H10).

Materials and methods

Participants

A total of 321 9- to 12-year-olds ($M = 10.50$, $SD = 1.12$, 153 males) participated in the original study (Evans and Lyon, 2019). Given that the current study was interested in differences between truthful reporters (no transgression) and dishonest reports (children who lied about the transgression), the children who were in the Break condition and truthfully disclosed the transgression were excluded. Thus, a total of 248 children were included in the current study.

Half of the children were maltreated ($N = 124$, 64 9–10-year-olds, $M = 7.45$, $SD = 0.50$, 33 males; 60 11–12-year-olds, $M = 11.47$, $SD = 0.50$, 31 males). Maltreated children were recruited from the Los Angeles County dependency court. Given that children were removed from parental custody due to substantiated cases of abuse or neglect, the Presiding Judge of Juvenile Court and the Los Angeles County Children's Law Center granted consent. Maltreated children were ineligible if they were awaiting an adjudication or contested disposition hearing on the date of testing (because they might be asked to testify) or if interpreter services were provided to their family and they were unable to communicate with the researchers in English. The sample was 56.5% Latino, 27.4% African American, 8.8% Caucasian, and 7.3% other. The non-maltreated sample was recruited from schools in mainly low-income ethnic minority neighborhoods ($N = 124$, 67 9–10-year-olds, $M = 9.49$, $SD = 0.50$, 33 males; 57 10–11-year-olds, $M = 11.42$, $SD = 0.50$, 25 males). Ethnic background was comparable to the maltreated sample: 58.9% Latino, 37.1% African American, 1.6% Caucasian, and 4% other. Non-maltreated children's parents provided written consent and all children provided verbal assent prior to participating. All study procedures were approved by the University of Southern California's Institutional Review Board.

Procedure

Transgression paradigm

Children began by completing several tasks unrelated to the current study with a female interviewer for approximately 10 min. Following the completion of these tasks, a male confederate entered the room to complete a video game activity. The female interviewer introduced the child to the male confederate and explained that when she returned, she would ask the child some questions about the video game they played while she was gone. She then left the room. The confederate opened a laptop to play one of two games: the Ball game or the Jewel game (the game played was counterbalanced between participants).

All children were randomly assigned to either the Break or No-Break Control condition. The confederate told children in the Break condition that he had played the game they were supposed to play too many times and wanted to play a different game instead. During the game, the confederate noted eight target details for the child to remember (e.g., "Check out the *birds*"). After 2 min, the confederate told the child to click a square that resulted in the computer crashing (a blue error screen appeared), following which the confederate explained they were not supposed to play the game because the computer crashes and the data on the computer was lost. He then explained to the child that the female interviewer was his boss and would be coming back to ask about the game they played. He asked the child to keep secret the fact

that they had played the forbidden game and coached the child on details to provide during the interview. Specifically, he told them not to mention 4 details about the game they had played (e.g., "Do not say that there were *birds*") and provided 4 details they should mention about the game they were supposed to have played (e.g., "Say you saw *blocks falling*"). The confederate then closed the computer and left the room.

In the No-Break Control condition, the child and confederate played a video game that did not cause the computer to crash. The confederate pointed out the same 8 target details for the game they played. After they finished the game, he said that the female interviewer would be returning to ask the child about the game. He then closed the computer and left the room.

Interview

Children's interviews were designed to be similar to best practice forensic interviews, with the use of rapport building and initial use of broad open-ended requests for recall, similar to the National Institute of Child Health and Human Development (NICHD) Structured Protocol, an internationally used evidence-based protocol for forensic interviews with children (Lamb et al., 2007).

Rapport phase

The female interviewer from the beginning of the session returned to the room. She began the interview with a 2-min rapport-building phase by asking the child to talk about the last time he or she felt really good or bad at school.

Recall

The recall phase began with an instruction based on one of two honesty conditions: Putative Confession or Control. In the control condition, the interview began with the following instruction: "Now that I know you a little better, [child's name], tell me everything that happened while I was out of the room from the very beginning to the very end." In the Putative Confession condition, children were told, "Now that I know you a little better, [child's name], *let me tell you something. The man, [confederate's name], who came in here, told me everything that happened and he said he wants you to tell the truth*. Tell me everything that happened while I was out of the room from the very beginning to the very end." Interviewers used facilitators (e.g., "*uh-huh*") and additional prompts (e.g., "*What happened next?*") to encourage the child to continue until they completed their initial narrative. Children were then asked what the first thing that happened was followed by a series of *what happened next* prompts until the child exhausted their narrative ($M_{prompts}$ = 2.75, SD = 2.35). The interviewer then used two follow-up open-ended prompts [e.g., "You said (action/verb). Tell me more about (action/verb)."]. Finally, children were asked to tell the interviewer everything they heard and everything they saw while the interviewer was gone (2 separate questions).

Two groups of children were included in the study based on their condition and their disclosure during the interview phase. In the Break condition, only children who concealed the transgression, dishonest reporters, were included (children who disclosed were not). The second group included children who were in the No-Break Control condition. These groups were chosen to compare because children who truthfully reported the event where no transgression occurred (No-Break Control) and children who experienced the transgression but concealed it (dishonest reporters in Break Condition) provided similar reports of the event. Specifically, both describe an event during which they played a computer game, but only one group is honestly reporting that event. Thus, the truthful reporters (No-Break Control) and dishonest reporters (Break) were compared in the current study.

Software analysis

Each child's interview was transcribed verbatim to be analyzed by two software programs.

Linguistic inquiry word count

LIWC software is designed to analyze words within a transcript and code them into word categories (Pennebaker et al., 2001). Each word is compared to the words within the program's internal library and subsequently placed into the relevant word categories. The output provides a frequency with which each word category was used within the report. For the present study, we focused on 7 of these word categories [first-person singular (e.g., I, me) and plural pronouns (e.g., we, our), cognitive mechanism terms (e.g., cause, know, and), affect terms (e.g., happy, worry, and sad), tentative terms (e.g., maybe, perhaps, and guess), exclusive terms (e.g., but, without, and exclude), and negations (e.g., no, not, and never)]. Additionally, LIWC provides a count of the total words within the transcript. The reliability of the word categories used in the current study range from $\alpha = 0.43–0.67$ (note: evaluating behavior, such as language, is distinct from evaluating psychological measurement; acceptable internal consistency for word types is lower given that repetition typical of psychological measures is not present in verbal behaviors; Boyd et al., 2022).

Connexor machinese syntax software

Connexor software was used to analyze the syntactic complexity of children's reports. It also produces a syntax tree to represent the complexity of the sentence structure itself, which is what is used in the current study to determine the syntactic complexity of children's reports. The software output provides the number of layers in each sentence within the transcript, which represent the number of noun and verb phrases in each sentence. Connexor's syntactic accuracy is 93.5% (Samuelsson and Voutilainen, 1997).

Each transcript was analyzed using the Connexor program to obtain the number of layers per sentence for each child's report. We then calculated the mean number of layers used per sentence across the report for each child. This mean was used in the analyses to represent syntactic complexity, such that a higher score indicated that the child's sentences were more complex.

Results

All analyses were conducted using SPSS (v28). First, to ensure univariate normality and remove extreme outliers, we performed a square-root transformation on all dependent variables. We assessed multivariate normality by calculating Mahalanobis distance for each participant's scores and comparing the highest value to the critical chi square table (Pallant, 2007). With nine dependent variables, values above 27.88 are considered outliers. Two participants in our dataset were above this value (max value = 28.70); however, given that these participants were above the critical value by less than 1, we decided to retain these data points as has been done in previous research (e.g., Hashemian et al., 2012).

Differences between groups on word types and syntactic complexity were assessed using a 4 (Age: 9, 10, 11, 12) by 2 (Honesty: Truthful Reporters vs. Dishonest Reporters) by 2 (Maltreatment Status: Maltreated vs. Non-Maltreated) by 2 (Honesty Promotion: Putative Confession vs. Control) MANOVA. The outcomes of interest were square-root transformed first-person pronouns, cognitive mechanism, affect, tentative, exclusive, and negation terms, as well as word count and complexity (average number of layers in children's sentences). The MANOVA revealed significant main effects of Age, $F(27, 630) = 1.89$, $p = 0.005$, $\eta_p^2 = 0.075$, Maltreatment Status, $F(9, 208) = 2.07$, $p = 0.034$, $\eta_p^2 = 0.082$, Honesty, $F(9, 208) = 5.42$, $p < 0.001$, $\eta_p^2 = 0.19$, and Honesty Promotion, $F(9, 208) = 2.98$, $p = 0.002$, $\eta_p^2 = 0.114$, as well as an Age by Honesty by Maltreatment Status by Honesty Promotion interaction, $F(27, 630) = 1.52$, $p = 0.046$, $\eta_p^2 = 0.061$. Below we outline each significant main effect and interaction in turn.

Main effect of honesty

Supporting H1 and H5, there was a significant main effect of honesty on first-person plural pronouns, $F(1, 216) = 4.58$, $p = 0.033$, $\eta_p^2 = 0.021$, cognitive mechanism terms, $F(1, 216) = 5.23$, $p = 0.023$, $\eta_p^2 = 0.024$, and complexity, $F(1, 216) = 39.87$, $p = < 0.001$, $\eta_p^2 = 0.16$. Dishonest reporters used *more* first-person plural pronouns than truthful reporters (dishonest reporters: $M = 1.46$, $SD = 0.56$; truthful reporters: $M = 1.31$, $SD = 0.51$; e.g., dishonesty reporter: "*we* just played and he just told me um, helped me when I needed help"). Dishonest reporters used *more* cognitive mechanism terms than truthful reporters (dishonest reporters: $M = 4.24$, SD = 0.44; truthful reporters: $M = 4.08$, SD = 0.44; e.g., dishonest reporter: "I only *know* the beginning and then he put away the laptop"). Additionally, dishonest reporters' statements were *less* complex than truthful reporters' (dishonest reporters: $M = 1.79$, SD = 0.13; truthful reporters: $M = 1.94$, SD = 0.14), supporting the prediction that dishonest reporters would use less complex syntax in their reports (H4). The main effect of honesty on first-person plural pronouns was qualified by the significant interaction (discussed below). Hypotheses 2 and 3 regarding differences on affect, tentative, and negation terms, as well as H4 regarding word count, were not supported. Additionally, contrary to H6, the above effects were not impacted by maltreatment status.

Developmental differences

Main effect of age

There was a significant main effect of age on complexity, $F(3, 216) = 4.53$, $p = 0.004$, $\eta_p^2 = 0.059$, first-person plural pronouns, $F(3, 216) = 3.35$, $p = 0.020$, $\eta_p^2 = 0.044$, and tentative terms, $F(3, 216) = 3.24$, $p = 0.023$, $\eta_p^2 = 0.043$. Post-hoc tests using Bonferroni correction were used to examine specific age differences. Partially supporting H8, 12 year-olds' reports ($M = 1.96$, $SD = 0.15$) were significantly more complex than 9 year-olds' reports ($M = 1.86$, $SD = 0.16$), $p = 0.002$, and 10 year-olds' reports ($M = 1.85$, $SD = 0.15$), $p < 0.001$. When solely examining first-person plural pronouns and tentative terms, no significant differences emerged between ages. However, the main effect of age on first-person plural terms was qualified by the significant interaction (discussed below). Contrary to H8, no age differences in the use of affect terms emerged.

Main effect of maltreatment status

Supporting H9, there was a significant main effect of maltreatment on complexity, $F(1, 232) = 6.05$, $p = 0.015$, $\eta_p^2 = 0.027$, and word count, $F(1, 216) = 3.92$, $p = 0.049$, $\eta_p^2 = 0.018$. Non-maltreated children had *more* complex statements (non-maltreated: $M = 1.91$, SD = 0.15; maltreated: $M = 1.86$, SD = 0.16), and used *more* words (non-maltreated: $M = 18.38$, SD = 4.29; maltreated: $M = 17.66$, SD = 4.56) than maltreated children. Additionally, there was a main effect of maltreatment on the use of affect terms, $F(1, 216) = 5.63$, $p = 0.019$, $\eta_p^2 = 0.025$, and negation terms, $F(1, 216) = 3.97$, $p = 0.048$, $\eta_p^2 = 0.018$. Specifically, maltreated children used *more* affect terms (maltreated: $M = 0.83$, SD = 0.22; non-maltreated: $M = 0.78$, SD = 0.21) and negation terms (maltreated: $M = 0.89$, SD = 0.55; non-maltreated: $M = 0.76$, SD = 0.47) than non-maltreated children.

Main effect of honesty promotion

There was a significant effect of honesty promotion on first-person singular terms, $F(1, 216) = 6.18$, $p = 0.014$, $\eta_p^2 = 0.028$, affect terms, $F(1, 216) = 7.76$, $p = 0.006$, $\eta_p^2 = 0.035$, complexity, $F(1, 216) = 4.34$, $p = 0.038$, $\eta_p^2 = 0.020$, and word count, $F(1, 216) = 6.36$, $p = 0.012$, $\eta_p^2 = 0.029$. Children in the Putative Confession condition used *more* first-person singular pronouns (putative confession: 2.12, SD = 0.54; control: M = 1.99, SD = 0.56), and affect terms (putative confession: $M = 0.83$, SD = 0.22; control: $M = 0.78$, SD = 0.21) than children in the control condition. Children's reports in the Putative Confession condition were *more* complex (putative confession: $M = 1.91$, $SD = 0.16$; control: $M = 1.86$, $SD = 0.15$), and contained *fewer* words (putative confession:

$M = 17.21$, SD = 4.35; control: $M = 18.68$, SD = 4.41). Beyond these differences, the predicted differences between Honesty Promotion conditions were not supported (H10).

Interaction

The main effect of honesty and age on the use of first-person plural pronouns were qualified by a significant 4-way interaction (Honesty x Age x Maltreatment Status x Honesty Promotion), $F(27, 630) = 1.52$, $p = 0.046$, $\eta_p^2 = 0.061$. To examine the effect of the interaction on first-person plural pronouns, follow-up univariate ANOVA were conducted. First, the effect of Honesty, Maltreatment, and Age were examined separately for each Honesty Promotion condition. In the control condition, there was a significant main effect of Honesty, $F(1, 121) = 6.45$, $p = 0.012$, $\eta_p^2 = 0.051$, such that dishonest reporters ($M = 1.47$, SD = 0.53) used more first-person plural pronouns than truthful reporters($M = 1.25$, SD = 0.45). No other effects were significant in the control condition. In the Putative Confession condition, there was a significant main effect of Age, $F(3, 95) = 3.48$, $p = 0.019$, $\eta_p^2 = 0.099$, which was subsumed by a significant 3-way interaction, $F(3, 95) = 2.76$, $p = 0.046$, $\eta_p^2 = 0.080$. Follow-up ANOVAs were conducted to further examine this interaction; however, when further split to examine significant effects of Age, Honesty, and Maltreatment, these ANOVAs revealed no significant differences.

Predicting veracity

The final analysis involved using a binary logistic regression to predict dishonest and truthful reporters using the linguistic and syntactic variables on which they significantly differed. Specifically, first-person plural pronouns, cognitive mechanism terms, and syntactic complexity were entered as predictors with Honesty as the dependent variable (0 = truth-tellers, 1 = dishonest reporters). The overall model was significant in predicting truth-tellers and dishonest reporters, χ^2 (3, N = 248) = 61.43, Nagelkerke $R^2 = 0.30$, $p < 0.001$, with 74.2% of children being correctly classified. Interestingly, only syntactic complexity emerged as a significant predictor above and beyond the common contribution of all other variables, such that as syntactic complexity decreased children were 8 times more likely to be dishonest, $B = -2.09$, Wald = 37.29, $p < 0.001$, OR = 8.33. The use of cognitive mechanism terms, $B = 0.06$, Wald = 1.65, $p = 0.199$, OR = 1.06, and of first-personal plural pronouns, $B = 0.109$, Wald = 0.96, $p = 0.328$, OR = 1.12, did not uniquely predict group membership.

Discussion

The current study examined linguistic and syntactic differences in maltreated and non-maltreated children's truthful and dishonest coached reports of an interaction with an adult. Children's dishonest reports included significantly more first-person plural pronouns and cognitive mechanism terms and were significantly less syntactically complex compared to truthful reports. Importantly, only syntactic complexity significantly differentiated truthful and dishonest reporters above and beyond the common contribution of all other variables in a logistic regression. The remaining linguistic cues examined did not differ between truthful and dishonest reporters, but some differences emerged based on age, maltreatment status, and honesty promotion.

Linguistic cues to dishonesty

The overarching goal of the current research was to examine how linguistic cues differed between truthful and dishonest reporters. Several important findings emerged. First, it was predicted that lie-tellers would use more first-person pronouns than truth-tellers, as has been found in previous research examining children's dishonest reports (Brunet et al., 2013; Williams et al., 2014; Talwar et al., 2018). Given that children were discussing an event in which they co-transgressed with an adult, both plural and singular first-person pronouns were examined separately. Interestingly, consistent with previous findings (Williams et al., 2014) dishonest reporters used more first-person plural pronouns than truthful reporters, but no differences were found for singular pronouns. The increased use of first-person plural pronouns may be particularly relevant when children are coached to dishonestly conceal a co-transgression. In the present study, children were coached to dishonestly report an event during which they played games and transgressed with a confederate. Thus, children likely referred to both themself and the confederate when providing their report due to the nature of the paradigm. Additionally, they may have preferred plural pronouns in case the transgression was discovered; including the confederate in their report ensured the interviewer would know that both individuals participated and thus the child could not be solely blamed for the transgression. Future studies in which a child is solely responsible for a transgression and no coaching occurred are necessary to more completely understand the role of first-person singular pronouns.

It was also predicted that, due to differences in perceptual experiences, dishonest reporters would use more cognitive mechanism terms and fewer affect terms than truth-tellers. This prediction was only supported for cognitive mechanisms: dishonest reporters used more cognitive mechanism terms than truthful reporters. Previous research on linguistic cues suggests that lie-telling relies on cognitive processes to fabricate events that were not experienced, rather than sensory or affective processes that would be used to recall true events (Vrij et al., 2004; Evans et al., 2012; Williams et al., 2014). These processes are thought to be reflected in the language used; while this was supported in the current study in children's use of cognitive mechanism terms, we did not find differences in the use of affect

terms. This finding aligns with previous research on the Reality Monitoring approach suggesting that these cognitive and affective processes are not uniquely able to differentiate between truth and lie-tellers (Gancedo et al., 2021). This may be due to the event being reported; both the truth-tellers and dishonest reporters experienced the same event during which they played a game; thus, both groups would rely on the sensory and affective processes used for true memory recall and would not differ between groups. The dishonest reporters, however, (1) omitted an aspect of the event (the transgression) and (2) provided the coached details. Omission would not require a change in words used as they simply did not mention the transgression. However, providing the coached details may have led to the increased cognitive mechanism terms (e.g., cause, know, and ought) as they had to provide details that had not been experienced. Given this pattern of findings, it is important to continue to examine instances of dishonesty in which a child is coached to conceal an aspect of an event and provide false details. For example, when children are interviewed about transgressions like sexual abuse, they may be coached by their abuser to conceal the abuse while still honestly reporting some information about what happened while they were together.

Contrary to predictions, we failed to find differences in the use of tentative and negation terms. In the only previous study to examine tentative terms with children, consistent with our findings, no significant differences were found between truth-and lie-tellers (Brunet et al., 2013), suggesting that tentative terms may not be a helpful cue in examining the veracity of children's reports. Negation terms have been shown to be used more by adults in false reports (Ali and Levine, 2008; Hauch et al., 2015), but have not been examined in children's reports. It was expected that perhaps children would use more negation terms to ensure the experimenter knew that they were not involved in the transgression ("I did *not* touch the button). This, however, was not the case; it appears that children may use language besides negation terms to accomplish this goal. For example, perhaps they blame others rather than emphasizing that they were not involved (Evans et al., 2021).

Syntactic complexity and word count

The current study is the first to examine syntactic complexity as an indicator of dishonesty. Consistent with predictions, dishonest reporters used simpler sentence structure than truthful reporters. Given that lie-telling is a cognitively demanding task for children, they may devote cognitive resources to their report by monitoring what details they provide and ensuring they do not reveal the transgression. This may result in children using more simple statements, as these may be easier for them to monitor and ensure they conceal the relevant details. Future studies could test this explanation by examining whether the increased cognitive load results in simpler sentence structure by increasing children's cognitive load when they report on an event.

It should be noted that there were also developmental findings; older children's and non-maltreated children's statements were more complex than younger and non-maltreated children's statements, respectively. Given these developmental findings, complexity may be a less reliable indicator of dishonesty; understanding how complex a child's report *should* be given their age would be important for examining whether their report is too simplistic to be truthful. Thus, future research should continue to examine syntactic complexity as an indicator of children's dishonesty to understand how this may be useful in a practical context.

Unlike complexity, word count did not differ between truthful and dishonest reporters. Some studies have found that dishonest reports are shorter than truthful ones (Brunet et al., 2013), and some approaches, such as CBCA, use report length as an indicator of dishonesty (Vrij, 2005). However, word count differences have typically been found in studies where children fabricate the full event without being coached (Brunet et al., 2013). When children are coached to fabricate their full report, word count differences have not emerged (Evans et al., 2012; Saykaly et al., 2013; Williams et al., 2014; Talwar et al., 2018). In the present study, children (1) experienced the event and thus had the same amount of information as truthful reports and (2) were coached on details to provide and conceal. The coaching they received likely allowed them to provide a similar amount of information as the truthful reporters, leading their reports to be of similar length. This is an important finding given that when children are interviewed about events, it is unlikely that they will fabricate an entire event. Additionally, if they fabricate parts of an event and conceal some details, it is likely that they will have been coached by an adult to do so, particularly in cases of maltreatment. Previous research and the current study suggest that in these cases, word count is not a reliable indicator of dishonesty; when children receive some support to fabricate a cover story they will be able to provide the same amount of information as a child who tells the truth.

Predicting dishonest vs. truthful reports

Given the differences found between truthful and dishonest reporters, we examined the extent to which the indicators that differed between the two groups could be used to predict group membership (cognitive mechanism terms, syntactic complexity, and exclusive terms). We found a higher rate of accuracy that is typically found in human lie detection research (~50%; Gongola et al., 2017). Interestingly, only syntactic complexity emerged as a significant predictor; as complexity decreased, children were 8 times more likely to be classified as dishonest reporters. This finding suggests that syntactic complexity may be a new, effective method for detecting deception in children. While the model predicted about 74% of children's group membership accurately, it could be that finding other linguistic indicators of dishonesty in this type of paradigm would improve this model's ability to predict deception. Future research should focus on a broader range of linguistic indicators to explore how to improve this model's ability to predict truth and lie-tellers.

Maltreatment

Interestingly, we did not find any differences in indicators of dishonesty between the maltreated and non-maltreated samples. The lack of differences is somewhat surprising given that maltreated children's language development often differs significantly than non-maltreated children, both in terms of the scope of words learned and the complexity of their speech (Coster et al., 1989; Eigsti and Cicchetti, 2004; Sylvestre et al., 2016). Despite this, it is important to acknowledge that this finding is positive; maltreated children do not differ significantly in the types of words that are used when providing dishonest reports, and thus the indicators that have been found in previous research are likely also evident in maltreated children. However, it may be the case that we did not find differences because of coaching; coaching may have supported maltreated children in producing similar statements to that of non-maltreated children. Future research should examine whether this is the case by comparing maltreated children's reports with and without coaching.

It is important to note that identifying linguistic or syntactic patterns to identify when children are being dishonest are also useful to identify when children are being honest. Identifying methods for differentiating truth and lie-tellers is useful for identifying instances of false allegations, honest or credible reports of abuse, as well as children who are lying to conceal abuse. Identifying children experiencing maltreatment, both by knowing when they are concealing and when they are honestly reporting, is vital for ensuring children are protected when necessary. These cues, specifically the use of first-person plural pronouns, cognitive mechanism terms, and syntactic complexity, may aid in identifying these cases.

Limitations

There are several limitations of the current study to note. Children's language proficiency was not assessed. Children with poorer language development (regardless of maltreatment) may have had less complex reports overall. Future studies should aim to account for children's language proficiency. Similarly, the results likely do not generalize to other languages. The rules governing the syntactic structure of sentences varies across languages; thus, syntactic complexity may look different depending on language.

Another important limitation lies in the laboratory design (simulated transgression paradigm). These paradigms are useful in that the ground truth is known, so researchers can know with certainty which children are being truthful and which are being dishonest. However, these designs may lack external validity, particularly when being applied to reports of maltreatment, given the difference in the nature of the experience. Additionally, children may adjust their behavior in an experimental setting and not report on an event in the same manner they would during a forensic interview. Furthermore, the current study used an interview protocol based on the NICHD Structure Protocol, an interview which emphasizes the use of broad open-ended requests for recall. It is possible that the linguistic structure of children's honest and dishonest reports may vary based on the interview protocol used. Thus, in the future, researchers should examine whether the current study's findings replicate with other interview protocols.

Conclusion

The present investigation found support for children's use of first-person plural pronouns and cognitive mechanisms terms as an indicator of dishonesty. The current study also identified a novel indicator of dishonesty, syntactic structure, which was highly accurate in classifying truthful and dishonest reports. This finding suggests an additional cue to examine when detecting deception in children, although further research is needed to be able to use this to discover a threshold of complexity that might distinguish truth and lie-tellers. Furthermore, the current findings suggest that, for the cues examined, linguistic cues to dishonesty may not differ for maltreated and non-maltreated children, providing the first evidence that previous research using linguistic cues is useful for both populations.

Data availability statement

The original contributions presented in the study are included in the article/supplementary materials, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by University of Southern California institutional review board. Written informed consent to participate in this study was provided by the parent/legal guardian or Court/attorneys (maltreated children consent given by court).

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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The relationship between Japanese adults' age and self-reported verbal strategies when lying

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We examined the relationship between age and self-reported verbal deception strategies in Japanese adults. Japanese participants (*N*=153) aged 18 to 73years took part in this study. We requested the participants to state their age and freely describe how they structure their speech to appear convincing when lying during their daily interactions. We extracted 13 verbal strategies from the participants' open-ended descriptions. Japan is a high-context culture. The results indicated that 11 categories corresponded to the verbal strategies reported in previous studies on lying conducted in low-context cultures. However, two strategies mentioned in the current study, making ambiguous statements and adding irrelevant details to the lie, were not reported in low-context cultures. As expected, age was significantly and negatively correlated with the number of verbal strategies used when lying. Moreover, verbal strategies that seem relatively cognitive demanding were used less as the age of the participants increased. We concluded that these results reflected the age-related decline of cognitive abilities.

KEYWORDS

lies, verbal strategies, age, adults, high-context culture, Japanese

Introduction

Research suggests that verbal cues are more effective for detecting deception than nonverbal cues (e.g., DePaulo et al., 2003; Vrij, 2019; Vrij et al., 2019, 2022). Specific interview techniques, including the Strategic Use of Evidence (SUE; Hartwig et al., 2014), the Verifiability Approach (VA; Nahari, 2018), and Cognitive Credibility Assessment (CCA; Vrij et al., 2017) have been developed to elicit verbal cues to deception.

Verbal deception strategies, or how people express what they want to say when they lie, are critical elements of verbal deception. It has been argued that focusing on the verbal strategies behind individual statements contributes to a general understanding of verbal behavior when lying (DePaulo et al., 2003; Vrij et al., 2010). A better understanding of lie tellers' verbal strategies could also be used to develop specific interview techniques aimed to counteract these strategies (Vrij and Granhag, 2012). In fact, the specific interview techniques developed to date (SUE, VA, and CCA) all aim to exploit the verbal strategies lie tellers use. Research conducted in Sweden and the United States has focused on verbal deception strategies used (Strömwall et al., 2006; Hartwig et al., 2007, 2010; Hines et al., 2010; Strömwall and Willén, 2011). The participants of these studies self-reported in response to an open-ended question the things they say or avoid saying to sound convincing during mock interrogations, which were coded to establish data-driven categories of verbal strategies.

Identifying factors influencing verbal deception strategies could result in a better understanding of these strategies. One critical factor is the communication style, defined as how people communicate with others (Hall, 1976; Liu, 2016). Cultures have been categorized according to whether people rely more on language or more on context for communication (Liu, 2016).

Low-context cultures use a communication style that relies heavily on language. In contrast, high-context cultures use a communication style that relies heavily on context. According to Liu's (2016) classification, the United Kingdom is a low-context culture, and Japan is a high-context culture. Tabata and Vrij (2022) compared self-reported verbal strategies used to appear convincing when lying and truth-telling between British and Japanese participants. Deception research has been conducted mainly in the so-called WEIRD (Western, educated, industrialized, rich, and democratic; Gerlach et al., 2019) cultural groups, and this study was an exception to this trend. Tabata and Vrij (2022) asked participants to rate how much they endorsed 16 self-reported verbal strategies that lie tellers and truth tellers use to appear convincing. They extracted these 16 strategies from previous studies all conducted in low-context cultures using an open-ended questions method (Strömwall et al., 2006; Hartwig et al., 2007, 2010; Hines et al., 2010; Strömwall and Willén, 2011). The results of this closed-questions method questionnaire revealed that British participants were more likely than Japanese participants to try to tell a lie in a logical way and to focus on facts, which corresponded to differences in communication styles between the two countries. For example, British participants were more concerned with providing innocent reasons and avoiding/denying incriminating evidence when lying than when truth-telling, which was not the case for Japanese participants. Tabata and Vrij (2022) also reported that the Japanese were less likely than the British to self-report using verbal strategies based on Grice's cooperative principles (1975). The Grice cooperative principles describe how people achieve effective conversation in general social situations. Violating Grice's cooperative principles (1975) is considered deceptive in low-context cultures, where language dominates when communicating with others (McCornack, 1992; McCornack et al., 1992), but those principles are often disregarded in high-context cultures (He, 2012; Herawati, 2013; Al-Qaderi, 2015). Indeed, coders in a study of Japanese participants (Tabata, 2009) categorized 9 of 55 participants (16.4%) as using the "Make the story ambiguous" strategy when they were forced to lie in experimental situations, which violated the maxim of manner (Grice, 1975).

The current study focused on age as another possible factor related to verbal deception strategies. A series of studies on the theory of mind, the ability to understand that other people have thoughts, knowledge, and feelings that are not the same as ours (e.g., Premack and Woodruff, 1978; Wellman et al., 2001), suggest that people's ability to conduct complex deception develops with the development of the theory of mind, which enables to use complex verbal deception strategies (e.g., Talwar and Lee, 2008). However, the relationship between age and verbal strategies when lying used by adults who have acquired the theory of mind remains unclear.

Lying can be mentally taxing (e.g., Zuckerman et al., 1981; Vrij, 2008; Christ et al., 2009). It is also known that cognitive abilities decline with age (e.g., Tucker-Drob, 2011). As a result, age-related cognitive changes might affect verbal strategies when lying. Studies of neurobiological variables including regional brain volume showed that continuous age-related decline begins in the 20s (e.g., Pieperhoff et al., 2008), resulting in age related cognitive decline. Normal cognitive aging begins relatively early in adulthood in healthy adults (Salthouse, 2019), and specific cognitive abilities such as reasoning and speed start to decline as early as from 20 or 30 years of age (Salthouse, 2009). Several studies have shown the effects of age-related decline of cognitive abilities on lying-related behaviors and judgments. For example, the number of lies told was negatively associated with age (Serota et al., 2010); and older adults were worse at lying or detecting lies than younger adults, and these detection failures were mediated by the relationship between age and older adults' decline in recognizing emotions (Ruffman et al., 2012). Based on these findings, we hypothesized that age would affect verbal deception strategies, such that fewer verbal strategies would be used as a person ages, reflecting the decline in older adults' cognitive abilities.

Tabata and Vrij (2022) asked participants to complete a verbal deception strategy questionnaire which included verbal strategies based on studies using the open-ended question method conducted in Sweden and the United States, which are classified as low-context cultures (Liu, 2016). Tabata and Vrij (2022) could thus compare differences in Japanese and British participants in endorsing verbal strategies identified in low-context cultures but did not give Japanese participants the opportunity to report strategies that are unique to their culture. In the current study we used the open-ended question method to identify verbal strategies used by Japanese participants when lying. Unlike the closed-ended question methods used by Tabata and Vrij (2022), an open-ended question method has the advantage that respondents can report new verbal deception strategies (e.g., Vrij, 2008).

Method

Participants

Japanese adults ($N = 153$, 82 men and 71 women; mean age 26.01 years, $SD = 11.51$, age range 18 to 73 years; Age distribution, 20 participants in their teens, 80 in their 20s, 20 in their 30s, 10 in their 40s, 13 in their 50s, and 10 in their 60s or older) took part in this study on a voluntarily basis. The participants' age distribution was skewed (Skewness = 1.92, Kurtosis = 2.66). Therefore, we used the log-transformed age in the analysis because the Kurtosis exceeded ±2, and the normality assumption of the distribution was not satisfied (e.g., Kunnan, 1998).

Procedure

We conducted this survey in July and August of 2021 after a university class on social psychology and at a public lecture on library information science for citizens held at the same university. We distributed questionnaires to the participants at the same time after the class or the lecture. The participants indicated their age and gender, and then we asked the participants the following. "Please explain the expressions you use when you lie in your daily interactions. Please freely describe how you structure your speech to appear convincing in your daily interactions. Please give as many strategies as you can think of." We gave participants 5 min as sufficient time to recall their behavior. We instructed the participants who did not use any verbal strategies to answer that they did not use a specific strategy. We debriefed the participants after collecting the questionnaires.

Response coding

The participants' open-ended descriptions of the verbal strategies they used to appear convincing were first analyzed qualitatively by three coders, who were two Japanese undergraduate students majoring in social psychology and the first author. All of them were native Japanese

speakers. We first excluded 33 descriptions of the 337 descriptions made by the 153 participants that were unrelated to verbal strategies. Then, we categorized the remaining 304 descriptions obtained from 143 (94.5%) participants so that the responses corresponded with the verbal strategies described in Tabata and Vrij (2022). The responses that did not correspond to Tabata and Vrij were categorized as new categories in a data-driven manner. Table 1 shows the 13 verbal strategies that we categorized. Eleven categories were identical to Tabata and Vrij, whereas two categories, "Make the story ambiguous" and "Add irrelevant details," were new categories. We defined "Make the story ambiguous" as blurring the content of a statement, and "Add irrelevant details" as adding details unrelated to the lie. "Make the story ambiguous" violated the maxim of manner, and "Add irrelevant details" violated the maxim of relevance (people should keep to the point) in Grice's cooperative principles (1975).

Next, the two Japanese undergraduate students allocated each description to the 13 categories. The agreement rate between the two classifications was 91.8% ($\kappa = 0.91$). The discrepancies were resolved in a discussion between the two coders.

Results

We included the 10 (6.5%) participants who indicated they did not use a specific verbal strategy in the analyses. Table 2 shows the number of times each verbal deception strategy was mentioned and the percentage of participants who reported them. We can see that "Deny/Avoid incriminating details strategy" was most frequently mentioned (56 times), followed by "Obey the maxim of manner" (44 times), "Minimal detail" (43 times), and Rich in detail (41 times).

We scored whether a participant mentioned using each verbal strategy category (Mentioned = 1 and not Mentioned = 0). On average participants reported 1.82 ($SD = 1.03$) categories, which was significantly and negatively correlated with the log-transformed age of the participants ($r = -0.40$, $p < 0.001$, 95% CI [−0.53, −0.26]). Table 2 shows the correlation results for each category. Four categories – "Deny/Avoid incriminating details," "Obey the maxim of manner," "Rich in detail" and "Add irrelevant details" – were significantly and negatively correlated with age.

TABLE 1 Verbal strategy categories used when lying and definitions.

Category	Definition
Deny/Avoid incriminating details	Avoiding reporting incriminating details while giving more details about innocent elements of the story.
Obey the maxim of manner	Avoiding obscurity and ambiguity and being brief and orderly.
Minimal detail	Saying as little as possible so that if the story needed to be repeated there would be less room for error.
Rich in detail	Giving as much detail as possible about what has happened.
Plausibility	Giving a statement that sounds plausible (that sounds as if it really could have happened).
Coherent and consistent	Explaining everything the same way even if asked the same question again.
Make the story ambiguous	Blurring the content of a statement.
Add irrelevant details	Adding details unrelated to the lie.
Provide innocent reason	Providing an innocent reason for an activity.
No hesitation	Appearing decisive.
Unrehearsed story	Making the story sound spontaneous.
Consistent story	Sticking with a story and do not change elements within it.
Emotions	Explaining the feelings experiencing during the event.

Discussion

This study investigated the relationship between self-reported verbal deception strategies and age in Japanese adults using the open-ended question method. The results supported our hypothesis based on the decline of cognitive abilities with age. Age was significantly and negatively correlated with the number of verbal deception strategies used.

Moreover, the verbal deception strategies significantly and negatively related to age – "Deny/Avoid incriminating details," "Obey the maxim of manner," "Rich in detail" and "Adding irrelevant details" – can all be considered to be relatively cognitively demanding to execute. Denying or avoiding incriminating details requires fabricating a denial that conforms to known facts (Hartwig et al., 2010), which is mentally taxing. Obeying the maxim of manner requires stories with complex speech structures to avoid ambiguity (Grice, 1975). Telling a story rich in detail or adding irrelevant details requires to make up details and fabricating details can be cognitive demanding (e.g., Köhnken, 2004; Vrij, 2008). These results corroborate the idea that older participants may find it challenging to use these verbal strategies. However, since we did not measure cognitive abilities, this remains an empirical question that needs to be examined. This study revealed two new verbal strategies – "Make the story ambiguous" and "Add irrelevant details" – that have not been identified in low-context cultures using the open-ended question method. Participants in low-context cultures most likely avoid these strategies because they violate Grice's cooperative principle and violating this principle sounds suspicious (McCornack, 1992; McCornack et al., 1992). However, speakers in high-context cultures often disregard Grice's cooperative principle (He, 2012; Herawati, 2013; Al-Qaderi, 2015). Over 10% of the participants in this study mentioned using these two verbal deception strategies, suggesting that they are common in Japan. The use of the open-ended question method in high-context participants contributed to discovering these new verbal deception strategies.

Another finding of this study was that "Deny/Avoid incriminating details" were most common strategies when lying in Japanese adults, followed by "Obey the maxim of manner," "Minimal detail" and "Rich in detail." "Minimal detail" and "Rich in detail" seems to contradict each other. Which of these two strategies people favor may depend on the context or the personality of the lie teller. The results of this study imply that age is a significant factor in the verbal deception strategies. Tabata and Vrij (2022) pointed out the lack of research on verbal

TABLE 2 Verbal strategies when lying, the number of statements, percentage of participants using statements, and correlation with log-transformed age (N=153).

Verbal strategies when lying	Number of statements	Participants who stated the statement (%)	Correlation with log-transformed age		
			r	*p*	95% CI
Deny/Avoid incriminating details	56	32.0	−0.27	<0.001	[−0.41, −0.12]
Obey the maxim of manner	44	25.5	−0.19	0.022	[−0.33, −0.03]
Minimal detail	43	23.5	−0.02	0.852	[−0.17, 0.14]
Rich in detail	41	25.5	−0.25	0.002	[−0.39, −0.09]
Plausibility	24	15.0	−0.10	0.243	[−0.25, 0.06]
Coherent and consistent	23	15.0	−0.09	0.256	[−0.25, 0.07]
Make the story ambiguous	19	12.4	−0.05	0.510	[−0.21, 0.11]
Add irrelevant details	16	10.5	−0.17	0.036	[−0.32, −0.01]
Provide innocent reason	14	9.2	0.14	0.084	[−0.02, 0.29]
No hesitation	13	6.5	0.01	0.942	[−0.15, 0.16]
Unrehearsed story	7	4.6	−0.02	0.801	[−0.18, 0.14]
Consistent story	3	2.0	0.07	0.399	[−0.09, 0.22]
Emotions	1	0.7	−0.00	0.974	[−0.16, 0.16]

deception strategies and the present study helps clarifying the verbal deception strategies used by younger and older adults. If our finding, older adults use simpler strategies than younger adults, will be replicated in future research a next step could be to develop specific interview protocols for younger and older adults aimed to counteract the specific strategies they use.

Several limitations of this study should be noted. First, the study examined the relationship between self-reported verbal deception strategies and age only in Japanese participants. Because we examined a topic never examined in verbal deception strategies research before (the relationship between self-reported verbal deception strategies and age), we started small scale with only one high-contact culture country. Since the predicted relationship between verbal deception strategies and age emerged in that high-context culture country (Japan), future research could examine whether this will be replicated in other high-context cultures. If so, it will make the findings more robust. Conducting research into examining the relationship between verbal deception strategies and age in low context countries is also essential. Based on Tabata and Vrij (2022), we can assume that people in low-context cultures are more accustomed to lying logically than people in high-context cultures, so lying may be less mentally taxing in low-context cultures than in high-context cultures. A negative relationship between age and self-reported verbal deception strategies may thus be most pronounced in high-context cultures. Second, in the current study we focused on lying in general social situations. For a more comprehensive understanding of verbal deception strategies, it is desirable to include more specific contexts, since different verbal deception strategies may be used in different contexts. Third, we only studied participants up to their early 70s in age but cognitive decline may be more pronounced in adults older than 70 years. A study that includes participants older than those in the current study might shed more light on age-related patterns of cognitive decline when using verbal deception strategies. Fourth, we measured self-reported verbal strategies rather than verbal responses. Focusing on verbal strategies used for lying facilitates insight into the lie teller's thought processes (Vrij et al., 2010). However, it is unclear how the actual speech content reflects the verbal strategy. We suggest future studies to empirically examine the link between self-reported verbal deception strategies and verbal deceptive behavior. Fifth, the open-ended question method has as limitation that it only reveals strategies participants could think of and reported. Participants may also use verbal deception strategies that they did not mention (e.g., Vrij, 2008). It would thus be desirable to examine the correlation between verbal deception strategies and age using the closed-ended question method, including the new strategies obtained in this study. Finally, despite the evidence from several studies that age-related decline of cognitive abilities affect lying-related decisions and behaviors (e.g., Serota et al., 2010; Ruffman et al., 2012), the findings of this study might be explained by mechanisms other than cognitive decline. For example, older participants might have stopped using verbal deception strategies they have found to be less effective. We have not addressed which verbal strategies are effective for successful deception because we assumed it was dependent on the situation (e.g., Levine, 2022). Further studies could investigate the possibility that specific verbal strategies, especially those that complicate the structure of a story, might be intentionally unused due to reasons other than age.

In summary, this study demonstrated that age was significantly and negatively correlated with the number of verbal deception strategies. Particularly, verbal strategies that complicate the structure of a story tended to be less used as participants' age increased. We hope that this study encourages other researchers to examine the relationship between age and self-reported verbal deception strategies.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Ethical Committee for Policy Studies Association in Aichi Gakuin University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

NT performed the data collection and analysis and wrote the first draft of the manuscript. AV contributed to the manuscript's final draft and revisions and read and approved the final version of the manuscript for submission. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Contextual considerations for deception production and detection in forensic interviews

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Most deception scholars agree that deception production and deception detection effects often display mixed results across settings. For example, some liars use more emotion than truth-tellers when discussing fake opinions on abortion, but not when communicating fake distress. Similarly, verbal and nonverbal cues are often inconsistent predictors to assist in deception detection, leading to mixed accuracies and detection rates. Why are lie production and detection effects typically inconsistent? In this piece, we argue that aspects of the context are often unconsidered in how lies are produced and detected. Greater theory-building related to contextual constraints of deception are therefore required. We reintroduce and extend the Contextual Organization of Language and Deception (COLD) model, a framework that outlines how psychological dynamics, pragmatic goals, and genre conventions are aspects of the context that moderate the relationship between deception and communication behavior such as language. We extend this foundation by proposing three additional aspects of the context — individual differences, situational opportunities for deception, and interpersonal characteristics — for the COLD model that can specifically inform and potentially improve forensic interviewing. We conclude with a forward-looking perspective for deception researchers and practitioners related to the need for more theoretical explication of deception and its detection related to the context.

KEYWORDS

deception, lying, context, cold model, language, forensic interviewing

Introduction

Deception production and detection are contingent phenomena. How people tell lies, what they lie about, and how well people can detect lies can vary across settings or depend on a range of factors. For example, the lies people tell about potentially controversial opinions (Newman et al., 2003) are different than the lies people tell during a fake 9-1-1 emergency call in terms of their emotional content (Burns and Moffitt, 2014). People who lie about their abortion views tend to overuse negative affect compared to truth-tellers, and people who lied about medical emergencies underuse negative affect compared to truth-tellers. The personality constructs of psychopathy and Machiavellianism have not only been associated with the propensity to lie, but also the amount of positive emotion experienced in deceiving others (Baughman et al., 2014). Lie detection accuracy is also dependent on artifacts of truth-lie judgments (e.g., lie-truth base-rates; Levine et al., 1999). Accuracy for truths is often greater than accuracy for lies because people tend to guess "true" more often than "false" in detection tasks (Levine, 2014, 2020). Together, across decades of empirical scholarship and hundreds of studies, one of the most stable findings in deception research is that telling lies and detecting lies are impacted by *the context*. However, theoretical conceptualizations of the context for deception

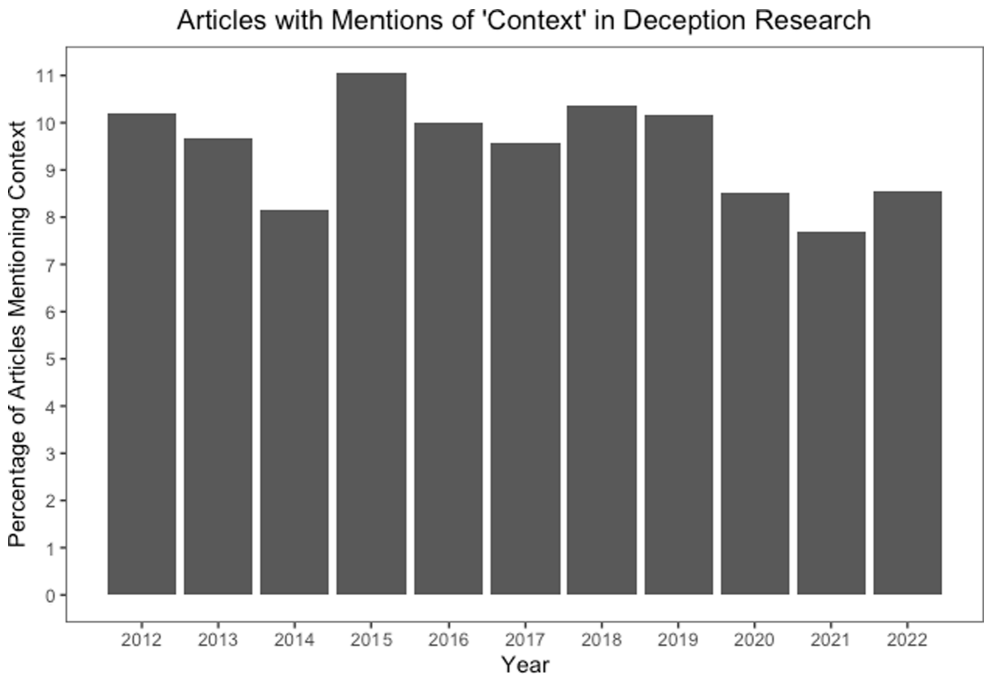

FIGURE 1
Frequency of context-related terms in the deception literature over time. The total number of articles in this analysis was 9,614.

research are uncommon (for exceptions, see Blair et al., 2010; Markowitz and Hancock, 2019), despite many papers and empirical investigations calling for a better understanding of what it means. The context is often a catch-all to describe why lie production or detection may differ across settings. This universal application of the context leads to conceptual opacity instead of clarity, which we hope to alleviate in this paper.

Here, we draw on and expand existing theoretical models to explicate aspects of the context that matter for deception production and its detection. We specifically focus our efforts on identifying how aspects of the context inform our understanding of deception production and detection in forensic interviewing, which will impact empirical research and practice to diagnose lies from truths. Existing scholarship has articulated how contextual characteristics (e.g., pragmatic goals) inform the relationship between deception and language (Markowitz and Hancock, 2019), though our aims are broader, as we attempt to build on this foundation by considering more contextual factors that modify how people lie and detect lies.

Deception and context: A current overview of the literature

Interest in the role of the context for deception research appears to be mixed over time. To validate this claim, we extracted academic abstracts from January 1, 2012 to October 2022 that contained the terms *deception* or *lying* as subjects using the first author's university library system. This resulted in a corpus of over 16,000 peer-reviewed papers over the decade. This number was reduced to 9,614 after removing duplicates and irrelevant pieces. We identified the number of articles that mentioned at least one term related to the context (e.g., *context, contextual*, *contextually* etc.), and chose abstracts because they are succinct summaries of the research. If the words *context* or *contextual* appeared in such short texts, this would indicate that they were a key focus for the authors, as opposed to being an afterthought in the Discussion.

A total of 901 papers focused on context (9.4%),[1] and the data in Figure 1 suggest the frequency of context-focused papers vacillates. This evidence is illustrative because it suggests a nontrivial number of deception papers attend to aspects of the context in the research process and in academic reports, though the majority do not. To understand why there are mixed effects across deception studies and how to perhaps resolve them, a greater understanding and treatment of the context is needed in the published literature.

Having established that deception scholarship has a limited focus on the context in the past decade, it is now important to consider how scholars have thought about the role of the context in terms of empirical evidence and theory. Perhaps the most compelling evidence suggesting that contextual factors impact deception production originates from a meta-analysis by Hauch et al. (2015). The authors observed that in over 40 studies, the relationship between deception and language was systematic for many verbal dimensions (e.g., emotion, cognitive complexity), though the effect sizes were small. Crucially, five moderators often changed the nature of the relationship between deception and language (e.g., the event type, the emotional valence of the situation, the intensity of the interaction, motivation, and the production mode). For example, as others have noted (Markowitz and Hancock, 2019, 2022),

1 Including the search terms *situation* and *situational* increased this percentage to 13.6% (1,304/9,614). This evidence suggests context-related terms are more common than situation-related terms, though the general focus on the context or situation remains relatively low. A similar trend in Figure 1 emerged for using situation terms, only.

liars typically use fewer words than truth tellers in their verbal accounts. This effect, however, is moderated by the interaction level between communicators (e.g., no interaction, computer-mediated communication, an interview, or a person-to-person interaction): liars tend to use more words than truth-tellers online, but fewer words without an interaction, when the interaction is an interview, or when it is person-to-person. The Hauch et al. (2015) meta-analysis provides clear evidence that the context and contextual factors matter for deception, yet our conceptualizations of the context are limited.

One theoretical model, however — the Contextual Organization of Language and Deception (COLD) framework — prescribes how the context may impact the relationship between deception and communication behavior such as language. Specifically, there are three aspects of the context that matters for the relationship between deception and language: (1) psychological dynamics, (2) pragmatic goals, and (3) genre conventions. Psychological dynamics relate to the emotional and cognitive experiences of a liar, which may be different than a truth-teller, and are often inconsistent across deceptions. Comparing primary study effects for the same linguistic indicator can help to demonstrate the impact of psychological dynamics on language patterns for deception. Prior online dating research observed that those who had more inaccurate items in their profile tended to focus on less negative emotion in the "about me" section of their dating advertisement compared to those who had more accurate items in their profile (Toma and Hancock, 2012). In a different deception setting, those who wrote false opinions related to abortion or their friends tended to focus on more negative emotion compared to those who wrote truthful opinions (Newman et al., 2003; Markowitz and Griffin, 2020). Using just these two examples, the same indicator (e.g., negative emotion terms) had a different relationship to deception that was modified by how people were thinking and feeling, or what they were attending to, at the time of lying or truth-telling.

Whether a person is apt to engage in deception at all can be tied to psychological dynamics of the situation as well. Mercadante and Tracy (2022) found that individuals who were labeled as "hubristically proud" (e.g., associated with low self-esteem, arrogance, and antisocial traits) were only more prone to lie when their status was threatened, and not in situations that were non-social or perceived as less threatening. Together, psychological aspects of a deception are critical contextual factors that change how people communicate about lies, an idea supported by decades of deception research across multiple domains, lie types, stakes, and settings (Ekman, 1989, 2001; Frank and Ekman, 1997).[2]

A second aspect of the context for deception and language relates to pragmatic goals. What people are trying to accomplish with their deception often changes how they falsely or truthfully communicate. Markowitz and Hancock (2019), in their evaluation of presidential lies, observed that those who lied about a rationale for war (e.g., President George W. Bush and President Lyndon B. Johnson) had a different linguistic profile and focus than those who lied because of a personal embarrassment (e.g., President Bill Clinton and President Richard Nixon). That is, the self-focus of these presidents was modified by what they were trying to accomplish. Presidents who were trying to convince the country of a contested war effort experienced a psychological distancing effect (e.g., a reduction in "I"-words in their lies compared to truths), whereas presidents who were trying to maintain their credibility after a personal and public humiliation experienced a psychological immediacy effect (e.g., an increase in "I"-words in their lies compared to truths; Weiner and Mehrabian, 1968). Goals are critical in deception research (Buller and Burgoon, 1996; Bond et al., 2013; Levine et al., 2016), and no two deceptions (nor deceivers) may have the same reasons for lying. Motivational attitudes and values also help facilitate our understanding of when an individual may be most inclined to dishonesty. For example, Lee et al. (2020) found that neutralization (e.g., overriding a social norm and justifying immorality) was the primary motivator for academic dishonesty. This evidence suggests a deeper consideration of how goals/motives modify communication and deceptive patterns is required.

A final aspect of the COLD model, genre conventions, draws on linguistics research to suggest how people communicate within "discourse communities," which have norms that shape behavior (Biber et al., 2007). Independent of deception, discourse communities suggest ways of communicating either implicitly or explicitly. For example, an implicit discourse community norm includes the idea of not swearing in a religious building, while an explicit discourse community norm includes rules to ban hate speech on certain online forums (Twitter, 2022). A critical function of genre conventions is to identify what is normative and non-normative for people to communicate within a particular setting. Discourse communities change and shift within social interactions even prior to deception being communicated. Baseline communication conventions are important to acknowledge as a contextual factor that can also modify how people lie or tell the truth across deceptions (Markowitz and Griffin, 2020). Altogether, the COLD model is largely a lie production framework that attempts to articulate various contextual factors that impact how people communicate verbally when they lie versus tell the truth. Since its creation, however, we — the original authors of the COLD model and other collaborators — have considered other context-related factors that are also likely to impact lie production and detection. Our aim with the remainder of this piece is to outline new directions for the COLD model and apply them to forensic interviewing, focusing on how the model can be extended with new lie production characteristics (which can have implications for detection as well). We use existing empirical evidence to ground our additions to the COLD model and encourage other scholars to continue adding to this non-exhaustive foundation.

Individual-level factors: Demographics and personality traits

Individual differences, including demographics and personality traits, have historically received limited treatment in the deception literature. While prior work has indeed suggested the role that certain dispositional traits may play in deceptive communication (e.g., self-monitoring; Miller and Stiff, 1993), recent work has offered even greater attention on individual-level characteristics to identify deception in a range of settings. General inclinations toward honesty can be identified using personality models such as the HEXACO model (Ashton et al., 2014), with evidence suggesting people who are high on honesty—humility tend to cheat less than people who are low on honesty—humility, on average (Markowitz and Levine, 2021). Personality traits beyond The Big Five and its derivations (John and Srivastava, 1999) have also identified people who

2 While we propose and present evidence suggesting psychological dynamics moderate the relationship between deception and language, there is mixed evidence for this claim as well (Hartwig and Bond, 2011). We acknowledge this evidence in the spirit of transparency and to encourage scholarship that identifies the boundary conditions of such effects.

are inclined to lie, cheat, or deceive in different deception settings. For example, the Dark Triad (Furnham et al., 2013; Jones and Paulhus, 2014) consists of three aversive personality traits: narcissism (e.g., people who are entitled and believe they are superior), Machiavellianism (e.g., people who are manipulative), and psychopathy (e.g., people who are generally less empathic and less anxious about misdeeds). What links these problematic personality traits is arguably manipulation and deceptive intent, with a recent study demonstrating that manipulativeness and dishonesty were some of the key characteristics defining psychopathy (Crego and Widiger, 2022). People who are high on such aversive personality traits tend to display more cheating behavior in some settings (Jones and Paulhus, 2017), and report higher-than-average lying self-reported lying rates than those who are low on such aversive personality traits (Daiku et al., 2021; Markowitz, 2022).

Deception studies may control for individual differences, but they might serve as key moderators for lie production or detection. Some people may be more dispositionally honest or deceptive than others (Jones and Paulhus, 2017; Markowitz and Levine, 2021), changing how often they lie and what they tend to lie about. We therefore suggest a natural extension of the COLD model is a focus on the individual and how certain underlying characteristics (e.g., personality traits) reveal deception across settings For example, Porter and Woodworth (2007) found that compared to non-psychopathic murderers, those scoring high on psychopathy were more likely to frame their offense in a reactive manner, downplaying the instrumental nature of the offense, and omitting specific details during an interview compared to those scoring low on psychopathy. A line of research has also found that individuals scoring high on psychopathy demonstrate unique language profiles indicative of low anxiety, less empathy, hostile and negative affect, as well as instrumental intentions compared to those scoring low on psychopathy (Hancock et al., 2013, 2018; Le et al., 2017). This less authentic and problematic language may not hinder their deceptive goals face-to-face (e.g., where they can also utilize nonverbal behavior), but in online environments, evidence suggests such people may have a reduced ability to manipulate others (Crossley et al., 2016).

Other types of individual differences (e.g., demographics) need greater treatment in the deception literature as well, since some work suggests they impact detection. One study evaluated how White students judged the veracity of Black and White targets, with evidence suggesting a greater truth-bias with Black compared to White targets (Lloyd et al., 2017). The effect was strongly related to one's need to not appear prejudiced. However, in an eye-tracking study from the same paper, participants focused more on the word "lie" when the target was Black compared to White. These data have clear intergroup conflict and intergroup dynamic implications (Giles, 2012; Dunbar, 2017), but they also motivate a greater need to use demographics as a contextual and moderating factor in deception detection research. The demographic makeup of the communicator and target of a deception matter.

Situation-level factors: Lie prevalence and base-rates

During interpersonal deception, most people lie when honesty is a problem (Levine, 2020), or when the opportunity for deception is available and facilitates some form of significant personal gain. Most people are not egregious liars; they tend to lie *just a little bit* to still be perceived as a good person while getting ahead of others by lying (e.g., the fudge factor; Ariely, 2012). However, a small segment of the population engages in prolific lying, defined as greater-than-average lying during a one-time task. Prolific lying, with skewed prevalence distributions where most people are honest and a few people have above-average lying rates, has been established in US settings (Serota et al., 2010; Levine et al., 2013; Markowitz and Hancock, 2018; Markowitz, 2022), Japan (Daiku et al., 2021), South Korea (Park et al., 2021), and other locations. Therefore, a critical contextual and situational moderator of deception is lie-truth base-rates. As others suggest (Levine, 2014, 2020; Markowitz, 2020), base-rates indicate how often deception is prevalent and how often one should expect deception in a particular setting. In a setting with very little deception and an overwhelming amount of honesty (e.g., disinformation online), detection accuracy will be near 100% as predicted by Truth-Default Theory (Levine, 2014, 2020). Therefore, to detect lies effectively, researchers and practitioners should attempt to establish base-rates of deception that can signal the probability of lying in each setting. If deception is improbable or implausible (Walczyk et al., 2014), detection efforts may be futile. Detection efforts with a more evenly distributed lie-truth base-rate may be more effective.

It is important to note that prolific lying and identifying prolific liars are not the same empirical task. Prolific lying considers deception tendencies during a single opportunity for gain (Serota et al., 2010; Levine et al., 2013; Daiku et al., 2021; Markowitz, 2022). Prolific liars are individuals who demonstrate a repeated proclivity for taking up the opportunity for deception (Serota et al., 2021). Therefore, the number of repeated deceptions over a particular timespan may be informative for deception research as a moderator to enhance detection abilities. A prolific liar may leave behind more behavioral traces of their deception than a person who engages in prolific lying because there are more datapoints on their behavior. This, in turn, may increase deception detection ability. However, it is unclear if prolific liars are also more clever deceivers who may cover their tracks and avoid detection better than people who engage in opportunistic, prolific lying. This open question offers a program of research for future deception scholarship. It is also worth noting that prolific lying may be considered an individual difference as well and therefore, there is some level of overlap between the current and prior sections. For example, pathological and prolific lying, along with manipulativeness, are considered two of the 20 key characteristics of psychopathy.

