Some Evidence for Unconscious Lie Detection

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Abstract

Evolutionary psychology argues that the mammalian ability to accurately detect others' lies was selected for because it maximizes the likelihood of survival and reproductive success. Contrary to evolutionary theory, however, research finds that conscious deliberations about sincerity rarely exceed chance-levels of accuracy. But consistent with evolutionary theory, research in both neuroscience and primatology suggests that deeper, less consciously accessed parts of the mind and brain *can* discriminate lies from truth. Building on these findings, we predicted that observing someone tell a lie would automatically activate cognitive concepts associated with deception; observing someone tell the truth would activate concepts associated with truth. Across two experiments, and consistent with evolutionary theory as well as evidence in both primatology and neuroscience, results demonstrated that indirect measures of detecting deception are significantly more accurate than direct measures.

Some Evidence for Unconscious Lie Detection

Human beings lie all day long and about all manner of things. On average, we lie in 14% of the emails we send, in 37% of the phone conversations we have, and 27% of the time we lie directly to the face of people we care about (Hancock, 2007; see also DePaulo et al., 1996 for similar findings). Sometimes lies are small, prosocial, and without negative consequence. Other times, lies instantly destroy precious, hard-earned value in personal, professional, and civic life (Ekman, 1992). Deception is everywhere in our daily lives and our livelihood can depend on detecting it. However, when asked to make a simple, binary decision about whether a person is lying or telling the truth, humans are incompetent—our judgments are no more accurate than the flip of a coin (Ekman & O'Sullivan, 1991; Bond & DePaulo, 2006; Porter, Woodworth, & Birt, 2000).

But our lie detection incompetence is inconsistent with evolutionary theory, which suggests that the accurate deception detection is critical—our very survival has been dependent on it throughout evolutionary history (Krebs & Dawkins, 1974). Evolutionary theory suggests that for survival and reproduction, the ability to accurately detect deception *must* have evolved. However, it seems that at some point more conscious (and incorrect) cognitions began to interfere with our ability to explicitly detect deception (e.g., The Global Deception Research Team, 2006). Consistent with this notion is evidence from primatology and neuroscience suggesting that parts of the human brain (without conscious awareness) and non-human primates can detect deception (e.g., Grezes et al., 2004; Wheeler, 2010). In the current report, we hypothesized that indirect measures of deception detection—measures capable of accessing less conscious parts of the mind—will yield more deception detection accuracy than direct/conscious measures which hover at 50% (Bond & DePaulo, 2006). If our hypothesis is supported, we will be able to offer the beginnings of a unifying framework to tie together previously disparate findings. Such findings also would call into question the adequacy of explicit truth-lie judgments as a marker of deception detection ability in humans.

Attempts to Explain Dismal Deception Detection Accuracy

Theories from social, forensic, and evolutionary psychology have attempted to explain consistent at-chance deception detection accuracy; however, most theoretical accounts fall short in explaining the full picture of findings. For example, some research on nonverbal behavior blames the lack of accuracy on the "absence of a Pinocchio's nose"; deception is not clearly linked across people and time to one specific cue (e.g. DePaulo et al., 2003). Instead, liars (versus truth-tellers) emit a complex array of nonverbal clues, and research suggests that—even in the presence of many deception cues—perceivers have inaccurate naïve theories about which ones to rely on. For instance, the commonly held naïve theory that liars look up and to the left is false (Wiseman et al., 2012). Other theories suggest that humans often live in conditions of such abundance and safety that we lack the motivation and suspicion necessary to detect signals of deception (Vrij, Granhag, & Porter, 2010). But the motivational account makes less sense when one considers the clear evolutionary advantage afforded to successful lie detectors (Carney, Dubois, Nichiporuk, ten Brinke, Rucker, & Galinsky, 2013; Krebs & Dawkins, 1984).

Did Humans Evolve to Detect Deception? Evidence from Neuroscience and Primatology

The evolutionary argument that humans should be accurate at detecting deception finds some traction in primate work, which suggests that *non-human* primates can both successfully produce and accurately detect lies (Byrne & Corp, 2004; Menzel, 1974). Jane Goodall (1986) and others have documented sophisticated and accurate deception detection by chimpanzees, allowing them to find (and subsequently steal) food hidden from them by a dishonest counterpart. Similarly, capuchin monkeys accurately detect deception, choosing to ignore others' false 'alarm calls' aimed at luring feeding monkeys away from their meal (Menzel, 1974; Wheeler, 2010).

Accurate deception detection to acquire (or maintain) access to resources is precisely the mechanism thought to promote this ability in humans too (Krebs & Dawkins, 1984), and while evidence suggests that people are not consciously able to discern liars from truth-tellers, or even accurately report which cues indicate deception, *this skill may linger below the reaches of introspection* (Hartwig & Bond, 2011).

