product of theists' belief in and adherence to moral rules espoused by their religion. For example, the moralization of purity may be due to theists' greater sacralization of the human body and how it is used. However, these moralizing differences may also reflect fundamental differences in emotional temperaments. Theists' greater moral concern about purity may be due to theists' greater sensitivity to disgust and/or greater reliance on such emotions when making moral judgments. At the group level, theists' broad morality may reflect both the use of moralization as a marker of group affiliation and submission to rules – such as obedience and loyalty – that sustain group cohesion and success.

A common humanity

Although theists and nontheists disagree whether obedience to authority or sexual impurity are morally relevant concepts, there is much greater consensus about moral issues involving harm and injustice. For example, both religious and nonreligious individuals take a predominantly deontological stance toward torture (Figure 1) and both groups find acts of unjust harm (e.g., killing an innocent for no good reason) to be objectively wrong. All world religions defend some version of the Golden Rule, a doctrine that reflects evolved inclinations toward fairness and reciprocity. Recent studies suggest that individuals, independent of religion, exhibit an impulse to behave cooperatively and that they manage to override this immediate prosocial impulse only on further reflection [14]. This universal preference toward prosociality is apparent even in infancy. Thus, although theists and nontheists may be divided through differences in sociality, earthly and supernatural reputational concerns, and meta-ethics, the two groups are united in what could be considered 'core' intuitive preferences for justice and compassion. Although the two groups may sometimes disagree about which groups or individuals deserve justice or their compassion, these core moral intuitions form the best basis for mutual understanding and intergroup conciliation.

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

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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.

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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 prime-time. In light of public disappointment with other deception techniques that may have been applied 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

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.

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