Interpersonal factors: Deception consensus and style matching

Deception production and detection research often focuses on the individual, specifically how they communicate lies and the degree to which people can detect such lies. Lies are communicated to a target, however, and the relationship between the liar and receiver requires greater treatment in the literature. Interpersonal Deception Theory (IDT) offers critical insights into interpersonal dynamics, specifically interactivity and motives, that can help to understand who people lie to and how detection efforts can be improved (Buller and Burgoon, 1996). However, IDT is largely an interpersonal theory from a face-to-face perspective. It is important to consider how other interpersonal communication characteristics, which might originate from online sources, can inform IDT and feed into the COLD model.

First, prior work suggest interpersonal perceptions of dishonesty are correlated in online (Markowitz and Hancock, 2018) and offline settings (Markowitz, 2022). For example, Markowitz and Hancock (2018) coined

the *deception consensus effect*, an idea that suggests one's lying rate is positively correlated with their perceptions of dishonesty for a given setting. Online daters who lied a lot tended to think that other daters were also lying a lot as well. Therefore, a critical moderator of deception production frequency might be one's perspective on the how often deception occurs for a given setting (e.g., Markowitz, 2020). If a person believes that others in a community are lying at high rates, this may license them to lie at high rates as well. Expectations for deception also have important implications for deception detection. If detectors believe that social media has widespread deception, they may be more likely to guess that a message is false compared to true (e.g., a deception bias instead of truth bias; Luo et al., 2022). Further, if law enforcement believes that certain individuals are more likely to lie than others, they might use shoddy interrogation tactics or unjustly accuse suspects. Interpersonal and intergroup perceptions are essential in everyday communication (Abeyta and Giles, 2017), suggesting they should also be considered when deception is involved as well (Dunbar, 2017).

While perceptions of suspects during the forensic interview are important to understand how detectors might judge certain groups of people, such investigations require the active recruitment of one's thoughts and feelings about a target. For example, to identify how someone feels about another person and if they are lying about these feelings, self-report data may be required to identify discrepancies between what people say and what they report *via* survey data. An alternative, but complementary approach might use language patterns to identify liking and affinity toward another person or group. A variety of studies have demonstrated the more that people match on their use of style words (e.g., articles, prepositions, pronouns), the more that two people tend to have more favorable interpersonal perceptions, cohesion, interest, liking, and better interactions (Gonzales et al., 2010; Ireland et al., 2011). This insight — using style words as markers of interpersonal interest and liking — can help forensic interviewers who want to understand the degree to which suspects feel psychologically connected to the interviewer as revealed at the language level. It is unclear if deceivers style match more in order to be psychologically closer to interviewers and closely monitor how they are perceived (DePaulo, 1992), or if they style match less to distance themselves from their target (Newman et al., 2003; ten Brinke and Porter, 2012; Markowitz and Griffin, 2020). This open question should be a prime candidate for future research. Importantly, style matching is closely associated with demonstrating empathy and building rapport, which may enable interviewers in forensic settings to obtain more accurate and relevant information from guarded suspects. Brimbal et al. (2021) found that for more guarded suspects who were being interviewed, rapport not only reduced their level of resistance (and increased cooperation), but also facilitated additional information retrieval and the chance to increase the amount of *accurate* information obtained compared to less guarded suspects.

Conclusion and future directions

Few theoretical perspectives are equipped to address how the context moderates lie production and lie detection effects. In this work, we broadly reintroduce the COLD model and articulate new directions for contextual constraints that impact how deception is communicated and detected. We suggest that researchers can take this evidence and build it into their research designs to test how individual differences, lie-truth base-rates and situational opportunities for deception, and interpersonal dynamics can modify lying and lie detection. More experimental research is needed to assess how these constraints compare or moderate deception and language effects relative to others that might exist in the literature (Vrij, 2018, 2019; Nahari et al., 2019). The COLD model is also limited in that it cannot yet make predictions. Future iterations of the model can work toward becoming a deception theory by making "formal, testable, falsifiable propositions" to be used in future scholarship (McCornack et al., 2014, 351). Practitioners should assess how their current approaches to lie detection fare, and perhaps draw on the COLD model to identify warning signs of lie production across settings where context effects loom large For instance, interviewing models (such as the Phased Interview Model) that incorporate substantial rapport building strategies show promise in obtaining additional credible and investigation relevant information in serious crime investigations (Cooper et al., 2021). Forensic interviewing can benefit from a more systematic acknowledgment that contextual elements impact lie detection, and the COLD model offers many pathways to understand the possible constraints that the context places on lie detection efforts.

We aimed to provide a non-exhaustive list of potential additions to the COLD model based on recent research, though there may be others that warrant consideration. We are excited to work collaboratively with research teams and further develop theory related to deception and context, particularly around how people communicate lies and truths. Practitioners play a critical role in this process, as their "boots on the ground" knowledge can highlight researcher blind-spots about how lies are told outside of the laboratory. Interestingly, clinicians in therapeutic settings are voicing concerns of using videoconferencing (particularly in forensic settings such as determining competency to stand trial), with 79.7% worrying about the reliability and validity of their work compared to in person interactions (Trupp et al., 2021). Within more general clinical settings, it is also incredibly important for additional research to consider therapists' ability to gauge client credibility across communication media, given the high stakes nature of some of the information provided (for example, level of suicidal intent). We encourage more cross-pollination between research and practice, as they are symbiotic for the study of deception.

Taken together, the evidence in deception research is often mixed and contingent across studies. We argue that incremental theory-building related to the context is essential to understand how people tell lies across deceptions and how detection accuracy might vary across deceptions. Our extension of the COLD model is another attempt to progressively build our theoretical basis of knowledge into how aspects of the context — psychological dynamics, pragmatic goals, genre conventions, and now individual differences, lie-truth base-rates and situational opportunities for deception, and interpersonal characteristics — moderate lie production and lie detection effects.

Author contributions

DM wrote the manuscript. JH, MW, and ME provided critical feedback. ME collected the article abstracts and DM performed the analysis. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Police suspect interviews with autistic adults: The impact of truth telling versus deception on testimony

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Investigative interviews by police are socially and cognitively demanding encounters, likely presenting significant challenges to those on the autism spectrum. Behavioral and communication differences mean that autistic people may also be more likely to be perceived as deceptive in the context of an investigative interview. In the present study, 32 autistic and 33 (age and IQ-matched) non-autistic adults took part in a novel virtual burglary scenario in either an 'innocent' or 'guilty' condition. In a subsequent mock-police interview, innocent suspects were instructed to tell the truth about what they did, while guilty suspects were instructed to lie in order to convince the interviewer of their innocence. In the mock-interviews, innocent autistic mock-suspects reported fewer details that would support their innocence than non-autistic mock-suspects, although both innocent and guilty autistic and non-autistic mock-suspects reported similar levels of investigation-relevant information and had similar levels of statement-evidence consistency. In post-interview questionnaires, innocent and guilty autistic mock-suspects self-reported greater difficulty in understanding interview questions, higher anxiety and perceived the interview as less supportive than non-autistic participants. Implications for investigative interviewing with autistic suspects and cues to deception are discussed.

KEYWORDS

investigative interviewing, autism (ASD), deception, social perception, virtual environment

Introduction

Whether a suspect appears to be telling the truth or lying during an investigative interview has far-reaching implications; from the perceived reliability of their statement by police to how they are viewed by jurors in court (Denault, 2020; Haworth, 2020). However, accuracy for detecting deception is broadly at chance level, often based upon faint or unreliable nonverbal and paraverbal cues such as eye contact and vocal pitch (Bond and DePaulo, 2006; Sporer and Schwandt, 2006). Verbal deception cues have proved a more reliable and promising direction for investigative interviewing research. Richness of detail is one such verbal indicator of veracity (Nahari, 2016) as liars use self-regulation strategies such as keeping a story simple and avoiding verifiable details that could reveal deceit (Hartwig et al., 2014; Nahari, 2018). Further, in the criminal justice system (CJS), evidence typically links a suspect to an alleged offence, meaning a suspect's account can be compared against available evidence (Police and Criminal Evidence

Act: PACE. Home Office, 1984/2008). Thus, lying suspects may display verbal deception cues such as contradicting this evidence ('statement-evidence inconsistencies') (Hartwig et al., 2005; Vredeveldt et al., 2014), viewed as indicative of deception by investigative officers in the field (Deeb et al., 2018).

However, the impact of such verbal deception cues within investigative interviews is, to date, based upon neurotypical population samples. Thus, whether such deception cues are applicable to neurodivergent adults is yet to be examined. Concerningly, individuals on the autism spectrum (henceforth autism) appear to be overrepresented in the CJS (Justice Inspectorates, 2021). Autism is a lifelong neurodevelopmental condition characterized by persistent difficulties with social communication and interaction, as well as restricted and repetitive behaviors, interests and activities (American Psychiatric Association, 2013; World Health Organization, 2018). Relatedly, social communication and memory differences in autism present substantial challenges for providing best evidence' during investigative interviews (Maras, 2021). Autistic mock-witnesses often provide less detailed free-recall accounts (Maras and Bowler, 2011, 2012; Henry et al., 2020) due in part to autism-common difficulties with episodic memory retrieval, exacerbated by insufficiently specific, structured questioning (Maras, 2021). More broadly, autistic individuals may produce less coherent and causally connected narrative versions of events with fewer key contextualizing details (Barnes and Baron-Cohen, 2012; Baixauli et al., 2016; but see Henry et al., 2020). Indeed, autistic adults more often fail to recognize and report extricating details that would help demonstrate their innocence of mock-criminal offences (Young and Brewer, 2020). Thus, even when being truthful, autistic suspects may display verbal cues associated with deception in neurotypical populations, such as statement-evidence inconsistencies (Vredeveldt et al., 2014), a lack of verifiable extricating information (Nahari, 2018) and sparsely detailed accounts (Vrij et al., 2014). Verbal responses containing insufficient information may be interpreted as evasive or deceptive, leading to repeated questioning and challenges by investigators (Gudjonsson et al., 2007) which, in turn may lead to further breakdown in communication (O'Mahony et al., 2012) and even false confessions (Gudjonsson, 2021). These issues are likely to be further exacerbated by the stress of a suspect interview experience, as autistic people may experience investigative interviews as highly socially and cognitively demanding (Herrington and Roberts, 2012; Maras et al., 2020).

Understanding the verbal behavior of autistic suspects who are actively deceptive is also crucial for effective investigative interviewing practice. While there is a substantial body of research showing that autistic children have difficulty with lying, relatively little is known about deception in autistic adulthood (Bagnall et al., 2022). Over the past few years, there have, however, been high-profile criminal cases in the United Kingdom (UK) in which autistic defendants have deceived others (e.g., Murray, 2020; De Simone, 2021). Like non-autistic individuals, some autistic adults without co-occurring intellectual disability tell verbal lies for self-protective purposes (Davidson and Henderson, 2010; Jaarsma et al., 2012) and can successfully deceive in computerized paradigms (van Tiel et al., 2021). Autistic adults also report an inclination to lie in everyday situations comparable with non-autistic adults, though such deception may require greater cognitive effort than neurotypical peers (Bagnall et al., under review). Deception, during even mock-suspect interviews, can be highly cognitively demanding (Caso et al., 2005). Common (though not universal) autism difficulties in taking others' perspectives—or Theory of Mind (ToM: Baron-Cohen, 1997; but see Milton, 2012)—and social decision-making (Woodcock et al., 2020; Brosnan and Ashwin, 2022) may suggest that autistic adults' verbal deception cues are more pronounced than those of non-autistic adults. Indeed, while many autistic children can and do tell spontaneous verbal lies, they tend to have greater difficulty than non-autistic children maintaining these lies during subsequent follow-up statements (Li et al., 2011). Identifying how verbal deception cues are displayed by (both truthful and lying) autistic mock-suspects is crucial for the development of best practice investigative interviewing.

In summary, socio-cognitive and sensory processing differences in autism raise numerous concerns relating to the investigative interviewing of autistic suspects. Ensuring that police suspect interviews are conducted fairly and ethically requires understanding if (and how) autistic peoples' accounts are affected, and if this depends on whether they are being truthful or deceptive. Recognizing how those on the autism spectrum experience investigative interviews is also crucial for identifying relevant areas of support (e.g., supportive interviewing practices or adjustments to custody – see Holloway et al., 2020; Maras et al., 2020). We address these issues in the present study. We predicted that, during a mock-suspect interview, autistic adults' deceptive accounts would present more pronounced verbal cues to deception (i.e., greater inconsistencies, sparser accounts) than those of non-autistic adults. We also expected that autistic adults' truthful accounts would more frequently display verbal deception cues (i.e., greater inconsistencies, sparser accounts and fewer verifiable extricating details) than neurotypical adults' truthful accounts. We also anticipated that experiencing the mock-suspect interview process would be more challenging for autistic than non-autistic adults (i.e., difficulty understanding questions, level of anxiety, how supported they feel).

Methods

Participants

A power analysis using G*Power (Faul et al., 2007) indicated that a total sample size of 64 would provide 80% power to detect a medium-large effects of interview performance. This is consistent with previous studies reporting medium (partial $\eta^2 = 0.07$) to large ($d = 0.94$) effect sizes in the difference of verbal information provided by autistic and non-autistic participants during mock-forensic interviews (Maras et al., 2020; Young and Brewer, 2020).

Participants were recruited *via* research participant databases, as well as physical and digital advertisements. All participants stated that they met the eligibility criteria of normal or corrected to normal vision and hearing, adequate computer ability, fluency in spoken and written English and no previous real-life experience of a police suspect interview. The final sample was comprised 32 autistic participants ($M = 35.25$ years, SD = 14.93), including 13 females, 16 males and three non-binary individuals and 33 non-autistic participants ($M = 35.15$ years, SD = 17.55) including 21 females and 12 males. Autistic participants provided documentary evidence of their formal autism diagnosis meeting Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association, 2000) or DSM-5 criteria (American Psychiatric Association, 2013). As

expected, the autistic group ($M = 33.97$, SD = 6.54) scored significantly higher than non-autistic participants ($M = 15.70$, SD = 8.76) on the Autism Spectrum Quotient (AQ-50; Baron-Cohen et al., 2001), $t(63) = 9.51$, $p < 0.001$, $d = 2.36$. The autistic group were significantly above the proposed autism threshold score of 26 (Woodbury-Smith et al., 2005), $t(31) = 6.90$, $p < 0.001$, Hedges' $g = 1.22$, and the non-autistic group were significantly below this threshold, $t(32) = -6.76$, $p < 0.001$, Hedges' $g = -1.78$. Four participants who considered themselves to be non-autistic scored above 26 on the AQ-50 (scores of 26, 28, 34, and 40). Three autistic participants had AQ-50 scores below the 26 thresholds (scores of 18, 23, and 25). In the interest of reflecting diversity in autistic and neurotypical samples, these participants were retained in the dataset and analysis.[1]

As both age (Debey et al., 2015) and cognitive ability (Sarzyńska et al., 2017; Littrell et al., 2021; though see Wright et al., 2012) have each been associated with deceptive behavior, we assessed whether the groups were matched on these characteristics. We also examined participants' previous level of experience playing computer games,[2] as the mock-criminal and non-criminal tasks were performed within an interactive virtual environment (see 'Procedure' section of Method). A series of two-way analyses of variance (ANOVAs) were performed to examine group characteristics of age, IQ and previous gaming experience (see Table 1). There were no main effects of Group (autistic vs. non-autistic) or Condition (innocent vs. guilty), or a Group X Condition interaction for age (all $ps > 0.921$, all partial η^2s < 0.001). While there was no main effect of Group or Group X Condition interaction for IQ ($ps > 0.170$, partial η^2s < 0.031), there was a significant main effect of Condition in which participants in the Guilty condition ($M = 120.96$) had significantly higher IQ scores than participants in the Innocent condition ($M = 114.96$), $F(1, 61) = 5.36$, $p = 0.024$, partial $\eta^2 = 0.081$. There were no main effects of Group or Condition, or a Group X Condition interaction for gaming experience (all $ps > 0.068$, all partial η^2s < 0.053). However, controlling for IQ led to a significant main effect of gaming experience on Group and Condition ($ps < 0.047$, partial η^2s > 0.064), but no Group X Condition interaction ($p = 0.610$, partial $\eta^2 = 0.004$). Consequently, we controlled for gaming experience as well as IQ when comparing innocent and guilty conditions in the subsequent analyses.

The study received ethical approval from the Psychology Ethics committee at the University of Bath (21–239).

TABLE 1 Autistic and non-autistic group mean scores for age, IQ, and gaming experience within interview conditions (standard deviations in parenthesis).

	Autistic adults ($n = 32$)		Non-autistic adults ($n = 33$)	
Innocent ($n = 32$)	($n = 17$)		($n = 15$)	
Age	34.88	−15.11	35.13	−16.41
IQ[a]	113.47	−11.64	116.46	−11.23
Gaming experience	2.65	−1.54	2.2	−1.27
Guilty ($n = 33$)	($n = 15$)		($n = 18$)	
Age	35.67	−15.24	35.17	−18.92
IQ[a]	118.86	−8.77	123.05	−9.64
Gaming experience	2.33	−1.4	1.61	−0.79

[a]IQ was measured using vocabulary and matrix reasoning subtests on the Wechsler Abbreviated Scale of Intelligence (WASI-II: Wechsler, 2011).

Procedure

Virtual environment

The study used an experimental paradigm in which participants either undertook a simulated 'criminal' or 'non-criminal' task in a virtual environment (VE). To our knowledge, this is the first investigative interviewing study to use VE technology. We adapted a VE originally developed by Nee et al. (2019), especially for the purposes of the present study. The original VE was developed and for this project updated using Unity Pro (2019) as the main development platform. The geometry of different sections within the VE was either created especially for the present study or purchased from the Unity Asset Store and adapted where required. For the creation and animation of humanoid avatar, we used the Character Creator (v3) and iClone (v7) software by Reallusion. The flow of the application through the different sections, on-screen messaging and data logging were accomplished through custom-designed C# code inside Unity Pro.

The adapted VE was piloted throughout the development to ensure usability. In the final VE, participants explored three distinct environments: a city, a suburban area and a residential property. The VE was presented using a high-performance gaming laptop computer, with headphones for immersive environmental audio (e.g., footsteps, passing cars, birdsong, etc.). Figure 1 presents an image from within the VE.

VE task and post-task

Participants took part in the study individually in a dedicated laboratory space at the University of Bath. Participants were randomly allocated to either a *guilty/criminal* or *innocent/non-criminal* VE condition with associated task and instructions[3] (appearing in-game as 'text messages'). In the both the *guilty* and the *innocent* conditions, participants received seven key text messages within the VE. In the *guilty* condition the messages were from their purported 'criminal collaborator' whose instructions participants follow to steal a laptop from a residential property. In the *innocent* condition the messages were from a 'friend' who asks the participant to locate (though not touch or remove) a missing laptop. Following these instructions created seven pieces of incriminating evidence against the participants, identical in both *innocent* and *guilty* conditions (see Appendix 1).

Post-VE task, participants completed Lessiter et al.'s (2001) ITC-Sense of Presence Inventory (ITC-SOPI) to measure level of immersion during the VE, the AQ-50 and rated their frequency of gaming experience (as reported earlier) in Qualtrics. The first author

1 The pattern of results remained the same when statistical analyses were performed with and without these participants in the dataset.

2 Gaming experience was assessed by participants rating how often they play computer games on a 1–5 Likert scale: 1=Never; 2=Once or twice per month; 3=Less than 50% of days; 4=50% or more of days; 5=Every day.

3 Participants first received a brief training session for how to navigate the VE (e.g., mouse/keypad buttons) in a separate virtual location to the main *criminal* or *non-criminal* task.

FIGURE 1
Image from within the virtual environment.

then administered the WASI-II vocabulary and matrix reasoning subtests.

Mock-suspect interview

Participants (in innocent and guilty conditions) received written instructions stating they were to be interviewed as a suspect in a burglary investigation and that they needed to attempt to convince the interviewer of their innocence (e.g., Hartwig et al., 2014). Participants were informed that it was likely that the police held some evidence against them, so they should establish a plausible story. To encourage motivation, participants were instructed that if they were successfully able to convince the interviewer, they would be entered into a lottery draw to win £50 in Amazon vouchers (in actual fact, all participants were entered into the draw). Participants had 10 min to prepare before being escorted to a separate interview room.

All interviews were conducted by the second author (then blind to all research questions, hypotheses and participants' diagnosis and veracity condition), who received training by the first author in investigative interviewing practice. The interviews followed a novel script which was responsive to the content of participants' verbal accounts and was based upon UK investigative interviewing protocol.[4] All the interviews proceeded in three phases: (1) *obtain mock-suspects' initial account*; (2) *probe questions of topics from initial account* and (3) *disclosure of incriminating evidence* (see Appendix 2) while being audio and video recorded.

Post-interview task

Participants completed a Qualtrics questionnaire on a 7-point scale (1 = Not at all; 4 = Neutral; 7 = Completely) which provided the dependent variables (DVs) to assess *interview motivation*: (1) participants' motivation to appear convincing; (2) the truthfulness of participants' accounts and (3) the deceptiveness of participants' accounts and *interview experience* (1) the difficulty of the interviewer's questions; (2) participants' level of anxiety during the interview and (3) how supported participants' felt to provide a full account. Participants were also asked to rate the extent to which they remembered the details of the VE task on the aforementioned 7-point scale. At the end of the study, all participants were fully debriefed and were reimbursed at £10 per hour (the study typically lasted 90 min).

Interview coding

Interviews transcripts were coded to produce three DVs for *interview performance.*

(1) *Statement-evidence consistency* (total scores = 0–7) measured how consistent participants' (in innocent and guilty conditions) accounts were with the seven pieces of incriminating evidence (see Hartwig et al., 2005). For example, if a participant described getting off the bus near the burgled property, they would score 1 point as this was consistent with the evidence held by the interviewer (i.e. CCTV footage from bus stop). If a participant failed to mention or denied getting off the bus, they would score 0 for that piece of incriminating evidence.
(2) *Extricating information* (total scores = 0–7) measured whether participants (innocent condition only) explained that each of the seven pieces of incriminating evidence were due to their 'friend' having asked them to perform those actions. For example, a participant would score 1 point if they specified their friend had asked them to enter the property. If the participant failed to mention this, they would score 0 for this piece of evidence linking them to the crime scene.
(3) *Investigation-relevant information (IRI)* (total score range: 20–223) measured the level of detail in participants' innocent

4 The UK uses the PEACE model interview, P, Planning and preparation; E, Engage and explain; A, Account, clarify and challenge; C, Closure; E, Evaluation (College of Policing, 2022). In the present study, only the Account, clarify and challenge phase was implemented.

and guilty mock-suspect accounts. The 'PALIT' (Person, Action, Location, Item, Temporal) coding scheme was used (see Oxburgh et al., 2012; Farrugia and Gabbert, 2020a). For example, '*I went to the bus stop at 1.30 pm*' (1 × Action; 1 × Location; 1 × Temporal) '*and saw a woman wearing a black coat*' (1 × Action; 1 × Person; 2 × Item). Each item of information was only coded once with all repetitions ignored. PALIT details were summed to produce a total IRI score for each participant.

Twenty per cent of the interviews ($n = 14$) were double-coded with intraclass correlations performed for statement-evidence consistency ($r = 0.929$, $p < 0.001$; $\alpha = 0.929$), extricating information ($r = 0.945$, $p = 0.008$; $\alpha = 0.945$) and quantity of investigation-relevant information (IRI) ($r = 0.958$, $p < 0.001$; $\alpha = 0.978$), all of which showed excellent interrater reliability (Cicchetti, 1994).

Statistical analysis

All statistical analyses were performed using SPSS (version 28). All analyses comparing innocent and guilty conditions controlled for participants' IQ and level of previous gaming experience as covariates. First, *task immersion, duration and motivation* (see Table 2) was assessed using a series of two-way ANCOVAs in a 2 (Group: autistic vs. non-autistic) X 2 (Condition: innocent vs. guilty) design. Second, we examined *interview performance* (i.e., statement-evidence consistency; extricating information; IRI detail). Statement-evidence consistency and IRI detail were each investigated using a two-way ANCOVA. A *t*-test was conducted to examine whether quantity of extricating information differed between autistic and non-autistic groups (innocent condition only). Finally, *interview experience* (i.e. difficulty of questioning; interview anxiety and perception of support) was analyzed using a series of two-way ANCOVAs.

Data inspection revealed one significant outlier in truthfulness scores, two significant outliers in VE task memory and one significant outlier in extricating information scores (>3 standard deviations from mean). The overall pattern of results remained whether these outliers were included or excluded from the analysis, so they were therefore retained in the dataset. Non-normal distribution was observed in a number of variables, which a series of transformations failed to substantially improve. Heterogeneity of variance was also detected in statement-evidence consistency scores (Levine's test, $p < 0.001$). Accordingly, bootstrapped 95% Bias corrected accelerated (BCa) confidence intervals (CIs) for estimated group means and/or mean differences were produced to account for violations (Field and Wilcox, 2017).

TABLE 2 Autistic and non-autistic group estimated mean scores in task immersion, duration and motivation.

	Autistic adults ($n = 32$)				Non-autistic adults ($n = 33$)			
	M_{adj}	SE	BCa 95% CI		M_{adj}	SE	BCa 95% CI	
			Lower	Upper			Lower	Upper
Innocent ($n = 32$)								
ITC engagement	3.33	0.21	2.92	3.81	3.53	0.11	3.27	3.76
ITC ecological validity	2.75	0.22	2.33	3.15	3.19	0.22	2.78	3.59
ITC negative effects	2.57	0.24	2.13	3.09	2.01	0.26	1.53	2.5
ITC spatial presence	2.88	0.23	2.46	3.35	3.1	0.14	2.83	3.38
VE task memory	5.74	0.18	5.4	6.1	5.87	0.27	5.19	6.34
Interview duration [b]	971.64	100.9	790.38	1189.59	894.92	59.2	778.95	1017.24
Interview motivation	5.63	0.32	4.87	6.31	5.73	0.33	4.99	6.33
Interview truthfulness	6.76	0.15	6.5	7.05	6.95	0.09	6.76	7.15
Interview deceptiveness	1.31	0.18	1	1.68	1.14	0.12	0.96	1.37
Guilty ($n = 33$)								
ITC engagement	3.26	0.15	2.95	3.56	3.32	0.17	3.03	3.64
ITC ecological validity	3.01	0.23	2.59	3.43	2.86	0.21	2.44	3.3
ITC negative effects	2.29	0.23	1.8	2.83	2.27	0.28	1.77	2.81
ITC spatial presence	2.82	0.19	2.4	3.2	2.93	0.21	2.52	3.36
VE task memory	5.59	0.29	4.95	6.09	5.7	0.2	5.29	6.09
Interview duration	746.07	82.56	616.57	908.51	646.41	62.85	519.66	770.01
Interview motivation	5.49	0.32	4.87	6.13	5.95	0.28	5.35	6.43
Interview truthfulness	3.11	0.36	2.42	3.82	3.13	0.35	2.47	3.79
Interview deceptiveness	5.28	0.3	4.59	5.92	5.24	0.23	4.74	5.72

BCa bootstrapped standard errors (SEs) and confidence intervals (CIs) for M_{adj} scores based on 1,000 resamples. [a]Gaming experience controlled for with IQ only. [b]Interview length is presented in seconds. ITC-Sense of Presence Inventory; VE, Virtual environment.

Results

Immersion, duration, and motivation

We first examined task immersion, duration and motivation (see Table 2). Innocent participants' interviews were longer than guilty participants' interviews, $F(1, 59) = 8.95$, $p = 0.004$, partial $\eta^2 = 0.132$, M difference = 237.05 s, BCa 95% CI (78.49, 395.60). Innocent participants self-reported as being more truthful than guilty participants, $F(1, 59) = 169.85$, $p < 0.001$, partial $\eta^2 = 0.742$, M difference = 3.73, BCa 95% CI (3.16, 4.31). Guilty participants self-reported as being more deceptive in the interview than innocent participants, $F(1, 59) = 299.12$, $p < 0.001$, partial $\eta^2 = 0.835$, M difference = 4.03, BCa 95% CI (3.57, 4.50). All other main effects of diagnostic group and veracity condition and Group X Condition interactions were non-significant ($ps > 0.175$, partial η^2s < 0.083). Therefore, autistic and non-autistic participants (across veracity conditions) were well matched in criminal and non-criminal VE task immersion, memory of the VE task and motivation to appear convincing during the interview. This indicates that our experimental manipulations (e.g., guilty participants needing to lie during the mock-suspect interview) were effective.

Interview performance

Next, we compared autistic and non-autistic participants' interview performance in guilty and innocent conditions (see Table 3).

Statement-evidence consistency

There was a significant main effect of Condition $F(1, 59) = 33.65$, $p < 0.001$, partial $\eta^2 = 0.363$, in which innocent participants' accounts ($M = 6.57$) were significantly more consistent with the available evidence than guilty participants' ($M = 4.29$), M difference = 2.28, BCa 95% CI (1.69, 3.03). There was no effect of Group or Group X Condition interaction ($ps > 0.221$, η^2s < 0.025). See Figure 2.

Extricating information

Innocent autistic participants drew upon significantly fewer extricating details ($M = 5.71$) than innocent non-autistic participants ($M = 6.73$), $t(30) = -2.45$, $p = 0.012$, $d = -0.826$, M difference = −1.03, BCa 95% CI (−1.87, −0.26). See Figure 3.

Investigation-relevant information (IRI)

There was a significant main effect of Condition $F(1, 59) = 29.96$, $p < 0.001$, partial $\eta^2 = 0.314$, for the proportion of IRI provided by participants, whereby innocent participants ($M = 132.74$) provided more detailed accounts than guilty participants ($M = 77.72$), M difference = 55.01, BCa 95% CI (30.63, 78.43). There was no significant effect of or Group X Condition interaction ($ps > 0.079$, partial η^2s < 0.051). See Figure 4.

Interview experience

Finally, we compared autistic and non-autistic participants' interview experience (see Table 3).

Difficulty of questioning

Autistic participants reported that they found the interview questions significantly more difficult ($M = 4.25$) than non-autistic participants ($M = 3.16$), $F(1, 59) = 6.97$, $p = 0.011$, partial $\eta^2 = 0.106$, M difference = 1.09, BCa 95% CI (0.17, 2.01). There was no effect of Condition or Group X Condition interaction ($ps > 0.404$, η^2s < 0.012).

TABLE 3 Autistic and non-autistic group estimated mean scores for interview performance and experience.

	Autistic adults ($n = 32$)				Non-autistic adults ($n = 33$)			
	M_{adj}	SE	BCa 95% CI		M_{adj}	SE	BCa 95% CI	
			Lower	Upper			Lower	Upper
Innocent ($n = 32$)								
Evidence consistency	6.31	0.24	5.78	6.79	6.84	0.13	6.52	7.07
Extricating information[a]	5.71	0.37	4.95	6.42	6.73	0.15	6.41	7.00
IRI detail	118.23	11.67	97.01	143.33	147.24	9.29	128.99	165.06
Difficulty of questioning	3.99	0.41	3.11	4.69	3.07	0.47	2.09	3.95
Interview anxiety	4.57	0.35	3.86	5.23	3.36	0.47	2.43	4.26
Perception of support	4.09	0.38	3.31	4.91	5.25	0.30	4.62	5.88
Guilty ($n = 33$)								
Evidence consistency	4.08	0.49	2.95	5.07	4.50	0.49	3.42	5.41
IRI detail	80.82	11.00	60.93	102.07	74.62	9.17	57.70	90.99
Difficulty of questioning	4.51	0.46	3.51	5.38	3.25	0.29	2.67	3.79
Interview anxiety	5.00	0.42	4.03	5.77	4.54	0.32	3.88	5.22
Perception of support	4.79	0.44	3.88	5.68	5.34	0.31	4.71	5.92

BCa bootstrapped standard errors (SEs) and confidence intervals (CIs) for M_{adj} scores based on 1,000 resamples. [a]Extricating information was only measured in the innocent condition (therefore not controlled for IQ or gaming experience), so original means and SE are presented. IRI: Investigation-relevant information.

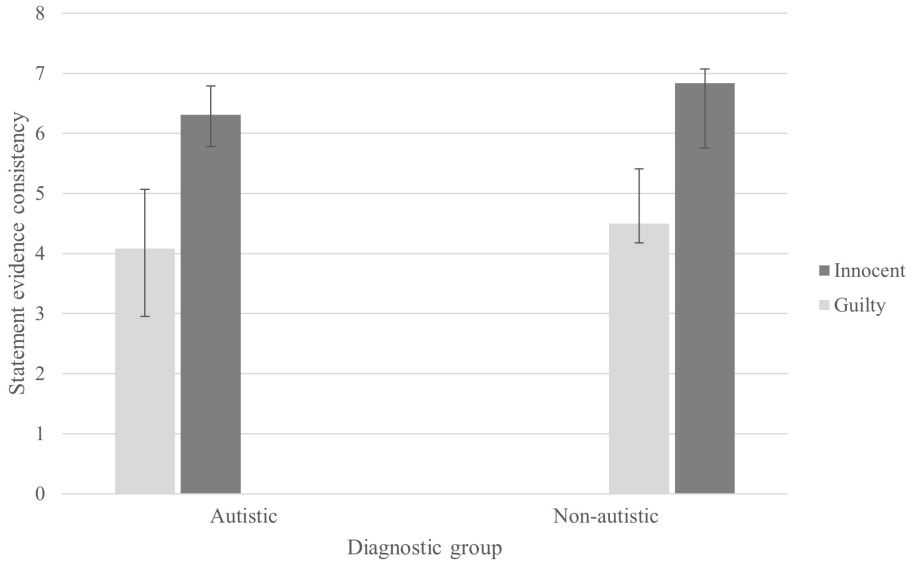

FIGURE 2
Mean statement evidence consistency scores for autistic and non-autistic groups in innocent and guilty conditions (with BCa 95% confidence error bars).

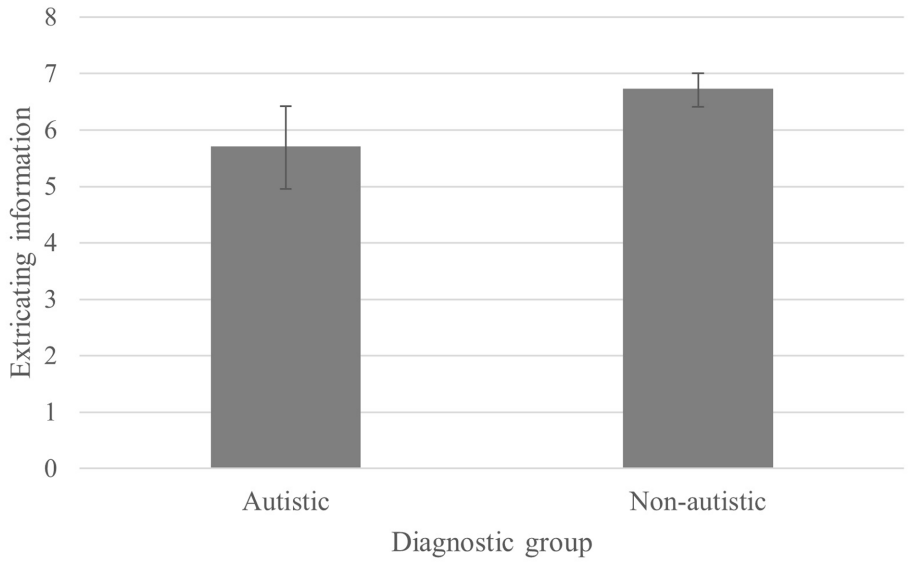

FIGURE 3
Mean extricating information scores for autistic and non-autistic groups in the innocent condition (with BCa 95% confidence error bars).

Interview anxiety

Autistic participants found the interview significantly more anxiety inducing ($M = 4.79$) than non-autistic participants ($M = 3.95$), $F(1, 59) = 4.41$, $p = 0.040$, partial $\eta^2 = 0.069$, M difference = 0.84, BCa 95% CI (0.07, 1.58). There was no effect of Condition or Group X Condition interaction ($p > 0.06$, $\eta^2 < 0.069$).

Perception of support

Autistic participants felt significantly less supported ($M = 4.44$) by the interviewer than non-autistic participants ($M = 5.30$), $F(1, 59) = 5.62$, $p = 0.021$, partial $\eta^2 = 0.087$, M difference = −0.86, BCa 95% CI (−1.60, −0.14) There was no main effect of Condition or Group X Condition interaction ($ps > 0.292$, η^2s < 0.019).

Discussion

In the present study, we examined verbal deception cues displayed by autistic adults during a mock-police suspect interview. We found that autistic mock-suspects displayed similar verbal deception cues (in

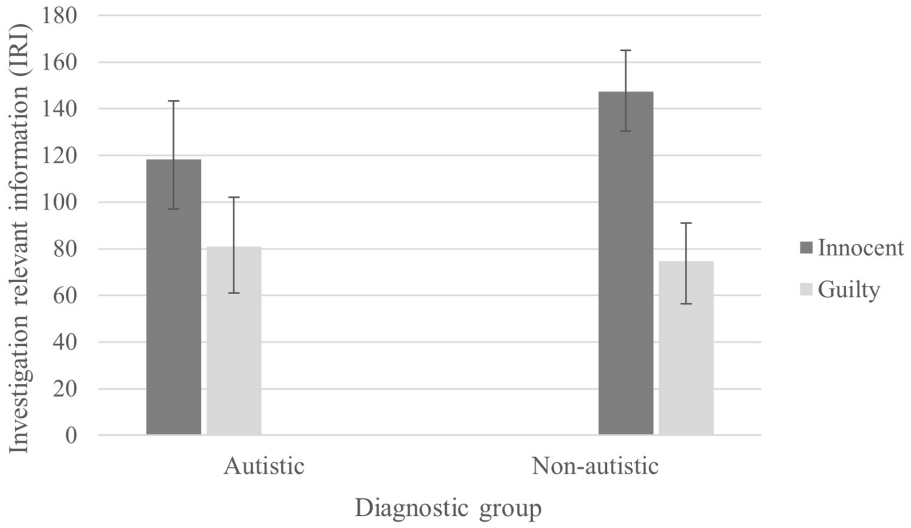

FIGURE 4
Mean IRI scores for autistic and non-autistic groups in innocent and guilty conditions (with BCa 95% confidence error bars).

terms of statement-evidence consistency and investigation-relevant information) to the non-autistic group regardless of whether they were telling the truth or being deceptive. To our knowledge this was the first study in which autistic adults (without co-occurring intellectual disability) actively demonstrated the ability to tell verbal lies (see Bagnall et al., 2022). Specifically, the degree to which mock-suspects lied through omitting incriminating actions during the VE task (therefore contradicting the incriminating evidence) was similar regardless of diagnostic group. Further, a similar proportion of investigation-relevant information (IRI) was reported by autistic and non-autistic mock-suspects who lied, with both diagnostic groups providing sparser verbal accounts than mock-suspects who told the truth. This is consistent with reality monitoring theory (Johnson and Raye, 1981), in which information derived from *internal sources* (e.g., imagination) is less detail-rich than information from *external sources* (e.g., experienced events). These findings therefore suggest an at least surface-level consistency between autistic and non-autistic verbal deception.

However, we also found that *innocent* autistic-mock-suspects displayed verbal cues associated with deception. Consistent with findings from Young and Brewer (2020), autistic-mock-suspects who told the truth reported fewer items of verifiable, extricating information to support their innocence. This is concerning given that providing fewer verifiable details during interview is not only consistent with liars' strategies to avoid disprovable claims (Nahari, 2018), it also makes veracity judgments more difficult (Porter and Salvanelli, 2020) and may narrow the options for further investigation and elimination from enquiries (College of Policing, 2021). As such, our findings emphasize that investigative interviewers should be cautious when interpreting gaps or missing elements in autistic suspects' accounts. Indeed, previous studies report that expressive language capacity predicts autistic adults' verbal specificity during interviews (Norris and Maras, 2022) and ToM (ability to take others' perspectives) relates to their likelihood of providing extricating innocence-supporting detail (Young and Brewer, 2020). Consequently, more supportive interview techniques appear necessary to help autistic suspects report all information relevant to an investigation (more on this point later in the "Discussion").

Contrary to our expectations, autistic mock-suspects' statements were not significantly less consistent with the seven pieces of incriminating evidence nor contained significantly less IRI than those of non-autistic mock-suspects. It is of note that innocent autistic-mock-suspects' statement-evidence consistency was indeed lower than the non-autistic group (with a small effect size of partial $\eta^2 = 0.017$), as was proportion of IRI (a medium effect size of partial $\eta^2 = 0.066$). The present study was powered to detect medium-large effects of interview performance, meaning that a larger sample may have been necessary to detect these smaller effects. Overall, however, our findings indicate that autistic adults may display certain verbal deception cues when telling the truth during police suspect interviews.

Further, autistic participants (in both innocent and guilty conditions) found interview questions harder to answer, felt more anxious and perceived the interview as less supportive to their needs. While investigative interviews elicit anxiety in neurotypical populations (Vanderhallen et al., 2011) this may be particularly problematic for autistic suspects. Elevated anxiety is associated with poorer executive functioning in autistic adolescents (Hollocks et al., 2014), and broader socio-cognitive processing difficulties (Velikonja et al., 2019) may impact autistic suspects' ability to provide best evidence. It should be noted that, although autistic participants reported significantly poorer interview experiences than non-autistic participants, average scores still tended to fall in a 'neutral' rating. However, the mock-interviewer was specifically trained and instructed to adopt an encouraging and non-confrontational questioning style. Interviews with vulnerable suspects carried out during genuine investigations are often less accommodating. Inappropriate (e.g., forced choice) questions and minimisation tactics have been found to be more commonly used with suspects who have mental health conditions than suspects without such conditions (Farrugia and Gabbert, 2020b). Autistic people have also described feeling overwhelmed by the frequency

and length of real-life suspect interviews, as well as difficulty concentrating on questions and experiencing pressure from investigators (Allen et al., 2008). Our present findings therefore likely underplay the difficulty of a real-life suspect interview for an autistic person and the degree to which subsequent verbal behaviors (associated with deception) may be exacerbated. Future research should further investigate the experience of police suspect interviews for autistic people, and the factors which contribute to atypical behavior as well as the elicitation of accurate and reliable information.

It should also be noted that increased anxiety may potentially contribute to autistic people displaying stress-adaptive (though atypical) behaviors during a suspect interview. For example, autistic people (automatically and voluntarily) use gaze aversion and repetitive movement to self-regulate hyperarousal (Collis et al., 2022; Stuart et al., 2022). Concerningly, these nonverbal behaviors are also stereotypically associated with deception (Hartwig and Bond, 2011; Vrij, 2019). Lim et al. (2022) examined whether the presence of specific autism-typical verbal, paraverbal and nonverbal behaviors (gaze aversion, repetitive movement, literal interpretation of figurative language, poor reciprocity and flat affect) predicted truthful autistic mock-suspects as being (incorrectly) perceived as deceptive. Autistic mock-suspects were rated by observers as more deceptive and less credible than non-autistic controls, though none of the hypothesized autism-typical behaviors predicted deception judgments (nor did behaviors significantly differ in prevalence between diagnostic groups). Understanding which verbal, paraverbal and nonverbal characteristics displayed by autistic people are most influential for inaccurate deception judgments, and how these may be exacerbated by police suspect interviews, is a key direction for future research.

The present research is not without limitations. Our participant sample was of above average intelligence (based upon IQ scores), and as such the autistic group is not reflective of the full heterogeneity of the autism spectrum. Indeed, it is estimated that between 13 to 20% of autistic people have co-occurring intellectual disability (Ghirardi et al., 2018; Rydzewska et al., 2019). Given that people with intellectual disabilities may be overrepresented in the CJS (Hellenbach et al., 2017; Chester, 2018), better understanding of specific vulnerabilities for autistic people with co-occurring developmental conditions during investigative interviews is needed. However, given the greater social and cognitive difficulties associated with intellectual disability (Smith et al., 2020), the issues raised in the present study may only be more pronounced for autistic people with co-occurring intellectual disability. It is also important to acknowledge that, unlike in a 'real' investigative interview in the UK, autistic mock-suspects were not entitled to support *via* an Appropriate Adult nor legal advisor (Home Office, 1984/2008) either of which may have helped improve interview performance and reduce anxiety. Though as appropriate support is often not provided to autistic adults in custody (Slavny-Cross et al., 2022), our findings emphasise the vulnerabilities of autistic suspects when support is absent.

The potential effects of employing a virtual environment (VE) paradigm should also be considered. It is possible that undertaking a mock-crime or a non-criminal task in a VE (rather than *via* an 'in-person' task) contributed to participants perceiving the task and subsequent mock-suspect interview as more simulative. In which case, guilty participants may have perceived their mock-crime to be less transgressive and innocent participants felt it less important they convey their innocence. However, previous studies have shown computer game-based (mock-crime and non-criminal) tasks to be effective when participants are required to generate truthful and deceptive accounts during a subsequent mock-investigative interview (e.g., Dando and Bull, 2011). Further, virtual recreations of tasks such as public speaking can induce comparable levels of stress response to real-life equivalent tasks (Kothgassner et al., 2016) and such immersive technologies often provide valid alternatives to *in vivo* (real-life) exposure (Wechsler et al., 2019; Liberatore and Wagner, 2021). It should be noted that we used a desktop-based VE paradigm in the present study, and VEs presented on head-mounted displays (e.g. 3D virtual reality) can produce greater spatial presence and immersion (Shu et al., 2019). The potential effects of using a desktop-based VE (rather than 3D virtual reality) in the present study is unclear. A more realistic criminal and non-criminal task (i.e., in 3D virtual reality) may elicit a greater sense of ecological validity and influence mock-suspects' perception of a subsequent mock-suspect interview (e.g., feel a greater desire to convey their innocence). However, given that autistic participants in the present study experienced the mock-interviews as more demanding than non-autistic participants, such group differences may only be more pronounced if a more realistic simulation were used. Future research may therefore benefit from presenting VEs using head-mounted displays (i.e., in 3D virtual reality) to further examine potential vulnerabilities for autistic people during suspect interview settings.

These limitations notwithstanding, the present research has several implications for practice. Our findings highlight the additional complexity for investigators when interviewing autistic suspects, as verbal deception cues may be displayed whether the interviewee is truthful or lying. Existing witness and suspect interview models provide future directions for more supportive practice to benefit both interviewer and interviewee. The Witness-Aimed First Account (WAFA) approach reduces social and cognitive demand through autistic mock-witnesses generating segmented event memories prior to 'free recall', resulting in more detailed and accurate accounts while also being making autistic mock-witnesses feel more socially comfortable (Maras et al., 2020). In turn, this approach may aid recall of relevant, verifying information while reducing stress-induced paraverbal and nonverbal behaviors (i.e., deception cues). Further, the 'Model Statement'—an example of a detailed statement on an unrelated topic presented to a suspect pre-interview (Leal et al., 2015)—may help account for autistic peoples' difficulty in gauging relevance and quantity of required information. An interviewer being more explicit and specific about what is expected of autistic suspects during interview may assist the suspect's understanding of questioning. Further research is needed to ascertain the validity of such models for detecting truth and lies in autistic suspects.

However, adaptations to interview practice with autistic suspects are dependent upon pre-interview identification of 'vulnerability'. Although custody staff and interviewing officers are guided to consider signs of potential vulnerability (College of Policing, 2022), an autistic suspect may not be correctly identified due to a lack of specific questions about autism during the 'booking in' phase in custody (Sims, 2017) or because a detainee chooses not

to disclose being autistic out of concern of stigma (Crane et al., 2016). A lack of awareness of a suspect's autism may lead to harsher interpretations of their behavior during interview (Maras et al., 2019; Logos et al., 2021; Lim et al., 2022). Custody staff should therefore make additional efforts to identify potential autistic detainees (Holloway et al., 2022) and interviewers should be conscious of avoiding a guilt-presumptive questioning style (Lidén et al., 2018). Despite PACE guidelines (section 11C) in the UK stating that vulnerable suspects' accounts may be inadvertently "unreliable" or "misleading," and that "corroboration of any facts admitted" should be obtained and an appropriate adult provided, there is little further specific guidance for interviewers relating to this issue. Extending this guidance with evidence-based examples highlighting the heterogeneity of autistic verbal, paraverbal and nonverbal behavior and embedding it in policy and training is an important future direction for CJS practice.

Conclusion

In the present study, we found that investigative interviews are more socially and cognitively demanding for autistic than neurotypical mock-suspects. In addition, verbal cues associated with deception can be displayed by autistic mock-suspects even when truthful. The development of autism-focused suspect interview techniques is therefore crucial to resolve the (interrelated) issues of interviewee welfare and provision of best evidence. Discriminating between *difficulty* and *deception* in autistic suspects' interview accounts is a challenging though necessary task for researchers and practitioners alike.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Psychological Research Ethics Committee at the University of Bath. The participants provided their written informed consent to participate in this study.

Author contributions

RB, AR, MB, MO, and KM contributed to the conceptualization and design of the study. RB and AC collected and coded the data. RB performed the statistical analysis and wrote the first draft of the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1117415/full#supplementary-material

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Cues to deception: can complications, common knowledge details, and self-handicapping strategies discriminate between truths, embedded lies and outright lies in an Italian-speaking sample?

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Deception research has shown that analysing verbal content can be effective to distinguish between truths and lies. However, most verbal cues are cues to truthfulness (truth tellers report the cue more than lie tellers), whereas cues to deception (lie tellers report the cue more than truth tellers) are largely absent. The complication approach, measuring complications (cue to truthfulness), common knowledge details (cue to deception), self-handicapping strategies (cue to deception), and the ratio of complications, aims to fill this gap in the literature. The present experiment examined the effectiveness of the complication approach when varying the amount of lying, with an Italian sample. Seventy-eight participants were assigned to one of three different experimental conditions: Truth tellers (telling the truth about the event), embedders (providing a mixture of truthful and false information) and outright lie tellers (providing false information). Participants were interviewed about a past experience concerning an out of the ordinary event. Complications discriminated truth tellers from lie tellers. The absence of significant effects for common knowledge details and self-handicapping strategies, the limitations of the experiment and suggestions for future research are discussed.

KEYWORDS

complications, common-knowledge details, self-handicapping strategies, lying, verbal cues to deception

Introduction

Scholars working in the area of investigative interviewing and lie detection have spent over five decades searching for nonverbal and verbal cues to deception (Vrij, 2008; Vrij et al., 2022b). Initially, the focus was on nonverbal cues (Ekman and Friesen, 1969; Zuckerman et al., 1981; Ekman, 2001; Bond et al., 2015). However, body language and facial expressions cues have shown to be unreliable cues to deception (DePaulo et al., 2003; Vrij, 2008; Burgoon, 2018). Scholars have therefore suggested to explore verbal content.

One of the first tools to analyse verbal content was Statement Validity Assessment (SVA), which assumes that truths are qualitatively different from lies (Undeutsch, 1967). SVA comprises instructions on how to conduct an interview and two checklists: the Criteria Based Content Analysis (CBCA) and a Validity Checklist. The former includes 19 verbal criteria that are thought to be more frequently present in truthful than in deceptive statements. The Validity Checklist examines whether the CBCA scores could have been influenced by factors other than veracity (Vrij, 2005, 2015). Reality Monitoring is another verbal veracity assessment tool. It builds on memory research (Johnson and Raye, 1981) and includes eight verbal criteria. Meta-analytic work showed that both tools can discriminate truth telling from lying with an accuracy rate of up to 70% (Hauch et al., 2017). The verifiability approach (VA) is a more recently developed tool (VA, Nahari et al., 2014). It focuses on details that can be potentially verified by investigators, including activities (i) carried out with or (ii) witnessed by named persons, (iii) captured on CCTV cameras or (iv) leaving a trace (receipts, debit card use, phone calls). A meta-analytic approach also provides support for the VA (truth tellers report more verifiable details than lie tellers), especially when interviewees are informed that the investigator may check their details (Palena et al., 2021b).

Although the available literature shows that verbal content analysis can be used for lie detection purposes, most verbal criteria included in the tools are indicative of truth telling (truth tellers provide a cue more than lie tellers). Cues indicative of lying (lie tellers provide a cue more than truth tellers) are rare (Nahari et al., 2019). The exception is the cognitive operations cue which is part of Reality Monitoring. However, that cue does not discriminate truth tellers from lie tellers (Gancedo et al., 2021). Furthermore, it is important to examine a mixture of cues to truthfulness and deceit as this will allow making verbal lie detection tools, which are mostly focused on truth cues, more attractive for practitioners, who usually look for signs of deception (Vrij et al., 2022a). The distinction between cues to truthfulness and cues to deception is important. Although one might believe that they are the same and that they work equally well for both truth detection and lie detection, this is not the case. Research shows that a lot of detail can be interpreted as a cue to truthfulness, but lack of detail does not imply deception *per se*. For example, a truth teller who can provide a CCTV recording as evidence for their statement can demonstrate their honesty. However, another truth teller who cannot provide such evidence is still telling the truth even without such evidence.

The term "detail" refers to the total amount of detail in a statement, regardless of the specific types of detail being considered. However, total details can also be broken down in more specific types of detail, such as perceptual details (information related to the five human senses) and spatial details (information concerning places and spatial arrangements of objects, people, etc.). In an effort to deal with the lack of lie cues, Vrij and colleagues recently introduced a mixture of three specific cues to truthfulness and deceit (Vrij et al., 2018a, 2021; Vrij and Vrij, 2020): Complications (cue of truthfulness) and common knowledge details and self-handicapping strategies (cues to deceit). They also considered the proportion of complication to the sum of complications, common knowledge details and self-handicapping strategies (a ratio score). Complications are pieces of information that make the interviewee's statement more complicated (e.g., "We flew from Rome to New York *via* Philadelphia because we have some friends living in Philadelphia"). Complications are also considered in CBCA coding. However, in CBCA complications need to be unexpected, which is not the case in Vrij et al. (2021) approach. Truth tellers report more complications than lie tellers because lie tellers try to keep their stories simple. Common knowledge details are pieces of information related to scripts or stereotypical mentionings of well-known situations (e.g., "The first day in Paris we visited the Louvre Museum where we saw the Mona Lisa"). When truth tellers report an experience, they often include some unique personal experiences in their accounts. Lie tellers, who lack such personal experiences, are tempted to draw on general knowledge (Vrij et al., 2018a). The self-handicapping strategies cue refers to justifications that people use when they cannot provide information ("There is not much to say about this bungee jump, it all happened very quickly"). Reporting self-handicapping strategies offers lie tellers an excuse not to provide information. The complication ratio is defined as (complications/[complications + common knowledge details + self-handicapping strategies]). A recent meta-analysis of the complication approach (Vrij et al., 2021) showed that truth tellers reported more complications ($d = 0.51$ to $d = 0.62$) and fewer common knowledge details ($d = -0.40$ to $d = -0.46$) and fewer self-handicapping strategies ($d = -0.37$ to $d = -0.50$) than lie tellers. The complication ratio variable was not included in the meta-analysis.

Lying strategies

There are different ways in which people can lie, including by telling total falsehoods (i.e., making up stories entirely by reporting invented information) or by telling embedded lies (including false information in an otherwise truthful story). Embedded lying could involve telling the truth about one part of the day (for example the morning) and lying about another part of the day (for example the afternoon). Vrij and Mann (2001) found that a convicted murderer did exactly this. Palena et al. (2019) developed an experimental design where participants were asked to tell the truth for one part of the story but to lie about the other part.

Research has shown that most people tend to tell embedded lies (for a more detailed discussion of lying strategies, see for example Weiss and Feldman, 2006; Leins et al., 2012; Nahari and Nisin, 2019; Orthey et al., 2019; Verigin et al., 2019). In deception research lie tellers sometimes tell total falsehoods and sometimes embedded lies but we are not aware of research that compares these two ways of lying. However, such a comparison is important. It sounds plausible that cues to truthfulness and deception covary with the degree of lying with fewer cues to truthfulness and more cues to deception arising in the more extreme form of lying (telling total falsehoods).

The complication approach has been tested in various countries, including the United Kingdom, United States, Russia, South Korea, Mexico and Lebanon (Vrij et al., 2018b, 2019a,b). The complication approach obtained general support in these different countries but was never examined in Italy. Although we expected the findings in an Italian sample not to differ from other samples, we felt it important to conduct an experiment in Italy. Practitioners typically prefer that a lie detection tool is tested in their own country before considering using the tool.

Building on the available literature, we hypothesised that truth tellers would report more complications (*H1*a) and a higher

proportion of complications (*H2*a), but fewer common knowledge details (*H3*a) and fewer self-handicapping strategies (*H4*a) than those participants who were requested to tell an embedded lie who in turn were expected to report more complications (*H1*b) and a higher proportion of complications (*H2*b) but less common-knowledge details (*H3*b) and less self-handicapping strategies (*H4*b) than those participants who were asked to tell an outright lie.

Methods

Participants

An *a-priori* sample size calculation conducted in GPower 3.1 (Faul et al., 2007), with *F* as the test family, an effect size set at $f = 0.40$ (Vrij et al., 2021), α set at 0.05 and power at 0.80 indicated that at least 66 participants were required for the experiment. In total, 78 participants took part in the experiment and all university students were recruited during university lectures and with flyers. Sixty-seven (86%) identified themselves as females, the remaining identified themselves as male. Age ranged from 20 to 60 years old ($M = 23.53$, $SD = 6.20$).

Procedure

A list of potential participants was obtained during university lectures. Volunteers were emailed instructions about the experiment 2 days before the interview. This reflects police practice in Italy, where interviewees are informed in advance that they will be interviewed by the police. Participants were told that they had to recount a memorable, out of the ordinary, event that happened within the last 12 months, building on Vrij et al. (2017) procedure. They also had to provide a title for the event to be used by the interviewer in the upcoming interview.

Our procedure was not identical to that used by Vrij et al. (2017). First, when describing the event they chose, one third of the participants were asked to tell the truth about the entire event (referred to as "truth tellers"), one third of them was asked to lie about the entire event (referred to as "outright lie tellers") and one third of them was asked to tell the truth about half of the day but to lie about the other half (referred to as "embedders"). Concerning this embedders group, half of the participants were asked to tell the truth about what happened before midday but to lie about what happened after midday, whereas the other half was asked the opposite. In this way we counterbalanced the truth and lie parts of the story. Second, in Vrij et al. procedure, lie tellers' stories were matched to truth tellers' stories (i.e., lie tellers were asked to invent a story about a truth teller's event). Instead, in our procedure, we asked lie tellers to report false information about their own suggested stories. We decided to do so as one of the aims of the present experiment was to mirror real-life situations where interviewees base their lies on their own experiences.

The instructions also informed participants that they could earn one additional point for a university exam if they would be believed by the interviewer. In contrast, if the interviewer would not believe them, they would have to write a statement concerning why, in their opinion, the interviewer did not believe them. In reality, all participants were offered the university exam point, and nobody was asked to write the statement.

On the day of the interview, the participants first read and signed the consent form. They were then brought to the interview room where they met the interviewer. The interviews started with the interviewer saying: "*I am aware that on day X you* (title of the event). *Could you please describe this event in as much detail as possible, from its beginning to its end, that is, from when you woke up to when you went to sleep?*" Once the participant stopped talking, they were asked *"Could you please now describe in as much detail as possible what happened on day X when (title of the event), this time focusing only on what happened in the morning, that is from when you woke up to midday?"* Once the participant stopped talking, they were asked *"Could you please now describe in as much detail as possible what happened on day X when (title of the event), this time focusing only on what happened in the afternoon, that is from midday to when you went to sleep?"* Although we are aware that an event could have lasted less than an entire day, we decided to structure the questioning as above for two main reasons. First, as said above, to mirror real-life situations where an interviewee is questioned about what happened the day of the event under investigation (see for example Vrij and Mann, 2001). Second, to create the embedded lie condition.

Once the interview had finished, the participants were asked to fill in a questionnaire where all answers were provided on a 0% (not at all) to 100% (completely/very much) scale. The questions concerned the amount of lying (*"How much did you lie while reporting the event?"*), motivation (*"How motivated were you to be believed by the interviewer,"* and *"How motivated were you to report details?"*), difficulty of the interview (*"How difficult did you find the interview?"*), plausibility of having to write a statement as to why the interview did not believe them (*"How likely did you think it was that you have to write a statement about why the interviewer did not believe you?"*), memory (*"How would you rate your memory of the event?"*), preparation time (*"How much time did you spend preparing for the interview in the time between when you received the email about the experiment and when the interview took place?"*), preparation effort (*"How much effort did you put in the preparing for the interview in the time between when you received the email and when the interview took place?"*) and credibility (*"How credible do you think you were?"*). The experiment was conducted following the Declaration of Helsinki and the Ethical Guidelines for research provided by the Italian Psychological Association (Associazione Italiana di Psicologia, 2015).

