Published in final edited form as:
Trends Cogn Sci. 2014 September ; 18(9): 441–444. doi:10.1016/j.tics.2014.05.004.

Cognitive-load approaches to detect deception: searching for cognitive mechanisms

Iris Blandón-Gitlin[1], **Elise Fenn**[1,2], **Jaume Masip**[3], and **Aspen H. Yoo**[1]

[1]Department of Psychology, California State University Fullerton, P.O. Box 6846, Fullerton, CA 92831, USA

[2]Department of Psychology, Claremont Graduate University, 150 East 10th Street, Claremont, CA 91711, USA

[3]Department of Social Psychology and Anthropology, University of Salamanca, Facultad de Psicología, Avenida de la Merced, 109-131, 37005 Salamanca, Spain

Abstract

A current focus in deception research is on developing cognitive-load approaches (CLAs) to detect deception. The aim is to improve lie detection with evidence-based and ecologically valid procedures. Although these approaches show great potential, research on cognitive processes or mechanisms explaining how they operate is lacking. Potential mechanisms underlying the most popular techniques advocated for field application are highlighted. Cognitive scientists are encouraged to conduct basic research that qualifies the 'cognitive' in these new approaches.

Introduction

Decades of deception research have shown that humans are not much better than chance at detecting deception. In two pertinent publications, including a 2006 TICS article, deception scholars called scientists to action to conduct research on cognitive approaches to detect deception [1,2]. The goal was to develop evidence-based and ecologically valid ways to detect deception, especially in forensic contexts. Since then a great deal of research has been conducted to develop cognitive lie detection approaches, some of which are strongly advocated for application in the field [3]. A few laboratories around the world, funded in part by important government sources (e.g., the High Value Detainee Group, an intelligence-gathering group created by President Obama) have conducted a large portion of that research.

Although these approaches have potential, research on the cognitive processes or mechanisms that explain how these approaches operate largely remains missing. It is not until we understand these mechanisms that we can better assess the conditions under which these approaches may or may not be useful or when they should be ready for primetime. In light of public disappointment with other deception techniques that may have been applied

Corresponding author: Blandon-Gitlin, I. (iblandon-gitlin@fullerton.edu).

prematurely (Box 1), it is imperative that cognitive scientists with a strong basic research background take action and develop experimental paradigms that evaluate the potential mechanisms by which these new approaches operate. The key is to study these mechanisms while keeping a reasonable level of ecological validity in experimental designs.

Below we provide a brief introduction to these approaches, discuss possible cognitive mechanisms, and highlight conditions that may influence their effectiveness.

Cognitive approaches to detect deception

The CLA is based on the premise that lying is cognitively more demanding than truth telling; therefore, inducing greater load with interview techniques will be more detrimental to liars than truth tellers. Increased load is hypothesized to result in greater behavioral differences between truth tellers and liars, differences that are diagnostic of deception [4].

There are several published studies on CLA [3,4]. For example, Vrij and colleagues implemented the reverse-order technique, which involves having truth tellers and liars describe an event in reverse chronological order. They also tested the use of unanticipated questions during interviews, such as asking participants to describe the spatial layout or temporal order of an event or to compose a drawing of the target event. Additionally, they examined the technique of having interviewees keep their eye gaze fixed on the interviewers. These techniques were hypothesized to be more cognitively demanding compared with control conditions [3].

A technique to similar unanticipated questions was tested by Hartwig and colleagues [5]. In the strategic-use-of-evidence (SUE) technique, interviewers disclose to suspects incriminating evidence later rather than early in the interview. This is to ensure that suspects have difficulty managing information if they make statements that are inconsistent with the evidence. Recently, Evans and colleagues [6] had participants report an event in their second language to induce cognitive load. Finally, Walczyk and colleagues [2] introduced the Time Restricted Integrity Confirmation (TRI-Con) interview approach, which instructs senders to answer closed-ended questions under time pressure.

What all of these studies have in common is the result that liars more than truth tellers showed increased signs of cognitive load and discernible cues to deception. Detecting deception by third-party observers improved in cognitive-load conditions compared with control conditions. Where these studies diverge is in providing convincing and evidence-based explanations of the possible cognitive mechanisms involved. TRI-Con is the only approach based on predictions from a well-articulated cognitive model of deception [2].