Coding

The interviews were transcribed and coded following Vrij et al. (2017) coding scheme of complications (e.g., *"I put the short-sleeves fur on, after which I realized that it was too cold"*; *"The 11 am train was delayed"*; *"As I walked into the store, I did not see a step. I stumbled and fell on the floor"*), common knowledge details (e.g., *"I went to Milan and visited several shops in the city centre"*; *"On my little sister's birthday, we opened the presents for her"*; *"We went to New York and visited the Statue of Liberty"*), and self-handicapping strategies (e.g., *"I have nothing much to say about the robber, as it went very quickly"*; *"I cannot tell much as I fell asleep during the journey"*; *"I cannot remember as it happened a while ago"*).

The answers to the free recall and the two follow-up questions were coded. Two coders independently coded 100% of the transcripts. Each of the three types of detail was counted only once and

TABLE 1 Manipulation checks and post-interview questionnaire statistics.

		M (SD)		
	F(2,75)	Truth tellers	Embedders	Outright lie tellers
Motivation to be believed	2.21	83.08 (17.61)	85.39 (17.49)	75.77 (16.53)
Motivation to be detailed	4.65*	87.31 (13.13)^{a}	81.92 (13.86)^{ab}	75.00 (16.55)^{bc}
Perceived interview difficulty	8.03***	24.62 (24.04)^{a}	46.15 (24.34)^{b}	50.39 (26.15)^{b}
Perceived probability of having to write a statement	12.08***	27.69 (29.16)^{a}	55.00 (22.14)^{b}	58.46 (22.22)^{b}
Memory of the event	0.25	83.46 (16.23)	84.23 (12.39)	81.54 (13.47)
Preparation time	5.55**	30.77 (17.19)^{a}	50.00 (23.83)^{b}	44.23 (22.48)^{ab}
Preparation effort	9.64***	42.31 (25.03)^{a}	70.39 (16.61)^{b}	53.50 (26.73)^{a}
Amount of lying	149.84***	1.92 (4.02)^{a}	47.69 (18.61)^{b}	75.39 (18.81)^{c}
Perceived credibility	14.30***	86.92 (7.36)^{a}	73.08 (12.89)^{b}	65.77 (20.23)^{b}

Different superscripts indicate $p < 0.05$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 2 Descriptives of the dependent variables according to the veracity condition.

	M (SD) [95% CI]		
	Truth tellers	Embedders	Outright lie tellers
Complications	8.31 (5.58) [6.16, 10.45]	6.50 (3.90) [5.00, 8.00]	5.00 (4.02) [3.45, 6.55]
Common knowledge details	10.46 (4.94) [8.56, 12.36]	8.58 (5.15) [6.60, 10.56]	10.12 (7.66) [7.17, 13.06]
Self-handicapping strategies	0.27 (0.83) [−0.05, 0.59]	0.12 (0.43) [−0.05, 0.28]	0.23 (0.86) [−0.10, 0.56]
Complications ratio	0.43 (0.17) [0.36, 0.50]	0.43 (0.15) [0.37, 0.49]	0.33 (0.23) [0.24, 0.42]

repetitions were not considered. To assess inter-coder agreement, we calculated Intraclass-Correlation Coefficients (ICC) by using a two-way random, single measure, model (ICC 2, 1) (Shrout and Fleiss, 1979). ICC was of 0.91 for complications, 0.96 for common knowledge details and 0.99 for self-handicapping strategies, indicating high agreement between the two coders. We used the ratings of the most experienced coder in the analyses.

Results

Manipulation check

A manipulation check was conducted on the truth telling-lying manipulation and showed that outright lie tellers reported to have lied more than embedders, who in turn reported to have lied more than truth tellers (Table 1). This means that the veracity manipulation was successful.

Post-interview questionnaire analyses

Several ANOVAs and Tukey *post-hoc* tests were conducted on the post-interview questionnaire (Table 1). The experimental condition was not associated with the motivation to be believed nor with the memory for the event, but it was significantly associated with the motivation to be detailed, the perceived difficulty of the interview, the perceived likelihood of being requested to write a statement and preparation time and effort. Outright lie tellers were less motivated to be detailed than truth tellers, which supports the idea that lie tellers prefer to keep their stories simple (Verigin et al., 2019). Both embedders and outright lie tellers, compared to truth tellers, perceived the interview as more difficult (in alignment with the cognitive approach to deception, Vrij (2015) and thought it to be more likely to have to write a statement. The latter finding suggests that lie tellers thought that their lie would shine through, in accordance with the illusion of transparency theory (Gilovich et al., 1998).

Moreover, embedders reported to have spent more time than truth tellers to prepare for the interview. Embedders also reported to have put more effort in their preparation for the interview than truth tellers and outright lie tellers. Both embedders and outright lie tellers thought that they were less credible than truth tellers (Table 1).

Hypothesis testing

Four ANOVAs were conducted, one for each dependent variable. Veracity (truth tellers vs. embedders vs. outright lie tellers) was the only factor. There was a significant effect for complications, $F(2, 75) = 3.42$, $p < 0.05$, $\eta^2 = 0.08$. *Post-hoc* analyses showed that truth tellers ($M = 8.31$, $SD = 5.58$) reported more complications than outright lie tellers ($M = 5.00$, $SD = 4.02$), $t(75) = 2.61$, $p < 0.05$, $d = 0.72$. The number of complications in embedders' statements ($M = 6.50$, $SD = 3.90$) did not differ from that in truth tellers' statements, $t(75) = 1.43$, $p = 0.33$, $d = 0.40$, or from that in outright lie tellers' statements, $t(75) = 1.18$, $p = 0.47$, $d = 0.33$. No significant differences occurred for common knowledge details, $F(2, 75) = 0.71$, $p = 0.49$, $\eta^2 = 0.02$, self-handicapping strategies, $F(2, 75) = 0.31$, $p = 0.73$, $\eta^2 = 0.01$, and for the ratio of complications, $F(2, 48.72) = 2.00$, $p = 0.15$,

$\eta^2 = 0.06$ (Table 2). Taken together, the above results support the experimental hypothesis only for the variable complications when comparing truth tellers to outright lie tellers (*H1*).

Discussion

In the present experiment, we examined the efficiency of the complication approach when comparing truth telling with embedded and outright lies. As predicted, we found the difference to be larger between truths and outright lies than between truth telling and embedded lies. However, only the number of complications was associated with veracity, with truth tellers reporting more complications than outright lie tellers.

The other three variables, common knowledge details, self-handicapping strategies, and the ratio of complications, were not associated with veracity. The nonsignificant results for common knowledge details and self-handicapping strategies can be interpreted in different ways. First, perhaps the instruction to think of and provide a statement concerning an out of the ordinary event impacted on the results. If an interviewee talks about an out of the ordinary event, lie tellers may find it inappropriate to report common knowledge details because they may think that sounds suspicious. Similarly, if the event is poor in verifiable details and/or sources (Nahari et al., 2014; Vrij et al., 2020), lie tellers perhaps think it is worth taking the risk to give extensive fabricated statements and do not think that self-handicapping strategies are required. Self-handicapping strategies are thought to be provided as justifications for not giving the required information to the interviewer (Vrij et al., 2021), but if an interviewer asks for more information to an interviewee concerning an event that is not checkable, it is possible that instead of using self-handicapping strategies to hide the true information the interviewee will substitute the "justification strategy" with a "providing unverifiable details" strategy.

Second, it is possible that the efficacy of the complication approach varies across people. Research has shown that there is high variability in deceptive communications due to interpersonal differences (Serota and Levine, 2015; Caso et al., 2018; Park et al., 2021). Building on this, scholars have made an effort to reduce the effect of interpersonal variability, for example by adopting specific interviewing strategies and within-subjects measures (Vrij, 2016; Vrij et al., 2018a; Verigin et al., 2020) but also by applying statical approaches that aims at grouping similar subjects (Palena and Caso, 2021; Palena et al., 2021a, 2022). It could be that people who score high on storytelling and on risk-taking and bluffing would provide more complications than people who score low on such variables, as the former would likely to be more apt and willing to create credible stories (storytelling skills) that include complication details that could be potentially proved wrong by an investigator (high risk-taking and bluffing tendency).

Embedders spent more time in preparing for the interview than truth tellers and they also put more effort in preparing for the interview than both truth tellers and outright lie tellers. It is not surprising that embedders prepared more than truth tellers, because lie tellers strategize more than truth tellers (Vrij, 2008). However, it was surprising that embedders put more effort in their preparations than outright lie tellers. Outright lie tellers would be expected to prepare more than embedders, as the former make-up their stories by reporting invented information. Hence, the act of creating a total falsehood is expected to require more fantasy, effort, creativity, and cognitive resources, thus, requiring more preparation effort. However, it could be that embedders had to put more effort in preparing their stories than outright lie tellers as the former needed to have their false information fit within their truthful part of the story in a consistent, coherent, and non-contradictory way.

Our experiment had some limitations. For example, we did not account for the effect of the topic of the statement provided by the interviewees. Moreover, we did not employ any within-subjects measure that could aid individual-case veracity decision. Further, we instructed participants to tell an embedded or outright lie. Hence, as is common practice in deception research, lying was not a participant's choice, neither was the type of lie they told. The problem of letting participants decide for themselves to tell the truth or lie may result in confounded factors. For example, if most female participants decide to tell the truth, and most male participants decide to lie, veracity will be confounded with gender. However, we recognise that the use of instructed lies could be considered a limitation and suggest that future research accounts for unsanctioned lies (let participants decide themselves to tell the truth or lie). Last, inter-rater reliability for the coding of the statements was assessed and was high, but only the coding from one coder was used. Although this is common practice in lie detection research, not unitizing the coding from the two coders might be a limitation, as high agreement (and thus correlation) cannot exclude that the coders are coding different details. Future research should thus explore this aspect in more detail.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study. The study was conducted in accordance with the Declaration of Helsinki and the guidelines provided by the Italian Psychological Association.

Author contributions

LeC, LuC, AV, and NP contributed to the designing of the experiment and edited the first draft of the manuscript. LuC and NP conducted the analyses, interpreted the results, and wrote the first draft of the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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In their own words: deception detection by victims and near victims of fraud

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Aim: Research on deception detection has usually been executed in experimental settings in the laboratory. In contrast, the present research investigates deception detection by actual victims and near victims of fraud, as reported in their own words.

Materials and methods: Our study is based on a nationally representative survey of 11 types of (mostly) online fraud victimization (*N*=2,864). We used qualitative information from actual victims and near victims on why they didn't fall for the fraud, or how, in hindsight, it could have been prevented.

Results: The main detection strategies mentioned by near victims (*N*=958) were 1) fraud knowledge (69%): these near victims clearly recognized fraud. Other strategies related to fraud knowledge were: noticing mistakes (27.9%), rules and principles about safe conduct (11.7%), and personal knowledge (7.1%). A second type of strategy was distrust (26.1%). A third strategy was 'wise through experience' (1.6%). Finally, a limited number of respondents (7.8%) searched for additional information: they contacted other people (5.5%), sought information online (4%), contacted the fraudster (2.9%), contacted their bank or credit card company (2.2%), or contacted the police (0.2%). Using knowledge as a strategy decreases the probability of victimization by a factor of 0.43. In contrast, all other strategies increased the likelihood of victimization by a factor of 1.6 or more. Strategies generally were uncorrelated, several strategies differed by type of fraud. About 40% of the actual victims (*N*=243) believed that their victimization might have been prevented by: 1) seeking information (25.2%), 2) paying more attention (18.9%), 3) a third party doing something (16.2%), 4) following safety rules or principles, like using a safer way of paying or trading (14.4%), or by 5) 'simply not going along with it' (10.8%). Most of these strategies were associated with a higher, not lower, likelihood of victimization.

Conclusion: Clearly, knowledge of fraud is the best strategy to avoid fraud victimization. Therefore, a more proactive approach is needed to inform the public about fraud and attackers' modus operandi, so that potential victims already have knowledge of fraud upon encountering it. Just providing information online will not suffice to protect online users.

KEYWORDS

online fraud, fraud victimization, crime victimization, cybercrime, human factors, deception-detection

1. Introduction

Fraud can be defined as '*crime* […] *targeted against individuals* [that use] *deception for the purpose of obtaining illegal financial gain.* [It] *involves the misrepresentation of facts and the deliberate intent to deceive with the promise of goods, services, or other financial benefits that in fact do not exist or that were never intended to be provided* (Titus et al., 1995). In practice, the 'fraud' label covers a broad range of activities (for a summary, see Levi and Burrows, 2008) such as telemarketing fraud, fraud involving financial services, insurance coverage, investment or business schemes and fake charities (Titus et al., 1995). Fraud is mostly online, today (Beals et al., 2015; DeLiema et al., 2017; Button and Cross, 2017a). Cybercrime consists to a large extent of 'online fraud'.

Fraud is a growing problem. In the Western world, registered crime and victimization have been declining since the late 1990s (Blumstein and Wallman, 2005; Farrell, 2013; Button et al., 2014; Hopkins, 2016; De Jong, 2018; Levi and Doig, 2020). However, in stark contrast, fraud increased relatively strongly in many Western countries during the past two decades. Fraud statistics are showing an alarming increase, with new peaks in the United States (Finklea, 2014; Javelin, 2014), in the United Kingdom (Financial Fraud Action UK, 2017; Button and Cross, 2017b) and elsewhere in Europe (Statistics Netherlands, 2018; Junger et al., 2020; Kemp et al., 2020). The present study investigates the strategies used by victims and near victims to recognize fraud, and can inform us on how to better protect consumers and online users.

Similar to Titus et al. (1995), most scholars considered fraud a form of deception (Baesens et al., 2015; Van Vlasselaer et al., 2015; Oxford Dictionaries, 2018). In line with this, it is not surprising that deception has been investigated with some regularity in fraud research (Stajano and Wilson, 2011). But deception has also been studied in the study of social engineering (Mouton et al., 2014; Bullée, 2017; Steinmetz, 2020; Bullée and Junger, 2020b; Steinmetz et al., 2021; Washo, 2021), in marketing (Goldstein et al., 2008), and in psychology (Grazioli and Wang, 2001; DePaulo et al., 2003; Hancock and Gonzales, 2013; Burgoon and Buller, 2015; Levine, 2019, for an overview, we refer to Docan-Morgan, 2019). By investigating into deception, we can gain more insight into successful strategies to prevent victimization.

In the review below, we will focus on the psychological literature on deception that presents some concepts that are applicable to the present study, and we present a brief review of the relevant fraud literature. These two bodies of research are to some extent complementary. The psychological literature has mostly focused on the receivers of deceptive communication: how do people recognize deception? In contrast, the fraud literature typically investigated (a) the senders, in the present case the fraudsters: how do they manage to deceive, and (b) the judges/receivers' characteristics, in the present case the victims: who is most likely to be defrauded? Accordingly, little information is available in the fraud literature on how fraud victims recognize deception, more specifically, how do they deal with online offers for products, services or unsolicited emails, or why they fall for scams (Button et al., 2014). Below we start with a summary of some of the main findings in both the psychology of deception detection and on fraud detection.

1.1. Psychological research on deception

A large body of psychological research investigated deception detection in human interactions (Vrij, 2019; Masip Pallejá et al., 2021), and has been summarized in several publications (Aamodt and Custer, 2006; Bond and DePaulo, 2006; Hartwig and Bond, 2011, 2014; DePaulo and Bond, 2012; Evans et al., 2012; Hauch et al., 2012, 2014; Suchotzki et al., 2017; Vrij et al., 2017, 2019; Levine, 2019; Verschuere et al., 2021).

People are not very good at recognizing deception in an experimental setting: in their meta-analysis, Bond and DePaulo (2006) analyzed 206 studies with a total of 24,483 experimental 'judges'. The experimental judges had to discriminate lies from truths in real-time without any aid or training. In these circumstances, people achieved an average of 54% correct lie–truth judgments, correctly classifying 47% of lies as deceptive and 61% of truths as nondeceptive (Bond and DePaulo, 2006).

The Truth-Bias, or 'veracity effect', as it was labelled by Bond and DePaulo (2006) is part of the explanation for this apparent lack of ability in recognizing deception. People generally start with the presumption of truth (Burgoon and Levine, 2010; Street, 2015; Street et al., 2019; Armstrong et al., 2021; Masip Pallejá et al., 2021; Levine, 2022). This seems sensible, as several studies demonstrated that most people tell the truth, most of the time (Serota et al., 2010; Levine, 2019). Accordingly, an observation or a noticeable cue is necessary to trigger suspicion. Research tried to discover why people are not very good at deception detection and whether they can improve, for instance through training. A number of possible factors could be the following (see Burgoon and Buller, 2015 for a review).

Researchers studied *deceiver social skills*. A small number of deceivers are convincing liars and accordingly are hard to detect (Burgoon and Buller, 2015), while some deceivers may be relatively easier to detect (Evans et al., 2017). Research also investigated *Judge's detection skills*. Generally, those who are asked to detect a lie, 'judges', perform equally well – or poorly (Bond and DePaulo, 2008). There are hardly any differences in detection skills by age, education and experience (Vrij and Mann, 2001; Levine, 2019). *Context and amount of exposure* also matters. When judges of interpersonal communication receive more context or background knowledge, they perform better at detecting deception (Burgoon and Buller, 2015). A lot of studies focused on the *message and the cues to deception.* Research examined verbal aspects of an account, such as the level of detail in an account, vocal tension, logical structure of a story, negativity in statements, and visual factors, such as nervousness or fidgeting (DePaulo et al., 2003; Vrij et al., 2019). However, several studies concluded that most cues to deception are weak and not very useful to detect deception (DePaulo et al., 2003; Hartwig and Bond, 2011; Luke, 2019).

1.2. Deception detection in real life

Research on deception detection has been criticized. Its main problem, according to Park et al. (2002) is a lack of external validity. Most research relied on laboratory experiments with senders who lied or told the truth and judges who had to figure out if they lied. Judges and senders do not know each other, there is no interaction and no possibility to ask questions or fact-checking. The senders do what they are told to do, and the stakes are minor. What is left is a focus on

verbal and non-verbal behavior that precludes other sources of information. All this is far away from what happens in real life, and what may lead people in the real world to detect a lie (Park et al., 2002). Consequently, Park et al. (2002) set out to ask people whether they recalled having been lied to and how they discovered that. They find that, in real life, lies are discovered mainly by third-party information (32%), physical evidence (18%), an unsolicited confession (8%) or some combination. Only 14.9% are discovered at the moment they are told, and most lies are discovered relatively late (Park et al., 2002). Several follow-up studies confirmed the importance of fact-checking and evidence (Blair et al., 2010; Masip and Herrero, 2015; Novotny et al., 2018; Levine and Daiku, 2019; Masip Pallejá et al., 2021).

Timing is different in real-life in comparison with laboratory experiments. In experimental studies, judges are asked to detect (or not) the lie on the spot. But because fact-checking is usually something that cannot be done immediately, in real life most lies are discovered sometime after they were told. Park et al. (2002) reported that only 14.9% of the lies were detected at the time they were told, 80.9% of the lies were discovered more than an hour after they were told, 60.3% were detected more than a day later, and 39.7% were uncovered more than a week later. Several studies replicated this finding (Masip and Herrero, 2015; Levine, 2019; Masip Pallejá et al., 2021). Also, many lies are discovered unexpectedly (Masip Pallejá et al., 2021). These findings emphasize the fact that verbal and non-verbal behavior do not play a significant role in lie detection (Masip, 2017). An interesting question is whether this applies to fraud, online or offline.

1.3. The importance of context

As mentioned above, most people start interpersonal communication with a Truth-Bias. Street (2015) stated that the Truth-Bias can change to become a lie-bias, depending on the context: '*According to Adaptive Decision Strategies in Lie Detection (ALIED), the presence and direction of the bias is all a matter of context: Relying on context-general information ("most people will lie/tell the truth") can be a useful aid to making an informed judgment in the absence of more precise information*'. 'Context-general information' tells us how likely it is that one may encounter a lie in a specific situation. In uncertain situations, people rely on generalized rules based on their knowledge of the situation (Street, 2015).

Besides context-general information, people can use 'individuating information'. In Street's model, 'individuating information' is information about a single specific statement, rather than about statements in general. Because of its specificity, individuating information usually has poor diagnostic value (Street, 2015; Street et al., 2016). For instance, if 'I went home after class' was a lie, this usually does not help much in terms of judging other statements of people. This specific information could allow almost perfect deception detection in certain conditions. For instance, one condition is that people need to pay attention to individuating cues (Street, 2015). '*raters trade-off individuating information with more context-general information so that as the individuating information becomes less diagnostic there is a greater influence of context.*' According to Street (2015). Individuating information is to be preferred, but when that is absent, context-general information needs to be used.

In line with ALIED, several researchers emphasized the importance of knowledge of context in real-life deception detection (Street, 2015; Street et al., 2019; Masip Pallejá et al., 2021). Based on his new theoretical account, (Street, 2015) concludes that individuals will make use of their knowledge of the world to make informed judgments about the truth.

1.4. Online communication

Today, it is important to distinguish between communication that occurs offline and online. Online fraud differs from deceit in interpersonal communication: it can, but it does not require personal interaction. Sometimes, online users must evaluate a possibly malicious website, an email, a WhatsApp message, or a text message. But it also consists of a phone call from someone posing as a help desk asking you for personally identifiable information or to log into your computer or transfer money to another bank account and there is an interaction with a fraudster.

Online users often have problems in identifying deception, similar to those involved in offline interpersonal communication (Williams et al., 2017; Norris et al., 2019): users have difficulties in recognizing phishing emails (Egelman et al., 2008), phishing websites (Downs et al., 2006; Purkait, 2012), fake advertisements and malicious web shops (Grazioli and Wang, 2001; Grazioli, 2004), or spoofed websites (Dhamija et al., 2006; Sheng et al., 2007; Lin et al., 2011).

1.5. Fraud research and the role of various forms of knowledge

Similar to research in offline interpersonal communication, research on online fraud tried to get a better grip on what happens when users are confronted with online fraud.

As mentioned above, a lot of fraud research has been focused on deceiver skills (Manky, 2013; Oest et al., 2018, Hyslip and Holt, 2019), fraudulent messages and persuasion techniques (Langenderfer and Shimp, 2001; Lea et al., 2009; Dolan et al., 2012; Button et al., 2014). Also, various studies investigated user's socio-demographic characteristics (Anderson and Agarwa, 2010; DeLiema et al., 2017; Bullée and Junger, 2020b) and personality (Holtfreter et al., 2008; Wilsem, 2011; Fernández-Alemán et al., 2013; Pratt et al., 2014; Holt et al., 2018, 2020; Mesch and Dodel, 2018).

Below we focus solely on the impact of fraud knowledge and on 'cross-situational' cues, for reasons of space. In an online setting, knowledge can be important just as it is in offline interpersonal communication. Research reported that many users have insufficient knowledge and lack strategies to identify indicators of online fraud (Grazioli and Wang, 2001; Hong, 2012; Purkait, 2012; Acquisti et al., 2015). They do not know the methods fraudsters use to execute their fraud (Kritzinger and von Solms, 2010; Kritzinger and von Solms, 2013). The importance of knowledge is underscored by the fact that training improves online deception detection (Kumaraguru et al., 2010; Purkait et al., 2014). A recent meta-analysis reported some highly effective training methods which achieve a Standardized Mean Difference of 1 or more, which is unusually high (Bullée and Junger, 2020a).

Some studies, however, reported no relationship between fraud knowledge (knowledge about fraud/phishing) and unsafe online behavior; in these studies, the authors focused mostly on knowledge and practicing safe online behaviors (Holt et al., 2018; Leukfeldt et al., 2018; Van't Hoff-De Goede et al., 2019).

A different look at knowledge impact was presented by Lea et al. (2009). These authors stated that the more knowledge near victims have about a specific field, the more they feel competent and, consequently, overestimate their abilities to take good decisions (Lea et al., 2009). For instance, victims of investment fraud have more knowledge in finance than non-victims. Lea et al. (2009) suggested that knowledge leads to 'overconfidence' which leads to biases in decision making for instance because it makes judges more selective in their information search (Anderson, 2016).

These different approaches to knowledge underscore the importance to distinguish between these two different types of knowledge: knowing and practicing safe behavior is something different from recognizing a malicious URL. Similarly, Lea et al. (2009) refer to 'field knowledge', which could be, for example, knowledge about the financial world. Later in this study, we write about 'fraud knowledge', which is knowledge about fraud, such as knowledge about investment scams; and this knowledge does not have to be related to knowledge of the financial world as such.

A problem with deception detection and fraud knowledge, is that it is hard to find cross-situational cues, that is, cues that would work for many or possibly all forms of deception or fraud (Burgoon and Levine, 2010; Burgoon and Buller, 2015). As fraud comes in uncountable varieties, we believe this is certainly true for fraud (Purkait, 2012; Button et al., 2014). For instance, a cross-situational cue could be 'typos' in an email. But phishing emails have improved their style and fraud is also executed more and more *via* telephone calls or text messages, so these 'handy' cues do not always work well in practice (NCSC, 2022).

In sum, there is a large body of research on deception detection based on laboratory experiments and on real-life deception detection. There is some research on fraud and fraud victims. But, according to Lea et al. (2009), '*The available research on scams is, for the most part, fragmented, descriptive, and non-psychological*'. Moreover, only a limited number of studies asked victims who experienced an attempted fraud to report what, in their own words, helped to avoid victimization. Those that did generally used relatively small samples and focused on the persuasive messages, not on what helped the victims to detect the fraud. Also, Fischer et al. (2013) combined victims and near victims who were confronted with a fraud attempt, which may blur differences between both categories.

The present study focuses on the victim, not the fraudulent message. It examines two main questions: (a) what preventive strategies are used by near victims, who experienced a scam attempt, to avoid falling for the fraud, and (b) what strategies, according to the victims, could have prevented them from falling victim to fraud? Our study will compare the preventive strategies of victims and non-victims, and it will examine whether strategies are interrelated and whether specific strategies are used for the different forms of fraud. It is based on a random sample of the Dutch population and investigated the prevalence of fraud. Respondents were given the opportunity to describe, in their own words, the fraud and the reasons for falling or not for the fraud.

2. Materials and methods

2.1. Fraud victimization survey sample

The current study analyszs data from a fraud victimization study reported upon by Junger et al. (2022). Data were collected using an online Dutch questionnaire that was administered *via* the LISS panel [Longitudinal Internet Studies for the Social Sciences panel (Centerdata, 2021)]. The LISS panel (managed by CentERdata, related to Tilburg University) is an online panel consisting of approximately 5,000 households, roughly 7,500 individuals in the Netherlands. Participating households were recruited by means of a random sample from the population register of Statistics Netherlands. If households do not have a computer and/or internet connection, they are provided with one or both in order to participate (Centerdata, 2021). This recruitment method provides very good representativeness of the population (De Vos, 2010; Scherpenzeel and Bethlehem, 2011; Brüggen et al., 2016; Eckman, 2016).

Data collection took place early 2021, January 11 to February 2, and asked respondents about fraud victimization in Statistics Netherlands (2020). 3,623 randomly selected LISS panel members were invited to participate in the fraud victimization study, of which 2,920 started the questionnaire. After the selection on completed questionnaires, 2,873 respondents remained. The removal of 9 respondents who gave unreliable answers resulted in a final sample of 2,864 respondents. The response rate was 79%.

Males constitute 44.9% of the final sample, and females 55.1%. The mean age of the sample is 53, with a standard deviation of 18.4, the minimum age was 16 and the maximum was 95. The average imputed household net monthly income was € 3,407, with a standard deviation of 3,401, the minimum was 0 and the maximum was € 147,416. Educational level was defined as the highest educational level, regardless of diploma. 2.3% of the respondents only had followed elementary school, 17.5% followed pre-vocational secondary education, 7.3% followed high school, 22.2% followed intermediate, vocational training, 30.6% followed higher vocational education, 18.4% followed university education, 1.3% did not follow any formal education.

A comparison of the present sample with the distribution within the Dutch population (Centerdata, 2021) shows that there were slightly too few men (−4.5%). The youngest age group (16–24) was also underrepresented (−5.1%) and the elderly (65 and older) were overrepresented (+8.6%). Finally, persons with higher vocational education were overrepresented (+6.1%) while persons with an intermediate vocational education were underrepresented (−4.4%).

2.2. Measures

The fraud victimization questionnaire was based on a pilot by DeLiema et al. (2017), which was conducted in the United States. This pilot used Titus et al. (1995)' definition of fraud, as mentioned above. DeLiema et al. (2017)' fraud taxonomy was used in a slightly adapted version, and it was expanded. One concept, 'relationship fraud' was split into dating fraud and friend-in-need fraud (such as 'WhatsApp' fraud). Furthermore, questions were added about identity fraud, based on the Security Monitor of Statistics Netherlands (2020), phishing, based on work by Näsi (2022) and spoofing, which includes 'help desk fraud'. Table 1 shows schematically the fraud taxonomy.

TABLE 1 Fraud taxonomy.

Fraud category	How often did it happen that …
Investment fraud	… you invested your money because someone promised high or guaranteed returns, but the investment yielded much less or your money was not invested at all?
Purchase fraud	… You paid for a product or service that you never received or that was a scam?
Job fraud	… you paid to get a job that did not exist, a fake job vacancy that made you lose money or wasn't as profitable as promised?
Prize fraud	… you paid to receive a prize, grant, inheritance, or lottery winnings that you never received?
Debt fraud	… you paid to pay off a debt that did not exist or for an account of something that you did not buy?
Charity fraud	… you donated money to a charitable organization or charity (for example on a crowdfunding website) that was (probably) fake?
Dating fraud	… you gave or lent money to someone who pretended to be in love with you?
Friend-in-need fraud (including 'WhatsApp fraud')	… you gave or lent money to someone who pretended to be a relative, friend, or acquaintance of yours?
Phishing	… you gave your username, password, or bank or credit card information to outsiders in response to email or website phishing.
Identity fraud	(in addition to the previous questions…) How often has someone made use of your personal data (e.g., name, bank details, social security number/ social security number) without your intention, for financial gain, for example, to withdraw or transfer money, take out a loan, request official documents, buying products and/or services or taking out subscriptions?
Spoofing (including 'helpdesk fraud')	(in addition to the previous questions…) … you lost money because someone pretended to be someone else (e.g., an employee of your bank)?
Other types of fraud	(in addition to the previous questions…) How many times has something else happened where you paid money because someone misrepresented information, lied about information, or withheld information?

For each fraud category in Table 1, respondents indicated how often they were victimized in the past year (1 January to 31 December 2020) and in the past 5 years (1 January 2016 to 31 December 2020). Information on the past year was used in the present study.[1] Respondents also indicated for each type of fraud whether they had experienced a fraud attempt and, if so, whether they responded to it. This was not asked in the case of identity fraud, because this form of fraud does not require contact between the perpetrator and the victim. Loss of money was required to be classified as a victim. An exemption was made in the case of phishing and identity fraud; victimization was possible for those forms if a respondent's data had been stolen or abused. Next, respondents were asked additional questions about the most important fraud victimization and about the most important fraud attempt. Finally, respondents were asked some background questions.

2.3. Current analysis

The current study analyses open-text answers about the most important fraud victimization and the most important fraud attempt. For both the attempt and the actual victimization, respondents were first asked to describe, in their own words, what happened. Questions were then also asked about how victimization was prevented or could have been prevented. Again, we asked respondents to describe this in their own words. This was done because we did not want to suggest answers but wanted to register respondents' own accounts (Züll, 2016). Similar approaches were used in other security research dealing with user information (Lea et al., 2009; Levine and Daiku, 2019; Breen et al., 2022).

For both victimization and the attempts, the coding of the qualitative answers was done in an iterative process, as described by Züll (2016). Beforehand, no specific codes were expected, and no previous research could be found to guide the coding process.

For the fraud attempts, a codebook was developed by the first author and the third author while reading the answers; it was checked by the second author and, after discussions, a new version of the codebook was established, which was used to code all answers by the first and the second author. Differences in coding were discussed, after which the final version of the codebook was established'. A similar procedure was followed for the coding of the actual fraud victimization incidents. The codebook was developed by the second author and checked by the first author and the final coding was performed by the second author. In developing the code book of attempts, we took possible preventive actions and potential policy measures into account, as will be explained below.[2]

For attempts, kappa's ranged from 0.96 to 1, and percentages of agreement ranged from 93 to 100%; for victims, the agreement was 100%.

Language issues. As mentioned above, the questionnaire was administered in Dutch, and all respondents typed their answers in Dutch, with one exception, who wrote English but whose answers

1 A five-year screening question helps recall and was used to allow respondents to report relatively recent incidents but, at the same time, avoid forward telescoping problems, that is, help respondents not 'push' older incidents forward and bring them into the reporting period (Tourangeau and McNeeley, 2003). Measuring crime and crime victimization: Methodological issues. In: Pepper, J. V., Petrie, C. V. (Eds.) Measurement problems in criminal research: Workshop summary. Washington, DC: The National Academies Press, (Reep, 2017). Fraude met online handel. Antwoorden uit de Veiligheidsmonitor vergeleken met het politieregister (Online trading fraud. Information from the Security Monitor compared with the Police Register). Methodologie paper. Den Haag, NL: Statistics Netherlands.

2 The codebooks can be obtained from the second author.

were not used for quotes. Accordingly, the quotes we add below have been translated by us, by using Google Translate and verifying the translation for the correct meaning.

2.3.1. Attempted victims

Respondents had to think of their most memorable fraud attempt in, 2020 and were asked to describe, in their own words, what had happened. They were also asked why they thought they did not lose money: (a) '*Why did not you pay?*', or for those with identity fraud as the memorable attempt the question (b) '*Why did not you lose money*'. Both variables (a and b) were combined into one. Respondents were also asked about if they noticed something that was not right during the fraud; if they answered that they did, a request followed to describe what they had noticed. The fraud attempt description, the answer on why respondents did not lose or pay money, and the answer on what respondents noticed that was not right were bundled and coded as one. This was done because respondents sometimes already mentioned what they had noticed as wrong or fraudulent in the description of the attempt, and the context given by the description was sometimes needed to understand the other answers. Thirteen codes were developed and assigned for strategies to detect and resist fraud attempts.

(1) Fraud knowledge. The respondents indicate that they recognized the fraud attempt, based on knowledge about fraud. Knowledge was also coded when indicators of fraud were described, such as 'typos', 'poor writing style', other stylistic errors, or a 'foreign accent'. Usually, several of these indicators were mentioned in combination. Examples are: '[the] *email address was incorrect', 'the accent, the poor language skills, and the so-called big company names. As [I already] said, I have not said anything and imposed'*, and *'yes, I follow the current fraud trends!'*.

(2) Distrust. The respondent recognizes the fraud attempt, based on a feeling that something was not right, often without further specification: something seems unreliable, unclear, strange, or weird. Examples are: *'was too insecure', 'was very suspicious', '[I] do not trust these emails'*, and *'emotionally it did not make sense'*.

(3) Rules and principles. This code was assigned when respondents mention that they have personal rules and principles about being careful and or (not) doing certain things. These rules and principles help them to avoid falling for fraud. Examples are: *'I am always alert', 'I would never send a debit card and code'*, and *'I always check the email address before opening anything'*.

(4) Independent information seeking. This code was assigned when certain information was missing and/or when respondents independently searched for more information, leading them to recognize the fraud. This includes respondents searching for information online. Examples are: "*I have verified the accuracy and found that this was a fraud', 'Wrong water company. Looked up on the Internet'* and *'I googled it and found the same texts on forums where people were warned'*.

(5) Mistakes. Respondents note facts that are incorrect or do not match the respondent's situation. For instance, he/she has no children, he/she does not bank with that specific bank. These mistakes refer to anything that the offender could figure out from the internet. Examples are: '*I do not have children', 'It was clear that the facts do not add up'*, and *'I do not bank with that bank'*. From a policy point of view, we note that, with a little effort, the fraudsters could improve their messages in such a way that the near victim no longer recognizes the fraud attempt and avoids these mistakes.

(6) Personal knowledge and private context. This code was assigned when a respondent recognized the fraud attempt based on knowledge of their family context or connections or any information that is not available to the fraudster, not available online but personal and private knowledge of the victim. In these cases, a fraudster is impersonating a family member, but the respondent knows this family member would never act the way that the supposed family member is acting. Examples are: '[I recognized this] *directly. My father would never do that', 'weird app, my kids would never communicate anything like this', 'my daughter would never ask that'*, and *'would be weird if this person asked me to'*. This was done with an eye on possible policy implications. This type of mistakes cannot be easily corrected even if the attackers would be able to collect much more information on a potential victim.

(7) Contact with the bank or the credit card company. Some respondents mentioned that they had contact with their bank or credit card company, for information or about blocking transactions.

(8) Contact with online shops and trading platforms. Some respondents contacted the online shop involved in an email or a transaction. One respondent noted: *'Because, on the advice of the employee, I changed my password of my e-mail account and for bol.com. (I was very disappointed with myself for opening the email)'*.

(9) Contact with others. Some respondents sought contact with others about the fraud, or occasionally were contacted by others about the fraud. This includes respondents discussing the event with relatives, to gauge whether it may be fraud or not. Examples are: '*Checked by calling her (WhatsApp)', 'In conversations with friends and relatives, it turned out that several people had received an assessment about a fictitious overdue tax amount'*, and *'Check via the authority, after which it turned out that it was indeed phishing'*.

(10) Wisdom through experience. Respondents also mentioned they were victimized in the past or had bad previous experiences and this was the reason they did not fall for the current attempt. For instance, respondents mentioned: '[I] *recognized the trick. Had happened before and then I fell for it*' and *'Didn't trust it from previous experience'*.

(11) Contact with police. Some respondents mentioned that they called the police to check the content of the fraud. Two examples are: *'On the advice of the police I ignored the invoice and I never heard anything about it again'*, and *'I found out through the police that it was a scam'*.

(12) Check with the attacker. Sometimes respondents contacted the attacker, mostly to check things. For instance, *'I wanted more information', 'he was having a hard time answering questions from my side', 'When I asked questions, I got strange answers and unclear prognosis'* (in the case of investment fraud) and *'Information requested by me was not immediately given'*.

(13) Something else. Various answers were given that were rarer and/or not easy to classify.

An additional code was assigned for respondents that mentioned explicitly that they recognized the fraud attempt immediately or emphasized speed in recognition and action. This is not a strategy but is informative and was analyzed as well.

Codes for attempts were not mutually exclusive. If respondents mentioned multiple reasons, multiple codes were assigned.

2.3.2. Actual victims

Respondents were first asked if they noticed something beforehand and if they thought someone could have prevented the experience, and who (a wide range of actors were listed, including the participant themselves and an 'other' option). If any actor was chosen respondents were then asked questions on prevention, among which, how, they believed, the victimization could have been prevented.

The description of the fraud was combined with the answer to a question about how respondents thought the experience could have been prevented. Ten codes were developed and assigned for strategies that could have prevented fraud incidents.

(1) Simply not doing it. Respondents mentioned that they just should not have done what they did, without specifying further, for example: '*not doing what I did*'.
(2) Distrust. Respondents mentioned that they should have been more distrusting and/or less gullible. Examples are: '*not trusting everything*', '*not being gullible*'.
(3) Being more alert. Respondents reported that they should have paid more attention to signals that were present which indicated fraud (without searching for more information), for instance, '*paying more attention*'.
(4) Thinking better. Respondents believed they should have thought better before taking an action. This included taking more time before acting, for example: '*thinking carefully first*'.
(5) Independent information seeking. Some respondents indicated they should have looked for more information by themselves. This includes asking the fraudster for more information, for example: '*asking for more information*'.
(6) Contact with others. Respondents replied that they should have contacted others (not the fraudster). This could be a third party or the person/organization concerned that the fraudster is posing as. Examples are *'If my parents or my brother had explained to me what was going on'*, *'That my father had called me again on my telephone number'* and *'first contact the tax authorities'*.
(7) Listening to one's own feelings. Respondents mention they should have listened to their gut feelings. For example: *'listening to your inner feelings'*.
(8) Not listening to one's own feelings. Some respondents, however, mention they should *not* have listened to feelings they had. For example: *'if I were not so greedy'*.
(9) A third party should have done something. Some respondents mention that someone else (not the fraudster) should have done something to prevent the fraud. For example: *'better inspection by Marktplaats' (Marktplaats is an online trading platform; a Dutch version of eBay).*
(10) Rules and principles. In contrast to following one's gut feelings, other respondents mentioned that they should have used safety rules and/or principles, which was this was worded as 'never do …' or 'always …'. This includes using safer payment or trading methods (like only paying after receiving a product/service, or not conducting a transaction digitally but physically). Examples are: '*stronger control from [the online trading platform] and sharper from me. Do not pay immediately*', *'do not download/share files via torrent. Better protection by torrent'*, and *'first product then payments'*.
(11) Something else. Various answers were given that were rarer and/or not easy to classify. For instance, respondents mentioned *'honest, well-paid employees at [online shop]'*, *'If more people know* [about them], *scams can be prevented'*, '*Better information about this scam*' and *'if these persons are noticed earlier'*.

Again, codes for these possible strategies were not mutually exclusive. If respondents mentioned multiple possible strategies, multiple codes were assigned.

2.3.3. Statistical analysis

The statistical analysis was based on unweighted data, with the exception of the presentation of the prevalence data. Chi-square tests and Pearson correlations were computed to analyze the relationships between variables; a Fisher's exact test was used when more than 20% of the cells had expected cell counts lower than 5.

In the cross-tabular analysis of attempts strategies mentioned less than 25 times were not included to avoid focusing on details. In the cross-tabular analysis of victimization, this would have left almost nothing to analyze, therefore strategies that occurred less than 10 times were not included.

In a second step of the analysis, strategies of attempts were combined, for parsimony as well as for theoretical reasons, based on Street (2015)'s ALIED framework, as well as the work of Levine and Daiku (2019), and Masip Pallejá et al. (2021) (see section 1).

A 'combined knowledge' strategy was created that consisted of four strategies described above: the first two strategies were (1) fraud knowledge and (2) using rules and principles, both of which could be regarded as 'context-general information'. Both knowledge and rules and principles are 'context-general information', as described by Levine and Daiku (2019), Masip Pallejá et al. (2021), and by Street (2015). Two additional strategies, (3) spotting mistakes and (4) personal knowledge, were also included in this combined knowledge variable. Noticing mistakes as well as relying on personal knowledge could both be conceived as 'individuating information', or specific knowledge, in line with Street (2015)'s theory of Adaptive Decision Strategies in Lie Detection (ALIED), as described above (see also Masip Pallejá et al., 2021).

The second combined strategy was 'Verification of information' which was the combination of: contact with others, independent information seeking, contact with the fraudster, contact with bank or credit card company, contact with police, contact with online shops & trading, and other preventive strategies. When respondents used knowledge as a strategy, other strategies were recoded as 'not used' in order to obtain a clear separation between respondents by strategy used. This was necessary as respondents could mention several strategies. All variables were coded as 'strategy not mentioned' versus 'strategy mentioned'.

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TABLE 2 Prevalence of fraud victimization and attempts in the fraud victimization survey (percent as weighted to the Dutch population; *N* as in sample).

	Victim weighted %	*N*	Attempt* weighted %	*N*
Any fraud	15,7	424	41.7	1,203
(1) Purchase fraud	10.5	282	17.3	475
(2) Friend-in-need fraud (including 'WhatsApp fraud')	1.6	44	12.9	387
(3) Identity fraud	1.6	45	5.2	155
(4) Charity fraud	1.5	39	6.5	183
(5) Investment fraud	1.4	42	8.5	258
(6) Phishing	1.3	35	18.8	558
(7) Debt fraud	1.1	29	9.7	286
(8) Prize fraud	0.9	25	9.4	287
(9) Dating fraud	0.9	20	2.4	61
(10) Spoofing (including 'helpdesk fraud')	0.9	27	14.5	430
(11) Other types of fraud	0.9	22	2.5	70
(12) Job fraud	0.2	7	1.3	42
N		2,864		2,864

*Attempts include the victims.

3. Results

3.1. Prevalence of fraud

By far the greatest part of the most important fraud incidents (68.9%) and fraud attempts (74.9%) took place online (percentages weighted to the Dutch population); 17.8% (frauds) and 7.2% (attempts) took place both offline and online and 13.2% (frauds) and 18.2% (attempts) took place completely offline. Although there were some differences between strategies by types of fraud, in all cases offline fraud constituted a minority of all cases.

Table 2 shows the victimization rate for the entire, representative sample. Online shopping fraud was the most common form of fraud: 10.5% in 2020. Six types of incidents had victimization percentages between 1 and 2% for 2020: identity fraud: 1.6%, friend-in-need fraud: 1.6%, charity fraud: 1.5%, investment fraud: 1.4%, phishing: 1.3% and lastly debt fraud: 1.1%. Finally, four types of incidents were reported by slightly less than 1% of the respondents in 2020: spoofing: 0.9%, price fraud: 0.9%, dating fraud: 0.9%, and finally job fraud: 0.2%. Another type of fraud was mentioned by 0.9% of the respondents. Attempted frauds were more common and did not entirely follow the same order of prevalence as the actual frauds. The most common attempts mentioned by respondents were phishing: 18.8%, online shopping fraud: 17.3%, spoofing: 14.5% and friend-in-need fraud: 12.9%. Other attempts occurred less often (Table 2).

It should be noted that the percentage of victims was comprised in the prevalence of the near victims. In other words, the number of people who experienced an attempt included both failed and successful fraud attempt.

This means that, for instance, 5.2% of the respondents experienced an attempt of identity fraud, among which 1.6% actually became a victim.

Although 34.5% of the respondents who experienced an attempt or became a victim indicated that they had no contact with the fraudster, 22.6% reported contact *via* email; 18.4% through an online trading platform, 7.5% through social media, 6.8% *via* telephone, 5.6% *via* an App and 2.6% *via* a text message. Finally, 5.2% met the fraudster(s) at home.

3.2. Strategies of near victims to avoid falling for fraud

A total of 960 respondents mentioned that they were aware of a failed attempt to defraud them and answered additional questions on the most memorable failed fraud attempt. Specifically, they were asked to provide a description of the fraud attempt, why they did not pay or lose money, and what they noticed that was not right (only if they indicated that they had noticed that something was not right).

Only 2 respondents did not answer the question on why they did not pay or lose money and also did not answer the question on what they noticed that was not right; they were thus excluded from further analysis. This left a sample of 958 respondents, all of which described the fraud attempt and indicated why they thought they did not lose money, and 859 respondents who specified noticing something that was not right.

The distribution of the fraud categories of these 958 respondents answering questions was: phishing (322), followed by friend-in-need fraud (127), debt fraud (114), spoofing (98), prize fraud (93), investment fraud (76), purchase fraud (34), other types of fraud (31), charity fraud (25), identity fraud (22), dating fraud (12), and job fraud (4). After coding, it appeared that 24 respondents did not properly answer the question and were marked as missing, after which these respondents were excluded from further analysis. This led to a final sample size of 934. Below, we describe the strategies near victims used to avoid fraud victimization in more detail (see Table 3).

Respondents could mention several strategies. About half, 52.1%, mentioned only one strategy, 35.8% mentioned two and 10.5% mentioned three strategies. 1.6% mentioned 4 or 5 strategies.

TABLE 3 Prevalence of preventive strategies mentioned to avoid falling for fraud in order of prevalence, in percent (*N*=934).

Preventive strategies	%	*N*
Quickly recognized	14.9	139
(1) Fraud knowledge	69.0	644
(2) Mistakes	27.9	261
(3) Distrust	26.1	244
(4) Rules and principles	11.7	109
(5) Personal knowledge	7.1	66
(6) Contact with others	5.5	51
(7) Seeking information	4.0	37
(8) Other preventive strategies	3.1	29
(9) Contact with the fraudster	2.9	27
(10) Contact with Bank or credit card company	2.2	21
(11) Wise by experience	1.6	15
(12) Contact with Police	0.2	2
(13) Contact with online shops and trading	0.1	1

3.2.1. Strategies based on knowledge of fraud

Four strategies focused on the respondent knowing and/or recognizing something.

3.2.1.1. Fraud knowledge

By far the most common preventive strategy was fraud knowledge (69%). Some respondents mentioned already 'phishing' in the description of the attempt. Several respondents mentioned that they recognized the fraud immediately: '*I immediately thought something was wrong*'. Some respondents mentioned they knew procedures of banks, tax authorities or other organizations and mentioned a mismatch with what happened during the fraud, for example: *'I just knew it wasn't real because I know the bank would never do this', 'the bank does not request information by email' or 'a bank never requests details via SMS*'. Respondents also mentioned having been informed by the media: *'this way of scamming was extensively [covered] in the news'*. Finally, respondents mentioned specific characteristics of fraud that helped them recognize the attempt: '[the] *email address was not correct' and '[it was] clearly phishing*'. It was notable that many respondents appeared to be quite confident of their analysis by describing the incident as '*it was clearly fake', 'it was clearly phishing*'.

Interestingly, several respondents provided us with instructions and tips on how to avoid fraud. For instance, one respondent mentioned that you needed to hover your mouse to detect a suspicious link, one respondent communicated that a delivery time of 2 weeks is often an indication of online shopping fraud, and another stated that it was important not to start a telephone conversation because the attacker may record your voice.

3.2.1.2. Spotting mistakes

The second most common preventive strategy was spotting mistakes (27.9%). Many types of mistakes were reported. For instance, respondents noted that certain facts were incorrect: they did not order a package, did not have debts, did not have children, or did not bank with the bank mentioned in the fraudsters' stories. Examples were: *'the work charged had not taken place and I had never ordered it', 'I knew I had not ordered anything'*, and *'I knew about the location, the chance that something would be built there was non-existent'*. Accordingly, the attacker had no chance of success. Some respondents also mentioned that if something seemed too good to be true, it probably was not: '*if something is too good to be true, it usually is not true'* and *'way too high return [on investment]'*. This was often mentioned for investment fraud attempts.

3.2.1.3. Rules and principles

Personal rules and principles were the fourth most frequently reported preventive strategy (11.7%). Respondents mentioned personal rules or principles about always being alert, about checking things such as e-mail addresses and links, and about never doing certain things. Examples were: *'I will not respond to an English-speaking person I do not know', 'I never pay to strangers via e-mail, not at all to the bank', 'I do not trust something like that from abroad and with a lot of language/spelling mistakes beforehand', 'I'm quite suspicious of such messages I do not go into unknown matters', 'I am always alert'*.

With respect to investment fraud, a respondent mentioned *'I had no faith in investing in this area*'. With respect to charity fraud a personal rule was: *'Even if it were true, I would not donate for these kinds of things*'. Regarding friend-in-need fraud one respondent mentioned*: 'Because I do not pay on requests for a loan by WhatsApp*' and regarding identity fraud: '[I] *never pay if I'm not sure of what, I'm suspicious*'. These personal rules and principles help them to avoid falling for fraud.

3.2.1.4. Personal knowledge and private context

Personal knowledge was reported by 7.1% of the respondents. They noticed inconsistencies that related to personal knowledge rather than factual mistakes. Examples were: *'my daughter would never ask for money via an app', 'the style did not correspond to what this family member normally uses', 'if it had been one of the children, they would have placed [a message in] the family app [group]', 'my children would never approach me like that, via WhatsApp', 'my daughter would never ask me for money', 'my father would never do that'*. These respondents had such confidence in their knowledge of their personal relations that they were sure that the fraudsters' stories were incorrect.

3.2.2. Distrust

Another preventive strategy consisted of negative gut feelings (26.1%); for respondents there was something odd about the fraud that generated negative feelings which protected them from becoming a victim. Respondents most often mentioned '*not trusting*' the message or the situation, without being precise about why. For instance, they say: *'[it] was too uncertain', '[it] was very suspicious', '[it was] not [to be] trusted', 'because I did not trust it and doubted it', '[I] guess it was fake', 'the person insisted so much and accordingly I had to respond quickly otherwise it would not go through*', and '*it did not feel right*'.

3.2.3. Wise through experience

Several respondents (15 respondents, 1.6% of the total) mentioned that they gained knowledge of fraud through previous experience with it. For instance, they wrote *'investing has led to a lot of damage in the past', [I] recognized the [fraud] trick, [it] had happened before, and then I fell for it', 'did not trust it from previous experience*', and *'because I almost did not get [the money] back last time*'.

3.2.4. Verification of information

Several methods were mentioned to search for information.

3.2.4.1. Contact with others

Contact with others was cited by 5.5% of the respondents. These respondents indicated that they consulted others about the fraud, or sometimes that others contacted them about the fraud. They for instance had contact with family, friends, colleagues, or specific organizations, except those coded under other strategies. Examples were: '*Checked by calling her*' (friend-in-need fraud) and '*Inspection via the authority, after which it turned out that it was indeed phishing*'.

3.2.4.2. Independent information seeking

Four percent of the respondents detected the fraud attempt because they independently searched for more information. Examples of answers that were given were *'just google it and you'll see it's wrong', '[I] looked up the number, [it] turned out to be a scam', 'then I go [went on] to investigate and [I] found that this party is unreliable', 'I have verified [it] and found that this was a scam', 'I googled it and found the same texts on forums where those people were warned'*, and *'after a short [bit of] googling, it was fully confirmed to me that it was phishing'*.

3.2.4.3. Checking with the fraudster

Information was checked with the fraudster by 27 respondents (2.9% of total) after which the fraud attempt was detected. This happened for instance for friend-in-need or investment fraud where elaborate communication with the fraudster was necessary for the fraud to succeed. For instance, with friend-in-need fraud, respondents asked which relative was contacting them, or with debt fraud respondents asked the fraudster to send the relevant purchase agreement. Respondents reported *'because it was wrong from the start, check question with wrong answer. The girlfriend's name was wrong'* and '*it was clear that it could not be trusted; she would not say her name, only: I am your daughter. So [then] you already know enough*'.

Besides these 27, two respondents played a little game with the fraudster, while they recognized the fraud, they replied as if they were going along with it for a short period: '*it was a game on my part, answered a spam email*' (charity fraud) and '[I] *asked the fraudster (to play the game) to call me back via a landline. [He] did not bother me anymore*' (friend-in-need fraud).

3.2.4.4. Contact with the bank or credit card company

Only 2.2% of the respondents contacted their bank for more information and thereby avoided falling for fraud. The bank stopped a transaction in 7 cases and the credit card company stopped a transaction in one case. In one case the respondent called his bank, and, as a result, the bank stopped the transaction.

3.2.4.5. Contact with police

Two respondents contacted the police for information which resulted in not performing any transaction, and another one mentioned the police as the reason for not paying. They mentioned: *'On the advice of the police I ignored the invoice and I never heard anything about it again'*, and *'I found out through the police that it was a scam'*.

3.2.4.6. Contact with online shops

One near victim mentioned that a large online shop helped him to notice fraud: '*Because, on the advice of the employee, I changed my password for [my] e-mail account and bol.com* [Dutch large online shop]. *I was very upset that I opened the email*'.

3.2.4.7. Other preventive strategies

Respondents mentioned various other ways that they avoided victimization (3.2%). For example: '[I have] *insufficient experience to start investing'*, *'[I] timely adjusted the login codes'*, and *'because I'm broke'*. In this category there were also some near misses; for three respondents avoiding victimization was a matter of luck rather than intent, with them writing: *'[the] link [did] not work', 'payment was not possible'*, and *'[I] could not login'*.

3.2.5. Special cases

Quick recognition or action. Some respondents, 14.9%, mentioned explicitly that they recognized the fraud immediately. They often used words like '*directly*' and *'immediately'*. For example, respondents wrote: *'because I directly did not trust it', '[my] alarm bells went off immediately', 'I directly called her', 'I directly verified this', 'because the phishing element was directly clear', 'because I directly thought 'this is fake'*, and *'I immediately knew it was not right'*.

Contacting the impersonated person or organization. In total, 75 near victims contacted someone else about the fraud (coded as either 'contact with others', 'contact with the bank or credit card company', 'contact with police', or 'contact with online shops'). Among those 75 near victims, 43 (4.6% of all near victims) contacted the person or organization that the fraudster was posing as and they verified with the concerned party if the fraudster's story was true (e.g., if they received a phishing e-mail from supposedly their bank, they contacted their bank about it). The other respondents that had contact with someone else about the fraud attempt, discussed it with someone who was otherwise not directly involved.

3.2.6. Co-occurrence of preventive strategies

To investigate whether strategies were interrelated Pearson correlations coefficients were computed (Table 4). There were only a few significant correlations, namely 15 out of 72, not counting 'quick response', which is not a strategy in itself. When they were statistically significant, they were usually below |0.20|. Also, most statistically significant correlations were negative: when respondents mentioned one strategy, they tended not to mention other strategies (with correlation ranging from $r = -0.07$ to $r = -0.20$). There were a few positive correlations. A notable significant positive correlation: respondents who contact others also mentioned relying on personal knowledge ($r = 0.17$). Recognizing fraud quickly was associated positively with relying on knowledge to recognize fraud ($r = 0.12$) and with having personal knowledge ($r = 0.07$) but negatively with distrust ($r = -0.07$).

3.2.7. Prevalence of preventive strategies by fraud category

Results showed that there were clear differences between strategies used by type of fraud (Table 5). Various types of fraud led to different strategies. Fraud knowledge was almost always the most important strategy, with about 65% or higher, but it was used less often in investment fraud, debt fraud, friend-in-need, with percentages of 50%

TABLE 4 Intercorrelations of strategies used in attempts, by type of fraud, Pearson Correlation (N=934).

	Fraud know-ledge	Mistakes	distrust	Rules and principles	Personal know-ledge	Contacting others	Seeking information	Some-thing else	Contact fraudster	Contact bank	Wise-experience	Contact police	Contact shop
Quick decision	0.12**	−0.01	−0.07*	−0.03	0.07*	0.01	−0.05	−0.06	0.04	−0.04	−0.01	−0.02	−0.01
Fraud knowledge		−0.20**	−0.20**	0.06	−0.17**	−0.14**	−0.05	−0.15**	−0.11**	−0.07*	−0.04	−0.02	−0.05
Mistakes			−0.14**	−0.02	−0.14**	−0.08*	0.04	−0.07*	−0.05	−0.08*	−0.04	0.02	0.05
Distrust				−0.04	0.02	0.06	0.03	−0.01	0.06	0.02	−0.06	0.03	−0.02
Rules and principles					−0.04	−0.04	0.03	−0.03	−0.04	−0.06	0.01	−0.02	−0.01
Personal knowledge						0.17**	−0.06	0.00	0.03	−0.04	−0.04	−0.01	−0.01
Contacting others							−0.05	−0.02	0.13**	0.00	0.04	−0.01	−0.01
Seeking information								0.00	0.03	−0.03	0.02	0.11**	−0.01
Something else									0.04	0.01	−0.02	−0.01	−0.01
Contact fraudster										−0.03	−0.02	−0.01	−0.01
Contact bank											−0.02	−0.01	0.00
Wise by experience												−0.01	0.00
Contact police													0.00
Contact shop													

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

TABLE 5 Strategies used in attempts, by type of fraud, in percent, Chi-Square or Fisher exact test.

	Invest-ment fraud	Purchase fraud	Prize fraud	Debt fraud	Charity fraud	Other fraud	Friend-in-need fraud (including 'WhatsApp fraud')	Phishing	Spoofing	Chi-Square/Fisher exact test
Quick decision	7.0	3.1	20.7	14.0	4.3	7.4	20.6	14.7	22.6	Fisher's exact: $p = 0.013$
Knowledge	49.3	40.6	82.6	64.9	69.6	44.4	47.6	83.8	75.3	$Chi^2 = 103.40$ ***
Mistakes	15.5	6.3	20.7	66.7	4.3	33.3	18.3	26.9	32.3	$Chi^2 = 112.10$***
Distrust	43.7	53.1	29.3	16.7	43.5	33.3	22.2	23.1	20.4	$Chi^2 = 37.61$***
Rules and principles	18.3	9.4	20.7	5.3	17.4	22.2	7.9	10.6	12.9	Fisher's exact: $p = 0.006$
Personal knowledge	1.4	0.0	1.1	0.9	0.0	3.7	46.8	0.3	2.2	Fisher's exact: $p < 0.001$
Contacting others	0.0	6.3	0.0	10.5	0.0	0.0	20.6	1.9	2.2	Fisher's exact: $p < 0.001$
Seeking information	7.0	6.3	2.2	8.8	0.0	11.1	0.8	2.5	5.4	Fisher's exact: $p = 0.007$
Contact the fraudster	4.2	3.1	0.0	1.8	13.0	7.4	7.9	0.3	3.2	Fisher's exact: $p < 0.001$
Other strategies	19.7	6.3	0.0	0.9	4.3	0.0	2.4	1.3	1.1	Fisher's exact: $p < 0.001$
N^a	71	32	92	114	23	27	126	320	93	

Strategies mentioned less than 25 times are not included in the table. [a]Numbers can vary slightly due to missing values.
***Correlation is significant at the 0.001 level (2-tailed).
Fisher exact test. For simplicity, most researchers adhere to the following: if ≤ 20% of expected cell counts are less than 5, then use the chi-square test; if > 20% of expected cell counts are less than 5, then use Fisher's exact test. Both methods assume that the observations are independent.

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or less. Mistakes were noticed mostly in the case of debt fraud: 66.7% and less often with other types of fraud. Distrust was mentioned relatively often in the case of investment fraud (43.7%), purchase fraud (53.1%) and charity fraud (43.5%). Rules and principles were mentioned most often with investment fraud (18.3%), prize fraud (20.7), charity fraud (17.4%) and other fraud (22.2%). Personal knowledge was used in less than 3.7% of the cases but was used in 46.8% of the attempted frauds with friend-in-need. Contacting others occurred mostly with friend-in-need fraud (20.6%). Seeking information happened the most with debt fraud (8.8%) and other types of fraud (11.1%). Checking with the fraudster did not occur a lot, but mostly with charity fraud (13%). Other strategies were most often used with investment fraud (19.7%). There were no large differences in the extent to which respondents mentioned reacting quickly to the fraud attempt. However, a swift response is mentioned between 20.6 and 22.6% of the cases with prize fraud, friend-in-need fraud, and spoofing.

3.3. Potential preventive strategies that victims could have used

Questions on the most important fraud were answered by 393 victims; 22% noticed, at the time, or in hindsight, that something wasn't right which they could have taken more seriously; 77.9% did *not* notice anything that might indicate that they were scammed. Asked about who could have prevented the fraud, 38.2% of those respondents answered that no one could have prevented the fraud and 61.8% (243 respondents) believed that the fraud could have been prevented and described how. Together with the fraud description these answers were coded. The distribution of the fraud categories, that these 243 respondents answered questions for, was as follows: purchase fraud (140), followed by investment fraud (17), phishing (14), friend-in-need fraud (11), other types of fraud (11), charity fraud (10), identity fraud (10), dating fraud (9), debt fraud (8), spoofing (8), and prize fraud (5). After coding, it appeared that 21 respondents did not properly answer the questions and were marked as missing, after which these respondents were excluded from further analysis. This led to a final sample size of 222. Below, the potential preventive strategies are described in more detail (see Table 6).

TABLE 6 Potential future preventive strategies mentioned by victims to avoid falling for fraud, in order of prevalence, in percent frequencies (*N*=222).

Potential future preventive strategies	%	*N*
(1) Seeking information	25.2	56
(2) Pay more attention	18.9	42
(3) Third-party could have done something/is to blame	16.2	36
(4) Safety rules/principles or safer way of paying/trading	14.4	32
(5) Simply not doing it	10.8	24
(6) Consult others	9	20
(7) Think better	8.1	18
(8) Distrust more	5.9	13
(9) Listen to feelings	4.1	9
(10) Consult the concerned person/organization	4.1	9
(11) Something else	3.2	7
(12) Not listening to feelings	0.9	2

3.3.1. Independent information seeking

Fraud victims most commonly (25.2%) said that victimization could have been prevented by independently seeking more information. Respondents for example wrote *'doing better research', 'I had not done research on the web shop where I ordered the product', 'by checking on the internet', 'asking for more information', 'doing more research about the app'*, and *'read up on it better'*.

Reading reviews about a seller was also mentioned commonly: '*I first should have read reviews of the web shop', 'looking at the reviews better', 'reading the reviews about the seller', 'reading review[s] of the company'*, and *'first properly checking the experiences of others with this website'*.

Seven respondents (3.2% of total) mentioned questioning the fraudster for more information as a way of independent information seeking to prevent fraud. For instance, they reported: *'by asking better questions', 'by asking more questions', 'by asking for more information', 'by asking for proof'*, and *'by asking the serial number'*.

3.3.2. Paying more attention and being more alert

The second strategy (18.9%) that could have prevented victimization, according to the victims, was by paying more attention to information that was already present during the fraud. Respondents, for example, wrote *'by paying more attention', '[by] reading well'*, and *'[by] being alert'*.

3.3.3. Third party should have done something

A third option (16.2%) to prevent the fraud was through something a third party should have done. One respondent mentioned that there could have been '*better public education about this scam*'. Another respondent blamed his/her bank: *'the reviews of the web shop were so bad that the bank could have known about this'*. Another respondent called for better inspection of platform users by the online trading platform *'Marktplaats'* (the Dutch version of eBay). Yet another respondent indicated that PayPal could have blocked the transaction.

3.3.4. Rules and principles

The fourth most common strategy (14.4%) mentioned by victims was by following safety rules and principles or making use of safer payment or trading methods. A respondent for example mentioned '*only picking up [purchased goods]*' (rather than relying on the sender to send the purchased goods *via* postage). Another respondent proposed: *'first [receiving] the product, then paying'*, and another respondent recommended *'by not paying beforehand'*.

3.3.5. Simply not doing it

The fifth strategy (10.8%) according to victims was by simply not taking the action that they took. Respondents declared this without specifying further. They wrote, for example: *'I simply should not have fallen for it', '[by] not clicking the link', '[by] not responding', 'by not opening the mail', 'by not ordering there'*, and *'[by] not doing it'*.

3.3.6. Contact with others

Next, 9% of the victims reported they could have avoided the fraud by consulting others about the fraud. A respondent wrote: *'[by] telling this to a friend who could have advised me to not do it'*. Another respondent wrote: *'[by] discussing [it] with family before [making the]*

investment', and yet another noted: '*if I had discussed it with someone before transferring money*'.

Nine respondents (4.1% of the total) mentioned that they should have contacted the concerned person or organization (that the fraudster was posing as), to verify the fraudster's story. A respondent declared about preventing friend-in-need fraud victimization: *'[by] first seeking contact with my son [to verify] if this WhatsApp [message] was right'*. Another respondent wrote about preventing debt fraud: *'[by] first seeking contact with the tax authorities.*

3.3.7. Thinking better

Another strategy, mentioned by 8.1% of the victims, was by thinking better before the action they took. This included taking more time before doing something. Respondents wrote, for example: 'by thinking better', *'[by] thinking logically', '[by] using common sense',* or *'by taking more time to think'*. Three respondents (1.4% of the total) specifically mentioned they should have taken more time to think; one respondent (0.5% of the total) on the other hand indicated that they should have thought quicker (*'thinking quicker'*).

3.3.8. Distrusting more

The eighth most common way that victimization could have been prevented was by being more distrusting and/or less gullible. Respondents specified, for instance: '[by] *not trusting everyone', '[by] being more distrusting', 'not trusting everything', 'not believing everything that someone else says'*, and *'[by] not being gullible'*.

3.3.9. (Not) listening to one's feelings

The ninth and tenth most common strategies that could have prevented fraud victimization were by either listening to one's feelings (3.6%) or conversely not listening to one's feelings (0.9%). About listening to one's gut feeling respondents reported, for example: '[by] *trusting my feeling*', '[by] *listening to my inner feeling*', '*[by] following my instinct and not ordering*' and '*Listen to my own feelings and not my girlfriend*'. About *not* listening to one's feeling respondents wrote: '*If I were not so greedy*' and '[by] *not letting me be tempted to more money*'.

3.3.10. Other potential preventive strategies

Finally, victims mentioned some other ways that fraud victimization could have been prevented (3.2%). One respondent (0.9%) for example mentioned he/she should not have listened to their friend, who convinced them to make a fraudulent investment.

3.3.11. Co-occurrence of potential preventive strategies

Pearson correlation coefficients were computed for each strategy (Table 7). There were mainly negative correlations, with some being significant. As was the case with the near victims, mentioning one strategy led to a lower likelihood of mentioning another as well. Victims who mentioned *'simply not doing'* mentioned significantly less often that they should pay more attention, that a third party was to blame or that they should have followed safety principles. Furthermore, victims who proposed to independently search for more information mentioned less often that they needed to consult others, that a third party was to blame or that they should follow safety principles. Victims who mentioned that they needed to have higher feelings of distrust had a relatively low likelihood of searching for information. Interestingly, those who mentioned that they needed to think better also mentioned that they should not listen to their feelings. This was the only positive correlation.

3.3.12. Prevalence of potential preventive strategies by fraud category

The occurrence of the potential preventive strategies by the six most common fraud categories is presented in Table 8. Fisher's exact tests (used instead of a Chi-square test because for each code more than 20% of the cells had less than 5 observations) indicated no significant relations between any of the possible potential preventive strategies and fraud category.

3.4. The combined strategies used by near victims and likelihood of victimization

An important issue is whether the strategies used by near victims helped to prevent victimization of one of the fraud types measured in the present study. To investigate this, four cross tables were created of the four strategies, namely the combined knowledge strategy, verification of information, distrust and wise by experience, with victimization in 2020, as was mentioned above (section 2.3.3).

The results showed that the strategies used by near victims had a very different impact on the likelihood of victimization. Please recall that the overall victimization percentage was 15.7% (Table 2). Among those who had experienced a fraud attempt and were analyzed because they provided complete information, 17.9% became a victim of fraud. Table 9 shows that, when knowledge was used as a strategy, the likelihood of victimization was 15.3%, but when it is not used, the likelihood of victimization was 35.6%. Consequently, using knowledge as a strategy decreases the probability of victimization by a factor of 0.43 (see 'ratio' column, Table 9).

In contrast, all other strategies increased the likelihood of victimization. Thus, when distrust was the strategy of choice, the likelihood of victimization is 26.5%, and when it is not used, the likelihood of victimization decreased to 16.7%, accordingly, using distrust increased the likelihood of victimization by a factor 1.6. Among respondents who mentioned they were wise by experience, 42.9% became a fraud victim, instead of 17.7%, an increase by a factor 2.4. Finally, when respondents wanted to verify information, 27% were victimized, and when this strategy was not used, victimization decreased to 16.9%. Clearly, it seems that having fraud knowledge is the best option to avoid victimization.

4. Discussion and conclusion

The purpose of this study was to gain a better understanding of how fraud victimization may be prevented. To this end we analyzed the answers on open questions about the strategies used by near victims to resist a fraud attempt and what strategy victims in hindsight thought could have prevented their victimization. Similar to Park et al. (2002), Levine and Daiku (2019), Blair et al. (2010), Masip and Herrero (2015), Masip Pallejá et al. (2021), and Novotny et al. (2018) we explored how this was done 'in real life' in a national random sample of respondents. Below we summarize the main findings and examine whether these can be connected to concepts proposed in the literature.

TABLE 7 Interrelationship between potential preventive strategies, mentioned by victims, Pearson correlation of codes (N=222).

	Simply not doing it	Distrust more	Think better	Pay more attention	Independently seek information	Consult others	Listening to feeling	Not listening to feeling	Third-party could have done something/is to blame	Safety rules/ principles or safer way of paying/ trading
Simply not doing it		−0.03	−0.05	−0.17*	−0.2**	−0.06	−0.07	−0.03	−0.15*	−0.14*
Distrust more			0	−0.02	−0.14*	−0.01	−0.05	−0.02	−0.11	0.01
Think better				−0.06	−0.1	−0.04	−0.06	0.15*	−0.09	−0.07
Pay more attention					−0.07	−0.11	−0.1	−0.05	−0.21**	−0.17*
Independently seek information						−0.18**	−0.12	−0.06	−0.2**	−0.15*
Consult others							−0.06	−0.03	−0.14*	−0.13
Listening to feeling								−0.02	−0.03	−0.08
Not listening to feeling									−0.04	−0.04
Third-party could have done something/is to blame										−0.08
Safety rules/principles or safer way of paying/trading										

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

TABLE 8 Most common potential strategies mentioned by victims, with Fisher exact test, in percent.

	Investment fraud	Purchase fraud	Charity fraud	Friend-in-need fraud	phishing	Identity fraud	Fisher exact test
Simply not doing it	7.7	5.3	11.1	11.1	30.8	12.5	$p = 0.26$
Distrust more	15.4	4.5	0	22.2	0	0	$p = 0.31$
Think better	23.1	6.1	11.1	11.1	7.7	0	$p = 0.13$
Pay more attention	7.7	16.7	22.2	11.1	46.2	25	$p = 0.70$
Independently seek information	7.7	34.1	33.3	33.3	7.7	12.5	$p = 0.43$
Consult others	23.1	3.8	11.1	22.2	0	12.5	$p = 0.34$
Listening to feeling	7.7	5.3	11.1	0	0	0	$p = 0.72$
Not listening to feeling	7.7	0.8	0	0	0	0	$p = 0.47$
Third-party could have done something/is to blame	15.4	16.7	0	22.2	15.4	25	$p = 0.40$
Safety rules/principles or safer way of paying/trading	0	19.7	0	0	0	25	$p = 0.88$
N	17	140	10	11	14	10	

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TABLE 9 Respondents who experienced an attempt and who were victimized Chi-Square, in percent, namely the percentage of respondents that was victimized when a specific strategy was absent or present.

Became a victim in 2020	Strategies		Ratio	Pearson Chi-Square	df	Significance
	Absent	Present	Present/absent			
	Combined knowledge strategies[a]					
Victimized	35.6	15.3	0.4	28.9	1	<0.001
N	118	816				
	Distrust					
Victimized	16.7	26.5	1.6	6.6	1	0.010
N	821	113				
	Wise by experience					
Victimized	17.7	42.9	2.4	18.4	1	<0.11*
N	927	7				
	Verification of information[b]					
Victimized	16.9	27.0	1.6	5.5	1	0.019
N	845	89				

*Fisher exact test.
[a]Knowledge: sum of fraud knowledge, mistakes, rules and principles and personal knowledge. The new variable was dichotomized into 'strategy not mentioned' versus 'strategy mentioned'.
[b]Verification of information: sum of contact with others, independent information seeking, other preventive strategies, contact with the fraudster, contact with bank or credit card company, contact with police, and contact with online shops and trading. The new variable was dichotomized into 'strategy not mentioned' versus 'strategy mentioned'.
When respondents mentioned knowledge, other strategies were recoded to zero, to avoid double coding in the present table.

Overall, 15.7% of the respondents were a victim of fraud and 41.7% encountered an attempt. The number of attempts is relatively high and suggests that many people will encounter an attempt to defraud them at least once in their lifetime and may become a victim of fraud. Almost all fraud took place online. Among the (near) victims, 65.5% had some form of contact with the fraudster, generally through online communication channels.

Despite evidence for the existence of a Truth-Bias (Bond and DePaulo, 2006; Burgoon and Levine, 2010; Street, 2015; Street et al., 2019; Armstrong et al., 2021; Masip Pallejá et al., 2021; Levine, 2022) the relatively high number of attempted fraud victims relative to the number of actual victims suggests that there are more failed attempts then 'successful' attempts in fraud. This underscores the importance of context (Burgoon and Buller, 2015; Street, 2015; Street et al., 2019; Masip Pallejá et al., 2021) and lends some credence to the statement that in situations where people encounter an attempted fraud they may tend towards a 'lie-bias', as was suggested by Street (2015).

4.1. Preventive strategies used by near victims to avoid falling for fraud

The main strategy of near victims to avoid victimization is fraud knowledge; for more than two third of the near victims, what they knew about fraud allowed them to detect the fraud attempt. They were often confident and quick in their decision-making. Even when a quick decision wasn't mentioned, they were often clear-cut in their judgment.

Previous research presented contradictory results on the importance of knowledge to avoid victimization. Several quantitative surveys concluded that knowledge of online fraud, and (un)safe behavior online behavior was unrelated to fraud victimization (Holt et al., 2018; Leukfeldt et al., 2018; Van't Hoff-De Goede et al., 2019). Lea et al. (2009) reported that victims, who have a great deal of field knowledge overestimate their abilities to make good decisions and accordingly, are relatively likely to fall for a scam in that field. For instance, victims of investment fraud had more knowledge in finance than non-victims and were relatively likely to fall for an investment scam. The present study however, focused on 'fraud knowledge', not on knowledge in one particular field.

In accordance with what has been stated above (see also section 1), it is necessary to underline that there are different forms of knowledge that we have encountered in the literature and in this study. Above we concluded that those who avoided victimization recognized the fraud as a scam and we described this as 'fraud knowledge'. Other studies mentioned above (Holt et al., 2018; Leukfeldt et al., 2018; Van't Hoff-De Goede et al., 2019) regarded knowledge of ICT security as 'knowledge'. These studies operationalized knowledge as recognizing stronger versus weaker passwords, identifying malicious URLs, or being able to define what a 'firewall 'is. We call this 'ICT knowledge'. Finally, a third form of knowledge, used by Lea et al. (2009), is 'field knowledge', i.e., having knowledge of a specific field, for example having knowledge of the financial world. Based on the literature and current research, only fraud knowledge is important for the prevention of victimization, as previous studies concluded that ICT knowledge or field knowledge do not help to prevent fraud victimization. Experimental studies, just as the present study, did find fraud knowledge to be relevant (Grazioli and Wang, 2001; Kritzinger and von Solms, 2010, 2013; Hong, 2012; Purkait, 2012; Acquisti et al., 2015; Steinmetz et al., 2021; Dixon et al., 2022). Research on the effectiveness of training showed that improving knowledge reduces victimization of online fraud (Purkait, 2012; Bullée and Junger, 2020a). These findings also fit with psychological research that has emphasized knowledge to detect deception in an offline environment, as was stated by Levine and Daiku (2019), Masip Pallejá et al. (2021), and Street (2015).

Besides knowledge, additional strategies were mentioned as well but at much lower rates (28% or less).

Some strategies were used relatively rarely: searching for facts, such as looking for information online; contacting others, or call one's bank or the police was mentioned by 5.5% of the near victim or less. This contrasts with deception detection studies in real life and offline (Park et al., 2002; Blair et al., 2010; Masip and Herrero, 2015; Novotny et al., 2018; Levine and Daiku, 2019; Masip Pallejá et al., 2021) where the role of additional information was more important.

4.2. Timing of detection

Another difference between offline and online interactions is the time that is needed to detect the truth. Deception detection studies reported that lies are often discovered relatively late and well after the fact (Park et al., 2002; Blair et al., 2010; Masip and Herrero, 2015; Levine, 2019; Masip Pallejá et al., 2021). For instance, 39.7% of the individuals who were lied to discovered this more than a week later (Park et al., 2002).

This relatively late detection offline contrasts with how online users seem to react to online messages. Respondents who mentioned relying on knowledge, mistakes, or personal knowledge generally 'just knew' right away and did not have to look for any additional information. Similarly, rules and principles were a guideline right away.

Speed of reaction time may be one of the differences between offline and online behavior. Usually, online users tend to react very quickly to messages. The likelihood that a user, who clicks on a malicious link, does this in the first 60 s is about 30% (Brink, 2018). Between 60 and 90% click within 12 h on a link in a phishing email and no one falls for a phishing email after 24 h (Mihelič et al., 2019; Jampen et al., 2020). This is surprising to some extent, as one might argue that there usually is no need to react fast online to, for instance, a specific email. But in practice, online users tend to react rather fast.

Near victims who mentioned one strategy usually did not mention another strategy. This may be the result of our methodology: when replying, respondents apparently tended to focus on one strategy and not mention another. It may also occur because, once a fraud attempt is detected *via* one strategy, further evaluation *via* other strategies is not relevant or necessary.

Globally, the rank order in strategies was often similar across the various types of fraud, with knowledge usually being the most important strategy, and with mistakes and feelings of distrust following. But some types of fraud seem to give rise to specific preventive strategies:

- To avoid falling for investment fraud, near victims use knowledge less often but listen to their feelings of distrust and follow their own rules and principles relatively often. This seems plausible as online offers often cannot be checked easily or refer to future profits that are hard to verify.
- To detect debt fraud, near victims most often noticed mistakes. This also seems plausible, as debt fraud often refers to something the near victim can verify with their own information, such as due taxes, or a package they supposedly bought.
- Near victims of friend-in-need fraud make use of fraud knowledge less often; instead, they commonly use personal knowledge. This makes sense as the fraudster is often impersonating someone known to the victim and therefore the near victim disposes of first-hand knowledge on the person who is being impersonated. These near victims also contact others more frequently. It is common sense to verify the content of the message with that specific person.

These findings show that near victims use different types of knowledge depending on the specific fraud forms they encounter.

4.3. Potential preventive strategies that victims could have used

The most common strategy mentioned by victims, that could have prevented falling for the fraud, was seeking for more information, such as reading reviews. A variety of other strategies were also mentioned, such as being more alert, relying on a third party, following certain rules and principles, contacting others or being more suspicious. As was the case with the near victims, victims who mentioned one strategy mentioned other strategies less often. There were no clear differences between the various strategies per the type of fraud. In part this could be the result of the relatively low number of victims in some categories.

4.4. Comparison of near victims and victims

When comparing the answers of the near victims with the actual victims a number of things stand out. First, there seems to be a difference in the degree of confidence between both victims and near victims. Respondents experiencing attempts were relatively clear in their answers: they overwhelmingly mentioned the use of fraud knowledge, followed by spotting mistakes and by listening to their own feelings of distrust. Looking back at what might have helped to avoid victimization, about 40% of the actual victims thought nothing might have been done. Only about one-fifth mentioned that they had noticed beforehand or in hindsight, that something wasn't right. When asked about preventive strategies, only about half could provide an answer. Second, victims' answers were much less consistent and more spread out over the various categories. Third, there is a discrepancy between what helped near victims to avoid victimization and what the actual victims believed about how to prevent fraud. Victims proposed strategies such as seeking information, relying on a third-party to do something, simply not doing it, consulting others, distrusting more, or listening (or not) to feelings were actually associated with higher and not lower likelihood of victimization. In contrast, near victims hardly ever searched for information online because they had already recognized the fraud or were sufficiently on their guard. Accordingly, searching online was not necessary anymore. It is unclear if strategies proposed by victims such as 'thinking better' and 'paying more attention' would be helpful in the future. Only 14.4% of the victims proposed safety rules and principles or safer ways of paying/trading as a strategy to prevent fraud victimization, which appeared to help near victims to avoid victimization.

All this suggests that numerous victims still have trouble understanding what had happened and were somewhat at a loss. This matches with reports by Whittaker et al. (2022) who found that 44% of victims who were scammed and reported to Scamadviser [a fraud information and reporting website (see Scamadviser, 2023)] noticed the

scam too late and 20% mentioned that they lacked knowledge. Whittaker et al. (2022) also reported that victims mostly used strategies that were not effective in identifying a scam. Razaq et al. (2021), similarly, emphasized victim's vulnerabilities. They described how some near victims in Pakistan were so enthralled by the possibility of winning a big prize that they could not be persuaded by relevant others that they were about to fall for a scam and should not pay. Taken all together, this seems to imply that a relatively large group of victims has insufficient knowledge of fraud, were perplexed, and still, after the fact, they had not managed to build a strategy for themselves that may work in the future.

Our results have implications for fraud prevention. We relied to a large extent on the comparison of the results of the victims with the near victims, it was the contrast between the stories of near victims and victims that is key to understanding how to avoid fraud.

Today, there is an enormous amount of online information on online security and online fraud. Practically every bank, insurance company, government organization, and law enforcement website provides webpages devoted to warn users and provide tips and guidelines on how to stay safe online (Whittaker et al., 2022). Apparently, this is not enough to curb the rising trends of online fraud that were described above. A disadvantage of this system of providing information is that users have to actively search for it. But they probably do not do so often. Many studies stated that security is seldom a user's first priority (Krol et al., 2012, Acar et al., 2016, Junger et al., 2017). Accordingly, when online, users are probably busy with other activities.

Therefore, we believe that the public should be proactively informed about fraud much more than is the case today. Instead of an information search process where users have to initiate a search, proactive information aims to identify users current information needs. Proactive information is necessary as those who become a victim obviously do not recognize the fraud and therefore generally do not start searching for additional information. Therefore, providing online information and hoping that users will find it, is not sufficient. This implies that public and private organizations should actively reach out to the general public, as well as to specific groups, such as students and the elderly. This could be done through media campaigns, in newspapers or on television or other media, that provide general as well as specific information about fraud with the aim to increase knowledge of the general public and propose guiding principles.

Besides, courses on online safety as well as on online fraud should be provided to students in educational institutions, to employees and to the elderly. Furthermore, a specific high-risk group are the first-time victims, as the level of repeated victimization is relatively high. Junger et al. (2022) reported that 40.2% of the fraud victims in the present sample are victimized more than once, in contrast with the overall victimization rate of 15.8%, a common finding for online and offline victimization (Farrell and Pease, 2018; Moneva et al., 2021). They could be reached after they reported their victimization, to the police, or to their bank or any other (victim) organization. In addition, information could be provided about how to act or where to find additional tips or tools, such as websites that check links for online users or where to find free anti-phishing training.

Implementing preventive policies, however, is easier said than done. While some were rather negative about teaching the public (Bada et al., 2015), research showed that there are effective interventions (Purkait, 2012; Purkait et al., 2014; Bullée and Junger, 2020a) that prevent falling for online fraud. The effectiveness of large public media campaigns has not been evaluated, as far as the present authors are aware of.

It is likely that online users will remain vulnerable to online fraud in the coming years. We believe the most important task for researchers is to continue to develop interventions to prevent online fraud and test them, as well as connect to policymakers and test new policies. At present, our professional contacts with policymakers suggest that many public campaigns are not very effective. Accordingly, the effectiveness of these campaigns needs to be measured and improved. It is important to verify whether they reached the right target group, or the majority of the public, if they were understood and if they managed to have an impact on fraud victimization.

Bullée and Junger (2020a) listed several problems in the field of online fraud prevention. As mentioned above, it is difficult to find cross-situational indicators of fraud (Burgoon and Levine, 2010; Purkait, 2012; Button et al., 2014; Burgoon and Buller, 2015). Fraud comes in countless varieties, and different types of fraud have different modus operandi. Fraud knowledge generally implies some familiarity with the specific modus operandi of a specific type of fraud. An important issue is to what extent one can warn the public against fraud in general or whether specific information is necessary that warns against each modus operandi. Despite many issues to solve, the present findings strongly point to the need to setting up larger efforts to proactively inform the public about fraud, as suggested by Whittaker et al. (2022).

Our study has a number of limitations. First, although we asked questions about victimization of many types of fraud, and added a question about 'other types of fraud', one can never be certain that all fraud victimization was measured. Second, due to the skewed nature of fraud victimization, some types of fraud, such as job fraud, had very low prevalence. Third, we cannot be certain that the fraud that targeted the near victims was similar to the type of fraud that targeted the actual victims. Although we could control for the type of fraud, this analysis may need more precision.

Despite these limitations, our study provides valuable insights into how near victims can avoid victimization and how actual victims believe they might have prevented their victimization. To the best of our knowledge, this is the first overview of preventive strategies used by near victims and actual victims of fraud based on a representative sample and making use of victims' own accounts. Our main findings showed that near victims can avoid victimization when they already have knowledge of fraud and consequently, they recognize it when they see it. Our main suggestion for policymakers is to organize broad information campaigns to inform the public. Most victims do not visit websites for more information or consult others at the time they are confronted with a fraud attempt.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: https://www.centerdata.nl/.

Ethics statement

The studies involving human participants were reviewed and approved by BMS Ethics Committee /domain Humanities and social sciences (HSS) of the University of Twente. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

MJ contributed to the conception and design of the study, the acquisition, the analysis, and the interpretation of the data, and main writer of the manuscript. LK participated in the initial design of the study, the pre-processing of the data, the data analysis, and the writing corrections of the various manuscript versions. MJ, LK, and PH developed both codebooks and worked on the coding of the victims-and near victims' answers. PH critically reviewed the article. BV contributed to the design of the study, advised and provided feedback on pre-processing of the data and the data analysis, final manuscript. All authors approved the final version of the manuscript and are accountable for all aspects of the work with regard to questions related to the accuracy or integrity of any part of the work that are appropriately investigated and resolved.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1135369/full#supplementary-material

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Detecting ulterior motives from verbal cues in group deliberations

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Introduction: Forensic interviewing entails practitioners interviewing suspects to secure valid information and elicit confessions. Such interviews are often conducted in police stations but may also occur in field settings such as border crossings, security checkpoints, bus terminals, and sports venues. Because these real-world interviews often lack experimental control and ground truth, this investigation explored whether results of non-forensic interviews generalize to forensic ones.

Methods: Organizational espionage was simulated to determine (1) what verbal signals distinguish truth from deception, (2) whether deception in groups aligns with deception in dyads, and (3) whether non-forensic venues can be generalized to forensic ones. Engaging in a mock hiring deliberation, participants (4–5 strangers) reviewed and discussed resumes of potential candidates. Surreptitiously, two group members assigned the role of "organizational spies" attempted to persuade the group to hire an inferior candidate. Each group member presented notes from an interview of "their" candidate, followed by a discussion of all candidates. Spies were to use any means possible, including deception, to persuade others to select their candidate. A financial incentive was offered for having one's candidate chosen. The interview reports and discussions were transcribed and analyzed with SPLICE, an automated text analysis program.

Results: Deceivers were perceived as less trustworthy than truth-tellers, especially when the naïve players won but overall, deceivers were difficult for non-spies to detect even though they were seen as less trustworthy than the naïve participants. Deceivers' language was more complex and exhibited an "echoing" strategy of repeating others' opinions. This collusion evolved naturally, without pre-planning. No other verbal differences were evident, which suggests that the difference between spies and non-spies was subtle and difficult for truth-tellers to spot.

Discussion: Whether deception can be successfully detected hinges on a variety of factors including the deceiver's skill to disguise and the detector's ability to sense and process information. Furthermore, the group dynamics and communication context subtly moderate how deception manifests and influence the accuracy of detecting ulterior motives. Our future investigations could encompass non-verbal communication channels and verbal patterns rooted in content, thereby providing a more comprehensive understanding of deception detection.

KEYWORDS

deception detection, verbal deception, interviewing, deceptive messages, structured programming for linguistic cue extraction (SPLICE), Linguistic Inquiry and Word Count (LIWC) features

1. Introduction

Deception is a ubiquitous human activity which is used to satisfy goals in human communication. Oftentimes, two interlocutors have goals that are in conflict with one another—one person is trying to create a false belief in another and the other person is trying to accurately judge the credibility of those statements (Burgoon and Buller, 2015). In certain circumstances, these goals are high stakes such as when a suspect is being interviewed by the police in a forensic interview. Forensic interviewing to detect deception typically entails practitioners interviewing suspects to gather information and to determine the veracity of the claims being made through the application of scientific methods and techniques (Shepherd, 2007; Inbau et al., 2013). Police often conduct these interviews, but they can also happen in the field such as at border crossings, security checkpoints, bus terminals, shopping malls, sports venues, and other locations (Vrij, 2014). These real-world interviews often lack ground truth and experimental control, making laboratory and field experiments beneficial if their findings generalize to real-world contexts.

The current investigation was undertaken to explore (1) what verbal signals distinguish truth from deception, (2) whether deception in groups aligns with deception in dyads, and (3) whether non-forensic venues can be generalized to forensic ones. We developed an experimental protocol to assess this possibility. Organizational espionage was simulated to determine whether deception during group deliberations of job applicants could be detected through the verbal content present. Groups of 4–5 participants (strangers) conducted a mock hiring deliberation in which they reviewed resumes of potential candidates and were charged with selecting the best candidates. Surreptitiously, two group members were assigned the role of "spies," who were ostensibly engaged in industrial espionage. Their goal was to persuade the group to hire a candidate who was objectively weaker than the other candidates. This methodology mirrored that of Dunbar et al. (2014). Group members reviewed the resumes of all candidates. Then each individual presented interview notes from an interview of "their" candidate and presented reasons for their choice of candidate. Spies were instructed to argue for the weak candidates using any means possible, including deception about their qualifications. Non-spies were instructed to hire the most qualified candidate. Both spies and non-spies were given a financial incentive to complete their task. Due to COVID restrictions, discussions took place online using video conferencing. Verbal statements made during the discussion/interview phase of the experiment were captured in verbatim transcripts of the conversations. This article presents the results of this experiment Application of these non-forensic field results to forensic ones were considered.

2. Background

2.1. Verbal deception in non-forensic settings

Deception detection has been widely studied in various non-forensic investigative interviews, such as security screening, financial auditing, and recruitment interviews. These contexts offer evidence of verbal forms of deception, where organizations and individuals conduct investigative interviews that may not necessarily engage in accusatory interrogation but entail fact-finding investigations (see Vrij, 2008, for an extensive list of references). Examples of these professionals include regulatory investigators, auditors, accountants, human resource professionals, and those who process any kind of application or claim (Shepherd, 2007). Each of these contexts not only speaks to the value of examining verbal clues to deception but also has found relationships between verbal communication and deception detection that are potentially generalizable to other, forensic contexts. One such context that shares the characteristics of investigative interviewing is audit interviews. The narratives gathered from auditor interviews of management during fieldwork are critical forms of audit evidence (Public Company Accounting Oversight Board [PCAOB], 2023). An audit interview study finds that both inexperienced and experienced auditors fail to detect deception at greater than chance accuracy levels (Lee and Welker, 2008). After analysis of publicly available data on question and answer (Q&A) portions of earnings calls, researchers found evidence to support that auditors experientially become more attuned to avoiding false positives than false negatives when detecting deception associated with fraud (Hobson et al., 2017). One of the few investigations of linguistic differences by Burgoon et al. (2016) found differences between manager and analyst language in the Q&A portions of earnings calls. Analysts were more likely to ask questions when interacting with fraudulent firms, and fraudulent managers used less negativity, more dominance, and more hedging language than their non-fraudulent peers (Burgoon et al., 2016; Spitzley, 2018).

A second context relevant to investigative interviewing is security screening, in which security guards must distinguish between innocent travelers and those who may be engaged in unlawful activities. The tremendous flow, brief interactions, and limited human attention make the task a complicated one (Twitchell et al., 2004). Often, interviews must be very brief to reduce the inconvenience to truthful and low risk individuals while producing an efficient flow of travelers through checkpoints. The brevity of such interviews and the sparsity of research on specific linguistic features reduces its applicability to forensic contexts. Nevertheless, both laboratory and field evidence show promise of using automated deception detection systems to identify deceivers at border crossings and security checkpoints using verbal and non-verbal indicators (Nunamaker et al., 2013; Twyman et al., 2015; although see Sánchez-Monedero and Dencik, 2022, for a counter perspective). These automated detection systems can be used in other contexts such as employment interviews and forensic interviewing as well.

Job interviews are a third context in which verbal content may reveal deception and are most akin to forensic interviews in their length, open-ended format and assumption of cooperative communication by truthful respondents (Taylor et al., 2013). Detecting deception from job interviews is difficult but important for human resource management (Roulin et al., 2014), because the poor decision on human capital placement can result in lost productivity and high cost in hiring, recruiting, and training replacements (CareerBuilder, 2017). Identification of reliable human indicators of deception can be leveraged to reduce the

risk of bad hires (Twyman et al., 2018, 2020). In the hope of appearing more attractive to employers, more than 90% of job applicants report using some degree of deceit and outright deceptive ingratiation in their interviews (Melchers et al., 2020; see also Roulin et al., 2014; Roulin and Bourdage, 2017; Roulin and Krings, 2020). Job seekers engage in such forms of deceptive misrepresentation as exaggeration and inflation of reported background, and fabrication of skills and experiences (Weiss and Feldman, 2006; Levashina and Campion, 2007). While the bulk of research on deception in job interviews has targeted non-verbal cues, recent studies have shown that verbal cues are more diagnostic and easier for practitioners to reliably use than non-verbal cues (Vrij, 2019). A recent experiment with automated job application systems indicated that word complexity was lower, and the rate of adverbs was higher, for deceptive than truthful responses (Twyman et al., 2020).

These foregoing bodies of research may be applicable to practitioners in a variety of non-forensic contexts as well as forensic ones. To the extent that deception functions in the same fashion in both, the bodies of research collected in several meta-analyses (DePaulo et al., 2003; Aamodt and Custer, 2006; Hartwig and Bond, 2014; Hauch et al., 2015) and summaries of verbal and non-verbal signals of deceit (Sporer and Schwandt, 2006; Burgoon et al., 2021) may generalize more broadly to include forensic contexts.

2.2. Deception by individuals versus groups

In the typical deception experiment, like those that use a typical cheating paradigm or a mock crime scenario, an actor will be randomly assigned to tell the truth or lie so that the researchers can establish what is called "ground truth" and know precisely who the liars are (Levine, 2020). Interviews to detect deception in research settings most often occur one-on-one but in the real-world context, groups often work on tasks together. As such, groups of people are responsible for flagging and reporting suspicious behavior. Research has shown that, on one hand, groups, especially established groups with prior interaction, can detect deception more accurately than individuals (Klein and Epley, 2015; McHaney et al., 2018; Hamlin et al., 2021). On the other hand, group size does not significantly affect detection accuracy (Hamlin et al., 2021). Multiple individuals may also deceive collectively [e.g., interviewing multiple suspects simultaneously in Vernham and Vrij (2015) and Vernham et al. (2016)]. However, research on deception in groups is still somewhat limited (for exceptions, see Hung and Chittaranjan, 2010; Wright et al., 2012; Zhou et al., 2013; Vernham and Vrij, 2015; Vernham et al., 2016), and it is common to fail to differentiate between research from dyads and research from groups. However, such generalization is often wrong, for several reasons. First, as groups grow in size from 2 to 20, individual degrees of engagement and participation may decline. With that decline comes a weakening of involvement with the group's topics of discussion, and a heightened presence of social loafing (Latané et al., 1979; Alnuaimi et al., 2010). It is easy for a group member to lose interest if the topics do not relate to that individual. As interest wanes, so does attention (Deci and Ryan, 1985). Unlike dyads, in which individuals must maintain at least a semblance of interest in what the interlocutor is saying, group settings allow group members' attention to wander so that measures of their interest become increasingly unequal (Kerr and Bruun, 1983).

Unlike in dyads, group members may also develop coalitions and clique groups, forming collusion with one another, especially when their self-interests diverge from the group at large (Komorita and Kravitz, 1983). Moreland (2010) argues that individuals are likely to experience stronger and more negative emotions in dyads than in groups. Deception is a case in point where members hold ulterior motives and engage in counter-behaviors (Buller and Burgoon, 1994). Covert and sly actions become much more likely as the group size grows. Other qualitative relationships also differ in dyads and groups of different sizes. For example, the complexion of affiliative feelings changes, group cohesion suffers, and information exchange becomes uneven as the group grows larger (DeSanctis and Gallupe, 1987; Wheelan, 2009).

Physicality changes as well when moving from dyads to groups. Whereas face-to-face dyads are typically within close proximity to one another–usually 2–4 feet, in groups, their distance from one another varies. It might seem likely that those who are adjacent to one another talk more often, and such proximity does foster some conversation, but research on small group interaction has shown that those who are directly opposite one another have the most interaction (the so-called "Steinzor effect," Steinzor, 1950). Seating arrangement can also dictate conversational distance, placing group members at different distances from the leader. In leaderless groups, seating arrangements can influence who becomes the leader: those at the head of the table or opposite the most others are more likely to be leaders (Burgoon et al., 2021). People working in teams or groups also sometimes "talk to the room" and direct comments to the group as a whole rather than one person in particular (Dunbar et al., 2021).

Information processing in groups also becomes more taxing. Attending to what multiple group members say, plus watching and listening for non-verbal signals from multiple members and allowing multiple members to have turns-at-talk, becomes more cognitively demanding becomes more cognitively demanding as the amount of information dramatically increases (Sweller, 2011; Van Der Zee et al., 2021). The result being that groupwork is less pleasurable and more tiring than dyadic deliberations. It also means that increasing cognitive complexity can make it more difficult for group members to detect deception among one another.

Finally, groups afford members the opportunity to "lay low" and speak very little. They can choose to ride on others' coattails and adopt a quiet communication style, something that is impossible in dyads. Interviewees must take as many turns-at-talk as the interviewers. By hanging back, deceivers may devote more energy to surveilling others.

The combination of all the foregoing factors produces a complexity that is absent from dyadic interactions, making predictions of group outcomes more uncertain the larger the group size. Put differently, groupwork is a different animal than dyadic work. This does not mean we cannot learn from the vast research on deception detection in dyads and apply that knowledge to groups, however (Williams, 2010). Forensic interviews among multiple individuals implicated in the same crime become a complicated tapestry in which the various strands of the storyline must be untangled. Each person's strand may introduce a different color and warp. The investigator's task becomes determining which ones

go together and corroborate each other rather than producing a collusive, accurate rendition.

2.3. Research questions

> RQ 1: Are naïve members of a group able to detect deception from those with malicious intent?

> RQ 2: Can linguistic cues of quantity, diversity, complexity, dominance, certainty and personalism differentiate insiders' and non-insiders' language use to provide verbal cues to deceit?

> RQ 3: Is deception evident from patterns of interaction among group members?

3. Materials and methods

3.1. Participants

We conducted experimental sessions with participants recruited from two large public universities in the Western US to engage in group interactions that simulated hiring decisions. The experiment was multi-phased, including review of resumes and interview notes, individual monologs, and group discussion. When there were not enough participants to form a group, we instructed those who showed up (N = 26) to perform an alternative task described in section "4.1. Alternative task: ranking the candidates." Participants (N = 109; 72 females, 35 males, and two who did not report gender) formed 22 group experiment sessions. One session had four participants, while all other sessions had five participants each. Among these participants, 55.0% were white; 19.3% were Asian; 9.2% were Hispanic/Latinx; and 3.7% were Black. Multiracial and other participants accounted for 9.2 and 3.7%, respectively. Average age was 21.3 years old (SD = 2.1; min = 18; max = 31). A total of 79.8% were native English speakers. Participants received $10 USD or extra course credit to compensate them for their time.

3.2. Design

The methodology mirrored that of Dunbar et al. (2014), which used chat conversations. The experiments were held on an online platform for synchronous video communication. In each session, a group of four to five participants simulated a hiring committee and worked together to identify the best candidate to hire, based on the candidates' qualifications. A trained research assistant facilitated each session by presenting videotaped instructions and following a standard script to ensure the consistency of experimental protocols across sessions.

After signing into the online platform, participants completed the consent form and demographic information. Following a randomized order, they introduced themselves to other participants. Each then rated the other participants' trustworthiness on four items: whether they thought the individual was dishonest, reliable, deceitful, and trustworthy. Ratings were on a five-point Likert scale and reflected participants' baseline perception of one another.

Next, they were all given a job description and five resumes from hypothetical candidates. The resumes included the candidates' education, employment history, and other information (e.g., skills, awards, and interests). Two of the resumes were designed to show preferable characteristics and have high quality. In contrast, two other resumes were unprofessional and less relevant to the job description and thus had low quality. One resume was of medium quality. Dunbar et al. (2014) pilot-tested the resumes with experts who unanimously agreed on the strongest and weakest resumes. For the four-person group, one of the high-quality resumes were not distributed. Without being told which resumes were of high, medium, and low quality, participants were instructed to read through the resumes and rank the candidates based on how well suited they were for the job. A rank of one indicated the candidate was thought to be the best candidate, while a rank of five meant they were the worst candidate. The job description and resumes were available to the whole group.

Two participants were randomly assigned to be deceivers, and the rest of the participants were assumed to be truthful. Each participant was instructed to review one interview note which documented one candidate's interview performance and to prepare a summary for the other committee members. The truth-tellers each received an interview note of one of the candidates with high- or medium-quality resumes, while the deceivers' interview notes corresponded to the low-quality resumes. The interview notes listed the evaluation of candidates' verbal communication skills, teamwork and interpersonal skills, enthusiasm, knowledge of the company, and goal-orientation. Two sample interview notes are presented in **Figures 1**, **2**. The candidates with the high-quality (or low-quality) resumes also performed well (or poorly) in the interviews and were therefore the best (or worst) candidates. The candidate with the medium-quality resume had mediocre interview performance. Because each participant only reviewed one candidate's interview note, an interview note was only known to one participant.

The deceivers were informed that they were corporate spies from a competitor company and their goal was to persuade the group to hire another spy who did not qualify for the position. If either one of the two worst candidates was hired, the deceivers won. In contrast, the truth-tellers were instructed that, in order to win, the group should hire the best candidate. By definition, the best candidate was either one of the top two candidates. For the four-person group, there was only one best candidate, because the other top candidate's resume and interview note were not distributed. Truth-tellers did not know that some participants would advocate for unqualified candidates. Both deceivers and truth-tellers were told they would each vote for the candidate to hire at the end of the experiment, and winners would receive a five-dollar bonus.

Participants were given up to 1 min to summarize their interview notes. They could also include details from their candidate's resume if they chose to. Presentations followed a randomized order. Then the group spent 5 min discussing the best candidate to hire. Deceivers were told they could

10.3389/fpsyg.2023.1166225

Candidate: Sandra Jensen

Rating Scale

1	2	3	4	5
Candidate's response contained very few of the target behaviors		*Candidate's response covered some of the target behaviors, but not quite at the level that would be ideal for that competency*		*Candidate's response contained many, if not all, of the target behaviors*

Verbal Communication Skills:

	1	2	3	4	5
Notes:	Very well-spoken and articulate. Was able to clearly communicate complex ideas. Demonstrated an ability to quickly switch between English and Spanish.				

Enthusiasm

	1	2	3	4	5
Notes:	Sandra seemed very excited about the prospect of working with international customers.				

Knowledge of the Company

	1	2	3	4	5
Notes:	She has done her homework! Was very informed about our company and the services we offer. Also was very knowledgeable about our business in general due to her previous consulting experience.				

Team Building/Interpersonal Skills

	1	2	3	4	5
Notes:	Seems like a very positive and supportive person. Had many good examples of past work situations where she had to work in teams to accomplish tasks.				

Goal Oriented

	1	2	3	4	5
Notes:	She said that she is very schedule oriented and enjoys the challenge of trying to reach goals through careful planning.				

FIGURE 1
The sample interview note of one of the top hypothetical candidates, Sandra Jensen. Sandra scores four to five in all the five metrics.

embellish the interview note during the candidate presentation and group discussion. Therefore, although the truth-tellers knew which candidates had the strongest and weakest resumes, they could be given false information about the candidates' interview performance and persuaded to select an unqualified candidate. After the discussion, participants voted for the best candidate, and the candidate with the majority vote would be hired. Participants ranked the candidates again before the facilitator announced the voting result. Finally, participants filled out a post-experiment survey and rated the information they gave to the group on its completeness, detail, accuracy, etc., on a five-point Likert scale. Participants also rated each other's trustworthiness on the same four items (i.e., dishonest, reliable, deceitful, and trustworthy) again. Figure 3 summarizes the experiment procedures.

10.3389/fpsyg.2023.1166225

Candidate: John Williamson

Rating Scale

1	2	3	4	5
Candidate's response contained very few of the target behaviors		*Candidate's response covered some of the target behaviors, but not quite at the level that would be ideal for that competency*		*Candidate's response contained many, if not all, of the target behaviors*

Verbal Communication Skills:

	1	2	3	4	5
Notes:	He was a very clear communicator, but kept interrupting me. Also, when I asked if he spoke other languages, he named 5 programming languages…				

Enthusiasm

	1	2	3	4	5
Notes:	He didn't seem very excited about the specific duties of the position. He appeared mostly concerned with a management role and larger salary.				

Knowledge of the Company

	1	2	3	4	5
Notes:	He knew a fair amount about the company, especially with respect to our U.S. business. However, he also said that he was cramming for the interview by reading our website and press releases. His knowledge of our history or what we specifically do was lacking.				

Team Building/Interpersonal Skills

	1	2	3	4	5
Notes:	Very little team work experience. His current management duties are mostly focused on ensuring workers complete their time sheets. He was also slightly over bearing, and interrupted frequently.				

Goal Oriented

	1	2	3	4	5
Notes:	He could not name a single project that he completed. It seems that he likes starting projects, but has a difficult time seeing them through to the end. He also showed up to the interview 5 minutes late.				

FIGURE 2
The sample interview note of one of the worst hypothetical candidates, John Williamson. John scores one to three in all the five metrics.

3.3. Self-reported perceived trustworthiness

After the self-introduction, participants rated baseline perceptions of one another on four items: whether they thought the individual was dishonest, reliable, deceitful, and trustworthy. The dishonest and deceitful items were reverse coded. A higher number reflected honesty and truthfulness. Two attention check questions were embedded. Three participants failed both questions and thus did not pass the attention check. Their ratings were removed. Cronbach's alpha of the four items was 0.794. The average of the four items was the trustworthiness score given by a rater to a ratee. We measured every participant's baseline perceived trustworthiness by averaging the trustworthiness scores they received.

In the post-experiment surveys, participants were asked to rate each other on the same items. Ratings from one participant

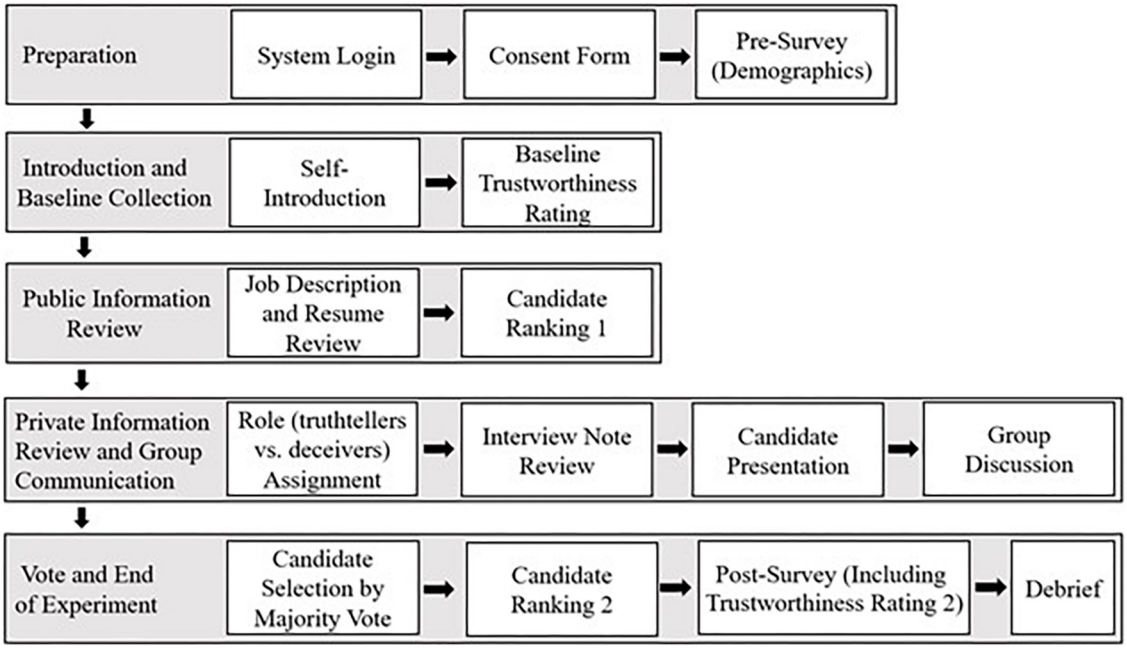

FIGURE 3
Summary of the experiment procedures.

TABLE 1 Linguistic composites and definitions.

Linguistic variable	Description	SPLICE variable
Quantity	The number of words in a passage of text	Number of words
Diversity	The percentage of unique words in a passage of text	Lexical diversity
Complexity	The syntactic and linguistic complexity of a passage of text	Complexity composite
Dominance	The percentage of dominant turns-at-talk in a passage of text	Dominance ratio
Uncertainty	The ratio of hedging words, uncertainty quantifiers and uncertainty terms in a passage of text	Hedging and uncertainty ratio
Personalism	The use of personal pronouns. First-person plural pronouns (e.g., we) are the most personal.	Ratio of first-person plural pronouns to total number of words

who did not pass the attention check were removed. Deceivers' ratings were also removed because they knew who was deceptive. Cronbach's alpha of the four items was 0.859. For every participant, we measured the perceived trustworthiness by averaging their trustworthiness scores given by the truth-tellers.

3.4. Linguistic tools and measures

To detect verbal cues to deceit, we manually transcribed participants' speech and employed SPLICE (Moffitt et al., 2012), an automated linguistic analysis tool, to extract language features. The language features of interest were quantity, diversity, complexity, dominance, certainty, and personalism. The definitions of these features are listed in Table 1. These composite measures combine several linguistic features and are meant to offer a more advanced tool to complement the frequently used Linguistic Inquiry and Word Count (LIWC; Pennebaker et al., 2007). The tool incorporates features of language used in previous analyses of language such as the General Architecture for Text Extraction for parsing and the Whissell dictionary for affect-related terms (e.g., Bradac and Mulac, 1984; Whissell et al., 1986; Bontcheva et al., 2002; Cunningham, 2002). The ones chosen are ones that have emerged in prior analyses of linguistic features and meta-analyses (e g., Qin et al., 2004; Zhou et al., 2004; Burgoon and Qin, 2006; Hartwig and Bond, 2014; Hauch et al., 2015; Burgoon et al., 2016). Quantity refers to the number of words, which commonly emerges in tests of language features and has been found to be negatively associated with deception (Hauch et al., 2015). Diversity is the percentage of unique words. Complexity combines lexical, syntactic and semantic measures. Deceivers are predicted to use more redundant, simpler, less diverse, and complex language unless obfuscating (Vrij et al., 2011; Hauch et al., 2015). Dominance includes a variety of indicators signaling one-up status. Deceivers' dominance is context-dependent (Dunbar et al., 2014, 2021). When attempting persuasiveness, deceivers become dominant; when attempting to evade detection, deceivers choose a non-dominant demeanor. Certainty is measured by the ratio of hedging words, uncertainty quantifiers, and uncertainty terms. Deceivers express more uncertainty (Zhou et al., 2004) unless they have planned or rehearsed their deception in advance (Burgoon et al., 2016). Personalism encompasses first-person pronouns versus third- and second-person pronouns. Deceivers are predicted to avoid first-person pronouns (Pennebaker et al., 2003, 2007; Hauch et al., 2015).

3.5. Conversational pattern analysis

To further discover the differences between successful and unsuccessful deception, we analyzed the group conversational patterns by manually abstracting content within each verbal turn into a set of entity transition sequences. As a preliminary analysis, one of our researchers conducted one round of manual coding on the transcripts of each group's discussion section. This involved categorizing the speech acts present in the data and identifying their directionality, including the speaker(s) and addressee(s) involved in each speech act, as well as the candidate(s) discussed. Another researcher examined the codes with the previous coder's coding schema (see **Appendix**) and utilized entity grids to visualize them. Further analysis was conducted to identify conversational patterns within the data. Specifically, our investigation focused on the manner in which spies participated in the group discussion, including their level of engagement (e.g., actively diverting the conversation or passively following its flow) and the extent of their collaboration with one another (e.g., supporting each other's candidate or challenging each other's arguments to bolster their credibility). After transforming the group discussion content into a set of entity transition sequences, we adapted the Entity-Grid Discourse Representation (entity grid) matrix (Barzilay and Lapata, 2008) to capture the micro conversational episodes. An entity is originally defined as a class of co-referent noun phrases that refer to or symbolize the same thoughts or reference (Barzilay and Lapata, 2008). In our study, key entities include the targeted subject (i.e., the job candidate who is being discussed) and the targeted group member (i.e., to whom the current speaker is responding). Given the dynamic nature of conversation, we added annotations that signal the speakers' attitude with the speech act codes (e.g., supporting or disparaging a candidate and whether or not they agreed with a specific group member). In our matrix, each column represents a single entity and each row represents the content of a verbal turn. An empty cell indicates that a verbal turn represented by the row does not include the entity represented by the column. We also color-coded each column to identify the speaker.

4. Results

4.1. Alternative task: ranking the candidates

Twenty-six participants who did not form a group conducted an alternative task. These participants were asked to review the job description, candidates' resumes, and interview notes and rank the candidates based on all the information. A rank of one indicated the best candidate, and a rank of five denoted the worst candidate. This ranking complemented the main experiment for validating the top and worst candidates. Recall that participants in the main experiment provided the first ranking of candidates prior to the role (truth-tellers versus deceivers) assignment based on only the job description and resumes. The candidates' average rankings given in the alternative task are shown in the first row of **Table 2**. These participants were able to correctly identify the top, medium, and worst candidates, showing that the resumes and interview notes were properly designed.

4.2. Manipulation checks

Candidate rankings also occurred in the main experiment in two stages based on different information. Participants were first asked to rank the candidates' resumes before the role assignment. They were asked to rank the candidates again after the group discussion, at which time they had received information on resumes and interview notes. We report these two rankings in **Table 2**. Deceivers' rankings after the group discussion are omitted because they were aware of their own deception. As expected, truth-tellers' and deceivers' rankings were similar before role assignment, and both truth-tellers and deceivers were able to identify the top, medium, and worst candidates. However, after the group discussion, the medium candidate (in bold) dropped to the last, and one of the worst candidates (in italics) was ranked the middle. Therefore, the truth-tellers perceived the qualifications of one of the worst candidates to be better than they actually were, and our manipulation was successful.

Another manipulation check in the post-experiment surveys asked participants to rate the information they gave to the group about their candidate. We conducted *t*-tests to compare truth-tellers' and deceivers' ratings and report the results in **Table 3**. Truth-tellers rated their information as more complete, detailed, believable, accurate, clear, precise, true, truthful, exact, and helpful to the group, while deceivers rated their information as more incorrect, uninformative, and overstated. These results indicate that the manipulation was successful.

4.3. Analytical responses to research questions

4.3.1. RQ 1

To study whether the naïve participants were able to detect the deceivers, the deceivers' perceived trustworthiness was compared against that of the naïve participants. If the deceivers were perceived as less trustworthy than the naïve participants, we concluded the naïve participants implicitly were able to detect deception. A non-parametric Mann–Whitney means test in the post-introduction survey (prior to the deception manipulation) indicated no significant difference in perceived trustworthiness between the deceivers and the naïve participants (U-statistics = 1,455.0, p = 0.880). The same test yielded a significant difference in perceived trustworthiness between the two parties in the post-experiment survey (U-statistics = 1,009.5, p = 0.009). The naïve participants' aggregated trustworthiness score (mean = 3.92, SD = 0.51) was higher than that of the deceivers (mean = 3.67, SD = 0.52). Therefore, the naïve players were able to discern deception and indirectly detect the deceivers.

As the awareness of deception affects decision making, a comparison of trustworthiness that accounts for the deception outcome may further reveal in which circumstances the naïve participants performed better at detecting deception. In half of the groups, the deceivers won. We replicated the comparison of trustworthiness when the espionage was successful and when it was not. When the deception was successful (the deceivers won), no significant difference in perceived trustworthiness was found between the deceivers and the naïve participants

10.3389/fpsyg.2023.1166225

TABLE 2 Candidates' average ranking ranked by participants in the alternative task, truth-tellers, and deceivers.

Time of ranking	Participant role	Top candidate 1	Top candidate 2	Medium candidate	Worst candidate 1	Worst candidate 2
At the alternative task	Alternative task	1.35 (0.85)	2.19 (0.69)	2.77 (0.71)	4.27 (0.83)	4.42 (0.81)
After resume review and before role assignment	Truth-tellers	2.00 (1.03)	1.69 (0.92)	3.23 (0.98)	3.48 (1.00)	4.60 (0.81)
	Deceivers	1.84 (0.81)	1.86 (1.03)	2.98 (1.00)	3.75 (1.01)	4.57 (0.85)
	All	1.94 (0.95)	1.76 (0.96)	3.13 (0.99)	3.59 (1.01)	4.59 (0.82)
After role assignment and group discussion	Truth-tellers	2.05 (0.91)	1.94 (0.81)	**4.22 (0.70)**	*2.69 (1.32)*	4.11 (1.24)

The average rankings are outside the parentheses, and the standard deviations are within the parentheses. A rank of one indicates the best candidate, and a rank of five indicates the worst candidate. After role assignment and group discussion, the medium candidate's ranking (in bold) dropped to the last, while one of the worst candidates moved up and ranked the middle (in italics).

TABLE 3 Participants' self-ratings of the information they gave to the group.