Possible mechanisms underlying CLAs

How could a CLA operate to undermine liars' success? At a neurocognitive level, one possible influence on senders is the activation of event-related information in memory – information that is detrimental to the liar but not the truth teller. For example, using an information-gathering interview like the SUE approach or question prompts as in the TRI-Con approach should activate event-relevant information in memory. This activation causes problems for the liar, who tries to manage information by suppressing leakage while creating a convincing account. For the truth teller, the spreading of activation in memory networks facilitates the availability of useful information to provide a convincing account. Indeed, research shows that, compared with truth tellers, liars are slower and make more errors when responding to questions and also report having to inhibit the truth that is automatically activated in the mind [7]. Furthermore, neuroimaging studies show that there is significantly greater activation of brain structures (e.g., the articulate cingulate cortex) associated with executive control processes (e.g., inhibition, attention, working memory) during lying than truth telling [8]. These neuroscience results support the notion that lying is more cognitively demanding than truth telling because of a greater need for executive control.

At a behavioral–cognitive level, a CLA may influence the use of cognitive (e.g., manage information smoothly) and behavioral (e.g., appear relaxed) strategies that senders use to appear honest and convincing. For example, the reverse-order technique may lead to extra steps in recall that would be more detrimental to liars than truth tellers. Intuitively, when recalling events in reverse order, the best cognitive strategy is to think of the event in forward order and then reverse the steps. The possibility of these processes is supported by research showing that, when recalling episodic events, backward recall leads to repeated cycles of forward recall [9]. Thus, retrieval in backward order involves a forward search first. This search strategy should be easier for truth tellers than for liars, because the active mental representations for truths and lies may be qualitatively different. Imagination requires more cognitive effort than simply retrieving an experienced event [10]. Therefore, a liar’s imagined event (especially if fully invented) would be challenging to manipulate during backward recall.

It is also possible that, in situations of high task demands, senders may use simpler and less resource-intensive strategies to appear convincing to observers. Basic research suggests that the cognitive demands of a situation predict the type of strategy utilized; in high-demand situations, people revert to strategies that consume less working memory capacity but may be ineffective at completing tasks that require better (resource-intensive) strategies [11]. Reliance on simpler strategies (e.g., provide few details) might be a way to deal with high cognitive demand but may not be effective in achieving the liars’ goals. These and many other possible mechanisms might begin to explain the operations of CLAs.

Too much or too little load

It is possible that a CLA may be too cognitively demanding for truth tellers in some contexts. For instance, the reverse-order technique may lead to few differences between truth tellers and liars or to misidentification of truth tellers as liars. For example, in intelligence-gathering settings where the goal of interviewing is to obtain actionable information, a detainee may be asked what he knows about semantic or episodic events that occurred long ago. Similarly, airport security officers may ask travelers about their travel plans and future intentions. In those situations retrieving the truth might be difficult, because recalling distant events and planned intentions can be cognitively demanding tasks [10]. Truth tellers may appear deceptive and in high cognitive demand in those situations. This is possible because reverse recall may require resource-intensive strategies (e.g., repeated cycles of forward recall) that cannot be used effectively to succeed on the task of convincing the observer (primary task).

It is also possible that, for some techniques, it may be easier to develop countermeasures that reduce extra cognitive load. For example, a liar who knows about the reverse-order or unexpected-question approaches might think ahead of time about answers. Given that liars tend to prepare their stories, it would not be difficult to also prepare for possible unanticipated questions. Further, in the face of such unexpected situations, liars might borrow from previous experiences to fabricate an account. Additionally, cognitive control may be facilitated by strategies that enhance access to inhibitory resources. The inhibitory spillover effect (ISE) occurs when invoking inhibitory control via a physical act (e.g., controlling urination urgency) activates cognitive control and benefits performance in cognitive inhibitory tasks (e.g., Stroop task) [12]. ISE studies provide intriguing evidence that it is possible to reduce cognitive load by easy-to-manipulate covert strategies.

Concluding remarks

Cognitive approaches to human lie detection seem promising and scholars have done an amazing job in creating sound experimental paradigms that utilize input from practitioners and are based on security needs. These paradigms are creative, offering humane ways to interview suspects or high-value detainees with increased effectiveness in deception detection. However, we remain in the dark about the cognitive mechanisms explaining these approaches. Cognitive scientists must take on the challenge to study these new approaches, their mechanisms, and their feasibility for use in the field. It is the potential for error that makes it critically important to understand the mechanisms by which these approaches operate. We simply need to better qualify the ‘cognitive’ in the cognitive load approaches before advocating their use in real-world settings.