Participant role	Complete***	Detailed**	Believable***	Accurate***	Clear***
Truth-tellers	4.17 (0.76)	3.88 (0.91)	4.46 (0.71)	4.52 (0.64)	4.25 (0.69)
Deceivers	2.86 (1.34)	3.16 (1.24)	3.66 (1.22)	2.09 (1.27)	3.11 (1.32)
Participant role	**Precise*** **	**Persuasive**	**Convincing**	**True*** **	**Truthful*** **
Truth-tellers	4.03 (0.81)	4.02 (0.93)	3.88 (0.99)	4.75 (0.56)	4.75 (0.50)
Deceivers	2.16 (1.26)	3.64 (1.31)	3.61 (1.20)	2.00 (1.18)	1.89 (1.15)
Participant role	**Exact*** **	**Incorrect*** **	**Uninformative** **	**Overstated*** **	**Helpful to the group*** **
Truth-tellers	4.40 (0.75)	1.72 (1.05)	1.86 (1.18)	2.92 (0.92)	4.82 (0.56)
Deceivers	1.84 (1.14)	3.93 (1.15)	2.52 (1.21)	3.93 (1.00)	1.61 (1.06)

The average ratings are reported outside the parentheses, and the standard deviations are reported within the parentheses. *t*-Tests are conducted to compare truth-tellers' and deceivers' ratings. $^{**}p < 0.01$, $^{***}p < 0.001$.

(U-statistics = 312.5, $p = 0.49$). However, when the naïve participants won, the deceivers were perceived as significantly less trustworthy than the naïve participants (U-statistics = 190.0, $p = 0.003$). The results show that in only half of the groups, suspicion was triggered and affected decision making.

4.3.2. RQ 2

Multiple mixed-effects linear regression models were developed to address RQ 2. The experiment role (deceivers versus naïve participants) was the main predictor variable. The regression also considered the interaction between the experiment role and the experiment outcome (deceivers won versus naïve participants won). A participant's gender, native language, and previous experience in hiring activities were controlled. Considering the nested design of the data collection, a mixed-effects specification was adopted using the group identifiers as the random-effect term. Table 4 presents the regression results.

The regression models show that the deception manipulation only produced differences in language complexity, with the deceivers' speech being more complex compared to the naïve participants. Secondly, hiring experience increased a participant's language productivity and reduced lexical diversity. Overall, no other verbal features except language complexity exhibited differences between the deceivers and the naïve participants. The control variables such as gender and native language also did not explain much variance in the linguistic variables. We found an increase of complexity in the deceivers' language, which may be accounted for by the preparation of the deception.

Though not many linguistic variables reliably manifested hiring espionage, multiple linguistic measures when combined may predict deception (see Hartwig and Bond, 2014, regarding combinations of non-verbal cues). To test this assumption, a discriminant analysis was performed. All linguistic features included in the regression analysis were used to differentiate the truth-tellers and the spies. To better explore the feature space and identify the most effective discriminant function, all subsets of the six linguistic variables were also tested in a random-split training and testing process. Specifically, 17 groups were randomly selected to train a discriminant function. The discriminant function was then evaluated on the remaining five

TABLE 4 Multiple regression analysis of deception regressed on linguistic variables (regression coefficients and *p*-values reported).

Dependent variable	Number of words	Lexical diversity	Complexity composite	Dominance ratio	Hedging and uncertainty ratio	First-person plural ratio
Deception	0.420 (0.988)	−0.000 (0.999)	**0.1277**** **(0.029)**	−0.004 (0.875)	−0.009 (0.558)	0.004 (0.181)
Winner	−13.923 (0.588)	0.012 (0.751)	0.000 (0.995)	0.018 (0.425)	−0.008 (0.559)	0.000 (0.893)
Male	25.410 (0.232)	−0.006 (0.828)	−0.046 (0.281)	0.004 (0.866)	−0.009 (0.431)	0.002 (0.470)
Native English speaker	11.068 (0.663)	0.002 (0.947)	−0.056 (0.284)	0.035 (0.110)	0.014 (0.300)	−0.004 (0.125)
Hiring experience	**54.162**** **(0.037)**	**−0.064**** **(0.056)**	−0.045 (0.396)	−0.027 (0.210)	−0.002 (0.879)	−0.002 (0.484)
Deception* winner	17.576 (0.662)	−0.039 (0.443)	−0.105 (0.191)	0.002 (0.964)	0.020 (0.332)	−0.006 (0.166)
Fitness (AIC)	1,258.261	−82.822	11.278	−169.744	−265.429	−576.314

The bold values indicate that the coefficients are statistically significant. **$p < 0.05$.

groups. The random split was repeated 1,000 times for each set of predictors. The average classification accuracy was reported to evaluate the discriminant power of the corresponding linguistic features. The prediction accuracy of the discriminant function that contained all six linguistic features was consistently below 60%, which is the percentage of truth-tellers in our experiment. Among various subsets, the highest accuracy, 0.636, was achieved by the discriminant function that used Lexical Diversity and Complexity Composite as its predictors. However, this accuracy level was still far from being satisfactory for detecting infiltrators. Therefore, from both the regression and the discriminant analysis, we suggest that language style provides very weak utility for detecting hiring espionage.

4.3.3. RQ 3

Our preliminary analysis of the conversation patterns indicates some systematic differences between spies' and non-spies' sequences. To reach an agreement on the best candidate to hire, group members needed to express their opinions about the job candidates, question one another about their opinions and even debate their views. Therefore, it is important to look into the transitional sequences where a group member expresses an opposite opinion of the current candidate or switches the focus to another candidate. From the entity grid matrix, we highlighted these sequences as well as categorized the speakers who initiated the transitions (spies versus non-spies) and the targeted candidates (low-quality ones versus others).

Among all experiment groups, non-spies more frequently initiated these transitions that changed the discussion direction. In comparison, spies were more passive and vigilant. From the entity grid matrix, we found 172 occurrences of these transitional sequences from 18 groups; 63 were initiated by a spy and non-spies initiated the rest. This could potentially be explained by the difference between truth-telling and deception. Non-spies can express their opinions more freely by pointing out both the strengths and weaknesses of a candidate, while spies needed to be more cautious with what they said about a candidate because they wanted to selectively present certain features (e.g., strengths) of the worst candidates.

However, we also noticed that this tendency was more salient in groups where spies successfully persuaded the group to choose one of the worst candidates (only 29 out of 85 transitions were made by spies). In a group setting, it may be easier to persuade other members when a spy is echoing others' opinions instead of being the first one to propose a different opinion. This can also be an effective strategy when two spies are collaborating (e.g., one first supports the other's assigned candidate and the other echoes that). Our further examination of the ten successful deception groups' sequences provided some support for a strong "echoing" effect. In 4 out of the 10 groups, the first transition to show favor for the finally chosen worst candidate was made by a non-spy. In four other groups, although non-spies did not make the first transition, they oriented the discussion back to the worst candidate later after the topic was switched to other candidate(s). The collaboration between the two spies (e.g., supporting the other's assigned candidate) appeared in six groups. Among the eight groups that failed the deception task, although collaboration between spies still happened in four groups, spies in seven out of eight groups made the first transition, possibly to show favor for their assigned candidate by themselves or to fill the conversational void if the non-spies did not speak up. In summary, by patiently waiting for others (including the other spy) to bring up the assigned worst candidate, spies significantly increased their chance of successful deception. One of the potential reasons is that spies can create a supportive atmosphere covertly in the group for one of the worst candidates in this way.

5. Discussion

The current special topic explores the role of language in revealing deception in forensic contexts. The first most obvious question in our investigation is, what facets of language distinguish truth from deception and do they differ in non-forensic as well as forensic contexts? Relatedly, does deception in dyads, which is the prototypical communication format for forensic interviews, differ from when the format is groups? Because different considerations emerge when the number of participants expands from the

two-person dyad to the multi-person group, another question that suggests itself is, do additional aspects of interaction reveal anything else about veracity? These are the questions that animated our investigation.

Whether and to what extent the alert was triggered may depend on the additional aspects of deceivers' ability to deceive and the naïve participants' ability to detect deception. Poor liars perhaps were easily spotted by skillful lie detectors, and therefore failed the task. Experienced deceivers may have disguised deception as effective persuasion and got away with it. Revealing the determinants of the ability to detect deception, however, needs further investigation.

Participants, serving as a mock hiring committee, simulated a multi-phase screening process that included presenting the qualifications of a single candidate then engaging in a group deliberation about the five candidates under consideration. Two group members were incentivized to support low-quality candidates and would be rewarded if one of their candidates was chosen. Results using automated tools for linguistic analysis showed that deceivers (those misleading the group about the quality of their candidate) were trusted less than truthful participants. Something in their verbal and/or non-verbal demeanor did not engender trust. However, their individual language use was not particularly revealing. Only the complexity of their speech differed, whereas other linguistic properties did not. By definition, complexity was measured by a composite of polysyllabic words, singular or mass nouns, plural nouns, coordinating conjunctions, subordinating conjunctions, prepositions, commas, and average sentence length (Burgoon et al., 2016). A greater value of this variable indicates a higher level of syntactical and linguistic complexity of the sentence. The prevailing view in the deception literature is that deceivers' language is less complex compared to the truth-tellers', as producing complex sentences and fabricating false statements would compete for finite processing capacity. In our study, the deceivers, rather than truth-tellers had more complex speech, possibly due to the experiment design and the deceiver's efforts to obfuscate their position (Markowitz and Hancock, 2016; Markowitz et al., 2021). As the espionage was anticipated, the deceivers could focus on developing arguments in support of specific candidate(s). They were saved from the effort of selecting a candidate at their own discretion. The reduction in cognitive effort and time could allow more mental effort invested in mental searching for more convincing language. The well-thought-out language might have been more sophisticated and complex compared to the naïve participants' language. Alternatively, the complexity may have introduced obfuscation in support of the low-quality candidates. By using verbalisms to describe the weaker candidates, the descriptions introduced ambiguity. This ploy is often ascribed to politicians' intent on avoiding clear, concrete answers to questions. Other linguistic variables did not yield significant differences between the deceptive and naïve participants. Possibly, deceivers were able to match the language of naïve group members to achieve their goals (Richardson et al., 2014). Beyond the individual verbal features, our analysis suggested that interaction patterns among group members were more telling. Examination of transition matrices revealed collaboration and an "echoing" effect that enabled moving the deliberations to discuss the poorest candidates. These initial exploratory analyses suggest some subtle ways in which deception was revealed.

Another purpose of the current investigation was to assess the generalizability to a new context of deception cues from our previous group deception experiment. The previous experiment entailed a mock "Resistance" game by groups of villagers warding off spies who intended to do harm. Truth-tellers in that experiment rated spies as less trustworthy over time, whereas ratings of villagers' trustworthiness slightly increased in later rounds of the experiment (Burgoon, 2021). Both experiments show that truth-tellers can indirectly discern deception in groups. Comparisons of the linguistic content of (truthful) villagers to deceptive spies showed that deceivers were more constrained, echoing the content of the other spy and using more complex language that obfuscated rather than clarified. Comparatively, the deceivers in the Resistance experiment had more distinguishing verbal "tells." They spoke less than the truth-tellers. The Resistance deceivers could adopt the "flight" strategy and deceive only when necessary. However, the Resume deceivers had to be more proactive in order to promote the less favored candidates. Clearly, the context shapes verbal content and style and argues for conducting experiments in the context of interest rather than "borrowing" conclusions from other investigations (see Markowitz et al., 2023).

In meta-analysis, deceptive accounts have shown to be less plausible, less intimate (or immediate), more uncertain and more repetitive than truthful statements (DePaulo et al., 2003). In our analysis, the paucity of deception findings has an important implication for deception: deception is very difficult to detect but easy to perpetrate, especially in a group where personnel may be colluding. In general, groups afford deceivers more latitude in which to operate. They may mimic or echo others' behavior patterns. They may choose to be more silent, passive members of the group—the so-called "hiding in the weeds" strategy—while being vigilant about others' reactions. Or, they might attempt to be persuasive, especially later in the group's deliberations. Unlike dyads, in which each person has conversational responsibilities, groups are a great place to hide one's intentions.

In addition to these deliberate actions by individuals, group dynamics can also influence deception outcomes. The success key for the spies also involves whether they can enlist others to back their candidate or others are more persuasive in advocating for different candidates. For example, when there is a convincing opinion leader who advocates for a strong candidate, spies are likely to face more resistance when voicing support for another candidate, which decreases their chance to win.

The novel protocol we developed had the advantage of mimicking the realistic, complex characteristics of insider threat communication but also had the disadvantage of lack of experimental control. Researchers must decide whether to privilege ecological validity or experimental control and the artificiality it brings. This is a common problem facing communication scholars attempting to create realistic circumstances that elicit valid behavior.

One direction for future research is capturing and analyzing non-verbal cues such as a speaker's head nods, vocal hesitations and

response latencies. Head nods often accompany persuasiveness, whereas hesitations and long pauses before responding detract from it. A multimodal approach of looking at non-verbal as well as verbal patterns of discourse may account for more variance. There are many possible combinations of non-verbal and verbal features that may enlighten insider espionage. Another direction is to dig deeper into the linguistic realm through content or conversational analysis. There are many other linguistic variables such as affect and obfuscation that could be tested, but it is reasonable to assume that verbal features beyond the lexical and syntactical level, such as the content or patterns of conversation, may provide another clue to deceit that could be automatically generated.

This experiment is not without weaknesses. Group size was a problem. Too often we did not have enough participants to fill out multiple groups of five and could only have one group at a time. Additionally, this small sample size, with group as the unit of analysis, underpowered our statistical analysis. This weak power may have accounted for some of the non-significant results. Inasmuch as the current corpus is underpowered, collecting more data perhaps will rectify this problem.

Data collection of groups requires tremendous planning and coordination, which partly explains our small sample size and thus the prevalence of null results in this study. The goal was to create groups large enough to deviate from dyads. However, we recommend if this experiment is replicated, to use a more manageable group size of four.

Collecting additional linguistic variables is also advisable. Previous investigations of deceptive language have often recommended combining tools like SPLICE and LIWC, once overlapping variables are removed (e.g., Jensen et al., 2011; Hauch et al., 2015; Burgoon et al., 2016).

6. Conclusion

In real-life contexts such as hiring committees, group members often interview one another during discussion to probe their decisions, and deception may occur and interfere with the process. Future research should probe further how deception transpires verbally in groups, because previous findings based on dyadic deception research may not apply to group settings. We conducted an online experiment in which groups of participants simulated a hiring committee with two deceivers covertly promoting unqualified candidates. We analyzed participants' linguistic features with SPLICE and their conversational patterns with entity grid matrices. The deceivers were less trusted than the naïve participants, especially when the deception was unsuccessful, showing that naïve group members could indirectly discern deception. But more overt verbal measures of deception did not materialize, indicating that in general, deceivers evaded detection. Exceptions were that deceivers used more complex language than naïve participants. Otherwise, we did not find significant differences in language quantity, diversity, dominance, certainty and personalism between spies (deceivers) and naïve (truth-telling) group members. Although disappointing, the results hint at the difficulty of discerning deception from verbal cues. The problem may have been the focus on individual rather than discursive patterns of behavior. Language analyzed at the discourse level revealed an "echoing" strategy by deceivers that facilitated collusion and garnered support, something which could be examined further in future studies.

The null results in this investigation indicate that it is important for deception research to account for group size and context (e.g., groups versus dyads, different domains of tasks) to uncover verbal features that are valid in forensic and other non-cooperative circumstances.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Human Subjects Committee at University of California, Santa Barbara. The patients/participants provided their written informed consent to participate in this study.

Author contributions

ND and JB contributed to the study design, rationale, and literature review as well as the discussion and analysis. XC, XW, SG, and QH contributed to literature review, analyses, results, and discussion. JN supervised data collection and reviewed/edited the final submission. All authors contributed to the article and approved the submitted version.

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Conflict of interest

JB and JN are founders of Discern Science International, a for-profit company that conducts credibility research. ND is a consultant to Discern Science International.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

Codebook for Manual Coding.

Action	Target
Support/Disparage/Comment on	Candidate 1
	Candidate 2
	Candidate 3
	Candidate 4
	Candidate 5
Agree with	Role 1: Spy A
	Role 2: Truth-teller A
	Role 3: Truth-teller B
	Role 4: Spy B
	Role 5: Truth-teller C
Justify (i.e., provide evidence/reasoning to support their own statement)	The group
Question (i.e., ask a question but not for another player's opinion)	
Ask for opinion (i.e., ask for another player's opinion)	
Change mind (i.e., change mind after the note presentation)	
Confusion (i.e., express confusion about whom to hire)	

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Cross cultural verbal cues to deception: truth and lies in first and second language forensic interview contexts

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Introduction: The verbal deception literature is largely based upon North American and Western European monolingual English speaker interactions. This paper extends this literature by comparing the verbal behaviors of 88 south Asian bilinguals, conversing in either first (Hindi) or second (English) languages, and 48 British monolinguals conversing in English.

Methods: All participated in a live event following which they were interviewed having been incentivized to be either deceptive or truthful. Event details, complications, verifiable sources, and plausibility ratings were analyzed as a function of veracity, language and culture.

Results: Main effects revealed cross cultural similarities in both first and second language interviews whereby all liar's verbal responses were impoverished and rated as less plausible than truthtellers. However, a series of cross-cultural interactions emerged whereby bi-lingual South Asian truthtellers and liars interviewed in first and second languages exhibited varying patterns of verbal behaviors, differences that have the potential to trigger erroneous assessments in practice.

Discussion: Despite limitations, including concerns centered on the reductionary nature of deception research, our results highlight that while cultural context is important, impoverished, simple verbal accounts should trigger a 'red flag' for further attention irrespective of culture or interview language, since the cognitive load typically associated with formulating a deceptive account apparently emerges in a broadly similar manner.

KEYWORDS

detecting deception, plausibility, first and second language, cross cultural, South Asian

1. Introduction

The forensic interviewing literature concerned with distinguishing liars from truth-tellers is largely based upon North American and Western European research and has typically focused on monolingual English speaker interactions (see Granhag and Strömwall, 2004; Castillo and Mallard, 2012; Laing, 2015; Leal et al., 2018). Yet, the transnational nature of criminal investigation is such that forensic interviewers regularly encounter persons of interest from diverse cultures. Culture can be defined as 'the collective programming' that distinguishes one group from another (Hofstede and Hofstede, 2005) and so culture typically refers to characteristic societal markers that determine individual attitudes, behaviors and values (Lytle et al., 1995). Accordingly, individuals from different cultures communicate variously, often differing in factors such as their degrees of verbal directness, cohesion and coherence, pacing and pauses,

and what to say (e.g., Levine et al., 2007; Reynolds et al., 2011; Taylor et al., 2014).

Psychological understanding of verbal deception in these 'cross-cultural' interactions is not well advanced, despite verbal behavior being known to be culturally diverse. Hence, cultural variability adds further to the well documented challenges of detecting verbal truth and lies in forensic interview contexts, which in part emanates from the inconsistent nature of verbal cues in general (see Porter et al., 2000; Dando and Bull, 2011; Vrij, 2014; Sandham et al., 2020). Even when interviewer and interviewee share the same first language, differences in expected norms and cultural speech practices are sufficient to trigger misunderstandings, both in face-to-face dialogue (van der Zee et al., 2014; Giebels et al., 2017; Taylor et al., 2017) and in computer mediated interactions (e.g., Levine et al., 2007; Durant and Shepherd, 2013; Hurn and Tomalin, 2013).

Additional challenges can arise when one or both interviewers are required to speak in a second language, since this complicating verbal communication still further (see Cheng and Broadhurst, 2005; Da Silva and Leach, 2013; Duñabeitia and Costa, 2015). While English is the most widely spoken language worldwide, for many, it is spoken as a second language and so it is not uncommon for cross cultural interviews to be conducted in English. Irrespective of veracity, the additional cognitive demands associated with communicating in a second language (Segalowitz, 2010; Tavakoli and Wright, 2020) may trigger verbal cues that research on first language interviews identifies as diagnostic of truth and lies. For example, research has indicated that liars often provide impoverished, simple verbal accounts, which lack verifiable information and contain proportionally fewer event details and complications than truth-tellers (e.g., Leal et al., 2018; Vrij et al., 2020; Vrij and Vrij, 2020). Although some of these verbal cues appear stable across cultures (Vrij and Vrij, 2020), as far as we are aware the forensic verbal deception literature has yet to fully investigate first and second language variances.

1.1. Deceptive and truthful verbal communication

Cognitive theories of deception predict differences in verbal behaviors because lying can be more difficult than being truthful. For example, Cognitive Load/Effort theory (Vrij, 2000) posits that lying is often a more complex mental activity than telling the truth since liars must manage the numerous concurrent cognitive demands associated with (among other things) withholding the truth, formulating a deceive account, matching accounts to known or discoverable information, appearing plausible, and maintaining consistency (e.g., Buller and Burgoon, 1996; Hartwig et al., 2005; Vrij et al., 2011; Leins et al., 2012; Vrij et al., 2012; Verigin et al., 2020). Consequently, liars may offer impoverished and vacuous accounts in response to questions versus truthtellers as a way of managing their deception.

Indeed, the amount of event information provided in verbal accounts has consistently emerged as a useful cue to veracity, with truthtellers typically providing more detail in their accounts than deceivers (e.g., DePaulo et al., 2003; Vrij, 2008; Taylor et al., 2013; Dando and Ormerod, 2020; Dando C. J. et al., 2022). Operationalizing this cue can be challenging, since researchers typically use interview transcripts, rather than having to be alert to deception in real time. Although interviewers are not generally required to make veracity decisions, they are expected to be alert to deception and so concerns about the cue's utility are valid. Nonetheless, the amount of event detail provided has been found to cue more accurate truth and lie decisions in both face-to-face and remote interview contexts (e.g., DePaulo et al., 2003; Vrij, 2008). Further, researchers have reported that both professionals and some lay persons are able to recognize information poor and impoverished accounts, and so are socially alert to this verbal behavior (e.g., Vrij and Mann, 2004; Verigin et al., 2020).

The amount of verifiable source information provided, the complexity of answers, and the overarching plausibility of the account are related factors that have also emerged as veracity cues (see Vrij and Vrij, 2020; Vrij et al., 2022). Verifiable sources, or 'concrete' details that *could* be verified from witness statements, CCTV, and trace evidence for example (see also Ormerod and Dando, 2015), are often more common in truthful accounts (e.g., Vrij et al., 2020; Leal et al., 2022). Complications are details provided that serve to complicate an account by adding uninvited additional event relevant detail. For example, *'I went up to the food counter, which had a basket of fruit on top. The fruit looked really lovely. I remember there were bananas, which I really love'* rather than *'I went to the food counter'*. Again, research has indicated that truthful accounts often include more complications (e.g., Vrij et al., 2021b) suggesting paucity of complications is indictive of deception.

Plausibility, in terms of judging how 'likely' or 'believable' an account is (e.g., DePaulo et al., 2003; Leal et al., 2019), is a subjective assessment/rating. Nonetheless, plausibility judgments have been found to distinguish truth tellers from liars whereby plausibility ratings of deceptive accounts are typically significantly lower (e.g., DePaulo et al., 2003; Vrij et al., 2021a). Furthermore, plausibility ratings using a Likert scale were found to positively predict details, complications and verifiable sources indicating observers recognized these verbal behaviors differed (Vrij et al., 2021a). Indeed, many interview techniques developed toward amplifying cues to detection in real time have drawn on the notion that truthful accounts *should* be more plausible and make more sense and so have focused on credibility cues (e.g., Dando and Bull, 2011; Granhag and Hartwig, 2014; Ormerod and Dando, 2015). It appears professional observers and interviewers are able to recognize improbable accounts in some circumstances, particularly when interviewers employ techniques to amplify credibility cues (e.g., Dando et al., 2009, 2018; Vrij et al., 2009; Evans et al., 2013; Lancaster et al., 2013).

Our understanding of how consistency, verifiability, plausibility and complications relate to veracity is more advanced for North American and Western European participants than for other populations. It seems sensible to assume, however, that theories of Cognitive Load/Effort are relevant irrespective of culture, since cognitive processes such as memory and attention are universal. What is less clear is how cognitive load will manifest for different cultures. For example, Taylor et al. (2017) found that liars with North African cultural backgrounds tended to increase their provision of perceptual details when lying, with this supplanting their cultural norm of providing social details. The opposite was true for liars from Western Europe. Conversely, some researchers have reported more event details and checkable sources are provided by truthtellers irrespective of language (see Ewens et al., 2016, 2017; Leal et al., 2018). For example, Russian, Korean and Hispanic truthtellers were found to include more complications than liars when providing travel accounts (Vrij and Vrij, 2020). These differing findings illustrate how nascent this area is, with a paucity of interview relevant research findings.

1.2. Truth and lies in first and second languages

Those few studies of veracity across second language and bilingual communication suggest that expectations, the cues attended to, and language (first versus second) all impact veracity judgment performance. Bilinguals experience heightened cognitive load when being both deceptive and truthful in a second language (Da Silva and Leach, 2013; Akehurst et al., 2018) and so verbal cues to veracity such as low information, reduced complexity, and fewer verifiable sources may be apparent but not necessarily associated with lying. However, laypersons and professionals (police officers) appear to believe liars communicating in both first and second languages are likely to exhibit the similar verbal veracity cues (Leach et al., 2020). They also expect differences in interview length due, for example, to misunderstanding of questions and delayed response times (Leach et al., 2020); this has been borne out by increased response durations when being deceptive in a second language versus first language (McDonald et al., 2020).

Despite expectations of similar verbal behaviors, a lie bias has begun to emerge when judging non-native (second language) speakers. In contrast, a truth bias is more evident when judging native (first language) speakers (Da Silva and Leach, 2013; Evans and Michael, 2014; Wylie et al., 2022). Similarly, veracity judgment accuracy is better when judging first vs. second language speakers (Da Silva and Leach, 2013; Taylor et al., 2014; Leach et al., 2017; Akehurst et al., 2018), although not always. Others have reported improved veracity judgments in second language contexts (e.g., Evans et al., 2013), or no discernable differences (Cheng and Broadhurst, 2005) as a function of language (First Cantonese; second English), although in this research the language status of the observers is not always clear.

1.3. The current research

The research reported here seeks to advance our understanding of the occurrence and potential cueing utility of details, verifiable details, complications, and plausibility as verbal veracity cues in forensic interview contexts, with bilinguals from a non-western culture. Specifically, monolingual (British) and bilingual (South Asian) participants took part in a laboratory task that involved carrying out an activity (that differed in part as a function of liar or truthteller condition), following which they were interviewed in either their first (English and Hindi) or second (English) language. All deceptive participants self-generated an account to convince the interviewer that they had completed the same activity as the truthful participants. Interviewers and interviewees were culture and language matched. Interview transcripts were coded and rated for plausibility.

The relevant literature is sparce and the findings are mixed. Hence, we formulated a series of questions driven not only by a clear need to advance understanding of verbal behaviors across different cultures with reference to the real-world challenges and associated empirical questions raised by professionals/practitioners tasked with maximizing opportunities to better understand truth and lies. It is these research questions and challenges that guided both our paradigm and analysis approach, as follows.

First, using first language (L1) as a proxy for operationalizing culture, we examined the occurrence of verbal cues (event details, complications, and verifiable sources) and plausibility as a function of veracity. Consistent with previous research, we expected truthtellers to present more of each cue than liars irrespective of cultural background.

Second, we examined the occurrence of verbal cues and plausibility when interviewed in a first versus a second language as a function of veracity. Consistent with previous research, we expected the behavior of second language speakers to include less of the verbal cues than the first language speakers.

Third, we examined cultural differences and similarities in the occurrence of verbal cues and plausibility across cultures as a function of veracity. While we recognize the inconsistencies of prior research in this area, we expected that judgments of plausibility would be particularly impacted for the those interviewed in their second language since empirical evidence has begun to emerge of lie bias for second language speakers (see Wylie et al., 2022).

2. Materials and methods

2.1. Participants

An *a-priori* power analysis was conducted using G*Power 3.1 (Faul et al., 2007) to determine minimum sample size estimation. Power analysis for ANOVA: main effects and interactions for three groups with a numerator df of 2 indicated the required sample size of mock witnesses to detect large effects (assuming power = 0.80 and $a = 0.05$) was $N = 121$. Thus, the obtained sample size of $N = 136$ was adequate given resource constraints and access to bilingual populations and is in line with sample size norms described in many empirical cross cultural studies such as the one reported here (e.g., Al-Simadi, 2000; Cheng and Broadhurst, 2005; Castillo and Mallard, 2012; Evans et al., 2017; Primbs et al., 2022). Participant interviewees were recruited through word of mouth, social media and advertisements placed in the locality of the University. This research was approved by Lancaster University's Psychology Ethics Committee and was run in accordance with the British Psychological Society code of ethical conduct.

2.1.1. Interviewees

A total of 136 adults took part in this research (64 males and 72 females). The Mean age was 22.13 ($SD = 2.14$), ranging from 18 to 29 years. There were 88 (64.7%) bi-lingual participants with Hindi as their first language and English as a second language (41 male and 47 female) and 48 (35.3%) monolingual English speakers (23 male and 25 female). Participants were randomly allocated to either the liar or truthteller veracity condition, resulting in 70 liars (51.5%) and 66 Truthtellers (48.5%). Bilingual participants were further allocated to one of two interview language groups, namely first language (Hindi) or second language (English). Accordingly, there were six conditions (i) Monolingual British liars (25 participants), (ii) Monolingual British truthtellers (23 participants), (iii) Bilingual first language interview liar (22 participants), (iv) Bilingual first language interview truth (23 participants), (v) Bilingual second language interview truthtellers (20 participants), and (vi) Bilingual second language interview liar (23 participants). There were no significant differences in age across the groups, $F(5, 130) = 0.621$, $p = 0.684$, nor differences in gender distribution, X^2 (5, $N = 136$) = 1.450, $p = 0.919$.

2.1.2. Interviewers

Two female volunteer research assistant interviewers (from here on referred to as interviewers) took part in the research as interviewers (aged 22 and 24 years), one bilingual (Hindi and English Language) and one monolingual female (English language). The monolingual interviewer, a British citizen, born in the UK, employed at an English University, conducted all monolingual English interviews. The bilingual interviewer, a second generation British Indian, conducted all interviews with bilingual participants according to language condition. Both interviewers underwent bespoke training over a 2-day period. Training was designed for this research by the first author, adopting a collaborative pedagogical approach, comprising: (i) a 2-h long classroom-based introduction to the interview protocols behaviors, (ii) a 2-h long practice session that included 3 practice interviews, which were digitally recorded to allow feedback and evaluation. Once the interviewers had attended the classroom training sessions (training day 1) and completed the practice interviews to required level of competency, (training day 2) they were able to commence research interviews. Interviewers were naïve to the veracity conditions and hypotheses.

2.2. Materials

2.2.1. Language and background questionnaire

Prior to participation all participants completed a 10-item hard copy self-report language proficiency and background questionnaire to guide groupings of 1st and 2nd language conditions (Supplementary materials OSF). Monolingual participants were all British citizens, born in the UK, with English as their first/only language. Bi-lingual participants were all Indian citizens born in India, attending a UK university to study at PG level. None of the bilingual participants ($n = 88$) self-reported having spent any time learning or working in another English-speaking country before the age of 16 years and reported starting to learn English at a mean age of 9.51 years ($SD = 2.16$, ranging from 6 to 15 years). On a Likert scale ranging from 1 (extremely poorly/never) to 7 (extremely well/always), bi-lingual participants reported that they spoke English well ($M = 5.64$, $SD = 0.93$), always spoke Hindi at home as a child ($M = 7.00$, $SD = 0.00$), always spoke Hindi with their parents ($M = 7.00$, $SD = 0.00$), always spoke Hindi at school ($M = 6.78$, $SD = 0.53$), and always spoke Hindi with friends ($M = 6.79$, $SD = 0.55$). The mean number of years spent completing formal education in English was 3.84 ($SD = 1.19$). All bilingual participants reported the language spoken at their first place of education was Hindi. Bilingual participants (Supplementary materials OSF) were asked which language they preferred to use (Hindi, English, or either/both) in various contexts while studying and living in England (see Table 1).

TABLE 1 Bilingual participant language preferences.

	English	No preference	Hindi
Home	4 (2.9%)	40 (29.4%)	44 (32.4%)
Work	7 (5.1%)	61 (44.9%)	20 (14.7%)
University	53 (39%)	31 (22%)	4 (2.9%)
Friends	43 (31.6%)	37 (27.2%)	11 (8.1%)
On Line	10 (7.4%)	67 (49.3%)	11 (8.1%)

2.2.2. Post interview questionnaire

Immediately post interview, participants completed a hard copy questionnaire comprising a series of Likert scale questions ranging from 1 (very little/extremely easy/not at all) to 7 (very much/extremely hard/extremely motivated). Questions concerned adherence to the pre-interview instructions, motivation, experienced difficulty, and understanding.

2.2.3. Interview protocol

Irrespective of condition, all interviews were similarly structured and comprised three information gathering phases, in the same order. First, participants were asked to provide a free recall account of everything they could remember, followed by a series of probing questions, finishing with a second free recall account (see Table 2). Explain and rapport building phases preceded the formal information gathering phases. Interviews finished with a closure phase (see Table 2).

2.3. Procedure

Participants were recruited to take part in an unspecified activity and then to take part in an interview following the activity. They were warned that they may be asked to deceive the interviewer as part of the interview but were naïve to the real aims of the project. All participants were asked to meet Researcher A (a confederate) in a café on the ground floor of a university building. Researcher A instructed the participant to deliver a package to Researcher B (also a confederate) who would to be waiting in an office on the third floor of the building. The package was marked confidential. It was explained to the participant that the package contained some important documents. Hence, once the package had been delivered to Researcher B it was vital the participant return to Researcher A, who would be waiting outside of the café in the courtyard, with proof of safe delivery in the form of a signed receipt. Researcher A then told participants that some money had gone missing and that they were going to be interviewed about it. Each participant was given 10 min to prepare for the interview.

Participants in the truth condition arrived at the 3rd floor office and were met by Researcher C (a confederate) who explained that Researcher B was running 15 min late and so could not sign for the package just yet. However, Researcher C suggested they go downstairs to the café until the researcher returned. Participants in this condition accompanied Researcher C to the café, where they had a coffee (or similar) and chatted about a series of general topics (e.g., University, where they lived, whether they had visited nearby cities etc.). After approximately 15 min Researcher C and the participant returned to the 3rd floor office. Researcher B was waiting and took the package from the participants and provided a signed receipt, which the participants took back to researcher A (back downstairs in the café), as instructed.

Participants in the deception condition however, upon arrival at the 3rd floor office, were immediately told by another confederate that the intended recipient (Researcher B) had just left the office but that they should not wait for his return, because it would seriously delay delivery of the package. Instead, they were instructed to deliver the package themselves to a courier who was waiting outside the building, but before doing so to forge Researcher B's signature on the proof of delivery receipt which should then be returned to Researcher A as directed. The participant was instructed to forge the signature by copying Researcher B's signature from his bank card that was in his

TABLE 2 Interview phase description.

Phase	Overview
1. Explain	Introductions, explain the interview process and procedure and offer participants the opportunity to ask questions.
2. Rapport	Interviewer verbally interacts with the participant using two types of behaviors: i. Open-ended invitations to exchange information. For example, '*Thank you for coming to the University today. Do you work here, or do you study here?*' ii. Offering some non-personal information to begin this process. For example, *'Oh ok, do you like your course. I have many friends on the same course, actually. You might know them. They love it;'* Interviewer displays one attentive physical behavior: i. Nodding when interviewees speak/answer questions. Interviewer displays one attentive verbal behavior: i. Thanking interviewees whenever they provided information and answered a question. For example, *'Thank you, that was useful in helping me to understand*' The attentive verbal and physical behaviors continued throughout the interview
3. Free recall	Commenced with an explanation of the four ground rules: 1. Report all/everything 2. Do not guess 3. Say if you do not know 4. Say if you do not understand Participants were then instructed to explain everything about their involvement in the events leading up to and after the theft of £5.00 from the researcher's wallet. Once interviewees had finished, all were asked if they wished to add anything else.
4. Questions	Commenced with a reminder of the four ground rules (above), following which participants were asked four Tell Explain Describe (TED) prefaced probing question: 1. Tell me about the conversation you had with the person you met in the University bar. 2. Describe the University bar to me. 3. Explain the route you took from the room where you met the research assistant to the University bar. 4. Describe what you could see out of the window nearest to where you were sitting in the University bar.
5. Free recall	Commenced with a reminder of the four ground rules (above) following which interviewees were again instructed to explain everything about their involvement in the events leading up to and after the theft of £5.00 from the researcher's wallet. Once interviewees had finished, all were asked if they wished to add anything else.
6. Close	Participants were thanked and offered the opportunity to ask questions.

wallet on the office desk. They were further instructed to take £5 from Researcher B's wallet to give to the courier. Deceptive participants all completed this task as instructed. Once the Deceptive participants gave the signed receipt to Researcher A they were told that some money had gone missing and that they were going to be interviewed about it. Researcher A gave the Deceptive participants 10 min to develop a "plausible" explanation of them being in the café with Researcher C for a coffee and were told that their role was to persuade the interviewer that they were being truthful.

Each participant was then interviewed about the theft of £5 from Researcher B's office. Two interviewers (one monolingual and one bilingual) conducted all interviews. Monolingual participants were all interviewed in English by the same western monolingual interviewer. The bilingual interviewer conducted all bilingual interviews in participant's first (Hindi) or second language (English), randomly allocated across veracity conditions (lie and truth).

2.4. Coding

2.4.1. Interview coding

Interviews were digitally audio recorded. English interviews were transcribed verbatim. Hindi interviews were first translated, and then transcribed. Transcriptions were coded for event details, verifiable information, and complications by a group of 10 British monolingual coders (each coding between 12 and 15 transcripts), all of whom were naïve to the experimental conditions and hypotheses. Coders comprised a group of post graduate research students, with experience of coding transcripts for information items with reference to a set of coding instructions. Prior to coding, all coders took part in two classroom-based group training sessions (each coder attending both sessions) lasting 2 h per session. Coding training was run by the first author and comprised (i) instruction/teaching on coding in general, (ii) project specific coding instructions, (iii) group coding of sample transcripts with feedback, (iv) individual coding of transcripts with feedback and group discussion regarding agreement and managing disagreement across coders, and (v) plausibility coding explanation/instruction. Coders also rated each transcript for plausibility. Items in each of the categories were only scored once (i.e., repetitions were not scored). Each of the 10 coders had therefore independently coded a minimum of three of the same transcripts.

Guided by the approach to coding employed by Leal et al. (2018) and Vrij and Vrij (2020), we counted the number of verifiable sources provided. Verifiable source information concerns verbalizations that could be used to verify the information provided by interviewees during the interview, such as named individuals, CCTV footage, text and phone conversations, purchasing information. For example, '*I went to the lab on the second floor,* scanned in using my student ID *and then*

logged onto my emails' includes 2 verifiable sources (underlined) that could be accessed to verify what the participant said. Event information details were defined as a unit of detail/information about the café paradigm event (from start to end) and included all visual, spatial, temporal, auditory, and action details. For example, *'There was a* desk *and* three chairs. *There was* a middle-aged *man* sitting *on the* middle chair. *He was* talking *to someone* on the phone. We *spent 20 min* in the café. XXX brought me a coffee, and packet of crisps. *After a while,* XXX got a call telling us to go back upstairs', includes 17 event information items. We defined a complication as a verbalization that serves to make the account of the event more complex and detailed. For example, '*I was talking to XXX when I asked if we could move because of the* fridge in the corner. *T*he light inside was so bright I *almost wanted to put sunglasses on!'*, includes two complications. Information items, verifiable sources and complications were only coded once in that each was assigned to one of the verbal cues categories, only. Repetitions within each category were not coded. Plausibility (see Vrij et al., 2020) was rated using a 7-point Likert scale, asking coders to rate how 'believable/plausible' the account was (1 = not at all believable/plausible; 7 = completely unbelievable/unplausible).

Thirty of these transcripts were randomly selected. Two-way mixed effects Intraclass Correlation Coefficient (ICC) for agreement between multiple (10) research raters for event details, verifiable sources and complications were conducted. Mean estimates with 95% CI revealed very good inter-rater reliability for (i) event details, ICC = 0.994 (95% CI 0.991; 0.997), (ii) verifiable sources, ICC = 0.894 (95% CI 0.836; 0.940), and (iii) complications, ICC = 0.920 (95% CI 0.876; 0.955).

2.4.2. Adherence to interview protocol coding

The same sample of 30 interviews were coded by an additional two independent coders for interviewer adherence to the interview protocol using a scoring sheet, which listed each of the required interviewer behaviors (i) inclusion of the 6 phases in the correct order, (ii) explaining the ground rules correctly, (iii) implement the four ground rules at the start of all three information gathering phases, (iv) asking four TED questions, and (v) using verbal rapport building behaviors in the rapport phase. Behaviors were coded, ranging from 1 to 3 for each (e.g., 3 = fully and correctly explained the four ground rules, 2 = partially explained the four ground rules, 1 = did not explain the four ground rules). Two-way mixed effects Intraclass Correlation Coefficient (ICC) analysis testing for absolute agreement between coders for the interviewer behaviors across the sample of 30 interviews revealed good inter-rater reliability for each of the interviewer behaviors, (i) six phases, ICC = 0.937 (95% CI 0.867; 0.970), (ii) correct ground rules, ICC = 1.000, (95% CI 1.00; 1.00), (iii) use of ground rules across three phases, ICC = 0.944 (95% CI 0.889; 0.972), (iv) four TED questions, ICC = 0.865, (95% CI 0.498; 0.964), and (v) rapport building, ICC = 0.757 (95% CI 0.096; 0.935). Mean scores for each behavior as a function of interviewer revealed a very high level of adherence to the protocol for each behavior, with no significant differences across interviewers for each behavior, all $Fs < 1.120$, all $ps > 0.299$ (see Table 3).

TABLE 3 Mean interviewer protocol adherence scores across interviewer 1 and 2 (dip sample of 30 interviews).

	Mean (SD) 95% CI	
	Interviewer 1	Interviewer 2
Behavior		
Six phases	2.74 (0.46) 2.48, 2.99	2.74 (0.46) 2.48, 2.99
Ground rules	2.80 (0.41) 2.57, 3.03	2.87 (0.35) 2.67, 3.06
Apply ground rules correctly	2.80 (0.41) 2.57, 3.02	2.86 (0.35) 2.67, 3.05
TED questions	2.73 (0.46) 2.48, 2.99	2.73 (0.46) 2.48, 2.99
Verbal rapport	2.93 (0.26) 2.79, 3.08	2.80 (0.41) 2.57, 3.03

3. Results

3.1. Analysis approach

A series of 3 (Language: South Asian L1; South Asian L2; British L1) X 2 (Veracity: Truth; Lie) ANOVAs were conducted across the three dependent variables (Event details; Verifiable sources; Complications), applying Bonferroni's correction as appropriate. Main effects are reported in the results text, interactions are displayed in Table 4.

3.1.1. Event details

There was a significant main effect of veracity for event details, $F(1, 130) = 1022.73$, $p < 0.001$, $\eta_p^2 = 0.89$. All liars provided fewer event details than truthtellers ($M_{Liar} = 24.49$, SD = 5.35, 95% CI 22.58, 26.21; $M_{Truth} = 66.97$, SD = 10.26, 95% CI 65.09, 68.84, $d = 5.44$). The main effect of language was non-significant, $F(1, 130) = 1.96$, $p = 0.146$, ($M_{SA\ L1} = 47.54$, SD = 25.42, 95% CI 45.25, 49.82; $M_{SA\ L2} = 44.62$, SD = 23.66, 95% CI 42.28, 46.96; $M_{British} = 44.13$, SD = 19.32, 95% CI 42.69, 47.09). The language X veracity interaction was significant, $F(2, 130) = 6.59$, $p = 0.002$, $\eta_p^2 = 0.91$. South Asian truthtellers provided significantly more event details than South Asian liars in both first (L1), and second (L2) languages, all $ps < 0.001$, languages (see Table 4).

3.1.2. Complications

There was a significant main effect of veracity for complications, $F(1, 130) = 248.84$, $p < 0.001$, $\eta_p^2 = 0.66$. All liars provided fewer complications than truthtellers ($M_{Liar} = 2.10$, SD = 1.43, 95% CI 1.77, 2.44; $M_{Truth} = 5.92$, SD = 1.56, 95% CI 5.57, 6.26, $d = 1.06$). The main effect of language was non-significant, $F(2, 130) = 2.38$, $p = 0.096$ ($M_{SA\ L1} = 4.24$, SD = 1.23, 95% CI 3.83, 4.66; $M_{SA\ L2} = 3.63$, SD = 1.09, 95% CI 3.21 4.06; $M_{British} = 4.15$, SD = 1.35, 95% CI 3.75, 4.55). The language X veracity interaction was significant, $F(2, 130) = 10.05$, $p < 0.001$, $\eta_p^2 = 0.13$. South Asian truthtellers provided significantly more complications than South Asian liars in both first (L1) and second (L2) languages all $ps < 0.001$ (see Table 4).

3.1.3. Verifiable sources

There were significant main effects of veracity, $F(1, 130) = 152.99$, $p < 0.001$, $\eta_p^2 = 0.54$ and language $F(2, 130) = 11.44$, $p < 0.001$, $\eta_p^2 = 0.15$, for verifiable sources. Liars provided fewer verifiable sources ($M_{Liar} = 2.66$, SD = 1.19, 95% CI, 2.72, 3.04) than truthtellers ($M_{Truth} = 6.09$, SD = 1.78, 95% CI, 5.70, 6.49, $p = <0.001$, $d = 0.82$). South Asian L1 ($M_{SA\ L1} = 4.12$, SD = 2.49, 95% CI, 3.67, 4.55) participants provided fewer verifiable details than South Asian L2 ($M_{SA\ L2} = 5.29$, SD = 2.21, 95% CI, 4.80, 7.78), $p = 0.003$, $d = 0.50$. The language X veracity interaction was significant, $F(2, 130) = 3.93$, $p = 0.022$, $\eta_p^2 = 0.06$ (see Table 4). South Asian truthtellers provided significantly more verifiable details than South Asian liars in both

TABLE 4 Event details, complications, verifiable sources, and plausibility interactions.

	Mean (SD) 95% CI		
	South Asian L1 (Hindi)	British L1	South Asian L2 (English)
Event details			
Liar	23.68 (5.86) 20.62, 26.75	26.76 (5.37) 23.89, 29.64	22.78 (4.00) 19.29, 26.28
Truthteller	71.39 (9.80) 68.39, 74.39	63.00 (7.18) 60.00, 66.00	66.45 (12.09) 62.71, 70.19
Complications			
Liar	3.09 (1.23) 2.51, 3.67	2.00 (1.35) 1.43, 2.57	1.22 (1.09) 0.65, 1.79
Truthteller	5.39 (1.44) 4.82, 5.97	6.30 (1.58) 5.71, 6.90	6.05 (1.70) 5.44, 6.66
Verifiable sources			
Liar	2.32 (1.21) 1.69, 2.95	1.56 (1.08) 0.94, 2.18	4.09 (1.91) 3.44, 4.74
Truthteller	5.91 (2.09) 5.29, 6.53	5.87 (1.39) 5.22, 6.52	6.50 (1.82) 5.80, 6.52
Plausibility			
Liar	3.82 (1.37) 3.33, 4.31	2.92 (0.99) 2.51, 3.32	3.09 (0.99) 2.66, 3.52
Truthteller	4.35 (1.27) 3.87, 4.83	5.22 (0.95) 4.79, 5.65	3.90 (1.20) 3.44, 4.36

first (L1) and second (L2) languages (see Table 4), all $ps < 0.001$. South Asian (L1) liars provided fewer verifiable details than South Asian (L2) liars, $p < 0.001$.

3.1.4. Plausibility

There was a significant main effect of veracity for plausibility ratings, $F(1, 130) = 38.59$, $p < 0.001$, $\eta_p^2 = 0.23$, All liars were rated less plausible ($M_{Liar} = 3.27$, SD = 1.18, 95% CI, 3.01, 3.54) than truthtellers, ($M_{Truth} = 4.52$, SD = 1.26, 95% CI, 4.21, 4.77, $d = 0.20$). The main effect of language was non-significant, $F(2, 130) = 3.85$, $p = 0.024$ ($M_{SA\ L1} = 4.09$, SD = 1.33; $M_{SA\ L2} = 3.47$, SD = 1.16; $M_{British} = 4.02$, SD = 1.51). The veracity X language interaction was significant, $F(2, 130) = 8.138$, $p < 0.001$, $\eta_p^2 = 0.11$. British (English speaking) truthtellers were rated more plausible than South Asian L1 and L2 truthtellers, all $ps < 0.032$ (Bonferroni adjusted). British (English speaking) liars were rated as less plausible than South Asian (L1 Hindi) liars, $p = 0.023$ (Bonferroni adjusted).

3.1.5. Post interview questionnaire

3.1.5.1. Motivation

Overall, self-reported motivation to comply with researcher instructions was high, $M = 6.13$ (SD = 0.87). Main effects of veracity ($M_{Liar} = 6.16$, SD = 0.91; $M_{Liar} = 6.11$, SD = 0.83) and culture ($M_{British} = 6.27$, SD = 0.89; $M_{SA} = 6.06$, SD = 0.85) were non-significant, all $Fs < 1.671$, all $ps > 0.194$. However, the veracity X culture interaction was significant with British liars self-reported more motivation ($M_{British} = 6.60$, SD = 0.76) than South Asian liars ($M_{SA} = 5.91$, SD = 0.90), $p = 0.001$. All other interactions were non-significant, $p = 0.173$.

3.1.5.2. Adherence

Overall, self-reported adherence to researcher instructions (as a function of condition) was high, $M = 6.32$ (SD = 0.72). Main effects of veracity (truthteller, liar) and culture (British, South Asian) were non-significant, as was the veracity X culture interaction, all $Fs < 0.001$, all $ps > 0.269$.

3.1.5.3. Difficulty

Overall, participants self-reported the interview to be neither easy nor difficult ($M = 4.34$, SD = 0.50). Main effects of veracity, $F(1, 132) = 195.167$, $p < 0.001$, $\eta_p^2 = 0.60$, and culture (British, South Asian), $F(1, 132) = 18.463$, $p < 0.001$, $\eta_p^2 = 0.12$, were significant. All liars found the interview more difficult ($M_{Liar} = 3.04$, SD = 1.20), than truthtellers, ($M_{Truth} = 5.71$, SD = 1.26), $p < 0.001$. South Asian participants found the interview more difficult than British participants ($M_{SA} = 4.05$, SD = 1.68; $M_{British} = 4.88$, SD = 1.94). The veracity X culture interaction, was significant, $F(1, 132) = 7.787$, $p = 0.006$, $\eta_p^2 = 0.56$. South Asian truthtellers and liars found the interview more difficult than British truthtellers ($M_{SA\ Truth} = 5.21$, SD = 1.23; $M_{British\ Truth} = 6.65$, SD = 0.65) and liars ($M_{SA\ Liar} = 2.93$, SD = 1.25; $M_{British\ Liar} = 3.43$, SD = 0.95), all $ps < 0.002$.

3.1.5.4. Understanding

Overall, participants self-reported understanding of the interviewer's questions was high ($M = 6.78$, SD = 0.50). Main effects of veracity (truthteller, liar) and culture (British, South Asian) were non-significant, as was the veracity X culture interaction, all $Fs < 4.206$, all $ps > 0.042$.

4. Discussion

There is a paucity of research concerned with verbal veracity cues in forensic interview contexts with bilinguals from non-western cultures. We investigated the occurrence of several verbal behaviors that have emerged from North American and Western European monolingual research as promising cues to veracity. To investigate differences and similarities in verbal behaviors between cultures as a function of veracity and interview language (L1 and L2), South Asian participants were interviewed in first and second languages, whereas British participants were interviewed in English only.

Irrespective of interview language (L1; L2) or culture (South Asian; British), all liars verbalized significantly fewer event details,

verifiable information, and complications than truthtellers. This pattern of results is consistent with our expectations and with previous research (e.g., DePaulo et al., 2003; Vrij, 2008; Leal et al., 2018; Vrij and Vrij, 2020; Vrij et al., 2021b, 2022) and advances understanding by suggesting these verbal behaviors are stable across cultures (British and South Asian) for liars and truthtellers, including when interviews are conducted in a second language. This latter finding is arguably the most intriguing, given the often-made assumption that speaking in a second language degrades the quality of discourse (Taylor et al., 2014) since speaking in a second language places additional demands on neural processing (Perani and Abutalebi, 2005) which makes conversations more challenging (Ullman, 2001; Da Silva and Leach, 2013). Nonetheless, as predicted by cognitive load theories, the increased cognitive demand typically associated with being deceptive has impacted verbal behavior similarly across cultures, irrespective of interview language, as has been reported by others.

We expected that second language speakers would include less of some of the verbal cues than the first language speakers due to the additive effect of cognitive load stemming from language and veracity. Our results do not support this hypothesis since main effects revealed that South Asian participants in the L2 condition provided more verifiable sources than their L1 language South Asian counterparts. Furthermore, South Asian L2 liars again provided more verifiable sources than their L1 counterparts. That said, the additional cognitive loading imposed by speaking in a second language is neither consistent nor static. L2 practice can lighten cognitive load whereby second language conversations become 'easier' because as proficiency improves control mechanisms strengthen, significantly reducing multiple language interference (e.g., Costa et al., 2006; Albl-Mikasa et al., 2020; Liu et al., 2021). Therefore, it seems sensible to expect that bilingual L2 proficiency may moderate cross-cultural differences in verbal veracity cues in an interview context (e.g., Evans et al., 2013).

Here, our bilingual participants were studying at a British university, and all indicated regular, daily use of L2. Indeed, responses to the language questionnaire indicate many participants preferred to speak in English rather than Hindi while at university or had no preference, and so participants were clearly comfortable speaking either language. Accordingly, it is possible that our findings are limited to those with a high level of English language proficiency. Objective language proficiency evaluations that map directly onto cognitive load may be important for understanding possible additive effects for fully understanding the utility of verbal cues. Furthermore, since second language ability develops variously according to exposure to relevant language-learning and cultural contexts, if exposure is limited and/or intermittent, second language ability may be inadequate, despite initial appearances (see Francis, 2006).

Our results are broadly consistent with prior literature, and reinforce an observation made elsewhere (Taylor et al., 2017), which is that cultural variations in interpersonal norms and memory encoding may manifest as 'main effect' differences in the behaviors observed from two cultures. This does not affect the evidence for aggregate effects of veracity across our dependent variables. But it does impact any effort to give a point estimate (Nahari et al., 2019) that answers practical questions centered on how to differentiate whether a person of interest is lying. The amount of information that would provide the best cut off between liar and truth-teller may be different for each culture.

Despite the inconsistencies of prior research, we expected that liars across all conditions would judged less plausible that truthtellers. Our results support this hypothesis whereby all liars were rated less plausible. We found no differences in plausibility ratings as a function of L1 or L2 for South Asian participants, but British (English speaking) truthtellers were rated more plausible than South Asian L1 and L2 truthtellers. Further, British (English speaking) liars were rated as less plausible than South Asian liars interviewed in L1 (Hindi). These results suggest that some judges may tend to use more extreme ratings when judging British speakers, which may reflect the cultural background of our raters who were all monolingual British. However, these findings are broadly in line with research suggesting an a more pronounced observer lie bias when judging non-native speakers (Da Silva and Leach, 2013; Evans and Michael, 2014; Wylie et al., 2022), although this may not be the case were judges and coders are bilingual and culturally matched to the interviewee, since the assessments of plausibility are likely to vary depending on the knowledge and expertise of those making a judgment. This would speak to questions concerning whether cross cultural interviews should be conducted in a second language or via an interpreter, perhaps.

That some cues manifested differently across our two cultural groups raises a challenge for research and practice in forensic interview contexts moving forward. As Taylor and colleagues summarize (Taylor et al., 2017), the challenge this poses for the research community is that research could become reductionary, with researchers introducing "new moderators and cut their samples into smaller 'cultures'" (Hope et al., 2022). This reinforces the view that research moving forward should concern itself less with providing ways to determine veracity and focus on techniques that improve the interaction between interview techniques, interviewer, and the person of interest being interviewed. A constructive interaction is likely to provide the best opportunity to derive checkable evidence that aids an investigation (see also Dando and Ormerod, 2020) rather than relying on research to project an absolute (but arbitrary) value of number of cues related to truthtellers and liars. Cultural differences in cue generation found in this research suggests that monolingual British interviewers and observers may well misjudge the veracity of British and South Asian liars and truthtellers, irrespective of whether they are basing their judgments on plausibility, numbers of complications, or verifiable sources.

Whilst our findings suggest that verifiability, and plausibility may be useful cues to deception, and that generally speaking they appear robust across cultures, how they manifest in absolute terms will vary. It will be interesting to determine if this remains true for cues that are not about information but about other elements of the interaction, such as relational humor (Hamlin et al., 2020) and rapport (Gabbert et al., 2021; Dando C. et al., 2022). We might hypothesize, for example, that if a second language person of interest might focus entirely on providing information, the wider facets of interaction suffer, and this may also expose their deception.

The limitations of our research are clear and ubiquitous. The paradigm employed allowed us to control several variables toward unpicking differences and similarities in verbal behaviors across cultures, but our approach may reduce generalizability. We culturally matched interviewer and interviewee, which maps onto the paradigms employed by some researchers (e.g., Cheng and Broadhurst, 2005; Leal et al., 2018), but differs from other approaches (e.g., Elliott and Leach, 2016; Akehurst et al., 2018). Our interviewers were kept constant, whereby we kept the same bilingual interviewer for the bilingual

group and a second monolingual interviewer for the monolingual group. This reduces potentially confounding interviewer behavior variables, but conversely introduces the possibility that our results are confounded by behaviors specific to each interviewer. That said, we used an interview protocol, and the single/multiple interviewer tension is common to all experimental interviewing research such as this.

We used transcripts only as the basis for plausibility judgments, which others have found to leverage higher discrimination accuracy for second language interviews than when visual + audio and/or audio only excepts are utilized (Akehurst et al., 2018). We sought to optimize accurate judgments by eliminating the non-verbal behavior which can decrease accuracy (Vrij et al., 2010; Bull et al., 2019; Sandham et al., 2020; Dando C. J. et al., 2022). However, in doing so we have reduced a complex social interaction to a series of sentences, thus reducing a multifaceted social interaction. It is likely that the value of verbal behavior is far more. Hence our findings may be most relevant for transcript only judgments. Further research centered on the utility of verbal cues when listening to the audio versus listening to the audio plus observing the social interaction would add to our results.

Translation of the Hindi interviews into English has been highlighted by others as a limitation, since around 10% of information may be lost in the process of translation (see Ewens et al., 2017; Leal et al., 2018). This may have impacted our results, although information loss is likely small and translation is a limitation for all bilingual research, irrespective of discipline. We only coded verbalized information within each of the three categories once. Hence, there were no within category duplications (i.e., event details; complications; verifiable sources). However, it is possible that some information items were not mutually exclusive, since an item of event information may also map onto our definition of a verifiable source, for example. This possibility was controlled for by analyzing each category individually, which maps onto the approach employed by others and does not negate our findings. Finally, South Asian liars self-reported being slightly less motivated to be deceptive than British liars. The locus of this result is unclear and the literature in this regard is sparce. It maybe that motivation was influenced by an interplay of intercultural communication, cultural group membership and social moral values (see Giles et al., 2019).

Finally, *a-priori* power analysis (Faul et al., 2007) revealed our sample size was adequate to detect large effects, but not powerful enough to detect small effects and so future research might consider larger sample sizes toward a more nuanced understanding, although the impact of small effect sizes for applied research is currently the subject of discussion (see Götz et al., 2022; Primbs et al., 2022).

Despite the limitations of research of this nature, our findings offer novel insights into the impact of two contextual variables, culture and language on verbal behavior in face-to-face forensic interviews which were information gathering in nature and designed to amplify potential verbal veracity cues. Our results are promising in terms of again highlighting that while context is an important consideration, irrespective of culture and interview language context, impoverished, simple verbal accounts should trigger a 'red flag' for further attention.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: https://osf.io/p72ur/?view_only=aa29c3c9cd4f463996cb08e85ca3f473.

Ethics statement

The studies involving human participants were reviewed and approved by the Lancaster University Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

CD and PT designed the paradigm. AS, CD, and PT steered the research question and data analysis and wrote the introduction, method, results, and discussion. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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From criminal interrogations to investigative interviews: a bibliometric study

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This paper presents the results of a bibliometric study providing a comprehensive overview of the social science research conducted on criminal interrogations and investigative interviews since the 1900s. The objectives are to help researchers to further understand the research field, to better communicate research findings to practitioners, to help practitioners understand the breadth of scientific knowledge on criminal interrogations and investigative interviews, and to foster dialog between researchers and practitioners. To begin, after a brief description of Web of Science, we describe how we developed our database on criminal interrogations and investigative interviews. Then, we report the yearly evolution of articles, the journals where they were published, the research areas covered by this research field, as well as the authors, the institutions and the countries that published the most on a variety of topics related to criminal interrogations and investigative interviews. Finally, we present the most used keywords and the most cited articles, and examine the research on questionable tactics and techniques in the research field of criminal interrogations and investigative interviews. This paper ends with a critical look at the results, for the benefit of researchers and practitioners interested in criminal interrogations and investigative interviews.

KEYWORDS

criminal interrogations, investigative interviews, bibliometrics, web of science, solving crimes, identifying perpetrators

Introduction

Tactics and techniques for solving crimes and identifying perpetrators evolved throughout history. For a long time, they were based on anecdotal evidence and spiritual belief. For example, in ancient India, crime suspects, crime suspects could be asked to take a handful of rice and put it in their mouth. The crime suspects would then spit out the rice, and if it was dry, or mixed with blood, they were considered guilty of the crime (Trovillo, 1939). Around the same time, in ancient sacred scriptures of Hinduism, instructions were given on how to discover someone who wanted to poison others. "He does not answer questions, or they are evasive answers; he speaks nonsense, rubs the great toe along the ground, and shivers; his face is discolored; he rubs the roots of the hair with his fingers; and he tries by every means to leave the house" (Wise, 1845, p. 394).

The above are only two of many examples. But historical evidence is abundant. The observation of behaviors and physical features has long been central to tactics and techniques for solving crimes and identifying perpetrators. This continued during the Middle Ages. For example, trials by ordeal were based on the belief that God would hold harmless innocent individuals. A crime suspect was subjected to a physical test and depending on the healing of

the injury then sustained, a decision was made. In one of them, the red-hot iron ordeal, following a religious ritual, the crime suspect had to walk a few steps with a piece of burning iron in his hand. The piece of burning iron was then removed, the hand was covered with a bandage, and a few days later, the bandage was removed, and the injury was examined. Depending on the healing, the decision of innocence or guilt was made (White, 1961; Pilarczyk, 1996). Bizarre practices have continued long after the Middle Ages, including during the 1,692 witchcraft trial in Salem, Massachusetts (Barry, 1994; Moriarty, 2001). Phrenology is another example of the weight given to observation in order to solve crimes and identify perpetrators. Popularized in the 19th-century, this technique claimed that scalp morphology was related to character traits (Stea et al., 2022), and was used to assess whether certain people might have a propensity to commit crimes (Berveling, 2021).

Besides the observation of behaviors and physical features, other tactics and techniques for solving crimes and identifying perpetrators assumed the human body reveals the truth. For example, during the 1900s, the ancestors of today's polygraphs were developed. Based on the premise that specific physiological reactions are indicative of deception, the polygraph would later become central in several law enforcement organizations around the world, but still be subject to severe criticism (Grubin and Madsen, 2005). Polygraph "as used in many places, is nothing more than a psychological third degree aimed at extorting confessions as the old physical beatings were" (Lykken, 1998, pp. 28–29; see also Leo, 2008; Denault, 2014).

Throughout history, besides the assumption that the human body reveals the truth, tactics and techniques for solving crimes and identifying perpetrators advocated for extraction rather than observation of behaviors and physical features. Torture is a prime example. According to the United Nations (1984), torture refers to:

> …any act by which severe pain or suffering, whether physical or mental, is intentionally inflicted on a person for such purposes as obtaining from him or a third person information or a confession, punishing him for an act he or a third person has committed or is suspected of having committed, or intimidating or coercing him or a third person, or for any reason based on discrimination of any kind, when such pain or suffering is inflicted by or at the instigation of or with the consent or acquiescence of a public official or other person acting in an official capacity. It does not include pain or suffering arising only from, inherent in or incidental to lawful sanctions.

Torture has been used for thousands of years, and is still used today in dozens of countries, including the United States (Amnesty International, n.d.). The same holds for the use of physical coercion within in law enforcement. For example, in the United States, during the 1900s, physical coercion, also known as "third degree" tactics, were common among police forces (Kassin et al., 2010). This is until the courts began to narrow their scope. In 1936, for example, the United States Supreme Court (Brown v. Mississippi, 1936) forced law enforcement to stop using physical coercion, because from now on, confessions obtained under torture would not be admitted as evidence (Leo, 1992; Darmer, 2009), and in 1966, the United States Supreme Court required law enforcement to warn suspects in custody of their rights before interrogating them (Miranda v. Arizona, 1966).

The decline of physical coercion among law enforcement, however, was replaced by other questionable methods to extract confessions. Accusatorial methods using psychological manipulation and persuasion, notably the Reid method developed by John E. Reid and Fred Inbau in the 1940s (Kassin et al., 2010), grew in popularity. The assumption that the human body reveals the truth was part of the first step of the Reid method. It was claimed that behaviors helped determine if the suspect's guilt "in the opinion of the investigator, seems definite or reasonably certain" (Inbau et al., 2013, p. 185), and if attempts to extract confessions should subsequently be made through the second step of the Reid method (Denault et al., 2020). However, accusatorial methods came under increasing criticism when researchers started to address them, and demonstrated, among other things, the danger of false confessions (Gudjonsson, 2021). A series of wrongful convictions has even led the UK to fundamentally change police practices. The PEACE (Preparation and Planning, Engage and Explain, Account, Closure, Evaluation) model, for example, was developed by psychologists, lawyers, and police officers, and aimed at eliciting information from victims, witnesses and suspects, rather than extracting confessions. More than 140,000 officers in England and Wales were trained in this model in the 1990s (Bearchell, 2010; Poyser and Milne, 2021). Law enforcement in the United States gradually followed, moving away from accusatorial methods and adopting rapport-building interviewing techniques (Mindthoff and Meissner, 2023). This change, however, was not widespread. Questionable methods to extract confessions are still integral to law enforcement around the world. This probably explains why the Principles on Effective Interviewing for Investigations and Information Gathering (also known as the Méndez Principles), an international initiative supported by the UN Human Rights Council, were translated in 10 languages. Those principles provide law enforcement "guidance on obtaining accurate and reliable information in full respect of the human rights and dignity of all, including through the implementation of legal and procedural safeguards in the first hours of police custody" (Association for the Prevention of Torture, n.d.).

However, despite the worldwide popularity of questionable methods to extract confessions, scientific data on criminal interrogations and investigative interviews is abundant. There are several handbooks on the subject (e.g., Williamson et al., 2013; Walsh et al., 2015; Lamb et al., 2018; Bull and Blandon-Gitlin, 2019; Barela et al., 2020). There are also several meta-analyses and reviews (e.g., Abbe and Brandon, 2013; van Ham et al., 2020; Akca et al., 2021; Lavoie et al., 2021; Meissner et al., 2023). Just recently, in 2021, Christian Meissner edited "What Works? Systematic Reviews and Meta-Analyses of the Investigative Interviewing Research Literature," a special issue of Applied Cognitive Psychology.

Moreover, scientific data on criminal interrogations and investigative interviews goes far beyond theoretical issues. The implementation of evidence-based practices, for example, has been subject to extensive research (e.g., Milne et al., 2019; Risan et al., 2020; Brimbal et al., 2021; Brubacher et al., 2021; Nicol et al., 2023). However, despite the numerous publications, little is known about the structure of the research field of criminal interrogations and investigative interviews. And while historical evidence allows for a better understanding of how tactics and techniques to solve crimes and identify perpetrators evolved throughout history, to our knowledge, there is no data about collaboration patterns, thematic groups, research constituents, emerging trends, and other

characteristics of a research field that advocates the importance of scientific data in developing better practices and in challenging unfounded and discredited tactics and techniques that a number of law enforcement organizations have turned to (e.g., Denault et al., 2020; Smith, 2020). This is not to be overlooked. All the more since the research field of criminal interrogations and investigative interviews fundamentally changed police practices.

Therefore, rather than waiting for historical evidence, this paper presents the results of a bibliometric study providing a comprehensive overview of the social science research conducted on criminal interrogations and investigative interviews since the 1900s. The objectives are to help researchers to further understand the research field, to better communicate research findings to practitioners, to help practitioners understand the breadth of scientific knowledge on criminal interrogations and investigative interviews, and to foster dialog between researchers and practitioners.

To achieve these objectives, the bibliometric study was conducted with the "Social Sciences Citation Index (SSCI)—1900-present" collection of Web of Science. This type of study offers the possibility to better understand the structure of a research field, including collaboration patterns, thematic groups, research constituents, and emerging trends (Donthu et al., 2021). Sugimoto and Larivière (2018) explain the relevance of a bibliometric study:

> Bibliometrics are particularly useful when the amount of data exceeds human capabilities to process. For example, a reviewer is well equipped to make a judgment on a single document or small set of documents. An author can fairly easily ascertain the number of publications he or she produced. However, measurements of the production of an institution or country are harder to gauge. Furthermore, relational data—like citations are nearly impossible to manually analyze even at the level of an individual. Therefore, measurements of research have their greatest utility at scale— to bring into the light that which is not easily observed by the individual (p. 3-4).

To begin, after a brief description of Web of Science, the bibliographic database used to carry out our bibliometric study, we describe how we developed our database on criminal interrogations and investigative interviews. Then, similarly to Denault et al. (2022), we report the yearly evolution of articles, the journals where they were published, the research areas covered by this research field, as well as the authors, the institutions and the countries that published the most on a variety of topics related to criminal interrogations and investigative interviews. Finally, we present the most used keywords and the most cited articles, and examine the research on questionable tactics and techniques in the research field of criminal interrogations and investigative interviews. This paper ends with a critical look at the results, for the benefit of researchers and practitioners interested in criminal interrogations and investigative interviews.

Methods

Created in the 1960s and maintained by Clarivate Analytics (Birkle et al., 2020), the Web of Science database features a massive amount of raw data about research publications and citations, and allows for large-scale bibliometric analysis. This raw data includes, for example, the document title, the author's name and address, the publication's name and year, language, and the number of times it has been cited. This database was chosen to create the corpus of articles for our bibliometric study on criminal interrogations and investigative interviews because it is "one of the most reliable publisher-independent global citation databases in the world" (Shamsi et al., 2022, p. 5992). The high quality of the metadata on Web of Science compared to Google Scholar was also considered (Mongeon and Paul-Hus, 2016; Sugimoto and Larivière, 2018). Not to mention similar studies on other research fields were conducted with Web of Science (e.g., Nadeau et al., 2018; Plusquellec and Denault, 2018; Dodier, 2019; Denault et al., 2022).

To create the corpus of articles for our bibliometric study, similarly to Denault et al. (2022), we first had to determine which concepts we wanted to include or to exclude. That is, the boundaries of the research field we wanted to investigate had to be set up. For example, although several papers about deception and lying are presented as useful to solve crimes and identify perpetrators, we decided not to focus on this issue, and not to use keywords related to deception and lying. Not to mention a bibliometric study on deception and lying has already been recently published (Denault et al., 2022). However, because of their similarity with investigative interviews, we decided to include forensic interviews in our search. Both involves gathering accurate and reliable information, but the former is with adults, and the latter is with children. However, we excluded motivational interviews, which aim at changing behavior posing health risks (Hall et al., 2012), and diagnostic interviews used by mental health professionals for establishing diagnostics (Andrews and Peters, 1998).

Then, after setting up the boundaries of the research field we wanted to investigate, we had to determine which articles to include or exclude. In other words, at what point is an article dealing with criminal interrogations and investigative interviews? This task is quite a challenge. For example, if an article addresses several subjects, including criminal interrogations and investigative interviews, should it be included or excluded? At what point do criminal interrogations and investigative interviews become the focus of an article? What criteria should be used to answer this question? The number of words, the research questions, the references cited? If the focus of an article is not criminal interrogations and investigative interviews, but is relevant and widely cited within this research field, should the article be included? If the focus of an article is criminal interrogations and investigative interviews, but is irrelevant and poorly cited within this research field, should the article be excluded? At what point an article is relevant and widely cited? At what point an article is irrelevant and poorly cited? Answering these questions involves making arbitrary decisions.

However, because consistency was a concern when creating the corpus of articles for our bibliometric study, we began a trial-and-error process to find the best search query, that is, a search query to automatically limit false positives (included articles that should have been excluded) and false negatives (excluded articles that should have been included), and to avoid having to manually identify articles to include or exclude. For example, unlike the term investigative interview which refers to a very specific concept, and results in few false positives and false negatives, the terms interrogation and interview yields a gargantuan number of false positives. For example, the term interview is widely used in abstracts referring to the qualitative methodology, and the term interrogation is used in a

variety of ways unrelated to criminal interrogations and investigative interviews (e.g., "interrogation of diseases," "interrogation of systems," "interrogation of nanostructures").

Therefore, following the trial-and-error process, on 14 February 2023, we conducted a three-step search query within the "Social Sciences Citation Index (SSCI)-1900-present" collection of Web of Science (see Table 1). First, we searched for articles with "investigative interview*" or "forensic interview*" in their titles, abstracts or keywords, both the authors' keywords and Web of Science's keywords (Keywords Plus). Second, we searched for articles with "interview*" or "interrogat*" or "confess*" in their titles or keywords, with one of the following words (police OR "law enforcement*" OR miranda OR "false confess*" OR suggestib* OR eyewitness OR eyewitnesses OR witness OR witnesses OR suspect OR suspects OR victim OR victims) in their titles, abstracts or keywords. Finally, we excluded articles with "motivation*" or "diagnostic*" in their titles, abstracts or keywords. This three-step search query yielded a total of 3,729 articles, but only articles and review articles were selected. Other formats such as book reviews and conference proceedings were excluded leading to a total of 3,423 publications. Finally, articles not written in English were excluded. This resulted in a total of 3,347 publications. Following previous bibliometric studies (e.g., Nadeau et al., 2018; Plusquellec and Denault, 2018; Dodier, 2019; Denault et al., 2022), this three-step search query was deemed to be good trade-off for getting the widest amount of results while limiting false positives and false negatives, although the emphasis on criminal interrogations and investigative interviews may vary from article to article.

The Full Record and Cited References of those 3,347 publications were downloaded in a TAB Delimited File, 500 at a time (the limit allowed by Web of Science), and were combined in a single file for analysis in Microsoft Excel and VOS Viewer. Subsequently, a total of 14 articles were removed because their author was unknown, and 74 articles because their publication year was also unknown. Finally, the corpus of articles for our bibliometric study on criminal interrogations and investigative interviews featured a total of 3,259 articles in English.

TABLE 1 Parameters of the research in Web of Science.

CORE COLLECTION: Social Sciences Citation Index (SSCI)— 1900-present
(TS = ("investigative interview*" OR "forensic interview*") OR ((TI = (interview* OR interrogat* OR confess*) OR AK = (interview* OR interrogat* OR confess*) OR KP = (interview* OR interrogat* OR confess*)) AND TS = (police OR "law enforcement*" OR miranda OR "false confess*" OR suggestib* OR eyewitness OR eyewitnesses OR witness OR witnesses OR suspect OR suspects OR victim OR victims))) NOT TS = (motivation* OR diagnostic*)
Results: 3729
[and] DOCUMENT TYPE: Articles AND Review Articles
Results: 3423
[and] LANGUAGE: English
Results: 3347

TABLE 2 Articles per decades.

Decades	Number of articles	Percentage of all articles
1900–1909	0	0.00
1910–1919	1	0.03
1920–1929	0	0.00
1930–1939	2	0.06
1940–1949	1	0.03
1950–1959	4	0.12
1960–1969	36	1.10
1970–1979	25	0.77
1980–1989	52	1.60
1990–1999	321	9.85
2000–2009	720	22.09
2010–2019	1,507	46.24
2020-present	590	18.10

Results

The results of our bibliometric study are divided in nine sections. To begin, we report the yearly evolution of articles on criminal interrogations and investigative interviews, the Top 15 journals and the Top 15 research areas, as well as the Top 15 authors, the Top 15 institutions and the Top 15 countries that published the most on a variety of topics related to criminal interrogations and investigative interviews. Finally, we present the Top 15 most used keywords and the Top 15 most cited articles, and examine the research on questionable tactics and techniques, namely Kinesic Interview, Synergology, Scientific Content Analysis (SCAN), Behavior Analysis Interview (BAI), and Reid Technique within the research field of criminal interrogations and investigative interviews.

The decades

As shown in Table 2, the highest number of articles about criminal interrogations and investigative interviews were published during the last decade (2010–2019) with a total of 1,507 articles, that is, 46.24% of all articles published since 1900, the first year covered by the "Social Sciences Citation Index (SSCI)—1900-present" collection of Web of Science. Half as many articles were published in the previous decade (2000–2009). Considering the number of articles per decades, the research field of criminal interrogations and investigative interviews took off strongly in the 1990s, with more than 96% of the articles published since then, and has grown substantially up to this day.

The journals

The 3,259 articles in our database on criminal interrogations and investigative interviews were published in more than 700 different journals. The Top 15 journals where they were published are presented in Table 3. The first place goes to Applied Cognitive Psychology with an Impact Factor of 2.360, and 7.09% ($n = 231$) of the articles in our database, closely followed by Psychology Crime & Law, at the second place with an Impact Factor of 1.752, and 6.20% ($n = 202$) of the articles in our database. Law and Human Behavior and Child Abuse & Neglect take the third and fourth place, respectively with an Impact factor of 3.870 and 4.863, and 4.45% ($n = 145$) and 3.84% ($n = 125$) of the articles in our database.

Interestingly, 7 journals in the Top 15 journals addressing issues of criminal interrogations and investigative interviews (Applied

TABLE 3 Top 15 journals.

	Journals	Number of articles	IF (2021)	Percentage of all articles
1	Applied Cognitive Psychology	231	2.360	7.09
2	Psychology Crime & Law	202	1.752	6.20
3	Law and Human Behavior	145	3.870	4.45
4	Child Abuse & Neglect	125	4.863	3.84
5	Legal and Criminological Psychology	92	1.756	2.82
6	Psychiatry Psychology and Law	84	1.247	2.58
7a	Personality and Individual Differences	80	3.950	2.45
7b	Psychology Public Policy and Law	80	3.317	2.45
8	Journal of Investigative Psychology and Offender Profiling	71	1.119	2.18
9	Behavioral Sciences & The Law	63	2.568	1.93
10	Frontiers in Psychology	49	4.232	1.50
11	Journal of Child Sexual Abuse	45	1.872	1.38
12	Journal of Interpersonal Violence	39	2.621	1.20
13	Journal of Criminal Law & Criminology	38	2.184	1.17
14	Memory	32	2.519	0.98
15	Journal of Experimental Child Psychology	29	2.547	0.89

Cognitive Psychology; Frontiers in Psychology; Journal of Experimental Child Psychology; Law and Human Behavior; Legal and Criminological Psychology; Personality and Individual Differences; Psychology Crime & Law) are in the Top 15 journals addressing issues of deception and lying (Denault et al., 2022). This suggest that both research fields appeal to similar readerships. In addition, 3 journals in the Top 15 journals addressing issues of criminal interrogations and investigative interviews (Child Abuse & Neglect, Journal of Child Sexual Abuse, Journal of Experimental Child Psychology) focus on children. This suggests that the scientific community is concerned about children.

The research areas

As shown in Table 4, almost two third of articles ($n = 2038$) about criminal interrogations and investigative interviews were published in journals covering Psychology related topics. Journals covering Government & Law ($n = 1{,}031$) and Criminology & Penology ($n = 827$) related topics have also made a significant contribution to the literature on criminal interrogations and investigative interviews. Furthermore, scientific knowledge about criminal interrogations and investigative interviews is enriched by studies done in several other research areas, including social work, linguistics, communication, and sociology, undoubtedly giving this research field an interdisciplinary dimension. It should be noted that journals indexed in Web of Science can be assigned to multiple research areas (Denault et al., 2022).

The authors

More than 4,500 different authors contributed the 3,259 articles of our database on criminal interrogations and investigative interviews. As shown in Table 5, the author who published the most in this research field, regardless of authorship rank (e.g., first, second, third author, etc.), is Martine B. Powell ($n = 115$) from Griffith University, the founding director of the Centre for Investigative Interviewing, with 3.53% of all articles. Gisli H. Gudjonsson ($n = 111$) from King's College London and Michael E. Lamb ($n = 104$) from the University of Cambridge follow closely behind at the second and third place, respectively with 3.41 and 3.19% of all articles. It should be noted that the number of articles is not the only way to measure the impact of authors within a research field. For example, Saul M. Kassin, from CUNY John Jay College of Criminal Justice, is at the 8th position, but his average number of citations per article is higher than authors with more articles than him, and he authored four of the Top 15 most cited articles on criminal interrogations and investigative interviews (see Table 6). In other words, the impact of authors within a research field can be measured in a variety of ways, including the number of articles, the average the number of citations per article, and the number of most-cited articles. Although it should be noted that in some cases authors may also be cited frequently because of repeated criticisms and scholarly debates.

Furthermore, it should be remembered that we used the "Social Sciences Citation Index (SSCI)—1900-present" collection of Web of Science. Therefore, our bibliometric study focuses on a particular strand of research, that is, social sciences research on criminal interrogations and investigative interviews. However, legal scholars, for example, have extensively addressed issues of criminal interrogations and investigative interviews. Steven A. Drizin, from the Northwestern Pritzker School of Law, and Richard A. Leo, from the University San Francisco School of Law, are two of them. However, a number of law journals do not appear in the "Social Sciences Citation Index (SSCI)—1900-present." The same holds for other disciplines. This is why our bibliometric study provides a rigorous, and novel, but inevitably incomplete picture of this research field. In other words, the

TABLE 4 Top 15 research areas.

	Research areas	Number of articles	Percentage of all articles
1	Psychology	2038	62.53
2	Government & Law	1,031	31.64
3	Criminology & Penology	827	25.38
4a	Psychiatry	297	9.11
4b	Family Studies	297	9.11
5	Social Work	210	6.44
6	Linguistics	107	3.28
7	Health Care Sciences & Services	103	3.16
8	Public, Environmental & Occupational Health	73	2.24
9	Communication	65	1.99
10	Business & Economics	57	1.75
11	Sociology	54	1.66
12	Rehabilitation	44	1.35
13	Education & Educational Research	42	1.29
14	Nursing	37	1.14
15	Biomedical Social Sciences	33	1.01

TABLE 5 Top 15 authors.

	Authors	Number of articles	Percentage of all articles	Total number of citations	Average number of citations per article
1	Martine B. Powell	115	3.53	1810	15.74
2	Gisli Gudjonsson	111	3.41	3,664	33.01
3	Michael E. Lamb	104	3.19	4,854	46.67
4	Aldert Vrij	86	2.64	2,946	34.26
5	Par Anders Granhag	64	1.96	2,106	32.91
6	Ray Bull	54	1.66	2,443	45.24
7a	Ronald P. Fisher	51	1.56	3,217	63.08
7b	Rebecca Milne	51	1.56	1854	36.35
8	Saul M. Kassin	46	1.41	3,569	77.59
9a	Irit Hershkowitz	45	1.38	2,589	57.53
9b	Lorraine Hope	45	1.38	671	14.91
9c	Thomas D. Lyon	45	1.38	650	14.44
10	Carmit Katz	43	1.32	595	13.84
11a	Jon Fridrik Sigurdsson	42	1.29	1,003	23.88
11b	Sonja P. Brubacher	42	1.29	426	10.14
12	Samantha Mann	35	1.07	1,178	33.66
13	Sharon Leal	31	0.95	889	28.68
14	Fiona Gabbert	30	0.92	586	19.53
15a	Leif A. Strömwall	29	0.89	1,184	40.83
15b	Yael Orbach	29	0.89	2,385	82.24

research field of criminal interrogations and investigative interviews as a whole is likely much larger than the one described here.

Subsequently, to gain insights on collaboration patterns in the research field of criminal interrogations and investigative interviews, we exported our database in VOS Viewer and established the co-authorship network (see Figure 1) and the citation network, that is, who cites who (see Figure 2) of the 3,259 articles of our database on criminal interrogations and investigative interviews. However, to

TABLE 6 Top 15 most cited articles.

	Articles	Citation counts
1	Harrison, Y., and Horne, J. A. (2000). The impact of sleep deprivation on decision making: A review. *Journal of Experimental Psychology-Applied, 6*(3), 236–249.	741
2	Kassin, S. M., Drizin, S. A., Grisso, T., Gudjonsson, G. H., Leo, R., A., and Redlich, A. D. (2010) Police-Induced Confessions: Risk Factors and Recommendations. *Law and Human Behavior, 34*(1), 3–38.	385
3	London, K., Bruck, M., Ceci, S. J., and Shuman, D. W. (2005) Disclosure of child sexual abuse: What does the research tell us about the ways that children tell? *Psychology Public Policy and Law, 11*(1), 194–226.	336
4	Lamb, Michael, E., Orbach, Y., Hershkowitz, I., Esplin, P. W., and Horowitz, D. (2007). A structured forensic interview protocol improves the quality and informativeness of investigative interviews with children: A review of research using the NICHD Investigative Interview Protocol. *Child Abuse & Neglect, 31*, 1,201–1,231.	332
5	Fink, L. A., Bernstein, D., Handelsman, L., Foote, J., and Lovejoy, M. (1995). Initial reliability and validity of the childhood trauma interview - A new multidimensional measure of childhood interpersonal trauma. *American Journal of Psychiatry, 152*(9), 1,329–1,335.	323
6	Bruck, M., and Ceci, S. J. (1999). The suggestibility of children's memory. *Annual Review of Psychology, 50*, 419–439.	321
7	Kassin, S. M., and Kiechel, K. L. (1996). The social psychology of false confessions: Compliance, internalization, and confabulation. *Psychological Science, 7*(3), 125–128.	295
8a	Orbach, Y., Hershkowitz, I., Lamb, M. E., Sternberg, K. J., Esplin, P. W., & Horowitz, D. (2000). Assessing the value of structured protocols for forensic interviews of alleged child abuse victims. *Child Abuse & Neglect, 24*(6), 733–752.	285
8b	Memon, A., Meissner, C. A., and Fraser, J. (2010). The cognitive interview: A meta-analytic review and study space analysis of the past 25 years. *Psychology Public Policy and Law, 16*(4), 340–372.	285
9a	Exline, J. J., Worthington, E. L., Hill, P., McCullough, M. E. (2003). Forgiveness and justice: A research agenda for social and personality psychology. *Personality and Social Psychology Review, 7*(4), 337–348.	270
9b	Gudjonsson, G. H. (1984). A new scale of interrogative suggestibility. *Personality and Individual Differences, 5*(3), 303–314.	270
10	Meissner, C. A., and Kassin, S. M. (2002). He's guilty!: Investigator bias in judgments of truth and deception. *Law and Human Behavior, 26*(5), 469–480.	264
11	Kassin, S. M. (2005) On the psychology of confessions - Does innocence put innocents at risk? *American Psychologist, 60*(3), 215–228.	252
12	Chard, K. M. (2005). An evaluation of cognitive processing therapy for the treatment of posttraumatic stress disorder related to childhood sexual abuse. *Journal of Consulting and Clinical Psychology, 73*(5), 965–971	249
13	Vrij, A., Mann, S. A., Fisher, R. P., Leal, S., Milne, R., and Bull, R. (2008). Increasing cognitive load to facilitate lie detection: The benefit of recalling an event in reverse order. *Law and Human Behavior, 32*(3), 253–265.	234
14	Vrij, A. (2005). Criteria-Based Content Analysis: A Qualitative Review of the First 37 Studies. *Psychology, Public Policy, and Law, 11*(1), 3–41.	222
15	Geiselman, R. E., Fisher, R. P., MacKinnon, D. P., and Holland, H. L. (1985). Eyewitness memory enhancement in the police interview: Cognitive retrieval mnemonics versus hypnosis. *Journal of Applied Psychology, 70*(2), 401–412.	217

facilitate the understanding of those networks, VOS Viewer only considered authors who had 5 articles or more, and for the co-authorship network, also ignored articles that had 25 authors or more.

The institutions

As shown in Table 7, the University of Portsmouth has the highest number of articles on criminal interrogations and investigative interviews is ($n = 110$). This is unsurprising considering five of the Top 15 authors (Aldert Vrij, Lorraine Hope, Samantha Mann, Sharon Leal, Rebecca Milne) are affiliated with that institution. King's College London ($n = 86$), home of Gisli H. Gudjonsson, Deakin University ($n = 83$), previous home of Martine B. Powell, and follow closely at the second and third position. In contrast with the research field of deception and lying, no institution clearly stands out in the research field of criminal interrogations and investigative interviews. In the research field of deception and lying, for example, the University of Portsmouth, the institution in first place ($n = 173$), had around three times the number of articles of the University of Arizona, the institution in the second place ($n = 67$) (Denault et al., 2022). This is not the case in the research field of criminal interrogations and investigative interviews. It should be noted that academics in the research field of criminal interrogations and investigative interviews come from more than 1,000 institutions, emphasizing the magnitude of the scientific community.

The countries

Researchers interested in criminal interrogations and investigative interviews come from more than 50 countries, once again showing the magnitude of the scientific community. The first place goes to the

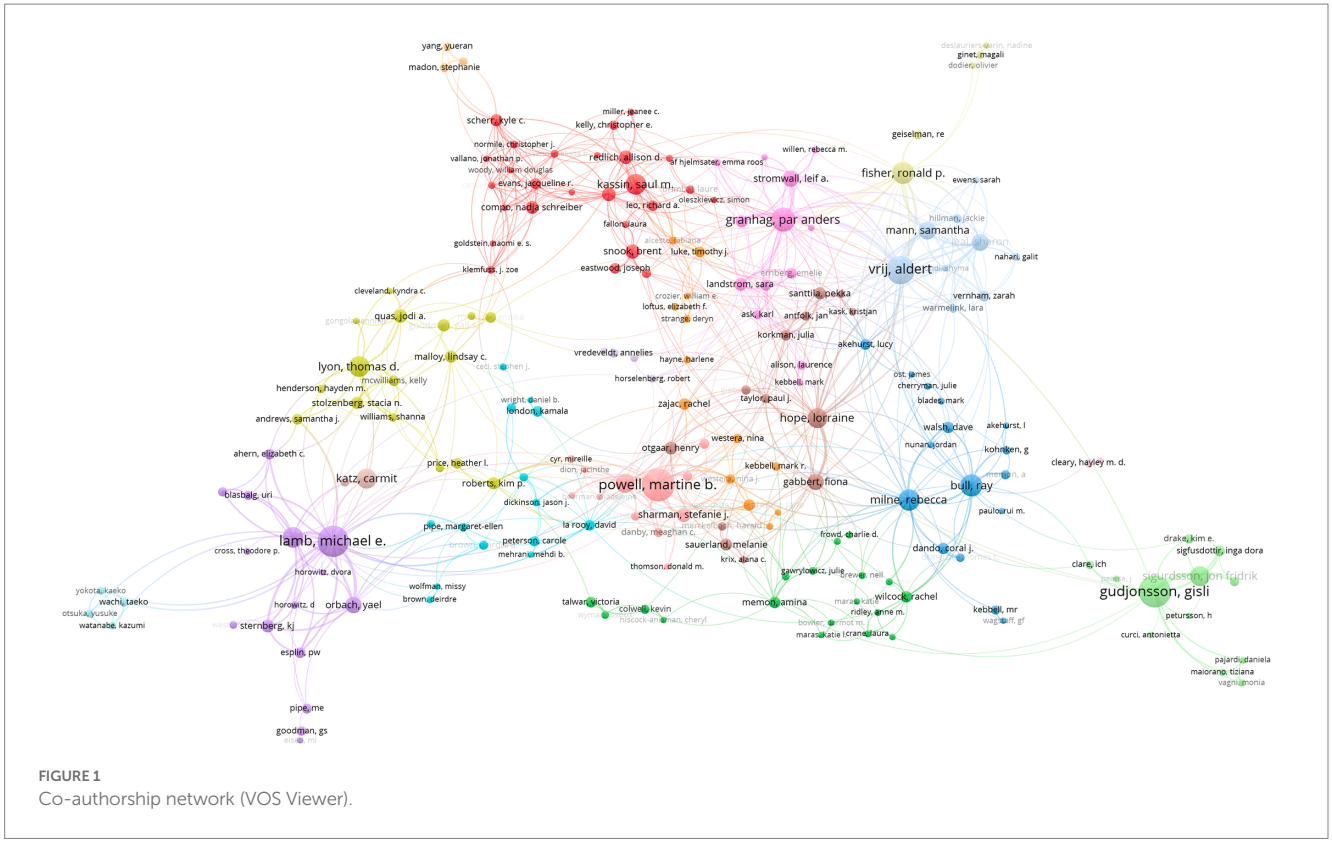

FIGURE 1
Co-authorship network (VOS Viewer).

United States ($n = 1{,}136$), with around two times the number of articles from the United Kingdom ($n = 712$) in second place, and around five times the number of articles from Australia ($n = 229$) in third place. However, since our database only features articles in English, the actual contribution of other countries, especially where English is not the primary language (e.g., Germany, France, Japan, Spain), is certainly underestimated (see Table 8).

The keywords

As shown in Table 9, the Top 15 most used keywords show the variety of themes the scientific community is interested in. The results suggests that "memory" is the theme related to criminal interrogations and investigative interviews receiving the most attention from the scientific community. However, apart from memory, the number of articles from one keyword to another are similar, and no other theme clearly stands out in the research field of criminal interrogations and investigative interviews. It should be noted that the 10th keyword in the Top 15 most used keywords suggests, once again, that the scientific community is concerned about children. This was previously evident also in the Top 15 journals (see Table 3), and is confirmed by the Top 15 most cited articles (see Table 6). Finally, although the number of articles using the keyword "interrogation" appears in the fourth place, the number of articles using the keywords "interview" or "interviews" is higher, and the use of those words in keywords per year shows a higher increase for the latter (see Figure 3). This is unsurprising because law enforcement moved away from accusatorial methods which is often associated with the former. It should be noted that "nonverbal behavior" is in 95th position.

Subsequently, to gain insights on thematic groups in the research field of criminal interrogations and investigative interviews, we exported our database in VOS Viewer and established the co-occurrence network (see Figure 4) of the 3,259 articles of our database on criminal interrogations and investigative interviews. However, to facilitate the understanding of this network, VOS Viewer only considered keywords who had 5 occurrences or more.

Furthermore, to have a better idea of the variety of themes the scientific community is increasingly interested in, the authors' keywords and Keywords Plus were extracted for all articles published since 2013 (see Table 10), and from 2003 to 2012 (see Table 11). The results suggests that "memory" and "suggestibility" are still the two themes related to criminal interrogations and investigative interviews with the most attention from the scientific community. The results also suggest that the scientific community have become increasingly concerned about children, but less about confession, false confession, and eyewitness memory, among other things.

The articles

The Top 15 most cited articles show a variety of topics related to criminal interrogations and investigative interviews (see Table 6). In the most cited article ($n = 741$), Harrison and Horne (2000) present a review of the impact of sleep deprivation on decision making, a topic relevant to police investigations, but also relevant to issues outside criminal interrogations and investigative interviews, which may have increased citation count. In the second most cited ($n = 385$), Saul M. Kassin and Gisli H. Gudjonsson, two authors from the Top 15 (see Table 5), and their colleagues present a review of the risk factors for

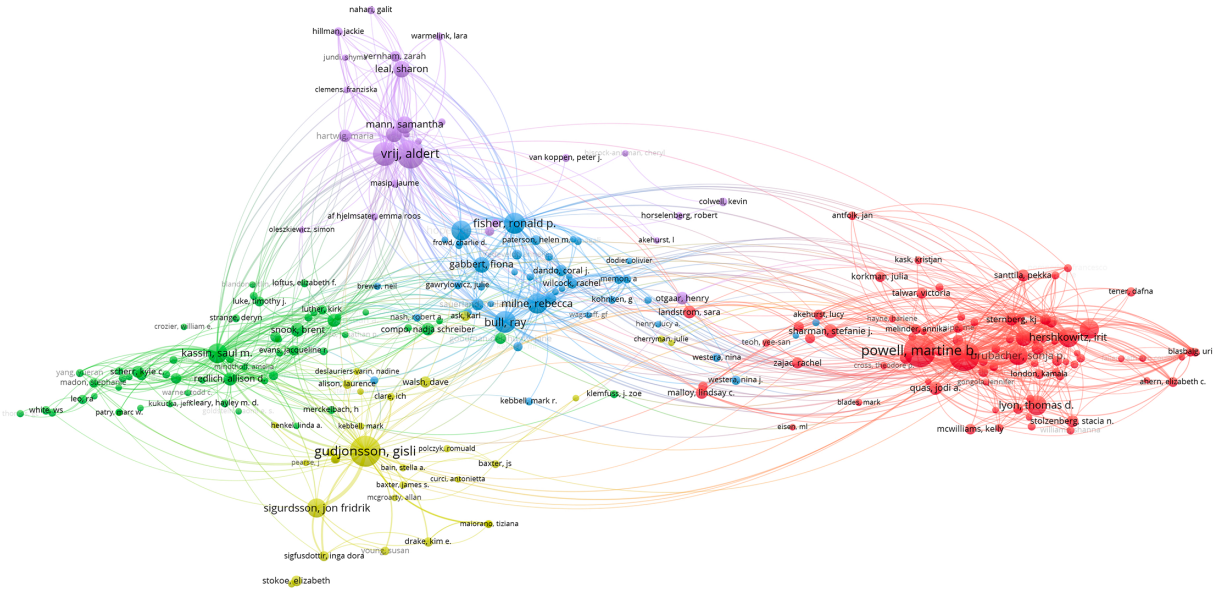

FIGURE 2
Citation (Authors) network (VOS Viewer).

TABLE 7 Top 15 institutions (of corresponding authors).

	Institutions	Number of articles	Percentage of all articles
1	University of Portsmouth	110	3.38
2	King's College London	86	2.64
3	Deakin University	83	2.55
4	University of Gothenburg	67	2.06
5	University of Cambridge	51	1.56
6	Maastricht University	49	1.50
7	CUNY John Jay College of Criminal Justice	45	1.38
8a	Florida International University	40	1.23
8b	Griffith University	40	1.23
9	Tel Aviv University	34	1.04
10a	Memorial University of Newfoundland	28	0.86
10b	University of California Irvine	28	0.86
11	NICHD	25	0.77
12	University of Southern California	24	0.74
13	University of Michigan	22	0.68
14a	University of Otago	21	0.64
14b	University of Liverpool	21	0.64
15	University of Leicester	20	0.61

police-induced confessions and offer recommendations to protect vulnerable individuals during criminal interrogations. Then, the third (London et al., 2005), fourth (Lamb et al., 2007), fifth (Fink et al., 1995), sixth (Bruck and Ceci, 1999), eighth (Orbach et al., 2000) and twelfth (Chard, 2005) articles address children related topics. The seventh article (Kassin and Kiechel, 1996) reports data showing that individuals may accept guilt for a crime they did not commit if presented with false incriminating evidence, and the eight article (Memon et al., 2010) present a meta-analytic review on the cognitive interview and a study space analysis of the past 25 years. At the 9th position, Exline et al. (2003) present a review about forgiveness, and Gudjonsson (1984) presents a scale on individual susceptibility to suggestion. At the 10th

TABLE 8 Top 15 countries (of corresponding authors).

	Countries	Number of articles	Percentage of all articles
1	United States	1,136	34.86
2	United Kingdom	712	21.85
3	Australia	229	7.03
4	Canada	190	5.83
5	Sweden	132	4.05
6	Netherlands	122	3.74
7	Israel	67	2.06
8	Germany	52	1.60
9a	Italy	47	1.44
9b	Norway	47	1.44
10	New Zealand	40	1.23
11	France	32	0.98
12	Finland	30	0.92
13	Belgium	29	0.89
14	Japan	23	0.71
15	Spain	21	0.64

TABLE 9 Top 15 most used keywords (author's keywords and keywords plus).

	Keywords	Number of articles	Percentage of all articles
1	Memory	550	16.88
2	Suggestibility	394	12.09
3	Sexual Abuse	309	9.48
4	Interrogation	302	9.27
5	Cognitive interview	285	8.75
6	Interviews	269	8.25
7a	Recall	260	7.98
7b	Accuracy	260	7.98
8	Eyewitness memory	259	7.95
9	False confessions	256	7.86
10	Children	240	7.36
11a	Interview	226	6.93
11b	Witnesses	226	6.93
12	Interrogative suggestibility	214	6.57
13	Confessions	207	6.35
14	Deception	201	6.17
15	Forensic Interviews	198	6.08

position, Meissner and Kassin (2002) report data showing that training and experience in deception detection fail to improve deception detection ability, and that experience in law enforcement may result in a bias where others are confidently, but erroneously judged more guilty. At the 11th position, Kassin (2005) presents a review on police practices that increase the risks of innocent individuals making false confessions, and at the 12th position, Chard evaluates a therapy for sexual abuse survivors. Finally, at the 13th position, Vrij, Mann, Fisher, Leal, Milne, and Bull, six authors from the Top 15 (see Table 5) report data showing that instructing suspects to report their stories in reverse order improve police observers' deception detection ability (Vrij et al., 2008), at the 14th position, Vrij (2005) presents a review of research on the Criteria-Based Content Analysis, and at the 15th position, Geiselman et al. (1985) compare the effectiveness of interviewing procedures to improve the eyewitnesses memory.

The research on questionable tactics and techniques

Despite the wealth of scientific knowledge on criminal interrogations and investigative interviews, as evidenced by our bibliometric study, a number of law enforcement organizations have turned to questionable tactics and techniques (e.g., Denault et al., 2020; Smith, 2020). But as some of them explicitly claim or implicitly suggest these techniques have widespread approval from the scientific community, the question arises: what is their weight in the research field of criminal interrogations and investigative interviews? The following five are examined: Kinesic Interview, Synergology, Scientific Content Analysis (SCAN), Behavior Analysis Interview (BAI), and Reid Technique. Walters (2002) defines Kinesic Interview:

> Kinesic interview and interrogation is viewed as a multiphase behavioral analysis system used to conduct more effective and efficient interpersonal communications… speech and body language behaviors can give insight into the individual's personality type, indicating the "psychological fingerprint" of that person. By combining the information received through diagnosis of verbal and nonverbal behavior with this psychological fingerprint, an interviewer can conduct an interview and interrogation that is specifically tailored for the subject (p. 2-3).

Even if it bears the hallmarks of a pseudoscience (Denault, 2020; Denault et al., 2020), kinesics interview is popular among various organizations, including the Association of Certified Fraud Examiners (ACFE) who promote it in their Fraud Investigators Manual, "the definitive body of knowledge for the anti-fraud profession, providing comprehensive guidance for anti-fraud professionals that no other work can match" (ACFE, n.d.). However, following a search in our database (titles, abstracts or keywords) not one article in our corpus focuses on Kinesic Interview.

According to its proponents, synergology is a "scientific discipline for reading gestures" (Synergology, The Official Website, n.d.). However, only one article in our corpus refers to synergology where it is described as a problematic method within security and justice contexts (Denault et al., 2020). And only one article (Armistead, 2011) in our corpus refers to Scientific Content Analysis (SCAN), and it addresses deficiencies of a study supporting SCAN as a technique to analyze textual documents.

Behavior Analysis Interview (BAI), however, is addressed in 7 articles. Three with Aldert Vrij as the first authors, three with Jaume

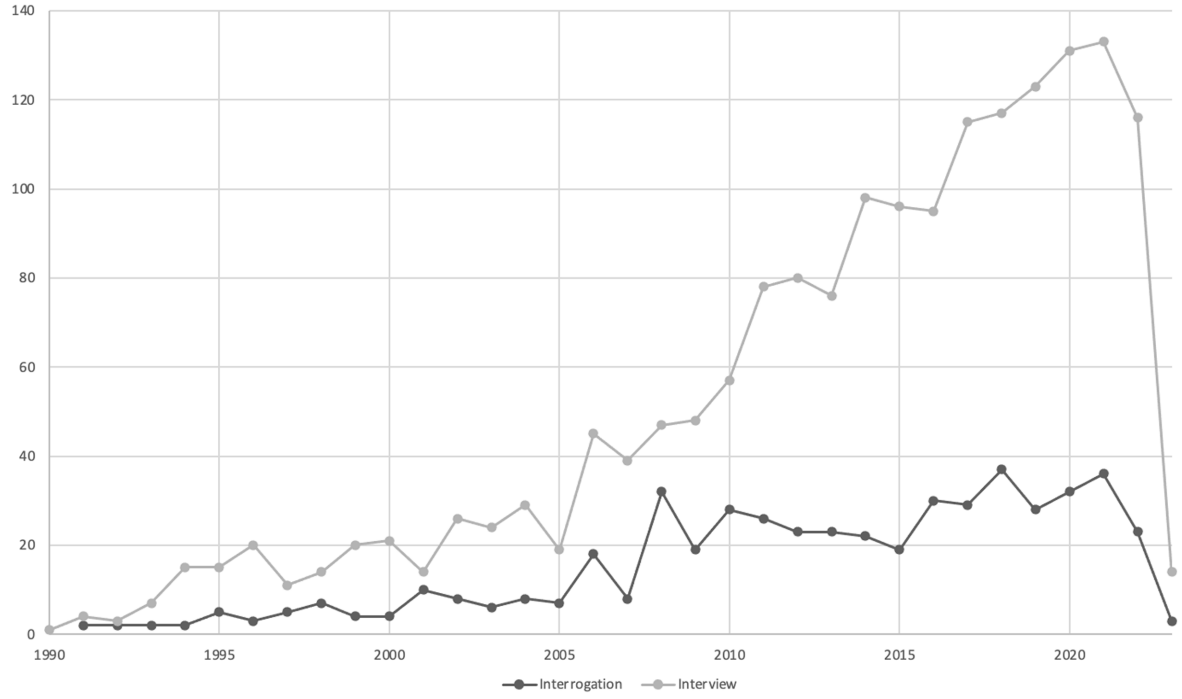

FIGURE 3
The words "Interrogation" and "Interview" in keywords per year.

Masip as the first author, and one with Vincent Denault as the first author. Masip et al. (2011) report data showing BAI recommendations are inaccurate and promote common-sense beliefs, Masip et al. (2012) replicate those findings with law enforcement officers, and Masip and Herrero (2013) report data questioning the value of BAI in identifying perpetrators. Vrij et al. (2006) report data opposing predictions of BAI, Vrij et al. (2007) report data showing BAI's standardized list of 15 questions are useless to detect lies using verbal or nonverbal behavior, and Vrij and Fisher (2016) argues that BAI cannot be included in a standard investigative interview. Finally, Denault et al. (2020) is the same article addressing synergology. BAI is described as a problematic method within security and justice contexts.

Finally, the Reid Technique is addressed in 12 articles. In the first article and second article, King and Snook (2009) reports data showing how the Reid Technique is used in video-recorded police interrogations in Canada, and Kostelnik and Reppucci (2009) report data showing police officers trained in the Reid Technique are less sensitive to the development maturity of adolescents and use a number of psychologically coercive tactics with adolescents. In the third article, Gallini (2010) argues that "From a policy standpoint, continued reliance on the Reid technique does a disservice to our justice system and unnecessarily risks obtaining inherently unreliable confessions. From an evidentiary standpoint, the methodology underlying the Reid technique fails every aspect of the Supreme Court's standards governing the admission of expert evidence" (p. 529). In the fourth, Gudjonsson and Pearse (2011) review police commonly used interviewing methods and their potential for false confessions, and in the fifth, Perri (2011) mentions the Reid Technique appears to have been used in the flawed interview of a convicted killer. The sixth article (Cleary and Warner, 2016) reports data showing experienced police officers are often trained in (legally permissible) psychologically coercive tactics, similarly with adult and juvenile interviewees, and the seventh article (Mason, 2016) present a case study addressing strategies embedded in the Reid Technique used by police officers to pressure suspects into cooperation. The eight article (Luke et al., 2017) reports data on how the bait question, a type of question promoted by the Reid Technique, can distort the memory of suspects. In the ninth article, Spierer (2017) argues that "The coercion and deception inherent in the Reid Technique, coupled with the recognized vulnerabilities and susceptibilities of children as a group, has led to an unacceptably high rate of false confessions among juvenile suspects. And, when a juvenile falsely confesses as the result of coercive interrogation tactics, society ultimately suffers a net loss" (p. 1719). In the tenth article, Keatley et al. (2018) report, among other things, on how the Reid Technique can result in suspects providing (false) confessions. Finally, in the 11th article, French (2019) address "how the courts' outdated understanding of coercion has impacted the evaluation of confession evidence and fueled the continued existence of the Reid accusatory model of interrogation" (p. 1031), and in the 12th article, Snook et al. (2020) provides a critical analysis of the Royal Canadian Mounted Police' Phase Interview Model, and explains how it features strategies of the Reid Technique.

Discussion

The research field of criminal interrogations and investigative interviews fundamentally changed police practices (Kassin et al., 2010). However, little was known about the structure of this research field. This paper presented the results of a bibliometric study providing a comprehensive overview of the social science research conducted on criminal interrogations and investigative interviews since the 1900s.

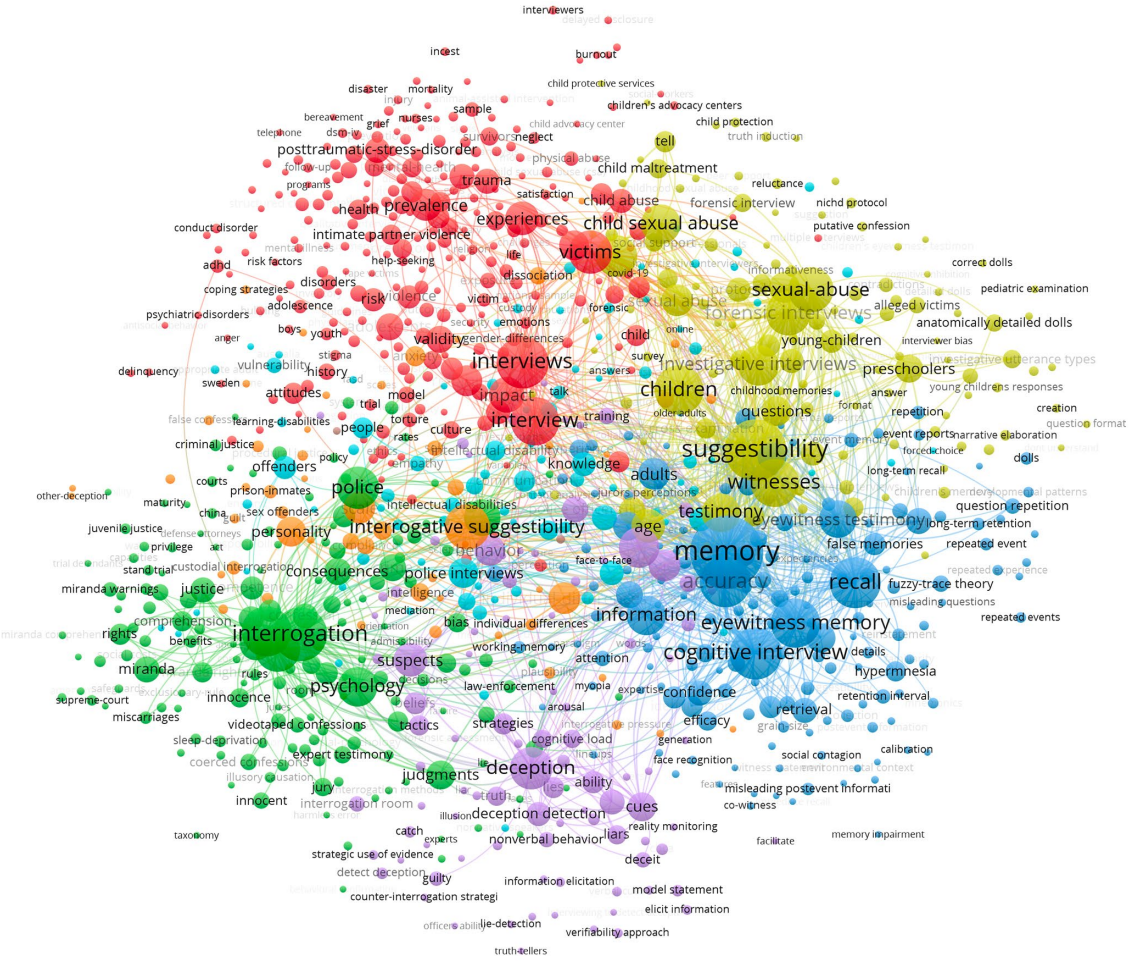

FIGURE 4
Keywords co-occurrence analysis (VOS Viewer).

The results revealed the richness of the research field of criminal interrogations and investigative interviews. Firstly, in the 1990s, this research field took off strongly. Secondly, issues of criminal interrogations and investigative interviews are subject to thousands of articles, written by thousands of researchers, published in hundreds of journals. Thirdly, the research areas, universities and countries (more than 50) interested this research field show the magnitude of the scientific community. Finally, keywords show the variety of themes the scientific community is interested in, "memory" and "suggestibility" receiving the most attention. The results of our bibliometric study also suggest the scientific community have become increasingly concerned about children, but less about confession, false confession, and eyewitness memory.

The richness of the research field of criminal interrogations and investigative interviews highlights what practitioners miss out when turning to unfounded and discredited tactics and techniques (e.g., Denault et al., 2020; Smith, 2020). To help practitioners understand the breadth of scientific knowledge on criminal interrogations and investigative interviews, if it takes four months to create an article (a very conservative estimate), from data collection to manuscript writing, it would take about 271 years to publish the 3,259 articles with a team of four researchers. Therefore, why have a number of law enforcement organizations turned to unfounded and discredited tactics and techniques rather than evidence-based practices?

Law enforcement has an history of tactics and techniques lacking scientific support, inside, but also outside the interrogation room (e.g., Lilienfeld and Landfield, 2008). For example, in the United States, microscopic hair analysis was used to identify suspects in countless investigations. But in 2015, "the FBI has concluded that the examiners' testimony in at least 90 percent of trial transcripts the Bureau analyzed as part of its Microscopic Hair Comparison Analysis Review contained erroneous statements" (FBI, 2015). Additional examples of tactics and techniques lacking scientific support include the identification of criminals from bitemark patterns (National Institute of Standards and Technology, 2023), and the use of 911 calls to arrest, prosecute and convict individuals (Murphy, 2022). This popularity, although worrying, is not surprising. As argued by Denault et al. (2020), so-called experts "offer immediate and easy solutions to complex challenges" (p. 7). Moreover, when organizations are faced with problems to solve, the lack of scientific knowledge, the ignorance of the importance of science, and the underestimation of the dangers of pseudoscience makes them vulnerable to unfounded and discredited tactics and techniques. But the scientific community also bears some

TABLE 10 Top 15 most used keywords since 2013.

	Keywords	Number of articles	Percentage of all articles
1	Memory	303	9.30
2	Suggestibility	185	5.68
3	Sexual Abuse	184	5.65
4	Interrogation	174	5.34
5	Cognitive Interview	167	5.12
6	Interviews	165	5.06
7	Children	160	4.91
8	Accuracy	150	4.60
9	Disclosure	145	4.45
10	False Confessions	139	4.27
11	Forensic Interviews	135	4.14
12a	Witnesses	132	4.05
12b	Eyewitness Memory	132	4.05
13a	Recall	128	3.93
13b	Deception	128	3.93
14a	Victims	127	3.90
14b	Interview	127	3.90
15	Investigative Interviewing	126	3.87

TABLE 11 Top 15 most used keywords from 2003 to 2012.

	Keywords	Number of articles	Percentage of all articles
1	Memory	157	4.82
2	Suggestibility	153	4.69
3	False Confessions	99	3.04
4	Interrogation	98	3.01
5a	Recall	86	2.64
5b	Eyewitness Memory	86	2.64
6	Interrogative Suggestibility	83	2.55
7	Accuracy	82	2.52
8a	Interviews	81	2.49
8b	Cognitive Interview	81	2.49
9	Sexual Abuse	77	2.36
10	Psychology	64	1.96
11	Deception	61	1.87
12a	Forensic Interviews	59	1.81
12b	Confessions	59	1.81
13a	Witnesses	57	1.75
13b	Interview	57	1.75
13c	Children	57	1.75
14	Testimony	53	1.63
15	Individual Differences	52	1.60

responsibility for why a number of law enforcement organizations have turned to tactics and techniques lacking scientific support.

Researchers and practitioners interested in criminal interrogations and investigative interviews must be proactive in communicating research findings, explaining why laboratory studies, even if they cannot always fully capture the complexity of actual interviews, are relevant for law enforcement, but also in addressing questionable tactics and techniques, and in helping law enforcement in recognizing and resisting to misinformation (Ecker et al., 2022). Although by its very nature scientific knowledge is constantly evolving, and there is always a need for further research, it is fundamental to take research findings, as they stand, with their strengths and limitations, and improve tactics and techniques for solving crimes and identifying perpetrators, even if it means improving them again when research findings change. Because otherwise, so-called experts will "offer immediate and easy solutions to complex challenges" (Denault et al., 2020, p. 7), and by the time research findings are disseminated, the questionable tactics and techniques will be overly rooted in organizations. Because of reputational damages and lawsuits they may face if they change their tactics and techniques, thereby admitting, either implicitly or explicitly, that previous tactics and techniques were inadequate, organizations might stand their ground. This will impede the dialog between researchers and practitioners. And eventually, even if organizations change their tactics and techniques, and practitioners learn that their beliefs are inaccurate, the continuous misinformation effect (Lewandowsky et al., 2012) will limit the impact of the change. In other words, even after practitioners learn their beliefs are inaccurate, their beliefs still influence them.

In addition, the richness of the research field of criminal interrogations and investigative interviews highlights the negligible contribution of questionable tactics and techniques to the literature on criminal interrogations and investigative interviews. That is, in addition to being subject to scrutiny in peer-reviewed publications, the questionable tactics and techniques lack widespread approval from the scientific community, contrary to what their proponents explicitly claim or implicitly suggest. For example, "nonverbal behavior" being far down in the list of the most used keywords, tactics and techniques focusing on "nonverbal behavior," and sold as being the best for solving crimes and identifying perpetrators, should arouse suspicion. However, nonverbal behavior is vitally important to investigative interviews, as it is with any other face-to-face interaction. But not just as it is professed on social medias and television shows such as Lie To Me. As Hall et al. (2019) underline,

> The breadth of topics that relate to NVC is quite wide, in accordance with its many functions, which include displaying affect (such as anxiety or happiness), revealing attitudes (such as interest, prejudice, or intimacy), regulating interaction (such as taking turns or directing attention), managing impressions (such as by presenting oneself as competent or brave), revealing physical and mental conditions (such as pain or mental disorders), and exerting interpersonal control (as in displaying dominance) (p. 273).

Therefore, researchers and practitioners interested in criminal interrogations and investigative interviewing should beware of falling into the trap of overlooking the vital importance of the nonverbal behavior because questionable tactics and techniques are heavily

promoted by so-called experts. Rapport building, for example, in central in eliciting the truth (Meissner et al., 2012), and nonverbal behavior is central in rapport building (Tickle-Degnen and Rosenthal, 1990). This makes nonverbal behavior central in solving crimes and identifying perpetrators.

Finally, despite the wealth of scientific knowledge on criminal interrogations and investigative interviews, as evidenced by our bibliometric study, the research community should keep in mind investigations are at the very beginning of the judicial process. Subsequently, if there is a trial,[1] the judge in a bench trial, or the jurors in a jury trial, will evaluate the evidence. And this should be considered by the research community. As Vrij and Granhag (2012) highlighted,

> … researchers must provide criminal investigators with techniques that will help them to produce evidence that will stand up in court. It is not just about assessing whether a suspect is lying or telling the truth, it is also about maximising the value of the evidence so that prosecutors can present it 'beyond reasonable doubt', the standard of proof typically required in criminal courts (p. 115).

In other words, beyond solving crimes and identifying perpetrators, if tactics and techniques do not stand up to the tests of the courts, and do not provide evidence of high value, research funding (paid for by public taxes) that supported their development will have a limited impact on the civil society. The same holds if, ultimately, courts assess the credibility of witnesses based on stereotypes and prejudices (Denault et al., 2023), and do not give appropriate weight to the evidence collected with state-of-the-art tactics and techniques.

Conclusion

Our bibliometric study provided a rigorous, and novel picture of this research field. However, our bibliometric study is not without limitation. For example, as mentioned above, it focuses on a particular strand of research, that is, social sciences research on criminal interrogations and investigative interviews. In other words, the use of other databases, and of other keywords might yield different results, and as Denault et al. (2022) pointed out, the keywords to create the corpus of articles for our bibliometric study could be subject to debate. Furthermore, many articles that do not deal with investigative interviews, but whose focus is relevant to investigative interview, may have an important role in developing better police practices, are not featured in our database. For example, peer-reviewed publications on lie detection, nonverbal behavior, memory, and cognitive biases, even if not addressing investigative interviews, can be of great importance for investigative interviews. Our bibliometric study, like others have done before (e.g., Nadeau et al., 2018; Plusquellec and Denault, 2018; Dodier, 2019; Denault et al., 2022), shows that, in the end, even if research fields are intuitively independent, even if researchers work in silos, research findings transcends disciplinary boundaries, and embracing interdisciplinary research can only foster the development of better police practices to solve crimes and identify perpetrators.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

1 It should be mentioned that even if the strength of the evidence can influence defendants in pleading guilty, and therefore, avoid a trial, a number of defendants plead guilty for crimes they did not commit (Gross, 2008; Dervan and Edkins, 2013; Blume and Helm, 2014).