References

1. Vrij A, et al. Detecting deception by manipulating cognitive load. Trends Cogn Sci. 2006; 10:141–142. [PubMed: 16516533]
2. Walczyk JJ, et al. Lying person to person about life events: a cognitive framework for lie detection. Pers Psychol. 2005; 58:141–170.
3. Vrij A, Granhag PA. Eliciting cues to deception and truth: what matters are the questions asked. J Appl Res Mem Cogn. 2012; 1:110–117.
4. Vrij A, et al. Outsmarting the liars: toward a cognitive lie detection approach. Curr Dir Psychol Sci. 2011; 20:28–32.
5. Hartwig, M., et al. Strategic use of evidence during investigative interviews: the state of the science. In: Raskin, DC., et al., editors. Credibility Assessment: Scientific Research and Applications. Academic Press; 2014. p. 1-36.
6. Evans JR, et al. Validating a new assessment method for deception detection: introducing a psychologically based credibility assessment tool. J Appl Res Mem Cogn. 2013; 2:33–41.
7. Walczyk JJ, et al. Advancing lie detection by inducing cognitive load on liars: a review of relevant theories and techniques guided by lessons from polygraph-based approaches. Front Psychol. 2013; 4:1664–1078.

8. Christ SE, et al. The contributions of prefrontal cortex and executive control to deception: evidence from activation likelihood estimate meta-analyses. Cereb Cortex. 2009; 19:1557–1566. [PubMed: 18980948]
9. Thomas JG, et al. Forward and backward recall: different response time patterns, same retrieval order. Psychol Sci. 2003; 14:169–174. [PubMed: 12661680]
10. Addis D, Schacter DL. The hippocampus and imagining the future: where do we stand? Front Hum Neurosci. 2012; 5:1–15.
11. Hoffmann JA, et al. Deliberation's blindsight: how cognitive load can improve judgments. Psychol Sci. 2013; 24:869–879. [PubMed: 23575598]
12. Tuk MA, et al. Inhibitory spillover: increased urination urgency facilitates impulse control in unrelated domains. Psychol Sci. 2011; 22:627–633. [PubMed: 21467548]
13. Honts, RC.; Hartwig, M. Credibility assessment at portals. In: Raskin, DC., et al., editors. Credibility Assessment: Scientific Research and Applications. Academic Press; 2014. p. 37-61.
14. Porter S, ten Brinke L. Reading between the lies: identifying concealed and falsified emotions in universal facial expressions. Psychol Sci. 2008; 19:508–514. [PubMed: 18466413]

Box 1

Screening of Passengers by Observation Techniques (SPOT) at airports

For us deception scientists, traveling through US airports raises our anxiety levels. We are primed to watch out for Behavior Detection Officers (BDOs) who assess behaviors indicative of stress, fear, and deception. They identify 'high-risk' passengers who may pose a security threat. The potential for error cannot escape our mind because we know that the foundation and effectiveness of their approach are unclear.

BDOs are part of a program called SPOT. They are trained to scan passengers in line, engage them in brief conversation, and identify behaviors that exceed the SPOT threshold indicative of deception. The goal is to provide an extra layer of analysis in the search for terrorists. SPOT was launched in 2007 at 42 airports; by 2012, 3000 BDOs were working at 176 airports. Its government funding has reached almost US$1 billion. Despite its continued implementation and increases in funding, the program is controversial because prominent scientists, the public, and government offices are concerned about its scientific validity and effectiveness [13].

The BDOs' behavior checklist and the threshold needed to make extra screening decisions are not public information. However, Paul Ekman, a prominent emotion and deception scientist, has testified before Congress that peer-reviewed studies show the behaviors to accurately differentiate between truth tellers and liars [Ekman, P. (2011) *Testimony to the Subcommittee on Investigations and Oversight Hearing – Behavioral Science and Security: Evaluating TSA's SPOT Program* (http://science.house.gov/hearing/subcommittee-investigations-and-oversight-hearing-tsa-spot-program)]. Ekman concluded that the program's development was based on solid science. Unfortunately, the empirical studies used to select behaviors and develop training were not referenced directly. What we do know is that Ekman was a consultant and his work heavily influenced the program. However, comprehensive meta-analyses suggest that detecting deception from demeanor, even by experts, is not very good.

Ekman contends that previous research showing low rates of deception detection is not applicable to situations involving terrorists and national security enforcers. His and colleagues' research applies because it involves high-stake situations with great consequences for individuals. However, independent research has not successfully replicated Ekman's findings and a recent published study showed that his approach was not as effective as claimed [13,14].

Was SPOT prematurely implemented? The jury is out on this issue, but at least an attempt was made to include science and scientists in its development and implementation. Would a future program with CLAs raise similar concerns? We hope not. There is potential for such approaches to be applied, but scientists must conduct extensive basic research before informing practice.