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The role of individual features of memory and impulsiveness in telling a true or false story in a realistic, clear, and reconstructible way

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Objective: The aim of the present study was to explore whether there was an interaction effect between such personal aspects and veracity on realism, clarity, and reconstructability of the story.

Methods: A total of 158 participants took part in the experiment and were asked to tell a truth and a lie during an interview (veracity condition). They filled in a questionnaire measuring their metamemory performance and their level of functional and dysfunctional impulsivity. A k-means cluster analysis on metamemory and impulsivity was conducted, and three clusters were obtained: controlled-memory inefficient, controlled-memory efficient, and impulsive-average memory.

Results: The results showed that participants scored higher on all three reality monitoring criteria when telling the truth than when lying. Further, a cluster membership by veracity interaction for realism was also significant, but when telling the truth, there was no difference between clusters in terms of realism used in the explanation. Follow-up analyses showed that, when lying, the level of realism in the story was significantly higher for people belonging to the cluster "impulsive-average memory" than for people belonging to the cluster "controlled-memory efficient", a result that seems to indicate that people with good memory and can control dysfunctional impulsivity have more difficulties when lying.

Conclusions: Research has shown that realism, clarity, and reconstructability of the story, all part of reality monitoring, can be useful to assess veracity. Generally, truth tellers obtain higher scores on all three variables than liars, but there is some variability across individuals owing to their personal characteristics. Metamemory and impulsivity also play a role in deception. From the implications of the results, the limitations of the study and suggestions for future research are also provided.

KEYWORDS

metamemory, reality monitoring, cluster analysis, impulsivity, deception

1. Introduction

Initially, the focus was on the search for specific verbal and non-verbal cues to deception (Granhag et al., 2015). However, although there are some cues that are statistically associated with lying, effect sizes are still small to moderate (Hauch et al., 2017; Palena et al., 2021b; Vrij et al., 2021). This happens for several reasons. First, researchers focused on truth cues and overlooked lie cues (Vrij et al., 2022). Second, humans are generally not accurate in

lie deception, and indeed, our mean accuracy is ∼54% (Bond and DePaulo, 2006, 2008). Third, interpersonal differences play an important role (Caso et al., 2018). For these reasons, a great amount of research at present focuses on the development of effective interviewing approaches that can maximize the amount of collected information and enhance differences between truth telling and lying. One example to deal with such differences is the baseline approach (Vrij, 2016), which builds on the idea that, if an investigator has a baseline reference of how someone behaves and talks when telling the truth, then deciphering if someone is lying should be easier than not having a baseline. Another and more recent approach is the application of person-centered methodologies in interviewing settings (Palena and Caso, 2021). Briefly speaking, the more common variable-centered approach assumes that the effect under investigation is the same across individuals. On the contrary, one of the pillars of the person-centered approach is that an effect is not the same for everyone. Indeed, the person-centered approach assumes that people can be grouped into specific subpopulations (often called clusters or profiles) through data-driven procedures. Consequently, people belonging to the same subpopulation (i.e., cluster or profile) are more similar to each other in the pattern of scores of the variables taken into account than people belonging to different subpopulations. It follows that whatever effect is being studied can be moderated by group membership. To provide an example, a researcher might be interested in studying the effect of different teaching methods on students' performance and assume that the personality profile (group membership) of their participants moderates such a relationship.

To the best of our knowledge, there are only a few examples of the applications of this approach in lie detection research. For example, Palena et al. (2021a) analyzed participants' scores on the five factors of personality, moral disengagement, and their perceived cognitive load when lying and obtained four profiles showing different patterns in such variables (e.g., one profile was characterized by high extraversion and high perceived cognitive load when lying, whereas another profile showed high extraversion but low perceived cognitive load when lying). They then ran additional analyses and found that profile membership was associated with lying behavior. In essence, profile membership predicted lying behavior. Similarly, Palena et al. (2022) obtained profiles starting from participants' scores on the six factors of personality, Machiavellianism, and moral disengagement and found that profile membership was associated with, among others, lying ability and lying frequency. These studies indicated that lie detection research might benefit from the application of person-centered approaches that, although new to the topic of lie detection, are well-known in other research areas (Palena and Caso, 2021). Indeed, given the high variability between individuals in lying behavior, person-centered approaches provide a solid psychometric ground to deal with interpersonal differences.

Several instruments for the detection of verbal lies have been used in the literature, such as the Statement Validity Assessment (SVA) and the Scientific Content Analysis (SCAN) (Vrij, 2008). However, reality monitoring (RM) is scientifically more robust because it refers to the cognitive processes that discriminate between perceived events and imagined events. The assumption is that memories based on real experiences differ in quantity and/or quality from memories based on fiction (Johnson and Raye, 1981). As a result, in the early 1990s, the RM approach was widely accepted as potentially one of the most efficient tools for verbal lie detection (Vrij, 2000; Sporer, 2004; Vrij et al., 2004; Masip et al., 2005). The first clear and comprehensive operationalization of the RM criteria can be observed in the study by Vrij (2000), who proposed eight criteria: Clarity, Perceptual Information, Spatial Information, Affective Information, Reconstructability, Realism, Temporal Information, and Cognitive Operations. The RM criteria have been applied to lie detection research, and researchers found them to discriminate truth telling from lying with up to 70% accuracy rates (Vrij, 2015; Hauch et al., 2017).

According to the RM model, the memory of an actual event has more perceptual, has more contextual information, has more affective information, sounds clearer, is more realistic, and is reconstructable (Johnson and Raye, 1981). For this reason, it is easier to recall and retrieve the memory of an actual event (i.e., everything that is outside us) than an invented one (Posner and Warren, 1972; Brown, 1975; Posner and Snyder, 1975; Hasher and Zacks, 1979). Recently, Besken (2018) examined the relationship between deception and memory while also assessing the metamemory of liars and truth tellers. Participants provided correct (truthful) or incorrect (lie) answers to a series of general knowledge questions and later estimated their confidence that they would remember their responses on a subsequent test. This study showed that people predicted that they would remember truthful responses better, but, in reality, they recalled more lie responses, so people overestimated their ability to accurately source their memory. These results are particularly surprising given that truth experiences are often better remembered than lied experiences (Vieira and Lane, 2013; Dianiska et al., 2019; Dianiska and Meissner, 2022). Starting from this, the aspect we believe is interesting to understand is what people think about their ability to remember their lies (and truths) over time. In the present experiment, we focused on verbal cues to deception and truth and just examined them through reality monitoring.

However, most of the criteria of the RM are impractical, as this would require that the interviewer counts them in real time, which is an impossible task (Vrij et al., 2022). Further, the countable details of the RM are culture dependent and, likely, also context dependent (e.g., Taylor et al., 2015). For these reasons, we only focused on the three impression cues of the RM: realism, reconstructability of the story, and clarity, which are the general RM criteria and are used to understand the truthfulness of a story.

The second aspect we decided to investigate is the features of metamemory (MM) because they could be involved in the deceptive process. MM refers to people's knowledge about learning and memory processes in general and to the assessment (monitoring) and regulation (control) of these processes as they occur (Flavell, 1971). This cognitive process involves awareness of one's own resources and limitations. The ability to correctly and realistically assess one's skills, abilities, and efficiency, in terms of accuracy, precision, appropriateness, and speed of execution, results in better control and adaptability of the individual to the demands of the environment. Despite this, when asked to recall information, people tend to display two biases: similar memory

predictions for different time intervals and overconfidence in memory performances. These errors constitute stability bias (Liu, 2019). Recent research (e.g., Harvey et al., 2017) suggests that liars were unable to precisely tune the amount of detail disclosed to simulate the effects of forgetting over time associated with genuine memory. The liar's insensitivity to delayed manipulation suggests a stability bias affecting their verbal behavior. Consequently, liars are more prone to metacognitive errors when lying after extended intervals (Harvey et al., 2017). To measure this complex aspect of metacognition, the MM questionnaires contain several subscales to capture different features of memory (Gopi and Madan, 2022); for this study, we took into account four aspects of the memory functioning based on self-appraisal: frequency of memory failures, severity of memory failures, changes of memory performance over time, and the use of memory facilitating strategies. The frequency and the seriousness of memory failures refer, respectively, to how often memory mistakes occur for specific situations (Bennett-Levy and Powell, 1980; Sehulster, 1981; Zelinski and Gilewski, 2004) and how serious one perceives their memory failure. Instead, the changes in memory performance over time refer to a subjective assessment of own mnestic abilities compared with earlier periods of their life. Finally, the last characteristic refers to the use of facilitating memory strategies, including internal memory aids such as mnemonics and external aids such as calendars (Dixon and Hultsch, 1983; Bouazzaoui et al., 2010) or mental repetition of items.

The third aspect we decided to investigate concerns a personality characteristic: impulsivity. Impulsivity may be defined as the tendency to act on immediate urges, either before the consideration of possible negative consequences or despite the consideration of likely negative consequences (DeYoung and Rueter, 2016). Dickman (1990) conceptualized impulsivity as a multi-dimensional construct and is comprised of two factors. Functional impulsivity refers to the tendency to make quick decisions with advantageous outcomes. In contrast, dysfunctional impulsivity refers to the tendency to act without forethought in situations in which this behavior is not advantageous. In general, when considering the relationship between impulsivity and lying, research studied only functional impulsivity. Indeed, some studies have found that (functional) impulsivity is related to lying. Makowski et al. (2021) have found that individuals with difficulties in cognitive control tend to have a higher lying frequency, and this pattern was found across different measures, such as impulsivity, emotion regulation deficits, and disinhibited behavior. Kumari (1996) showed that a high score on the lie scale was associated with a higher score on impulsivity. Consequently, we can deduce that lying is associated with impulsivity. When people truthfully describe or deny an action, they can rely on their memory of the experience to process a response (Dianiska and Meissner, 2022). In contrast, lying takes longer to produce a response (Suchotzki et al., 2017) and is more cognitively demanding (Vrij et al., 2008). Therefore, when dysfunctional impulsivity is involved, lying should result in a more confusing, contradictory, or unrealistic report of the events. Instead, as far as we know, no study ascertained the role of functional impulsivity in the lying process. Hypothetically, people with functional impulsivity should be able to tell a coherent and clear story of what occurred even when lying.

Building on the above literature, we expected that the effect of veracity on source monitoring would be moderated by participants' cluster membership. In particular, we expected that the difference between truth telling and lying on source monitoring scores would be higher for participants belonging to a cluster characterized by high impulsivity and worse meta-memory than for participants belonging to a cluster showing an opposite trend.

2. Methods

The present experiment is based on a dataset previously used for the study of the effect of suspicion and liars' strategies on reality monitoring (Gnisci et al., 2010). However, in the present study, we took a different look at the data by focusing on memory and personality-related variables (see below) and by employing a person-centered approach. Such a statistical approach has rarely been used in deception research experiments (Palena et al., 2021a, 2022) but has the advantage of accounting for interpersonal differences (Caso et al., 2018; Palena and Caso, 2021).

2.1. Participants

In total, 158 participants ($\approx$ 65% females) took part in the experiment. Their mean age was $M = 21.90$ ($SD = 2.80$). All the participants were Italian students; they were recruited in the Department of Psychology or Biology of the university now labeled University of Campania "Luigi Vanvitelli". Their participation was voluntary, and they did not receive any incentive for the participation. Multivariate observed power ranged from 0.76 to 1.

2.2. Variables and instruments

Metamemory was measured via the Memory Functioning Questionnaire (MFQ; Gilewski et al., 1990). The MFQ consists of 64 items rated on a 7-point Likert scale (1 *vs.* 7 = *Gives me big vs. not at all problems*) and includes four scales. The first scale is named Frequency of Forgetting and includes ratings of how frequently forgetting occurs. This scale consists of 28 items divided into four subscales: the General Rating, Frequency of Forgetting, Frequency of Forgetting When Reading, and Remembering Past Events. The second scale is called Seriousness of Forgetting, which consists of 18 items ratings of memory failures. Retrospective Functioning, the third scale, includes ratings of change in memory ability relative to 5 points earlier in life. The last scale, Mnemonics Usage, consisted of items from the frequency with which eight specific mnemonics are used. Higher scores suggest a more positive evaluation of self-perceived memory functioning and less frequent use of memory aids or strategies. We adopted the Italian version of MFQ (Pedone et al., 2005).

Impulsivity was measured via the Dickman's Impulsivity Inventory (DII; Dickman, 1990) that is a 23-item self-report measure that distinguishes between two types of impulsivity: functional and dysfunctional. Functional impulsivity is the tendency to make quick decisions when such decisions are

appropriate for the situation, and 11 items assess this type of impulsivity (e.g., "People have admired me because I can think quickly."). Dysfunctional impulsivity is the tendency to make quick decisions in contexts when such decisions are not adaptive and 12 items assess this type (e.g., "I often get into trouble because I don't think before I act."). Items were answered on a 5-point Likert scale (1 *vs.* 5 = *Does not describe me at all vs. Describes me completely*). Higher scores indicate higher levels of functional and dysfunctional impulsivity characteristics. Because an Italian version of the instrument was not available, the questionnaire was translated from English to Italian.

The original dataset also included measures of both verbal content and non-verbal behavior in the perception of lying. Among them, transcripts were coded via reality monitoring criteria (Johnson and Raye, 1981) by three coders[1] that received training from an expert coder and were blinded about the experimental procedure and the study objectives.

For the present experiment, we were only interested in three criteria of the reality monitoring: realism, clarity, and reconstructability of the story, which were coded on a 3-point scale, ranging from 0 to 2 (0 = *Absent*, 1 = *Present*, 2 = *Strongly Present*). The average inter-rater reliability, measured via Cronbach's alpha, was 0.91 for the first, 0.77 for the second, and 0.93 for the third, indicating good agreement between coders.

2.3. Procedure

Once the participants arrived at the site of the experiment, they were welcomed by the experimenter. The experimenter opened a backpack and asked the participant to take a pencil case out of the backpack and observe its content. The experimenter told the participants that the experiment aimed at examining how good people are at telling lies. The participants were also informed that they would be interviewed twice about the objects that were in the backpack and the person with whom they interacted with. The participants were told that, for one interview, they would be asked to be honest, and for the other interview, they would be asked to lie about what they saw in the backpack and the interaction with the experimenter, adding that in neither case the interviewer knew whether the participants were honest or not. The experimenter told them in which of the two interviews they should lie. The participants were then left alone and were given time to prepare for the interview. Then, a first interviewer entered the room and interviewed the participants and then left the room when the interview was over. Then, a second interviewer entered the room and did the same as the first interviewer. The interviews were structured and consisted of 12 questions. The analyses presented in this study only focused on the weak suspicion section of the interview (10 questions), during which the interviewer showed a weak suspicion toward participants' sincerity (full description of the experimental procedure in the original paper: Gnisci et al., 2010). This study was conducted in conformity with the Declaration of Helsinki.

1 One coder coded all transcripts, whereas the other two coders coded 30% of the transcripts.

2.4. Statistical analyses

Here, we will provide basic information on the statistical analyses we used. More details will be provided in the results.

First, we performed a cluster analysis on the six variables, four regarding memory and two regarding impulsivity. Once the clusters were obtained, they were put in relation with the RM variables via a multivariate analysis of variance where the cluster membership was a between-subjects factor, veracity was a within-subjects factor, and realism, clarity, and reconstructability of the story RM criteria were the dependent variables. *Post-hoc* tests for main effect and interactions were executed by comparing groups with Bonferroni correction for multiple testing.

3. Results

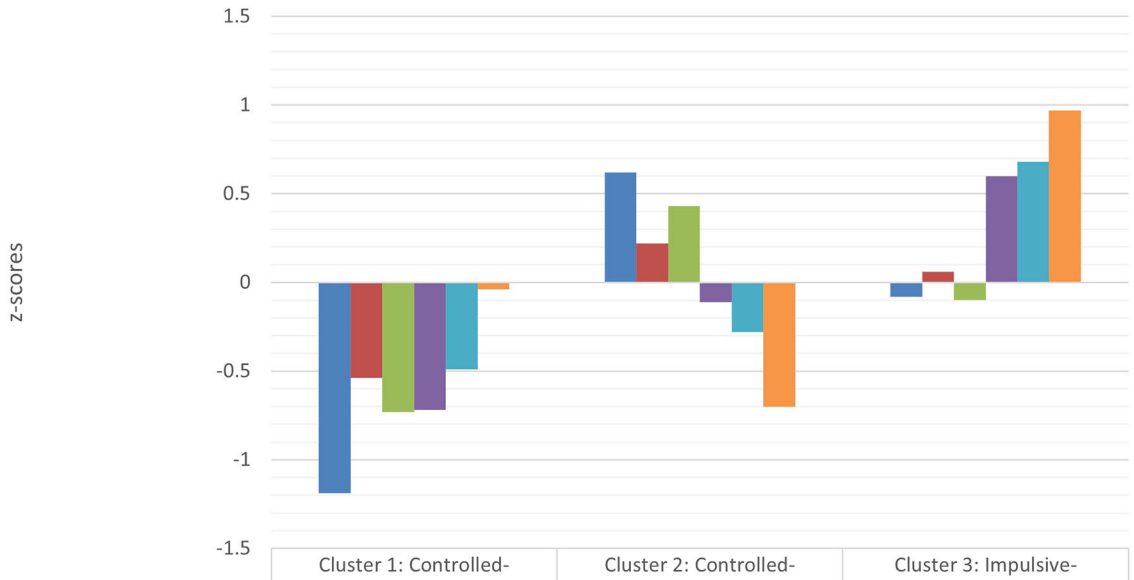
3.1. Cluster analysis for individual profiles

For the k-means cluster analysis on the memory and impulsivity variables, we assessed the normality of the data and Hopkin's H via the R package *Performance* to assess whether the data were suitable for clustering. Further, a method agreement procedure based on the aggregation of 28 different algorithms was used to explore the optimal number of clusters to retain. The maximum number of iterations for convergence was left at the default value of $n = 1{,}000$. The six variables used for the cluster analysis were converted to z-scores before analyzing the data. Totally, within-clusters sum of squares and between-clusters sum of squares were reported to describe the variability within and between clusters. Normality was deemed to be present if skewness did not exceed |2| and kurtosis did not exceed |7| (West et al., 1995), whereas Hopkin's H below 0.5 was deemed as indicative of data suitable for clustering (Lüdecke et al., 2019, 2020; Makowski et al., 2021).

All variables were normally distributed ($\text{Skewness}_{\text{MAX}} = -1.35$; $\text{Kurtosis}_{\text{MAX}} = 1.02$) and Hopkin's H was 0.39, indicating that the data were suitable for cluster analysis (Lüdecke et al., 2019; Makowski et al., 2021). The analysis also showed that 8 out of 28 algorithms (28.5%) supported the presence of three clusters. Within-clusters, between-clusters, and total sum of squares and z-scores of the three clusters are reported in Figure 1.

The first cluster was characterized by low scores on all the scales of metamemory and functional impulsivity, whereas dysfunctional impulsivity was about the grand mean. This cluster was the one with lower variability between its members. Cluster 1 was labeled "controlled-memory inefficient" and appears to be the worst group in terms of the combination of memory and impulsivity features out of the three.

The second cluster was characterized by high scores on three scales of metamemory, namely frequency and seriousness of forgetting and retrospective functioning, about average scores on the fourth scale of metamemory (mnemonic usage) and low scores on both impulsivity scales, particularly on the dysfunctional one. Therefore, this group was labeled "controlled-memory efficient" and appears to be the best group in terms of the combination of memory and impulsivity.



	Cluster 1: Controlled-memory inefficient (n = 34; wss = 122.75)	Cluster 2: Controlled-memory efficient (n = 71; wss = 292.25)	Cluster 3: Impulsive-average memory (n = 53; wss = 246.09)
Frequency of forgetting	-1.19	0.62	-0.08
Seriousness of forgetting	-0.54	0.22	0.06
Retrospective functioning	-0.73	0.43	-0.1
Mnemonics usage	-0.72	-0.11	0.6
Functional Impulsivity	-0.49	-0.28	0.68
Disfunctional Impulsivity	-0.04	-0.7	0.97

FIGURE 1
Cluster descriptives. Total variance explained 29.82%; BSS (Between Sum of Squares) = 280.91; TSS (Total Sum of Squares) = 942 (WSS = Within Sum of Squares).

The third cluster was characterized by average scores on three scales of metamemory, namely frequency and seriousness of forgetting and retrospective functioning, high scores of mnemonic usage, and high scores on both scales of impulsivity. This cluster was labeled "impulsive-average memory". This is an intermediate group in terms of memory and impulsivity features.

3.2. Is there an effect of individual profiles and of telling the truth/lying on real monitoring?

A 3 (clusters; between-subjects) X 2 (veracity: truth *vs.* lies; within-subjects) MANOVA was conducted on the RM scores of realism, reconstructability of the story, and clarity as dependent variables. At a multivariate level, all three effects were statistically significant: cluster, $F_{(6,308)} = 2.35$, $p = 0.03$, $\eta p^2 = 0.04$, veracity, $F_{(3,153)} = 35.74$, $p < 0.001$, $\eta p^2 = 0.41$, cluster by veracity interaction, $F_{(6,308)} = 2.15$, $p = 0.048$, $\eta p^2 = 0.04$.

At a univariate level, none of the three RM scores were statistically different between clusters (all *p*s > 0.08). There was a significant main effect of veracity for realism, $F_{(1,155)} = 76.31$, $p < 0.001$, $\eta p^2 = 0.33$, reconstructability of the story, $F_{(1,155)} = 50.36$, $p < 0.001$, $\eta p^2 = 0.24$, and clarity, $F_{(1,155)} = 13.18$, $p < 0.001$, $\eta p^2 = 0.08$. Participants obtained higher scores on realism ($M = 1.78$, $SD = 0.42$), reconstructability of the story ($M = 1.34$, $SD = 0.67$), and clarity ($M = 1.44$, $SD = 0.55$) when telling the truth than when lying (realism, $M = 1.23$, $SD = 0.69$; reconstructability, $M = 0.96$, $SD = 0.63$; reconstructability clarity, $M = 1.27$, $SD = 0.58$).

Of the three possible interaction effects, only the one for the variable realism was significant, $F_{(2,155)} = 5.75$, $p < 0.01$, $\eta p^2 = 0.07$. Table 1 shows the average scores for this interaction effect (Figure 2).

For the interaction, we executed the *post-hoc* tests with Bonferroni correction across clusters within each condition (truth telling *vs.* lying). Given that we executed six comparisons in all (three within each condition), the adjusted threshold for an alfa level of 0.05 was 0.0083 (that is 0.05/6). When telling the truth, there was no difference between clusters in terms of realism used in the explanation (minimum $p = 0.528$). When lying, Cluster 1 was not significantly different from the two other clusters (p= 0.200 and p =0.140); however, the level of realism in the story was significantly higher in Cluster 3 with respect to Cluster 2 (p = 0.001). Therefore, people with good memory who can control dysfunctional impulsivity seem to have more difficulties in lying, because they use stories that seem less realistic and therefore less believable.

TABLE 1 Realism means and standard deviations for truth telling and lying split by cluster membership.

	Cluster 1: Controlled-memory inefficient	Cluster 2: Controlled-memory efficient	Cluster 3: Impulsive-average memory
Realism truth telling *M*(*SD*)	1.77 (0.43)	1.80 (0.40)	1.76 (0.43)
Realism lying *M*(*SD*)	1.24 (0.78)	1.06 (0.63)	1.45 (0.64)

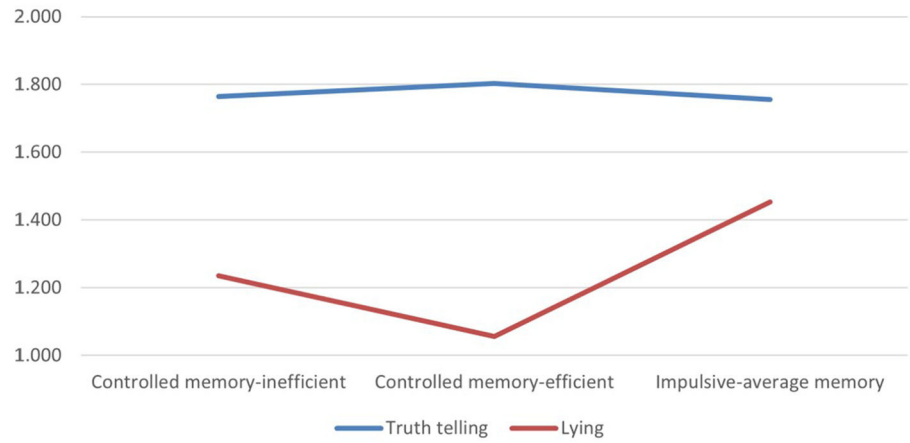


FIGURE 2
Means of Realism scores for truth telling and lying in the three different clusters (Cluster 1: Controlled-memory inefficient; Cluster 2: Controlled-memory efficient; Cluster 3: Impulsive-average memory).

4. Discussion

The first contribution of this study is to have identified three profiles of individual features, based on two strongly related aspects as metamemory and impulsivity and their sub-dimensions. In terms of memory features and control of impulses, the most functional profile is the one presented as Cluster 2. This group has, in general, optimal features of memory with good control of impulses, which prevents them from realizing that their actions lead to negative consequences. In an intermediate position is Cluster 3, which performs at an average level on three features of metamemory but makes wide use of mnemonic techniques associated with high functional and dysfunctional impulsivity. A possible key could be that the high use of mnemonic techniques in this group could be a kind of antidote to their general, and particularly dysfunctional, impulsivity. The less efficient profile is Cluster 1, with low scores on all the aspects of metamemory and functional impulsivity, whereas dysfunctional impulsivity was about the grand mean.

As far as the effect of the three profiles and the veracity condition on the aspects of RM, we found that the profiles did not have an effect, but that veracity did. Indeed, in truth-telling condition, the participants told a more clear, vivid, reconstructible, and realistic story than when they lied. Moreover, we found an interaction effect of profiles and veracity on realism. Particularly, an understanding that realism always remains greater when telling the truth, when lying, those with good memory, and those with a good control of dysfunctional impulsivity tell a less realistic story than people with average memory and highly functional and dysfunctional impulsivity (i.e., Cluster 3). Therefore, our data show that people very effective in memory and control of dysfunctional impulses may tell less realistic stories when lying, probably because, in lying, they do not have a real memory of the event to remember. People with average memory and high impulsivity, but provided with a good capability of mnemonic use, instead, may provide a more realistic performance when lying. Recent studies (Besken, 2018; Dianiska and Meissner, 2022) have found that individuals who were aware of their own memory inaccuracies were more successful at lying than those who overestimated their memory abilities. Our findings add further information that helps to delineate the role of metacognition in influencing our ability to deceive. The result whereby no main effect was found for cluster membership could be because, rather than directly influencing RM scores, cluster membership act as a moderator for the within-subjects effect of veracity. In essence, cluster membership affects the difference that the same individual shows when telling the truth vs. lying.

Research on lie detection shows that relying on verbal behavior is more effective than relying on non-verbal behavior (Vrij, 2015). When looking at speech, truth telling is often associated with higher scores on truth criteria, such as realism, clarity, and reconstructability of the story than lying (Masip et al., 2005). However, sometimes, there might be no difference at all or sometimes, liars might report a higher frequency of truth criteria than truth tellers. This is likely due to the fact that contextual factors play an important moderating role, and one such factors is culture. For example, research showed that lying is associated with a decreased reporting of spatial information for white British and

Arabian people but an increased reporting for North African and Pakistani populations (Taylor et al., 2015). In our research, all the participants were Italian students.

The personal characteristics of each individual also play an important role, and this might explain why some people are more transparent than others (Levine, 2010). Specifically, the results obtained in this study showed that impulsivity (both functional and dysfunctional) can play an important role in telling truth or lying. These results are consistent with those of other studies that have shown both a relationship between Machiavellianism and the tendency to lie (Palena et al., 2022) and a relationship between functional and dysfunctional impulsivity and Machiavellianism (Jones and Paulhus, 2011). It follows the principle that, to enhance the chances to detect lies, the personality and nuances of the interviewee should be accounted for. In the same vein as Palena et al. (2021a, 2022), we explored the effect of individual profiles on lying and found an interaction effect between veracity and profiles (which in our case were obtained starting from meta-memory and impulsivity). This suggested that the effect of veracity might not be constant across individual profiles, which in turn supports the idea that the search for cues to truth/deception should be tailored based on the interviewee profile, although this will be a difficult task due to the huge amount of other contextual variables at play and on the difficulty to decide what variables should be detected to obtain the profiles. Nonetheless, this is a possible new research line for future research. In this perspective, identifying additional personality traits that could be linked to truth-telling or lying behavior would be of interest. We hope that the findings of this study will encourage investigators to pay attention not only to non-verbal behaviors when attempting to detect deceit but also to verbal cues, using verbal veracity assessment tools, such as RM. Moreover, we hope that they will also pay attention to interviewees' individual characteristics and put them in relation to possible interrogation strategies as support to their work.

Although we obtained interesting results, our experiment had some limitations. First, all participants belonged to the same culture; thus, the generalizability of our results can be limited. Second, we only focused on three verbal criteria and did not account for non-verbal behavior, omitting some information that could have supported verbal cues in the detection of lying. Third, we did not employ any specific interviewing technique, and this could have affected the accuracy of lie detection. Indeed, a study (Mac Giolla and Luke, 2021) showed that, for example, the Reality Interviewing protocol (Bogaard et al., 2019) can detect lies with almost 76% accuracy. Fourth, the number of participants within each cluster was unbalanced. Although, commonly, clusters differ in the number of members, this unbalance might have affected the results. Fifth, we should have done a manipulation check to understand whether participants really behaved according to the condition in which they were located. Future research should thus take into account these limitations, for example, by studying if the relationship between cluster membership and veracity on RM criteria is moderated by culture, if the results change when focusing on other verbal cues such as those from the CBCA, and if the application of a specific interviewing protocol affects the results. Further, a larger sample size is desirable so that it would be possible to randomly select participants from within each cluster to reach equal sample sizes.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the patients/participants or patients/participants legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

IS contributed to the conception and design of the study, collected data, organized the database, and wrote the first draft of the manuscript. NP performed the statistical analysis, wrote the first draft of the manuscript, and revised substantial parts of the manuscript. FM wrote the first draft of the manuscript and wrote sections of the manuscript. AG contributed to the conception and design of the study and performed the statistical analysis. LC contributed to conception and design of the study and organized the database. All authors contributed to manuscript revision, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Adult's veracity judgments of Black and White children's statements: the role of perceiver and target race and prejudice-related concerns

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Introduction: Seldom has work investigated systematic biases in adults' truth and lie judgments of children's reports. Research demonstrates that adults tend to exhibit a bias toward believing a child is telling the truth, but it is unknown whether this truth bias applies equally to all children. Given the pervasiveness of racial prejudice and anti-Black racism in the United States, the current study examined whether adults are more or less likely to believe a child is telling the truth based on the race of the child (Black or White), the race of the adult perceiver (Black or White), and the perceiver's concerns regarding appearing unprejudiced.

Methods: Using an online data-collection platform, 593 Black and White American adults reviewed fictitious vignettes in which a child denied committing a misbehavior at school (e.g., damaging a laptop). The race of the child in the vignette was manipulated using an AI-generated photo of either a Black child or a White child. After reading each story, participants provided a categorical veracity judgment by indicating whether they believed the child in the story was lying (and therefore committed the misdeed) or telling the truth (and was innocent), as well as rated how honest or deceptive the child was being on a continuous scale. Participants also completed questionnaires assessing their internal (personal) and external (normative) motivations to respond in non-prejudiced ways.

Results and discussion: Results indicated that systematic racial biases occur in adults' veracity judgments of children's statements. Both Black and White participants exhibited a truth bias in their veracity judgments of Black children, but not when evaluating the deceptiveness of White children. Consistent with the prejudice-related concerns hypothesis, the observed truth bias toward Black children was moderated by individual differences in participants' desire to respond without prejudice and whether those motivations stem from external or internal sources. The current findings present novel evidence regarding racial bias and prejudice-related concerns as potential barriers to making veracity judgments of children's statements and, ultimately, successful lie detection.

KEYWORDS

deception, honesty, lying, prejudice, racial bias, veracity judgments, lie-detection, children

1. Introduction

Children tell lies for many reasons: One of the most common reasons is to protect themselves from the consequences of their transgressions (Stouthamer-Loeber, 1986; Newton et al., 2000; Wilson et al., 2003). These transgressions are often relatively benign, such as peeking during a guessing-game (e.g., Talwar and Lee, 2002; Bruer et al., 2020; Liu et al., 2022). However, children may also lie in situations in which the consequences are more serious, such as lying to conceal cheating on a test in school (e.g., Zhao et al., 2021), in legal cases for which the child is a suspect (e.g., Redlich Q. et al., 2008) or victim/witness to a crime (e.g., Redlich G. et al., 2008; Dykstra et al., 2022; Price et al., 2022), and even in cases where the child is a victim of abuse or maltreatment (Lyon et al., 2008; Williams et al., 2020). Adults, such as parents, teachers, social workers, and law-enforcement personnel, regularly face the challenge of determining whether a child is being honest or deceptive – also known as *veracity judgments*.

Decades of research has examined how adults assess the veracity of children's statements, both in developmental (e.g., Talwar and Lee, 2002; Talwar et al., 2006) and legal contexts (e.g., Ross et al., 2003; O'Connor et al., 2023). These studies have primarily focused on issues regarding accuracy (see Gongola et al., 2017 for meta-analysis). While it is important to determine whether adults are *accurate* deception detectors, it is also important to determine whether adults are *biased* deception detectors – since labeling statements as a "lie" regardless of accuracy has meaningful consequences. In the current study, we followed the suggestions of Lloyd et al. (2017) and investigated what factors may contribute to individuals being biased detectors of children's lies. Specifically, we examined (1) whether adults' veracity judgments of children's statements are influenced by the race of the child target, the race of the adult perceiver, or both; and (2) whether such veracity judgments are related to the perceiver's desire to act – or *appear* to act – in non-prejudiced ways. These are important questions to investigate because deciding whether someone is being honest or deceptive based on prejudicial biases – and not factual evidence – could reduce the accuracy of such judgments and potentially lead to serious consequences.

1.1. Truth bias in detecting children's lies

Extant research has found that adults tend to be more accurate at identifying children's true statements as true (60% accuracy rate) than they are at identifying children's false statements as false (49% accuracy rate; see Gongola et al., 2017 for meta-analysis). Furthermore, consistent with the patterns observed in their veracity judgments of other adults (e.g., Levine et al., 1999; Levine, 2014), adults seem biased toward wrongfully labeling children's false statements as being true (Gongola et al., 2017). One reason for this pattern may be that adults often believe that children are simply unlikely to tell a lie (Quas et al., 2005; Goodman et al., 2006; Talwar et al., 2006). Alternatively, this may be due to a general anchoring effect, in which people tend to believe that social interactions are honest and often fail to sufficiently adjust this assumption when making veracity judgments, resulting in a bias toward their initial position that the person is being truthful (Vrij et al., 2006, 2010; Gongola et al., 2017). Considerable research has documented that adults exhibit a truth bias in their veracity judgments of children's statements (e.g., Strömwall and Granhag, 2005; Talwar et al., 2006; Talwar et al., 2015; Evans et al., 2016; Saykaly et al., 2017; but see Masip et al., 2004; Crossman and Lewis, 2006; Edelstein et al., 2006), yet it is unknown whether this bias applies equally to all children.

Little work has been done to investigate systematic biases in truth and lie judgments. As a result, it is unclear to what extent particular characteristics of the individual influence whether they are more or less likely to be perceived as honest or deceptive. Previous research has demonstrated that a person's physical characteristics, such as their facial structure and attractiveness (Zebrowitz et al., 1996; Bond and DePaulo, 2008), can have a substantial effect on whether they are judged to be truthful or dishonest. Race is yet another, perhaps more salient, characteristic that also has the potential to bias adults' veracity judgments. It could be that factors such as personal prejudices and anti-Black stereotypes about criminality (Plous and Williams, 1995; Welch, 2007; March, 2022) may lead to racial bias in adults' veracity judgments of children's reports. This may manifest as a weaker truth bias for Black children compared to White children, or perhaps even as a lie bias, such that adults are more likely to label the statements of Black children as a lie but the statements of White children as the truth. Research is needed to investigate this possibility.

1.2. Racial bias

Racial prejudice and anti-Black racism remain a pervasive crisis in the United States. Recent events, such as the murders of George Floyd, Breonna Taylor, Ahmaud Arbery, and other people of color have fueled the ongoing movement to end racial inequality, particularly within the legal system – where racial inequalities have been well-documented (Henderson et al., 1997; Hurwitz and Peffley, 2010; Kovera, 2019). For example, it is a well-established problem that Black people, including Black youth, are overrepresented in United States correctional institutions (U.S. Department of Justice, 2020a, 2020b). Black people are also overrepresented in samples of false confessors (see Najdowski, 2011) – individuals who wrongfully admit to committing a crime, often because of police pressure during interrogation. Najdowski (2011) proposed that the stereotype threat associated with awareness of the Black criminality stereotype (i.e., the idea that Black people are inherently criminal; Plous and Williams, 1995; Welch, 2007; March, 2022) is activated in police interrogations for Black suspects. The activation of this stereotype threat is theorized to lead Black suspects to behave in ways that make them more likely to be judged as being deceptive.

It could be that Black children's denials of having committed a wrongdoing are less likely to be perceived as honest and are instead more likely to be judged as lying compared to the denials of White children. Adults have also been shown to perceive Black children – particularly Black boys – as older and less childlike than their White same-aged counterparts (Goff et al., 2014). When Black children are victims of abuse, adults tend to perceive them to be more mature and more responsible for that abuse than White children (Bottoms et al., 2004). This is especially concerning since research has shown that older children are judged more harshly and are more likely to be labelled a liar than younger children (Bottoms et al., 2004).

Although we have highlighted the problem of racial inequalities in the justice system, these inequalities begin far earlier in life and occur in a multitude of contexts, particularly within schools. For

example, White students are perceived as more compliant than students of color, which decreases the former group's likelihood of being expelled (Okonofua et al., 2016). In contrast, Black children are more likely than other children to be disciplined in school (Wymer et al., 2022), even when considering factors such as their grades, attitudes, gender, and their conduct in school as perceived by teachers (Rocque and Paternoster, 2011). Research has shown that teachers regard the behaviors of Black children as more hostile than those of White children (Wymer et al., 2022). However, it is largely unknown whether Black children are also perceived to be more or less (dis) honest compared to White children. Evidence from studies of adult targets suggest that race influences adults' veracity judgments of other adults' statements – but not necessarily in the pattern one might expect (Lloyd et al., 2017).

In a series of studies conducted by Lloyd et al. (2017), adult participants watched video footage of Black and White college-age individuals describing an acquaintance and were asked to indicate whether they believed the adult in the video was telling the truth or a lie. The results indicated that both Black and White participants judged Black adults as more honest compared to White adults (Lloyd et al., 2017). Participants also exhibited a truth bias for Black adults but showed no such bias for White adults (Lloyd et al., 2017). While this finding seems to contradict our expectations based on the previous discussion regarding the racial inequalities Black people face in the educational and legal systems, analyses examining eye-gaze during the task revealed that while they may have ultimately chosen to judge Black adults as telling the truth, White participants were significantly faster to first fixate on the "lie" response option for Black adults. Together with self-report questionnaire data, Lloyd et al. (2017) interpret these findings as evidence to suggest that the tendency for White participants to label Black targets as more truthful than White targets was influenced by their desire to appear unprejudiced toward Black people. In other words, White participants' initial judgment of Black targets is that they are lying, but this judgment is then overcome by subsequent processing involving the desire to act in non-prejudiced ways (Lloyd et al., 2017).

Though the findings obtained by Lloyd et al. (2017) suggest that adults demonstrate a truth bias based on race when judging the veracity of *adults'* statements, it is largely unknown whether a similar pattern occurs when judging the veracity of *children's* statements, since no study (to the best of our knowledge) had examined this question. However, recent work by O'Connor et al. (2023) sheds light on a related question. In their study, a sample of primarily (89%) White adults in the UK provided trait-honesty ratings of Black and White children based on a single photograph of the child and were found to explicitly rate Black children as more honest than White children. Similarly, the study found that adults rated children's (fictitious) testimony of physical abuse as more honest and were more likely to render a guilty verdict for the accused when the child alleging the abuse was Black (79%) compared to when the child alleging abuse was White (69%). These findings may initially suggest the existence of a stronger truth bias for Black children than for White children. However, as with Lloyd et al. (2017), the findings O'Connor et al. (2023) obtained using implicit measures of racial bias contradict this interpretation.

Using the Implicit Association Test (IAT; Nosek et al., 2007), O'Connor et al. (2023) found that adults were implicitly biased to associate White children more strongly with honesty compared to Black children, and that greater implicit racial bias predicted less trust in the child's testimony and a lower likelihood of convicting the accused of abusing the child. As O'Connor et al. (2023) argue, these results are concerning as they suggest that adults hold implicit biases regarding the honesty of children based on race and that these biases may affect how they appraise case details and render verdicts.

While the findings from both O'Connor et al. (2023) and Lloyd et al. (2017) offer important insights to the complex and potentially dangerous impact of race on veracity judgments, significant gaps in our understanding remain. Notably, O'Connor et al. (2023) examined children's statements in the context of being a victim of harm (physical abuse) but it is unknown whether these findings generalize to other contexts where deception may occur, such as when the child is the one accused of committing a wrongdoing. Given the potential implications in contexts such as the legal and educational systems (as discussed above), it is important to understand whether adults are biased in their veracity judgments of Black and White children denying misbehavior or misconduct.

1.3. The current study

The current study investigated potential racial bias in adults' veracity judgments using (fictitious) vignettes of an authority figure (i.e., teacher) interviewing a child (age 7) who denies having committed a misbehavior. A sample of Black and White adult participants reviewed the vignettes (two total) and provided two types of veracity judgments for each child: (1) a *categorical* truth-lie judgment (i.e., is the child lying or telling the truth?) and a (2) *continuous* deception rating (i.e., ratings of how honest or deceptive the child is being on a 10-point Likert scale). To determine whether adults perceive Black children as more or less deceptive than White children, the race of the child in each vignette was manipulated using a photo of either a Black or White (randomized within-subjects) girl or boy (randomized between-subjects).

We offer two competing hypotheses regarding the expected direction of racial bias in veracity judgments: Consistent with our earlier discussions of the prevalent stereotype that Black people are inherently criminal (Plous and Williams, 1995; Welch, 2007; March, 2022) and of prejudicial attitudes contributing to adults' perceptions of Black children as more mature and more responsible for their transgressions compared to White children (Bottoms et al., 2004), the first hypothesis is that Black children will be rated as *more deceptive* than White children. However, extant research also suggests that participants may be influenced by a desire to avoid appearing or acting prejudiced, leading them to inflate their positivity toward Black people (Crandall et al., 2002). As Lloyd et al. (2017) argues, *prejudice-related concerns* may lead individuals to avoid labeling Black people (relative to labeling White people) as liars. Therefore, the second, opposing hypothesis is that participants' prejudice-related concerns will lead to Black children being rated as *less deceptive* than their White counterparts.

Previous research has shown that the degree of one's intrinsic and extrinsic motivations to respond without prejudice are related to actual expressions of prejudice and racial bias (Plant and Devine, 1998; Devine et al., 2002; Butz and Plant, 2009; Lloyd et al., 2017). Thus, we examined whether participants' prejudice-related concerns influenced their veracity judgments using self-report measures of internal (personal) and external (normative) motivation to respond in

non-prejudiced ways (Plant and Devine, 1998). We also investigated whether prejudice-related concerns may have differentially influenced Black and White participants' veracity judgments of children's statements. For example, White adults may show a stronger truth bias when judging Black children, perhaps in part due to an increased saliency of social norms regarding avoiding racial prejudice against Black people (Plant and Devine, 1998; Crandall et al., 2002; Bergsieker et al., 2010; Kunstman et al., 2013; Mendes and Koslov, 2013; Rozmann and Nahari, 2021). On the other hand, factors such as ingroup favoritism (Turner et al., 1979; Tajfel, 1982) may result in Black people showing a stronger truth bias toward Black children. We begin to address the potential role of the race of the child in question, the race of the adult making the veracity judgment, and the adult's prejudice-related concerns in the current study.

2. Materials and methods

2.1. Participants

Sample size was determined by *a priori* power analyses to detect a small effect (0.12), with power set at 0.85 and $\alpha = 0.05$, conducted in G*Power 3.1.9 (Faul et al., 2009). Based on power analyses of the mixed model analysis of variance (ANOVA) and hierarchical linear and logistic regressions needed, it was determined that 592 participants would be needed to detect a small effect (chosen based on Lloyd et al., 2017). Including a buffer for participants who fail attention checks, we sought to recruit 600 participants for this study using Prolific, an online crowdsourcing research platform. A total of 609 Black and White jury-eligible United States citizens (aged 18+, no felonies, English fluent) participated. Data was removed from participants who stated they had felony convictions, failed attention checks, took less than 2 min to complete the study, or provided the same score on every item of every measure (suggesting they erroneously selected responses). A total of 16 participants were excluded from the study based on these criteria, resulting in a final sample of 593 participants (50% Black, 50% White) ranging from 18 to 79 years of age ($M_{age} = 35.89$, $SD = 13.13$). Roughly half (49%) of participants were male, 49% female, and less than 2% ($n = 11$) identified as nonbinary or genderfluid. Participants resided in a variety of geographical regions across the United States. Based on the geographic regions identified by the United States Census Bureau (2021), 48% of participants were from the South, 21% from the Midwest, 16% from the Northeast, and 15% from the West.

2.2. Procedure

This study was reviewed and approved by the University of Regina Research Ethics Board. Participants accessed the study through Prolific, which then redirected them to Qualtrics, where they provided written informed consent and completed the study procedures. Participants were told that the purpose of the study was to explore adults' accuracy when judging the reports of children. To reduce the potential for demand characteristics having an influence on their responses, participants were not informed of the racial bias component of the study goals until after they had completed the study (during debriefing).

Participants were first asked to provide basic demographic information. Next, they completed a veracity judgment task and answered questionnaires regarding their "personal beliefs" (i.e., their motivation to respond without prejudice). The order of tasks was counterbalanced so that half of participants completed the veracity judgment task *before* the questionnaires, while the other half did the veracity judgment task *after* the questionnaires. This was done to reduce the potential for demand characteristics and priming effects that may arise due to task order. At the end of the study, participants were fully debriefed on the purpose and goals of the study.

2.3. Veracity judgment task

During the veracity judgment task, participants were asked to review two fictitious vignettes, each outlining a scenario where a teacher suspects a 7-year-old of committing a wrongdoing in school (cheating on a spelling test or damaging a laptop). In each scenario, the teacher has reasons to suspect that the child is guilty of the transgression, but the evidence is unclear. When the teacher asks the child about it, the child denies the misbehavior. The vignette was intentionally written so that it is unclear whether the child committed the misdeed and is lying about having done so, or whether the child is innocent and is being truthful in their denial of the wrongdoing. The race of the child in each story was experimentally manipulated by presenting a photo of either a Black child or a White child (artificially created using Generated Photos, n.d.) alongside each vignette. The child's name in the vignette was also changed to one that is stereotypically associated with the targeted race and therefore may increase the saliency of the child's race.

To maximize the statistical power of race-related hypotheses tests, the race of the child was experimentally manipulated within-subjects, whereas the gender of the child was manipulated between-subjects. Participants were therefore randomly assigned to review and provide veracity judgments for one Black boy and one White boy, or one Black girl and one White girl. The order in which participants reviewed each vignette was counterbalanced and evenly distributed among White and Black participants.

After reviewing each vignette, participants gave two types of veracity judgments for each child. First, participants provided a *categorical* veracity judgment by indicating whether they believed the child in the story was lying (and therefore committed the misdeed) or telling the truth (and was innocent). Participants were not given the option to skip this question or indicate that they were "unsure" and did not know whether the child was being honest or deceptive. This was intentional, as we wanted to mimic real-world contexts where adults are forced to make veracity judgments regarding children's statements in the face of ambiguous or unclear evidence. However, the use of a binary outcome measure has its limitations due to decreased variability in potential responses. Furthermore, the nature of the vignettes is such that the child is given multiple opportunities to either lie or tell the truth when speaking with the teacher. To overcome these limitations, participants also rated how honest or deceptive the child was on a 10-point Likert scale, from *not at all deceptive* (1) to *very deceptive* (10).

2.4. Motivation to respond without prejudice

The Internal and External Motivation to Respond Without Prejudice scales (Plant and Devine, 1998) were used to measure participants' personal (internal) and normative (external) motivations to respond without prejudice. As described by Devine and colleagues, "internal motivation to respond without prejudice arises from internalized, personally important nonprejudiced beliefs (i.e., the self sets the standard against which one's prejudice-relevant responses are evaluated)." In contrast, "external motivation to respond without prejudice derives from a desire to avoid negative reactions from others if one were to respond with prejudice (i.e., others impose the standard against which one's prejudice-relevant responses are evaluated)" (Devine et al., 2002, p. 836).

The internal motivation scale (IMS) contains 5 items, such as "*I attempt to act in non-prejudiced ways toward Black people because it is personally important to me*." The external motivation scale (EMS) also contains 5 items, such as "*because of today's politically correct standards I try to appear non-prejudiced toward Black people*." Participants responded to each item using a 9-point Likert scale, ranging from-4 (*strongly disagree*) to +4 (*strongly agree*). Responses were then averaged to create two distinct, but related, measures of participants' motivation to appear unprejudiced (Plant and Devine, 1998). The EMS and IMS subscales achieved high internal consistency within this study ($\alpha = 0.88$ and $\alpha = 0.85$, respectively).

3. Results

We first used the McNemar test of paired-samples proportions and one-sample chi-square tests to examine whether adults demonstrate a racial bias in their categorical truth-lie judgments of children's statements. Next, we conducted a mixed model analysis of variance (ANOVA) to determine whether adults' continuous deception ratings differ based on their own race, the race of the child in the vignettes, or both. Lastly, we used hierarchical logistic and linear regression analyses to examine whether participants' prejudice-related concerns (i.e., internal and external motivations to not appear prejudiced) are related to their veracity judgments of Black children. Initial analyses indicated no significant effects of the order in which participants completed the veracity judgment task (before or after completing the questionnaires) or the order in which they viewed each child in the vignettes (Black child or White child first). Order variables were therefore removed from analyses and the more parsimonious results are presented here.

3.1. Effects of the child's race on veracity judgments

Of primary interest was whether adults demonstrate a racial bias when judging the veracity of Black and White children's statements. We examined participants' *categorical* truth-lie judgments (i.e., is the child lying or telling the truth?) and (2) *continuous* deception ratings (i.e., ratings of how deceptive the child is being on a 10-point Likert scale) separately to investigate this question.

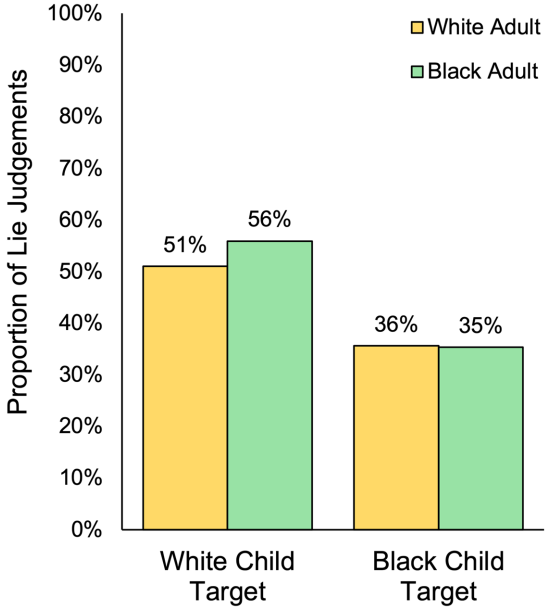

FIGURE 1
Differences in categorical truth-lie judgments based on the race of the child target and the race of the adult perceiver.

3.1.1. Categorical truth-lie judgments

A McNemar's test with continuity correction was conducted separately for Black participants and White participants to determine if there was a difference in the proportion of truth and lie judgments based on the race of the child. As shown in Figure 1, results revealed that, among White participants, the proportion of lie judgments was significantly greater for White children (51% labelled as lying) compared to Black children (36% labelled as lying), $\chi^2 = 14.89$, $p < 0.001$, mean difference in proportions = 0.15 (95% CI [0.08, 0.23]). Similarly, Black participants also gave more lie judgments to White children (56% labelled as lying) compared to Black children (35% labelled as lying), $\chi^2 = 27.07$, $p < 0.001$, mean difference in proportions = 0.21 (95% CI [0.13, 0.28]). An examination of confidence intervals indicates that the proportion of the difference in lie judgments given to White children compared to Black children did not significantly differ based on the race of the participant, $p > 0.05$. In other words, White participants and Black participants demonstrated similar levels of bias in categorical truth-lie judgments based on the child's race (Figure 1).

Follow-up one-sample chi-square tests indicated that the categorical veracity judgments of White children did not significantly differ from chance (50%), indicating that – regardless of their own race – participants were no more likely to label White children as lying (54%) as they were to label them as telling the truth (46%), χ^2 (1, $N = 593$) = 2.84, $p = 0.092$. In contrast, they were significantly less likely to label Black children as lying (36%) and more likely to label them as telling the truth (64%), χ^2 (1, $N = 593$) = 49.81, $p < 0.001$. Taken together, these findings suggest that Black adults and White adults exhibit a truth bias in their categorical truth-lie judgments of Black children, but they show no such bias toward White children.

3.1.2. Continuous deception ratings

Utilizing participant's continuous deception ratings (higher scores = more deceptive) as the dependent variable, we conducted a 2 (participant race) × 2 (child race) mixed model analysis of variance (ANOVA) to determine whether continuous veracity judgments differ based on the race of the participant (between-subjects) or the race of the child (within-subjects) in the vignettes.

Consistent with our findings obtained using the categorical truth-lie judgments, results revealed a significant main effect of the child's race on continuous deception ratings, such that White children ($M = 5.23$, $SD = 2.52$, 95% CI [5.03, 5.44]) were rated as more deceptive than Black children ($M = 4.16$, $SD = 2.39$, 95% CI [3.97, 4.36]) by an average of 1.07 points (95% CI of the difference [0.81, 1.33]), $F(1, 591) = 65.28$, $p < 0.001$, $\eta_p^2 = 0.099$. Neither the main effect of participant race, $F(1, 591) = 0.73$, $p = 0.394$, $\eta_p^2 = 0.001$, nor the interaction between participant race and child race, $F(1, 591) = 0.71$, $p = 0.399$, $\eta_p^2 = 0.001$, were significant (Figure 2). Thus, just as with categorical truth-lie judgments, both Black adults and White adults gave Black children lower deception ratings compared to White children.

3.2. Prejudice-related concerns and veracity judgments of Black children

We next examined how prejudice-related concerns may have differentially influenced Black and White participants' judgments of whether the child in the vignette was telling the truth or a lie. If, as we hypothesized, the observed truth bias toward Black children was driven at least in part by prejudice-related concerns, then the magnitude of this bias should be predicted by individual differences in participants' internal and external motivation to not appear prejudiced (i.e., their IMS and EMS scores). In line with Lloyd et al. (2017), we regressed the deception ratings for Black children on participant race (coded as 0 = White and 1 = Black), IMS score, EMS score, the interaction terms of EMS × participant race and IMS × participant race, and we entered participants' deception ratings for the White children as a covariate to control for individual differences in participants' overall willingness to believe a child is lying versus being truthful. We conducted separate hierarchical regressions for each of the types of veracity judgments obtained: a logistic regression was used to examine the categorical truth-lie judgments (Table 1) and a linear regression was used to analyze the continuous deception ratings (Table 2). The order of variable entry was identical across analyses: we entered the covariate alone on the first step, all main effects on the second step, and the interactions on the third step.

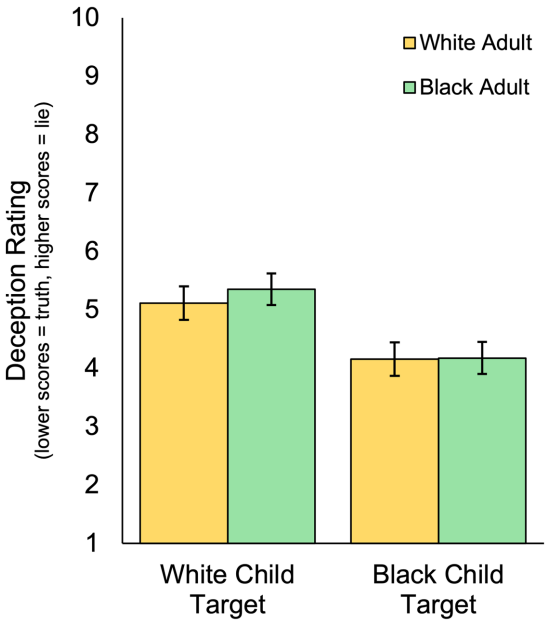

FIGURE 2
Differences in average continuous deception ratings as a function of the race of the child target and the race of the adult perceiver. Error bars represent 95% confidence intervals.

In both cases, the overall model significantly predicted 5% of the variance in adults' deception ratings of Black children. The results obtained from the hierarchical logistic (Table 1) and hierarchical linear (Table 2) regressions diverged from one another in terms of which individual steps in the model significantly contributed to the model over and above the contributions of prior steps (the logistic regression found only step 1 to be independently significant, whereas the linear regression found steps 1 and 2 to be independently significant). However, the results of the final overall models were largely consistent regardless of the type of veracity judgment examined (categorical or continuous) and are thus discussed jointly.

The following results were obtained from both sets of analyses unless otherwise explicitly stated. Participants' veracity judgments of White children significantly predicted their veracity judgments of Black children. The positive direction of the coefficients in the models indicates that participants who rated White children as telling a lie and gave higher deception ratings for White children also did so for the Black children (see Tables 1, 2).

Participants' IMS scores, but not EMS scores, were found to be significant predictors of adults' veracity judgments of Black children. However, these main effects must be interpreted in conjunction with the two interaction terms examined: IMS × participant race and EMS × participant race. Across analyses, neither the main effect of EMS scores nor the interaction of EMS × participant race was found to be significant (all $ps > 0.05$; see Tables 1, 2). Thus, it appears that for both White adults and Black adults, their degree of external motivation to respond without prejudice is not significantly related to their veracity judgments (categorical or continuous) of Black children. In contrast, a significant IMS × participant race interaction term was observed, indicating that the relation between IMS and veracity judgments of Black children depends on the race of the adult participant. Simple slopes analysis revealed that there was a statistically significant negative relationship between IMS scores and veracity judgments among White adults ($ps < 0.01$), but not Black adults ($ps > 0.05$). Regarding categorical truth-lie judgments (Table 1), an odds ratio of 0.51 suggests that for every 1-point increase in IMS scores, White participants are nearly half as likely to judge a Black child as telling a lie (Figure 3). Similarly, increases in White participants' internal motivation to respond without prejudice are associated with significantly lower deception ratings of Black children (Table 2).

Examining the predicted veracity judgments generated by the logistic and linear regression models (Figures 3, 4, respectively)

TABLE 1 Hierarchical logistic regression results for prejudice-related concerns predicting categorical truth-lie judgments (0=truth, 1=lie).

	χ^2	R^2	ΔR^2	*B*	*SE B*	Wald	Odds ratio	95% CI for odds ratio
Model 1	7.36**	0.02	0.02					
Constant				−0.37**	0.12	9.94	0.69	
Deception rating: white child				−0.48**	0.18	7.27	0.62	[0.44, 0.88]
Model 2	6.64	0.03	0.02					
Constant				−0.01	0.20	<0.01	0.99	
Deception rating: white child				−0.48**	0.18	7.27	0.62	[0.44, 0.88]
Participant race				−0.07	0.18	0.14	0.93	[0.66, 1.33]
IMS				−0.15*	0.06	6.56	0.86	[0.77, 0.97]
EMS				<0.01	0.05	<0.01	1.00	[0.91, 1.10]
Model 3	5.73	0.05	0.01					
Constant				0.35	0.26	1.83	1.42	
Deception rating: white child				−0.50**	0.18	7.65	0.61	[0.43, 0.87]
Participant race				−0.67*	0.32	4.32	0.51	[0.27, 0.96]
IMS				−0.31**	0.09	11.39	0.74	[0.62, 0.88]
EMS				<−0.01	0.07	<0.01	1.00	[0.86, 1.15]
Participant race × IMS				0.28*	0.12	5.56	1.33	[1.05, 1.68]
Participant race × EMS				<0.01	0.10	<0.01	1.00	[0.83, 1.22]
Overall model	19.72**	0.05						

Black participants serve as the reference group for all steps: Participant Race coded as White = 0, Black = 1. IMS = internal motivation to respond without prejudice score; EMS = external motivation to respond without prejudice score; CI = confidence interval. *$p < 0.05$, **$p < 0.01$.

reveals that White adults who score in the mid to high range of internal motivation to respond without prejudice and Black participants of any IMS or EMS score all seem to exhibit a truth bias in their veracity judgments of Black children (below 50% probability of a lie judgment in Figure 3 and below the deception rating midrange of 5–6 in Figure 4). In contrast, White adults who score very low in internal motivation to respond without prejudice do not show such bias.

4. Discussion

The current study examined whether adults exhibit racial bias in their veracity judgments of children's reports. Our key goals were to determine if adults' judgments of whether children are being deceptive about a suspected misbehavior at school differ based on the race of the child (Black or White), the race of the adult perceiver (Black or White), and the perceiver's motivations to appear unprejudiced. Our findings revealed that systematic race-based biases occur in adults' veracity judgments of children's statements, along with evidence to suggest that such biases are related to the perceiver's prejudice-related concerns.

4.1. Race differences in truth bias

In the current study, White children were more likely to be categorically labelled a liar (versus a truth-teller) compared to Black children. This finding is consistent with the race-based biases Lloyd et al. (2017) reported to occur when adults made veracity judgments of other adults. We also found that participants' categorical veracity judgments of White children did not significantly differ from chance – meaning that participants were no more likely to label White children as lying (54%) as they were to label them as telling the truth (46%). In contrast, participants were significantly less likely to label Black children as lying (36%) and more likely to label them as telling the truth (64%). The same pattern emerged when examining the continuous measure of veracity judgments: Similar to O'Connor et al. (2023), who showed that White adults explicitly rate Black children as being higher in trait-honesty than White children, we found that participants of both racial groups (Black adults and White adults) gave lower deception ratings to Black children compared to White children, indicating that Black children were perceived as being more honest in their denials of wrongdoing compared to White children. Taken together, our findings suggest that adults exhibit a truth bias in their veracity judgments of Black children, but not White children. There are several ways this finding may be interpreted.

One possible interpretation could be due to the stimuli used in the current study: Perhaps the vignettes performed as intended and created an ambiguous situation where it was unclear whether the child committed the misbehavior that they were accused of – resulting in random guessing and chance-level responding across participants. From this perspective, when adults were trying to assess whether a White child was being honest or deceptive, it could be that they felt like they did not have enough information to make a clear veracity judgment one way or the other but they were forced to make such a judgment because no neutral response option was provided

TABLE 2 Hierarchical linear regression results for prejudice-related concerns predicting continuous deception scores.

	R^2	ΔR^2	*B*	95% CI for *B*	*SE B*	β
Model 1	0.02	0.02***				
Constant			3.47***	[3.02, 3.92]	0.23	
Deception rating: white child			0.14***	[0.06, 0.22]	0.04	0.15
Model 2	0.04	0.02*				
Constant			3.98***	[3.40, 4.56]	0.30	
Deception rating: white child			0.13**	[0.06, 0.21]	0.04	0.14
Participant race			−0.02	[−0.42, 0.37]	0.20	−0.01
IMS			−0.20**	[−0.32, −0.07]	0.07	−0.12
EMS			0.04	[−0.07, 0.15]	0.06	0.03
Model 3	0.05	0.01				
Constant			4.36***	[3.69, 5.03]	0.34	
Deception rating: white child			0.13**	[0.05, 0.21]	0.04	0.14
Participant race			−0.66	[−1.37, 0.05]	0.36	−0.14
IMS			−0.36***	[−0.55, −0.17]	0.10	−0.23
EMS			0.03	[−0.13, 0.19]	0.08	0.02
Participant race × IMS			0.29*	[0.04, 0.55]	0.13	0.19
Participant race × EMS			0.02	[−0.20, 0.23]	0.11	0.01
Overall model	$F = 4.53$***					

Black participants serve as the reference group for all steps: Participant Race coded as White = 0, Black = 1. IMS = internal motivation to respond without prejudice score; EMS = external motivation to respond without prejudice score; CI = confidence interval. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

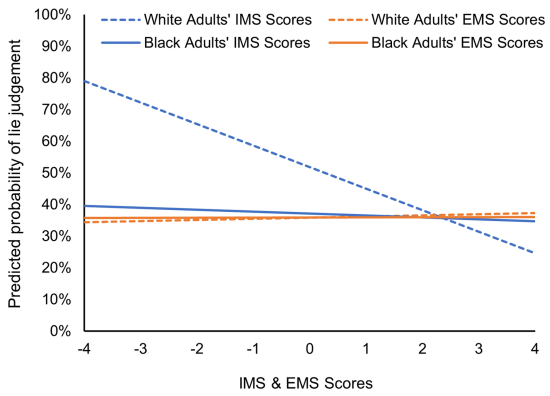

FIGURE 3
Predicted probability of a lie (versus truth) response given to Black children as a function of the race of the adult perceiver and their internal (IMS scores) and external (EMS scores) motivation to respond without prejudice. Results are based on the final logistic regression model (Table 1) conducted on adults' categorical truth-lie judgments of Black children after controlling for their truth-lie judgments for White targets.

(e.g., "*I do not know*" or "*unsure*"). However, additional research is needed to properly assess this hypothesis. Moreover, though this may explain why adults were just as likely to label a White child as telling the truth versus telling a lie, their veracity judgments of Black children tell a different story: In both their categorical veracity judgments and continuous deception ratings of Black children, participants showed a clear bias toward believing that Black children were telling the truth and were being more honest than they were being deceptive. The fact that the truth bias was observed with Black children, but not White children, suggests that knowledge of the child's race – specifically that they are Black – was enough information for participants to tip the metaphorical scales toward reporting that they believed the child was telling the truth instead of a lie. While this may be interpreted as an unfair advantage granted to Black children but not White children, recall that the truth bias is a well-documented phenomenon (e.g., Strömwall and Granhag, 2005; Talwar et al., 2006, 2015; Evans et al., 2016; Gongola et al., 2017; Saykaly et al., 2017) and past studies have found that the responses that adults give to children are indeed truth-biased. This is best reflected in the current study by the responses that adults made of Black children. From this perspective, what appears counter-normative is not how people responded to Black children, but the absence of a truth bias observed when rating White children.

One potential explanation for why adults demonstrated a truth bias for Black children but not White children could concern the harmful Black criminality stereotype, which falsely contends that Black people are inherently criminal (Plous and Williams, 1995; Welch, 2007; Levinson et al., 2010; Goff et al., 2014; Todd et al., 2016; March, 2022). It could be that White and Black participants are aware of the Black criminality stereotype and attempt to combat its harmful effects by underestimating their perceptions of dishonesty (or inflating their perceptions of honesty) regarding Black children. Additional research is needed to elucidate whether adults' veracity judgments are indeed a product of their desire to combat the anti-Black criminality stereotype and if so, determine whether they are consciously aware of this source of bias in their veracity judgments or if it occurs on a conscious or subconscious level. Although examining knowledge and beliefs regarding the anti-Black criminality stereotype was not a goal of the current study, we did examine whether prejudice-related

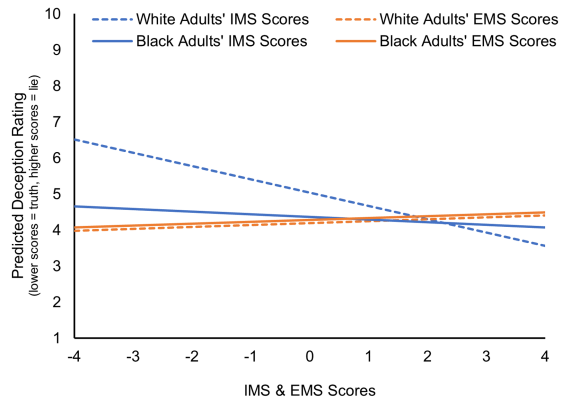

FIGURE 4
Predicted deception ratings given to Black children as a function of the race of the adult perceiver and their internal (IMS scores) and external (EMS scores) motivation to respond without prejudice. Results are based on the final linear regression model (Table 2) conducted on adults' continuous deception ratings of Black children after controlling for their deception ratings for White targets.

concerns may have differentially influenced Black and White participants' veracity judgments of children's statements.

4.2. Prejudice-related concerns

In findings consistent with the prejudice-related concerns hypothesis, the observed truth bias toward Black children was moderated by individual differences in whether participants were motivated to respond without prejudice and whether those motivations stem from external or internal sources. We found that, regardless of their own race, participants' level of external motivation to respond without prejudice was not a significant factor in their judgments of the deceptiveness of Black children. This suggests that participants seemed unconcerned about whether their veracity judgments of Black children would be perceived as prejudiced. This effect is unsurprising given that participants completed this study online and were anonymous. It is possible that we would have observed a significant effect of externally motivated prejudice-related concerns if participants completed the study in-person in the presence of a research assistant or other participants (Maeder et al., 2018).

On the other hand, for White adults only, participants' *internally* motivated prejudice-related concerns were significantly negatively related to their deception ratings of Black children. That is, White adults with greater internal motivation to respond without prejudice rated Black children as less deceptive (more honest) compared to participants with lower internal motivations, suggesting that the truth bias White adults exhibit toward Black children may be driven (at least in part) by participants' inner desires to respond without prejudice. This finding is consistent with those obtained by Lloyd et al. (2017) regarding the veracity judgments that adults give to other adults. However, it is also important to recognize once again that such a truth bias in veracity judgments of children's statements is generally normative (e.g., Strömwall and Granhag, 2005; Talwar et al., 2006, 2015; Evans et al., 2016; Gongola et al., 2017; Saykaly et al., 2017). Notably, only very low levels of internal motivation to respond without prejudice among White adults were associated with neutral, chance-level veracity judgments. In contrast, all other patterns – internal motivation scores in the mid to high range of among White participants and Black participants of any internal or external motivation scores – were associated with a truth bias in their veracity judgments of Black children.

Caution is warranted regarding interpreting the relation (or lack thereof) between Black participants' internal and external motivation to respond without prejudice scores and their veracity judgments of Black children. Black participants responded to the motivation to respond without prejudice measures as in-group members. Thus, the responses of a White participant (a potential actor of prejudice) may be qualitatively distinct from those of a Black participant (a potential victim of prejudice). Although Black adults may still demonstrate a prejudice toward other Black people (David et al., 2019), it is possible that the IMS/EMS scales may be capturing different motivations or desires to respond without prejudice for these participants. It would be beneficial for future research to qualitatively assess this possibility.

4.3. Limitations and future directions

A potential limitation of this study is the use of vignettes instead of, for example, video footage of children denying having committed a misbehavior or participants witnessing a live mock trial. Although, O'Connor et al. (2023) deployed a similar methodology to the current study, where participants rated the honesty of Black and White children after reading vignettes describing a legal scenario, it remains possible that the vignettes may not have triggered the same biases that would otherwise emerge in the real-world. However, while responses to vignettes may be imperfect guides to actual behavior (Malloy et al., 2014), they are commonly used in deception research (e.g., Redlich G. et al., 2008; Popliger et al., 2011; Zanette et al., 2020; O'Connor et al., 2023) because they allow researchers to systematically test the effects of key variables of interest and may help circumvent challenges associated with socially desirable responding. It will be important for future work in this area to assess the relation between the race of the child and adult's veracity judgments both in the field and in the laboratory (Malloy et al., 2014).

The current evidence suggests that adults are more likely to perceive Black children as being less deceptive (more honest) than White children and that concerns regarding acting in non-prejudiced ways may contribute to a truth bias toward Black children but not White children, at least when it comes to elementary-aged children's simple denials of minor transgressions in a school setting. However, it is important to note that this finding is inconsistent with many inequalities present in the real-world that place Black children at a disadvantage compared to White children in educational and legal contexts. For example, Black elementary school students have been shown to be more likely to experience disciplinary practices from their teachers (Wymer et al., 2022) and receive more severe disciplinary actions, such as school suspensions and expulsions (McFadden et al., 1992; Rocque and Paternoster, 2011) compared to White children. The current study's findings that Black children are perceived to be more truthful than White children may therefore be due to limitations regarding the external validity of our study design, including potential issues with socially desirable responding.

Another factor to consider is that participants were aware that their veracity judgments were given for research purposes and therefore did not directly impact children in the real world. Moreover, the design of the current study meant that there were only two trials per participant. As highlighted by Levine et al. (2022), there may be idiosyncrasies due to the small number of trials and the stimuli developed for this study. As such, additional research with a greater number of trials is needed to increase the external validity of the study design and gain a more accurate account of how participants would conduct their veracity judgments in real-world situations. It remains possible that differences in adults' perceptions of how honest or dishonest Black children are compared to White children may indirectly contribute (at least in part) to many of the social inequalities that Black children face, but additional research is needed to achieve a better understanding of this possibility, including studies involving contexts where the consequences of incorrect veracity judgments are more severe. For example, Black children are particularly vulnerable in legal situations (as victims, suspects, or witnesses), where they may be susceptible to being kept in an unsafe environment (e.g., due to false denials of abuse) or being wrongfully convicted of a crime (e.g., due to false allegations or false confessions). For these reasons, it is especially important to identify factors that influence adults' ability to make unbiased veracity judgments. Although this study investigates racial bias in veracity judgments within relatively low-stakes contexts compared to those that take place in a legal setting, it provides a foundation for future research to investigate veracity judgments of children's reports in a variety of contexts.

5. Conclusion

To the best of our knowledge, this study is the first to identify systematic differences in adults' veracity judgments of children's simple denials of minor transgressions based on the race of both the child and the adult perceiver. Adult participants from both racial groups exhibited a truth bias in their veracity judgments of Black children, but not when evaluating the deceptiveness of White children. Consistent with the prejudice-related concerns hypothesis, the observed truth bias toward Black children was moderated by individual differences in participants' desire to respond without prejudice, providing the first evidence of racial bias and prejudice-related concerns as potential barriers to making veracity judgments of children's denials of a misdeed.

Data availability statement

The original contributions presented in the study can be accessed at https://doi.org/10.17605/OSF.IO/983GB. Further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the University of Regina Research Ethics Board. The patients/participants provided their written informed consent to participate in this study.

Author contributions

SZ conceived the idea, secured funding, performed statistical analyses, and wrote the initial manuscript, with significant contributions by SH. SZ, SH, and LM contributed to the design of the study. SH collected the data. All authors contributed to revisions and interpretations.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Cultural differences in the efficacy of unexpected questions, sketching, and timeline methods in eliciting cues to deception

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Asking unexpected questions, asking the interviewee to sketch the room, and asking the interviewee to make a timeline are techniques that have been shown to help an interviewer detect deceit. However, evidence of the efficacy of these techniques comes from studies of North American and North-West European participants, who are on average more individualistic (i.e., value individual achievements and uniqueness over group achievements) than people from other parts of the world. In two experiments involving participants with individualistic and collectivistic cultural backgrounds, we provide a more culturally diverse test of these techniques. Specifically, this study describes two experiments that investigated these interviewing techniques with people who are recent migrants to the UK. Experiment 1 used the LIWC categories "I," "we," "cognitive processes," and "social processes" as the dependent variables; Experiment 2 measured details provided in a sketch and a timeline. The results show no effects of veracity in either of these experiments, although various effects of cultural differences in the outcome variables were observed. This suggests that cues to deception may not necessarily generalize to people from different cultural backgrounds. These results highlight the importance of conducting lie detection research across different countries and cultures.

KEYWORDS

deception, cultural differences, individualism and collectivism, deception cues, LIWC

Introduction

The amount of information an interviewee reports, particularly when operationalized as the number of details provided, has been shown to be a cue to deception (DePaulo et al., 2003). However, this cue is often weak: The effect size is small and can be highly dependent on context (Luke, 2019). In response to this concern, researchers have developed techniques that elicit more and/or different details from interviewees. The increase in information is valuable in its own right in applied contexts, such as police interviews (Memon et al., 2010), and it can also increase the difference between truth-tellers and liars in the amount and type of information they provide, thus improving discrimination (Vrij and Granhag, 2012).

Asking unexpected questions has been shown to increase the capacity to identify deception about past events (Vrij et al., 2009; Lancaster et al., 2013) and future intentions (Warmelink et al., 2012, 2013; Sooniste et al., 2013). This may be because liars prepare "cover stories" by anticipating what an interviewer might ask (Clemens et al., 2013); thus, asking unexpected questions forces liars to create spontaneous lies.

Coming up with a spontaneous lie that is credible and/or plausible likely generates additional mental load for the liar. By contrast, truth-tellers can rely on their memory to answer both expected and unexpected questions, so they are not negatively impacted by unexpected questions. Similarly, making sketches during the interview can help interviewees provide more details in two ways: They can provide details in the sketch itself (Vrij et al., 2010), or the act of producing the sketch may help them remember and verbally report more details (Deeb et al., 2021). In both cases, truth-tellers typically provide more detail than liars, and so the relative absence of details is a cue to deception. Finally, timelines are similar to sketches: Interviewees are asked to provide their accounts using a physical timeline to link events, people, and actions. In the context of truthful witnesses, the timeline technique helps interviewees provide more information (cf. control interviews; Hope et al., 2013, 2013). The technique has also been used with pairs of truthful or deceptive participants (Jundi et al., 2013). They found that truth-telling pairs asked each other more questions whilst building the timeline and that pairs could be accurately classified as truthful (71% correct) or deceptive (87% correct) based on the timeline task.

One major limitation of the deception literature is that the majority of research has been conducted in the US and the UK: 39% of deception studies originate from the US and 11% from the UK, whilst almost 7% of deception studies emerged from Canadian labs (Dineault et al., 2022). This regional profile is particularly concerning as research has shown that cues to deception differ between populations from different countries (Taylor et al., 2014; Leal et al., 2018). For example, in Leal et al. (2018), although truth-tellers provided more details than liars across all cultural groups in the study, British participants provided more visual, spatial, and action details than Arab and Chinese participants. Similarly, Taylor et al. (2014) found that white British truth-tellers provide more contextual details compared to white British liars, whilst Pakistani liars tended to provide more such details compared to Pakistani truth-tellers, inverting the cue to deception. Vrij and Vrij (2020) also found that Russian, Hispanic, and Korean samples differed in the cues to deception they provided: For Korean and Hispanic samples, the total number of details provided was a cue to deception (with a small effect size), whilst for a Russian sample, detail level was not a cue to deception. Tabata and Vrij (2023) research investigated the use of verbal strategies in a sample of Japanese adults. They found that, although several reported deception strategies in this sample matched strategies reported in the literature by participants from Western countries, there were also strategies reported by Japanese participants that did not occur in the Western samples in the literature. These differences in culture between populations from different countries may be a consequence of differences between these populations.

There are several distinct types of cultural differences between populations in different countries. Hofstede and Bond (1984) identified four: individualism–collectivism; power distance; uncertainty avoidance; and masculinity-femininity. Despite its complexity, individualism–collectivism is one of the most commonly used methods to compare cultures, and its relationship with a very wide range of behaviors has been studied (Fiske, 2002). Despite its commonness in the literature, or perhaps because of that commonness, there have been critiques of the value of individualism–collectivism amongst researchers (Hope et al., 2022). Individualism–collectivism is intended to measure the extent to which a culture values the individual over the in-group members or vice versa. Individualist cultures value concerns for individuals themselves and their immediate family, whilst in collectivist cultures, the in-group is more important, and members are expected to value and support the group as a whole (Hofstede and Bond, 1984). Individualism is associated with Western countries (such as the US and the UK), whilst collectivism is associated with Eastern and Southern cultures (e.g., China, Burkina Faso). However, this association between countries and individualism–collectivism creates a mismatch between individualism/collectivism at the level of countries and individualism–collectivism at the level of the individual (Hope et al., 2022). Even if we accept that there are differences in average (and see Oyserman et al., 2002 for some indication that these differences are smaller than expected), how do those differences translate to individuals or to individuals in varying contexts?

Despite this, differences in individualism–collectivism are associated with a wide range of behaviors and cognitions (Fiske, 2002), including communication styles, self-construal, and values (Gudykunst et al., 1996). Individualism–collectivism is not a single axis of differences: Individualism and collectivism can be expressed in a variety of ways. One of the most studied dimensions within individualism–collectivism is the extent to which a culture focusses on horizontal or vertical relationships, i.e., the extent to which a culture is hierarchical (Triandis and Gelfand, 1998). Whereas people with a greater horizontal individualistic focus emphasize the importance of being unique, someone with a more vertical individualistic focus will emphasize being the best. Similarly, horizontal collectivists tend to focus on the homogeneity and interdependence of the in-group, whilst vertical collectivists tend to emphasize sacrifice for the group and competition by the group against out-groups (Triandis and Gelfand, 1998). Taylor et al. (2014) suggest that differences in cues to deception between populations from different countries may be explained by cultural differences in individualism–collectivism because individualism–collectivism affects self-construal. Self-construal is the way in which people cognitively, emotionally, and behaviorally relate themselves to (and separate themselves from) others, and it is affected by cultural differences (Singelis and Sharkey, 1995). Taylor et al. (2017) showed that participants from collectivist cultures differed significantly from participants from individualistic cultures in how they changed their pronoun use when lying compared to when they were telling the truth. Where participants from a more collectivistic culture used first-person pronouns more in lies and third-person pronouns less in lies (compared to truths), participants from individualistic cultures used first-person pronouns less in lies and third-person pronouns more in lies (compared to truths). Taylor et al. (2017) suggest that this may be strategic: People from collectivistic cultures maybe attempting to disassociate in-group members from their lies to protect them, whilst people from individualistic cultures are more focused on disassociating themselves from their lie.

Other cultural dimensions likely also affect cultural differences in deception behaviors. For example, Leal et al. (2018) studied UK, Arab, and Chinese populations because these cultures

differ in whether they are low communication context or high communication context cultures. People from high-context cultures rely more heavily on the context surrounding communication (e.g., background knowledge and body language) than people from low-context cultures, who tend to put more information in the communication itself. Tabata and Vrij focused on a Japanese sample, as Japan is a high-context culture, in contrast to the countries that have been extensively studied in deception research. However, differences between low and high-context cultures are linked to differences in individualism–collectivism (Gudykunst et al., 1996), which leads to the possibility that the differences in deception behavior between people from different cultures could be due to either dimension.

In the current study, the focus is on individualism–collectivism including its vertical and horizontal aspects because individualism–collectivism is one of the primary measures of cultural differences, and data on how it affects the cues to deception under investigation are available in the scientific literature. However, much of the available literature focusses on individualism–collectivism only; less information is available with regard to sub-divisions of individualism–collectivism.

In the current study, we report two experiments in which the effects of horizontal and vertical individualism and collectivism on cues to deception were investigated. The first experiment investigated these effects in interviews with expected and unexpected questions, whilst the second experiment examined these effects in interviews that included a sketch and a timeline. Both experiments recruited participants with diverse cultural backgrounds who were currently living in the UK.

Experiment 1

In Experiment 1, participants with individualist and collectivist cultural backgrounds were asked to either lie or tell the truth about a future intention in the context of an interpersonal interview. All participants spoke English as a second language and were interviewed in English by British interviewers. A population consisting of non-native speakers was selected because being a non-native speaker affects lie detection. Specifically, non-native speakers report a lower ability than native speakers to control cues for deception (Cheng and Broadhurst, 2005). Observers of non-native speakers tend to show a lie bias (a tendency to report that the person is lying even when they are telling the truth), which is not present when observing native speakers. This may be due to stereotypes surrounding non-native accents (Wylie et al., 2022). Therefore, recruiting a mix of native and non-native speakers would have added a confounding variable (see Discussion).

To measure participants' individual cultural values (rather than relying solely on country-level data on cultural values), participants completed the Culture Orientation Scale (COS; Triandis and Gelfand, 1998). To ensure that the interview covered a broad range of questions, participants were questioned using expected and unexpected questions designed in a pilot study to be relevant to their cultural background (see Method).

In this experiment, we focused on three categories of Linguistics Inquiry and Word Count (LIWC) as cues to deception. LIWC is a piece of language analysis software that has been used in the field of deception for several decades (see, e.g., Newman et al., 2003). All three LIWC measures used are pertinent to both deception and individualism–collectivism. The first type of cues examined in this study was personal pronouns (e.g., "I" vs. "we"), which are affected by both individualism–collectivism and veracity. Specifically, research suggests that individualism is associated with the use of fewer "we" pronouns in an auto-photographic essay (Burke and Dollinger, 2005). With respect to veracity and the use of personal pronouns, Newman et al. (2003) found that deception is associated with first-person pronoun use: Liars use "I" less often than truth-tellers. Taylor et al. (2017) found that this reduction in the use of I (and a commensurate increase in the use of third-person pronouns) was only present in a sample of participants from individualistic countries. People from collectivistic countries showed the opposite effect.

The second cue examined was cognitive processes, a LIWC category that captures words that indicate speakers' cognitive processes surrounding the topic they are discussing (e.g., causation, differentiation, and insight). The use of these words is affected by both individualism–collectivism and veracity. Higher individualism is associated with more use of cognitive process words, likely because cognitive process words are associated with greater variety in individual expression (Burke and Dollinger, 2005). Individual expression is valued by people high in individualism, particularly horizontal individualism. Truth-telling is associated with the use of fewer cognitive processing words than those who are lying (Chiranjeevi et al., 2018).

The third cue examined was social processes, a LIWC category that covers words related to social behavior and social referents (e.g., conflict or family). Collectivism is associated with more use of social process words than individualism, likely because collectivists place greater value on social connectedness (Burke and Dollinger, 2005). Truth-telling is also associated with more social process words than lying (Chiranjeevi et al., 2018).

In light of these previous findings, we predicted that as the use of first-person pronouns is affected by both culture and veracity, individualists will use "we" less than collectivists (Hypothesis 1a) and liars will use "I" less than truth-tellers (Hypothesis 1b). We next predicted that both individualists and liars would use more cognitive processes than collectivists and truth-tellers (Hypotheses 2a and b). Finally, we predicted that individualists will use social process words less than collectivists, whilst liars will use fewer social process words than truth-tellers (Hypotheses 3 a and b).

Method

Participants

An *a priori* power analysis, using GPower and assuming an effect size (f) = 0.25, suggested that we would need 120 participants to achieve a power of 0.8, at an alpha level of 0.05. Participants were second-language English-speaking undergraduates (N = 132; 44 males, 88 females, M age = 22.76, SD = 4.59) recruited at Lancaster University in the UK and paid £3.50 for their time completing the study. Participants had been residents of the UK for an average of 2.23 years (SD = 1.45). When participants were recruited, they were classified as individualist

or collectivist based on the individualism–collectivism score of their country of birth (see https://www.hofstede-insights.com/fi/product/compare-countries/), with scores below 50 leading to assignment as collectivist and scores over 50 to assignment as an individualist; participants whose Hofstede score was undetermined were excluded from the analysis. On the basis of this classification, the sample comprised 66 participants from countries that are collectivist in orientation and 59 participants from countries considered individualist in orientation (6 participants were unclassified due to individualism–collectivism scores not being available for their countries of birth). Participants in the individualist group had a mean Hofstede score of 67.00 (SD = 9.28), whilst those in the collectivist group had a mean Hofstede score of 27.16 (SD = 10.60). Participants' reported countries of birth were China (N = 22; Hofstede score = 20); France (N = 11; Hofstede score = 71); Germany (N = 10, Hofstede score = 67); Nigeria (N = 8; Hofstede score = 30); Italy (N = 7; Hofstede score = 76); Bulgaria (N = 7; Hofstede score = 30); Hong Kong (N = 6; Hofstede score = 25); Lithuania (N = 5); Spain, Poland, Hungary, India (N = 4); and 28 further countries.

Participants' language ability was assessed by their most recent University-approved English language tests (e.g., Cambridge CPE, IELTS) or, where this was not available (29% of participants), by their self-reported ability on a scale from 1 (very poor) to 7 (very good). Test results were mapped onto the 7-point scale. Participants' English-speaking ability was reported to be on average in the good to very good range (M = 5.89, SD = 0.76).

Design

The study had a mixed design with veracity (between-subjects: truth vs. lie), culture (between-subjects: individualistic vs. collectivistic), and question expectedness (within-subjects: expected by all, unexpected by all), expected by individualists (i.e., more expected by individualistic participants than collectivistic), and expected by collectivists (i.e., more expected by collectivistic than by individualistic participants) as independent variables.

The dependent variables were the percentage of words in the participants' answers that were assigned by LIWC to the following LIWC categories: first-person pronouns, third-person pronouns, cognitive processes, and social processes.

Materials

Interview questions

We took care to develop an interview protocol that had culturally appropriate expected and unexpected questions. In a pilot study, 29 undergraduates {M age = 32.97, SD age = 12.11; 14 individualists [mean Hofstede score = 85 (SD = 8.17)] and 15 collectivists [mean Hofstede score = 27 (SD = 5.68)]; 15 males, 14 females} were recruited via word of mouth at the same university as the main study. These participants did not take part in the main study. A set of 46 interview questions relating to the topic of the interview (travel to the participants' home country) were generated. Participants were asked to rate the expectedness of these 46 possible questions on a 4-point scale. This resulted in a list of questions separated into four categories, based on the cultural background of those who rated them: expected by all (e.g., "Tell me everything about your intention"), unexpected by all (e.g., "What was a difficult thing to plan for this intention?"), individualist-expected/collectivist unexpected (e.g., "Please describe how you feel about this trip"), and individualist-unexpected/collectivist-expected (e.g., "How will the people who you are going to see feel about your trip?").

The final interview question list (12 items/questions, see Appendix 1) was developed by selecting questions that were rated most or least expected by everyone, and questions that were rated most expected by one culture whilst most unexpected by the other. The final question list began with a general question about the intention (the most expected question) and continued with specific questions about a particular aspect of the intention (most important aspect of intention; the most important part of the travel; the most important person). This question list was asked in the same order for all participants.

Post-experiment questionnaire

A post-interview captured participants' gender, age (in years), motivation (10-point scale), and preparation (10-point scale). To gain a better understanding of our sample and their cultural background, self-reported ethnicity, country of birth, country of permanent residence, current country of residence, and the date they moved to the United Kingdom were also recorded. As the Hofstede score measures culture at the country level and individuals may differ substantially from their countrymen's average, we also wanted a measure of individual cultural values. To measure their individualism–collectivism values, participants completed the Culture Orientation Scale (COS). The COS is a 16-item scale, with 4 subscales: horizontal individualism, vertical individualism, horizontal collectivism, and vertical collectivism (see Triandis and Gelfand, 1998 for all items and validity information). Horizontal individualism is associated with strong positive values toward independence (people high in HI endorse items such as "I'd rather depend on myself than others"), vertical individualism is associated with competition (endorsing items such as "Winning is everything"), horizontal collectivism is associated with cooperation (endorsing, e.g., "I feel good when I cooperate with others"), and vertical collectivism is associated with a strong connection with family (endorsing "family members should stick together, no matter what sacrifices are required"). As validation of our manipulations, participants also rated the questions' expectedness and the likelihood and familiarity of the event discussed (on a 10-point scale). They were also able to comment on their experience in an open text box.

Procedure

Participants were met by the researcher and informed that they would be interviewed about a specific future intention: The next time they would travel to their home country. This event was chosen because of its relevance to all of the participants in the near

future as they all moved to live in the UK for the duration of their studies. Participants in the "truth" condition were instructed to tell the truth about their intention. Participants in the "lie" condition were instructed to lie about what they intended to do and make sure that they do not share any details about what they are truthfully intending with the interviewer. They were not given any specific instructions on what that lie should be, except that it should be untrue. All participants were instructed to try to convince the interviewer of their truthfulness, and they knew the interviewer was expecting that some might lie.

After making sure the participants had understood the instructions and had consented to take part, they were given 10 min to prepare for the interview. After this time, participants were introduced to the interviewer. There were eight different interviewers, they were all native English-speaking, UK-based PhD students, and blind to the veracity condition of the participants and the hypotheses of this experiment [interviewers' mean scores for vertical collectivism = 27 (3.12), horizontal collectivism = 29 (4.84), vertical individualism = 18.13 (8.58), and horizontal individualism = 23.63 (3.89)]. The interviews were all recorded. Following the interview, participants completed the post-experiment questionnaires and were paid and debriefed.

Analysis

Audio recordings of the interviews were transcribed, and the transcripts were analyzed using Linguistic Inquiry and Word Count (LIWC; Pennebaker et al., 2015). LIWC calculates the proportion of words in a text that match a set of over 90 categories that concern affective, cognitive, linguistic, and social dimensions. These categories have been shown to be both reliable (Tausczik and Pennebaker, 2010) and valuable in their contribution to the analysis of interviews (Richardson et al., 2014; Taylor et al., 2017).

Modeling

Linear mixed effects models were run using R (R Development Core Team, 2015), through RStudio (RStudio Team, 2015), alongside the lme4 (Bates et al., 2015) and lmerTest (Kuznetsova et al., 2016) packages. Each dependent LIWC variable fit, in turn, to the same sequence of models: beginning with the (0) baseline model of random effects of participant and question number, adding to this the fixed effects of veracity, culture (as classified by Hofstede score), and question expectedness in (1) all main effects model, following this with an interaction effect of veracity and culture (2), and, finally, adding all main effects interactions model (3). It should be noted that, for all models, the random effects of participant and question type significantly accounted for some of the variance. As these effects are not themselves of interest, they are not described below.

Model comparisons were done between each complex model and its nested predecessor. The best-fit models were selected by observing the best agreement in the highest increase in the log likelihood ratio, given a significance check of a p-value of <0.05 using a chi-square test. All models converged successfully.

Results

Manipulation checks

The COS did not consistently correlate with the Hofstede score (only one significant correlation: with horizontal collectivism: r = 0.20, $p < 0.05$, $-0.09 <$ other COS scales r < -0.02, ns). Contrary to our expectations, we also did not replicate the expectedness ratings (see Table 1). There was no significant correlation between any of the COS measures and the expectedness ratings of any of the question types. We did find a small, but significant correlation ($r = -0.2$, $p = 0.02$) between the Hofstede score and questions expected by all: Participants from countries with more individualistic Hofstede scores rated the questions that in the pilot study were expected by participants from all countries as less expected than participants from countries with more collectivistic Hofstede scores.

The mean motivation ratings were high [7.72 out of a possible 10 (SD = 2.21)]. Liars reported a slightly higher motivation rating (M = 8.03, SD = 1.9) than truth-tellers (M = 7.4, SD = 2.46), but this is not a statistically significant difference [$t_{(130)} = 1.74$, $p = 0.11$]. Liars rated the likelihood of the event they discussed as less likely (M = 7.07, SD = 3.65) than truth-tellers [M = 8.58, SD = 2.52; $t_{(130)} = 2.76$, $p = 0.01$]. This indicates that participants understood and complied with the instruction to lie. However, some liars reported in the open text box that although the event that they discussed was in itself very likely, it was not an event that they intended to complete on their next trip. This suggests that the likelihood of the event is not a perfect proxy for veracity: i.e., some lies are very likely. Liars and truth-tellers did not significantly differ in the rating of their familiarity with the event they discussed [liars M = 8.21, SD = 2.45, truth-tellers M = 8.94, SD = 1.94, $t_{(130)} = 1.98$, $p = 0.06$]. This suggests that liars mostly choose to set their lies in familiar surroundings.

> ***Hypothesis 1: The use of first-person pronouns is affected by both culture and veracity. Individualists will use "we" less than collectivists. Liars will use "I" less than liars.***

Model comparisons found that the random effects baseline model was the best fit for the word "I". This suggests that veracity, culture, and question expectedness had no significant influence on its use. Instead, any difference found can be attributed to the random effect of either the participant or the question used.

Model comparisons showed the best-fit model for "We" pronoun use was the main effects model, with no interactions. The main effects model showed that contrary to the hypothesis, collectivists use fewer "We" pronouns (M = 0.59, SE = 0.06) than individualists (M= 0.84, SE = 0.06). There was no difference (F = 1.19, $p > 0.32$) between liars (M = 9.54, SE = 0.30) and truth-tellers (M = 9.99, SE = 0.30) or between different question expectedness (F = 3.79, $p = 0.053$) in the use of "We" pronouns.

> ***Hypothesis 2: Individualists and liars will use more cognitive processes than collectivists and truth-tellers.***

TABLE 1 Correlations between measures of culture and measures of question expectedness.

	All expected	All unexpected	Ind > col	Col > Ind
Hofstede score	−0.20*	0.11	−0.16	0.08
Vertical collectivism	−0.07	−0.01	0.03	0.03
Horizontal collectivism	−0.03	0.14	0.01	−0.11
Vertical individualism	−0.09	−0.16	−0.09	0.04
Horizontal individualism	0.01	0.07	−0.07	−0.10

*indicate significance at a p-value of < 0.05 level.

Model comparisons showed that the three-way interactions model was the best fit for cognitive processing of words. In this model, the three-way interaction was not significant. Instead, there was a significant interaction between culture and question expectedness ($F = 7.63$, $p < 0.001$). To unpack this effect, the data were subset by question type, and t-tests were run between the two cultures. We found differences between the individualist and collectivist groups when answering expected [$t_{(344.35)} = 2.79$, $p = 0.01$] and unexpected by all [$t_{(355.62)} = -2.33$, $p = 0.02$] questions. Collectivists used more (M = 13.89, SD = 10.27) cognitive words when answering expected questions than individualists (M = 11.21, SD = 7.84) but fewer (M = 14.73, SD = 7.43) when answering unexpected by all questions compared to individualists (M = 16.58, SD = 7.54). There were no differences between the two cultures when answering individualist-expected [$t_{(364.45)} = -1.72$, $p = 0.09$] and collectivist-expected [$t_{(355.65)} = 1.58$, $p = 0.11$] questions.

> ***Hypothesis 3: Individualists will use social process words less than collectivists. Liars will use more social process words than truth-tellers.***

Model comparisons showed the best-fit model of word use representing social processes was the main effects model, with no interactions. The culture effect was the cause of this model being better than the baseline model, although the culture effect itself is not significant ($F = 3.84$, $p = 0.05$): contrary to the hypothesis, collectivists used fewer words (M = 8.93, SE = 0.30) to represent social processes than individualists (M = 9.61, SE = 0.30). The main effects model showed that there was no difference ($F = 2.39$, $p = 0.12$) between liars (M = 9.54, SE = 0.30) and truth-tellers (M = 9.99, SE = 0.30) or between different question expectedness ($F = 3.16$, $p = 0.08$).

Discussion

None of the hypotheses in this experiment were entirely supported. For Hypotheses 1b, 2b, and 3b, no effect of veracity was found using the LIWC categories I, we, cognitive processes, and social processes. For Hypotheses 1a and 3a, an effect of culture was found but in the opposite direction of the hypothesis. For Hypothesis 2a, an interaction effect between culture and question expectedness was found. The results also showed that our manipulation of question expectedness was not entirely successful: Culture did not affect the expectedness of questions in the way that was assumed based on the pilot. In fact, except for a small negative correlation between Hofstede Score and the expectedness of questions that in the pilot study were expected by all participants, there was no relationship between culture and question expectedness. This makes the interaction effect between culture and question expectedness difficult to interpret and means we cannot draw any strong conclusion on whether using unexpected questions as a way to elicit cues to deception is a technique that generalizes to non-Western cultures.

Taken together, these results suggest that the cues to deception previously identified in the literature were not present in this sample. Results from the individualism–collectivism literature also did not replicate. Although culture effects were present in this sample, they ran in the opposite direction of those reported in the literature for two hypotheses. This suggests a lack of generalization of the effects in the literature (Newman et al., 2003; Chiranjeevi et al., 2018) or a methodological issue in these comparisons (see General Discussion).

Experiment 2

Experiment 2 investigated sketches and timelines as techniques to increase cues to deception in culturally diverse populations. Sketches have been shown to yield useful cues to deception. For example, Vrij et al. (2010) found that truth-tellers provided more plausible sketches, were more likely to include a Confederate in the drawing, and were more likely to use a shoulder-height point of view. Deeb et al. (2021) also found that sketches helped both truth-tellers and liars provide more core detail, although Vrij et al. (2022) results suggest that sketches may not benefit lie detection in online interviews. Although there is, to our knowledge, no direct research of how individualism–collectivism affects people's sketching in the context of information-gathering interviews, research suggests that individualists tend to be more focused on objects than collectivists, who tend to focus more on background fields (Gorodnichenko and Roland, 2012). This tendency may be reflected in people's sketches. The level of detail can be a cue to deception in timeline interviews [such as the adapted timeline format used by Izovotas et al. (2018)]. There has been little research into how culture affects timeline performance, although there is anecdotal evidence that people from non-Western cultures report less information compared to participants in studies conducted in Western countries (Hope et al., under review).

In Experiment 2, participants committed a mock crime that involved a Confederate using a scenario drawn from Vrij et al. (2010), who explored the use of sketching in interviews about a

mission that involved a Confederate. In both Vrij et al. (2010) and Experiment 2, participants were then interviewed and asked to make a sketch of the location where they met the Confederate. In Experiment 2, participants were also asked to provide a timeline of their actions during the scenario.

Based on Vrij et al. (2010), the following hypotheses were formulated with respect to sketching: Truth-tellers will draw more objects (H1a), more people (H1b), and are more likely to draw the Confederate (H1c) than liars. Individualists will draw more objects (H1d) but fewer people (H1e) than collectivists. Truth-tellers are more likely to draw a shoulder camera position than liars, whilst liars are more likely to use an above-eye view position (H2a) than truth-tellers. Individualists are more likely to draw a shoulder camera position and less likely to use an above-eye position than collectivists (H2b).

For the timeline, the lack of previous data makes it harder to set clear evidence-based hypotheses specifically for the timeline. However, we assumed that timelines might show similar effects as interviews and sketches. Based on the literature on interviews (Luke, 2019) and sketches (Vrij et al., 2010), we hypothesized that truth-tellers would report more detail (object, people, and action) (H3) and that individualists would report more object detail (H4a), but fewer people detail (H4b) than collectivists.

Methods

Participants

As in Experiment 1, participants were living in the UK and were not native speakers of English. They were selected based on the Hofstede score of their country of birth. An *a priori* sample size analysis, using GPower assuming a large effect size ($f = 0.4$, $\alpha = 0.05$, power $= 0.8$) recommended a total of 112 participants. A large effect size was assumed, based on strong effects reported by Vrij et al. (2010) and Jundi et al. (2013) for sketches and timelines, respectively. Originally 113 participants completed both the sketch and the timeline tasks in their interviews. The most common countries of birth were China and Italy ($N = 10$); India and Poland ($N = 9$), France ($N = 6$), Bulgaria, Indonesia, Malaysia, and Spain ($N = 5$) and 28 other countries. However, due to data loss at data collection (recording errors; Hofstede country data not available for some participants) and coding (loss of data in storage) not all participants' data were available for analysis. For clarity, the total samples are reported here for each task separately.

Sketches

For 17 of the 113 participants, no Hofstede score was available, due to their countries' data not being available, leaving 96 participants in the final sample. Of these participants, 59 reported being female, 36 male and one participant did not report their gender. The participants mean age was 23.30 (SD: 4.68). Fifty-two participants reported being white, 28 being East/South Asian/Pacific Islander, 7 other, 5 Hispanic/Latino, 2 Middle Eastern/Arab, and 2 black Caribbean/African/other.

Timeline

For 89 of the 113 participants, a coded timeline was available. Data loss occurred at the recording and coding stage, rather than the data collection phase. For 14 of those 89 participants, no Hofstede score was available, due to those participant countries' data not being available. This left 75 participants in the final sample for the timeline task. Of these 45 reported being females and 29 males, and 1 participant did not report their gender. Their mean age was 23.31 (SD = 4.36). Forty-one reported being white, 21 reported being East/South Asian/Pacific Islander, 5 other, 4 Hispanic/Latino, 2 Middle Eastern/Arab, and 1 black Caribbean/African/other.

Design

The experiments had one independent variable: veracity (between subjects: truth-tellers vs. liars) and a quasi-IV: culture. As in Experiment 1, culture was measured in two ways: I) via the Hofstede score of the country of birth of the participants and II) via the COS scale. Unlike in Experiment 1, the Hofstede score and the four subscales of the COS were treated as five separate continuous variables for the analysis. This change was adopted after the findings of Experiment 1 showed that the correlation between these variables was lower than expected. The dependent variables include the number of details, objects, and people included in the sketch/timeline and the point of view in the sketch.

Materials

For the sketching task, participants were provided with white, A4 paper, and a pencil. For the timeline task, participants were provided with a physical timeline made of a light card to act as the base of their timeline. They were also given a stack of post-it notes on which to write details of events to place on the timeline. Participants also completed the COS (Triandis and Gelfand, 1998). They were also asked to fill out a post-task questionnaire that contained a measure of their drawing ability, demographic details, measures of their motivation, and their experience of the task.

Procedure

Participants came to the laboratory and were informed that they would be asked to take part in a scenario that might include actions that would be considered against university regulations, if they were done outside of the scenario. They were randomly allocated to the truth-telling or lying condition by selecting an envelope that contained condition-specific written instructions. All participants were instructed to go to a room in the library near the laboratory. Once there, they met with a person (who was a Confederate), requested a set of documents from this person, took these documents, left them in a prearranged location, and returned to the laboratory. All participants followed the same route. Participants in the truth-telling condition received instructions that they were helping the university by legitimately relocating a set of exam papers from a graduate teaching associate (the Confederate)

to a safe location. Participants in the lying condition were told that they had been helping move exam papers for someone who stole them (the Confederate). When they returned to the laboratory, all participants were told that they were seen moving exam papers, that this was considered suspicious, and that they would be interviewed about this. Participants in the truth-telling condition were instructed to tell the truth about what happened. Participants in the lying condition were instructed to lie about what happened: In particular, they were told that they should not "give away" the person who they got the documents from. The interview consisted of sketching and timeline tasks. The order of these tasks was counterbalanced. They were instructed to sketch what happened when they received the documents and to make a timeline of all the events that happened from when they left the laboratory to when they returned. Participants were encouraged to verbally describe their thinking process as they completed these tasks, although this narration was not analyzed. After these tasks, participants were informed that the scenario had ended. They were asked to fill out the post-task questionnaire. They were then debriefed, received their reward, and thanked for their participation.

Data analysis

Data were coded by the main experimenter (first author) and a reliability coder who was not otherwise involved with the project. The first coder coded 72% of the sketches and 62% of the timelines, and the second coder coded 52% of the sketches and 66% of the timelines. Sketches were coded for the number of objects (ICC = 0.89, 95% CI = 0.76–0.95), people (ICC = 0.80, 95% CI = 0.63–0.90), whether the Confederate was present (Cohen's kappa = 1), and the camera angle Cohen's kappa = 0.44, z = 4.37, $p < 0.0001$). The timeline was coded by the same coders for the number of each type of card that participants used and the objects, people, actions, and other details that they provided on each type of card (ICC = 1 for all types). The types of details were then summed across cards.

The data were analyzed using regression models in R. The independent variables were veracity, horizontal individualism, cultural individualism, horizontal collectivism, vertical collectivism, and Hofstede score. The dependent variable varied according to the hypothesis tested. For drawing, the Confederate and camera angle binary logistic regressions were run using the GLM function and family = binomial in R.

Results

As in Experiment 1, the relationship between the participants' country of birth's Hofstede scores and their COS scores was low (all r's between −0.19 and −0.05). The two collectivism scales do correlate at 0.50; the two individualism scales at r = 0.35. Participants rated themselves as very seriously engaging in the task (liars M = 8.30, SD = 1.59, truth-tellers mean = 8.67, SD = 1.42) and highly motivated (liars M = 8.65, SD = 1.53, truth-tellers mean = 9.00, SD = 1.49) to convince the interviewer that they were telling the truth. These ratings did not differ between truth-tellers and liars [serious engagement: $t_{(109)} = 1.29$, $p = 0.20$; motivation: $t_{(109)} = 1.22$, $p = 0.22$].

TABLE 2 Coefficients of the independent variables on objects drawn in the sketch.

Independent variable	Estimate	SE	t	p
Intercept	13.51	2.33	5.80	<0.001*
Veracity: Truth	0.12	0.51	0.24	0.81
Horizontal collectivism	−0.05	0.07	−0.75	0.45
Horizontal individualism	−0.12	0.06	−2.08	0.04*
Vertical collectivism	−0.15	0.05	−3.30	0.001*
Vertical individualism	0.05	0.04	1.25	0.21
Hofstede score	0.01	0.01	1.04	0.30

*indicates a p-value of < 0.05.

Sketches

Hypothesis 1: Drawing objects, people, and the Confederate. Participants drew on average 6.89 objects (SD = 2.56), 0.39 people (SD = 1.17), and 90% included the Confederate. Vertical collectivism and horizontal individualism are associated with drawing fewer objects (VC estimate = −0.15, $t = -3.30$, $p = 0.001$; HI estimate = −0.12, $t = -2.08$, $p = 0.04$). There are no effects of veracity or any of the other culture scores (see Table 2). Neither culture nor veracity affected the number of people drawn or the Confederate (all t's between −1.21 and 1.23, all p's > 0.22).

Hypothesis 2: camera position. Neither veracity nor any of the culture measures affected camera position (all t's between −0.96 and 1.31, all p's > 0.23).

Timeline reports

Hypotheses 3 and 4. Higher scores on vertical collectivism were associated with reporting a lower number of object details (VC estimate = −0.23, $t = -2.15$, $p = 0.04$) and a lower number of person details (VC estimate = −0.86, $t = -4.47$, $p \leq 0.001$) (see Table 3) than having lower scores on vertical collectivism. There was no effect of veracity or any other culture measure (all t's between −0.14 and 1.31, all p's > 0.23) on the number of action details (all t's between −1.00 and 0.19, all p's > 0.24).

Discussion

The results provide some support for Hypotheses 1d and 4a: Vertical collectivism was associated with providing less object detail in both the sketch and the timeline. This is in line with Gorodnichenko and Roland (2012) finding that individualism is associated with more object detail. However, contrary to Hypothesis 1d, high horizontal individualism was also associated with providing fewer object details in the sketch. Contrary to Hypothesis 4d, vertical collectivism was also associated with

TABLE 3 Coefficients of the independent variables on objects and people details reported in the timeline.

	Objects				People			
	Estimate	Std. Error	*t*-value	Pr(>|t|)	Estimate	Std. Error	*t*-value	Pr(>|t|)
Intercept	3.54	5.77	0.61	0.54	14.48	12.65	1.15	0.26
Veracity	0.04	1.19	0.04	0.97	2.12	2.78	0.76	0.45
Horizontal collectivism	0.16	0.17	0.97	0.34	0.36	0.39	0.93	0.36
Horizontal individualism	0.02	0.13	0.19	0.85	0.20	0.29	0.69	0.49
Vertical collectivism	−0.23	0.11	−2.15	0.04*	−0.86	0.25	−3.47	<0.001*
Vertical individualism	0.06	0.10	0.64	0.52	0.18	0.23	0.78	0.44
Hofstede score	0.03	0.03	1.02	0.31	−0.01	0.06	−0.14	0.89

*indicates a p-value of < 0.05.

providing less detail about people in the timeline. In addition to these findings, the other hypotheses were not supported.

General discussion

The hypotheses in the two experiments were generally not supported: No effects of veracity were found with any of the interview techniques, and effects of culture were found sporadically and not always in line with the hypotheses. These findings will be discussed in turn. The fact that we find no veracity effects in these experiments, for any of the interview techniques that were tested, might be a sign that veracity effects in the literature do not generalize to populations outside of those populations in which the cues were originally found. The fact that the lack of veracity effect occurs in participants from both individualistic and collectivistic cultures might suggest that even small changes in the cultural or linguistic background can lead to a failure to generalize results. The current results are broadly in line with Taylor et al. (2014) and Leal et al. (2018) findings that cues to deception differ across cultural populations and that cues uncovered in one cultural context may not readily or directly translate to another. These observations highlight the importance of deception researchers considering cultural factors in the populations that are being studied. Failure to consider cultural factors is a serious limitation to the current literature, and research using a more diverse sample is needed to remedy this problem.

Second, the cultural results for both studies/experiments not only did not support some hypotheses but were directly opposite for others. This observation suggests that the problem with generalizing results from one cultural population to another is not limited to the veracity or lie detection. Rather, it may extend to behaviors that are not necessarily cues to deception. This study is part of a growing body of work that suggests that the effects of culture on verbal and non-verbal behaviors do not generalize robustly. This suggests that the need for more research from currently underrepresented countries and cross-cultural research may extend to the whole of forensic psychology (see, e.g., Hope et al., 2022) and possibly to the whole of psychology (see, e.g., Roberts et al., 2020).

Another finding of interest is that in both experiments, there was a low correlation between participants' COS scores and the Hofstede score of their country of birth. There are several possible explanations for this. Hofstede and Bond (1984) and Triandis and Gelfand (1998) might interpret individualism–collectivism differently: i.e., although they use the same concept of individualism–collectivism, they measure this concept differently and may therefore be inadvertently measuring different concepts. Adding the horizontal–vertical dimension to the COS might have created a measure of a different cultural dimension that does not overlap with Hofstede's individualism–collectivism. The low correlation may also be due to the mismatch between the country level measures that Hofstede and Bond (1984) use and the individual level measures used by Triandis and Gelfand (1998). Voronov and Singer (2002) have suggested that the individualist–collectivist cultural dimension is not sufficiently theoretically developed to be used effectively in psychological research. They argue that large differences in values within countries and methodological concerns surrounding Hofstede's study mean that individualism–collectivism, as measured by the Hofstede score, is often not usable as an independent variable. This may explain the lack of clear effects in these experiments and the literature.

It is also possible that the participants in these experiments, all of whom were migrants to the UK, were unrepresentative of their country of birth. Migration from a collectivist to an individualist country has been associated with changes in cultural identity (Bhugra, 2005) and may lead to changes in cultural values, such as those measured by COS. It is also possible that, for some people, having different values than the country they live in was a cause of the migration. Alternatively, Hofstede scores per country were often collected years before the current experiments, and these studies were not always able to get a fully representative sample of the population of that country (Voronov and Singer, 2002). It may well be that the Hofstede score for certain countries was not or is no longer representative of the countries' cultural values when the participants lived there.

Limitations

There are a number of limitations to note. First, pertaining to the sample recruited, it is important to note that participants in these experiments were all non-native English-speaking migrants to the UK. The advantage of this sampling approach was that it avoided mixing native with non-native speakers, which could produce a fatal confound reflecting language fluency. However, it has several disadvantages. First, although all participants achieved or self-reported high levels of English, speaking in a second language does affect deception cues (Akehurst et al., 2018; Wylie et al., 2022). Furthermore, non-native speakers use some of the language features of interest differently than native speakers would [e.g., non-native speakers may use "we" more inclusively than native speakers; Dafouz et al. (2007)]. This may affect the cues that were used, particularly in Experiment 1. Second, in Experiment 1, we used LIWC to measure the deception cues: I, we, cognitive processes, and social processes. Although LIWC is regularly used to study the language use of non-native English speakers (e.g., Dhillon et al., 2021), it is possible that non-LIWC-derived deception cues would, unlike LIWC-derived cues, generalize to this sample. Third, both the interview and the COS were conducted in English for all participants. English is spoken in several individualistic countries (e.g., the US and UK) and might act as a prime for an individualistic mind-set and language use that is more associated with individualistic cultures (Lee et al., 2010). Conducting the interviews, in a more culturally neutral second language (e.g., Spanish) may yield different results. Together, these limitations highlight that further research is needed to untangle the effects of culture, language, and how people change as a consequence of migration.

A second limitation is that the research was limited to the individualism–collectivism dimension of culture. Culture is highly variable, has many different aspects, and affects people's behavior in a myriad of ways. Broader measures of culture, such as uncertainty avoidance in a high–low context, might have given us a greater insight into what is making these participants different from participants in previous lie detection studies. It would also be interesting to investigate whether there are cultural differences in the participants' beliefs about deception itself.

Third, the fact that the hypothesized veracity results were not found in the different populations in these experiments does not mean that such veracity results will never be generalizable across populations from different cultures. It may well be that these effects generalize to some cultures, just not the ones tested in these experiments. Conversely, there are only a very small number of experiments showing the robustness of the effects of unexpected questions, sketches, and especially timelines (with only one study) in deception detection. So there may be issues replicating these results even within the same cultural population.

Fourth, the current study focusses on a limited number of dependent variables (four categories of LIWC in Experiment 1; details in Experiment 2). It is possible that other lie detection methods produce cues that generalize across populations.

Fifth, in Experiment 2, due to data loss, the sample was smaller than the power analysis suggested was necessary. Low power might explain the lack of significant results in that study. Further research in this field should ensure sufficient power.

Conclusion

The results from the two experiments in this study suggest that asking unexpected questions, sketches, and timelines may not be beneficial in eliciting cues to deception in populations outside of those that were tested in the original experiments. The results also suggest that the effects of culture on the behaviors that are used as cues to deception are not always consistent. Overall, we conclude that cultural differences affect our ability to detect lies in ways of which we have only a very limited understanding. More research conducted in countries outside the US and Europe is needed.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Faculty of Science and Technology Research Ethics Committee, Lancaster University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

IT designed both studies, collected data for both studies, analyzed and drafted study 1, edited the article. LW supervised IT during experimental design and data collected, analyzed and drafted study 2, drafted the general section of the articles, and edited the article. PT and LH supervised IT during experimental design and data collected and edited the article.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Appendix

Table A1 Study 1 question list.

Question	Question type	Expectedness rating mean	SD
1. Please describe your intention in as much detail as possible. Please leave nothing out, even if you consider that it might not be important.	Ind > col expected	1.44	0.70
2. How are you going to get to your destination?	All expected	2.02	1.02
3. When traveling to your destination, what part would you say it the most important?	Col > Ind expected	2.73	0.98
4. When you arrive at your destination, who is the first person you will see and why?	All expected	2.40	0.99
5. Have you already done any preparation or planning for this trip?	All expected	1.90	0.92
6. While you were preparing, did you make any alterations to your original travel plan?	Col > Ind expected	2.93	0.91
7. Are you intending to do any preparation or planning for this trip in the future?	Col > Ind expected	2.48	1.04
8. Please list all the people who have something to do with your intention.	Ind > Col expected	2.86	1.02
9. Out of these people, who would you say is the most important person and why?	Ind > Col expected	2.98	1.03
10. Could you please list everyone who you are leaving behind during your trip.	All unexpected	3.55	0.72
11. Who is the most important person who is staying behind and why?	All unexpected	3.39	0.83
12. How will your trip affect the people you are leaving behind?	All unexpected	3.52	0.76

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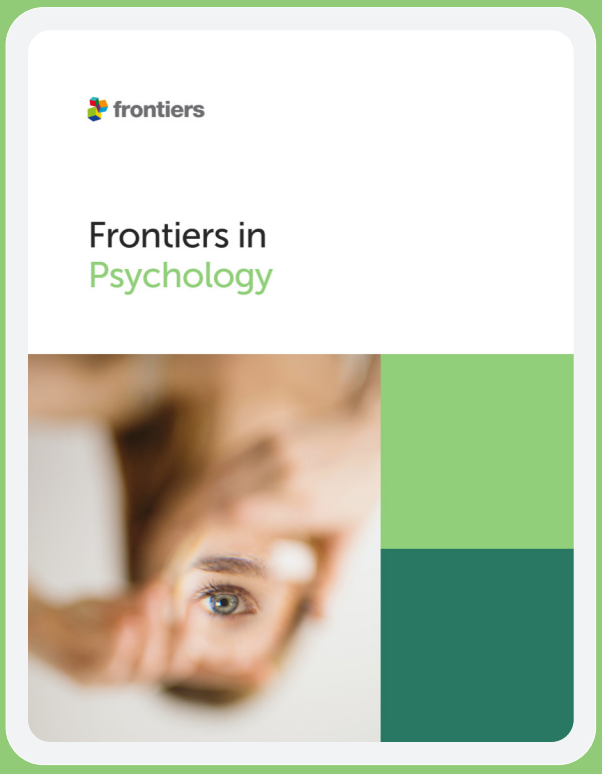

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