Recent brain imaging work suggests that three brain regions are activated when deceptive acts are correctly detected: the orbitofrontal cortex (a region involved in understanding others' mental states), anterior cingulate cortex (a region associated with monitoring inconsistencies), and the amygdala (a bilateral structure associated with threat detection) (Grezes et al., 2004; Lissek et al., 2008). Abnormal functioning in these regions is associated with deficits in basic social cognition more generally and with impaired deception detection accuracy (e.g., among autistics; Sodian & Firth, 1992). Research also strongly suggests that the right hemisphere has special insight about sincerity; genuine or deceptive audio statements received by the left ear (processed by the right hemisphere) are more accurately classified than those fed to the right ear (Malcolm & Keenan, 2005). Similarly, left-handed (likely right hemisphere-dominant) individuals experience a small advantage in accurately detecting deception, relative to right-handers (Porter et al., 2002). Further, aphasics—individuals sustaining left cerebral hemisphere damage (particularly the left orbitofrontal cortex), who cannot comprehend spoken sentences and must rely on nonverbal cues to detect deception—are more accurate than right hemisphere damaged patients and healthy controls (Etcoff, Ekman, Magee, & Frank, 2000). Together, these findings suggest that when conscious thought is impaired or stripped away, deception detection accuracy is enhanced.

Why Aren't Conscious Judgments Accurate?

From a dual-process perspective, it is possible that less conscious parts of the mind are equipped with the architecture for accurate deception detection but that conscious reasoning compromises accuracy by imposing incorrect stereotypes about how liars behave during deception (Evans & Stanovich, 2013; Vrij, Granhag, & Porter, 2011). Explicit deception detection decisions are better predicted by subtle but valid behavioral cues, than those erroneous stereotypes commonly reported as decision-making criteria by perceivers, suggesting a less-conscious, accurate influence on explicit decisions (Hartwig & Bond, 2011). Further, that imposing cognitive load increases explicit deception detection accuracy (Albrechtsen et al., 2009) suggests that both more- and less-conscious processes contribute to explicit deception detection decisions in a consolidative or "corrective" mental design, with less-conscious accuracy dampened by the extent to which cognitive resources are available to cause more-conscious interference (Gilbert, 1999). To shift this process toward accuracy, researchers have attempted to inform conscious reasoning by providing lie detectors with detailed information about deceptive behavior. Modest success has been observed ranging from gains of 4% (Frank & Feeley, 2003) to over 30% (Porter, Woodworth, & Birt, 2000; Shaw, Porter, & ten Brinke, 2012). Overall, evidence points overwhelmingly to the idea that somewhere below the reaches of introspective access, deception-detection accuracy is lurking.

The Current Research

In the current report, we hypothesized that indirect measures of deception detection—capable of accessing less conscious parts of the mind—will yield more deception detection accuracy than direct/conscious measures which yield chance-levels of accuracy. Experiment 1 employed a high-stakes mock crime paradigm to produce videos of people ($N_{stimuli}$ = 12) who were either lying or telling the truth about stealing $100. We used these videotaped stimuli to test our unconscious lie detection hypothesis with the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998; Nosek, Greenwald & Banaji, 2007). Experiment 2 further tested the hypothesis by using subliminally presented images and a semantic classification task (Draine & Greenwald, 1998). In both experiments naïve participants also made direct, self-report judgments of whether each person was lying or telling the truth.

Experiment 1

The goals of Experiment 1 were to: (1) create a set of videotaped targets insisting they did not commit a crime—half of whom were genuinely pleading their innocence and half of whom were lying, and (2) to use the videotaped pleaders to test the hypothesis that indirect measures of deception detection would yield more accuracy than traditional self-report judgments. These videotaped stimuli are freely available for research use from the authors.

Method

Participants

Seventy-two (51 female) undergraduate students at the University of California, Berkeley, were recruited to the economics lab (xLAB) at Haas Business School and completed the study for $16 in compensation. Participants were 20.7 years old, on average (*SD* = 3.1).

Materials

High-Stakes Mock Crime: Development of Truthful and Deceptive Pleader Videos. A "high-stakes mock-crime paradigm" was borrowed from the field of criminal justice (Kircher et al., 1988). This paradigm is often used in the social psychology literature (e.g., Frank & Ekman, 2004; see DePaulo et al., 2003). An experimenter sat with each participant and explained that they would have an opportunity to earn $100 by convincing the experimenter that they did not steal a $100 bill hidden in the testing room.

Participants were told that after the experimenter left the room, the computer would randomly decide and instruct the participant whether or not to steal the money. All participants were equally incentivized to do their best to convince the experimenter they did not steal the money (regardless of whether or not they did); all had the chance to earn the $100, and be entered into a lottery to win an additional $500. Failure to convince the experimenter resulted in a loss of the $100 prize.

After instructions were given to participants, the experimenter left the testing room and the participant received randomly assigned, computerized instructions which stated either (steal condition):

> “STEAL THE MONEY OUT OF THE ENVELOPE!!! Be very quiet. Put the envelope and books back exactly as you found them. Put the money ON YOU somewhere—pocket, sock, wherever but make sure the experimenter can’t see it (obviously). When you are done STEALING the money come back to the computer and click ‘continue’.”

Or, (no-steal condition):

> DO NOT steal the money in the envelope. Leave the money in the envelope and put it back where you found it. Be very quiet. Put the envelope and books back exactly as you found them. When you are done putting the money and envelope back in the books, come back to the computer and click ‘continue’.”

After the possible theft, the experimenter re-entered, turned on a video camera, and began the interrogation. Participants were asked a series of questions in an affectively neutral, firm manner. Ten questions were asked, including: ”baseline questions” (i.e., neutral questions not pertaining to the mock theft about things which were verifiable) and “pleading questions” (i.e., questions about the possible theft; Kircher et al., 1988). Baseline questions included: “what are you wearing today?” and “what is the weather like outside?” The “pleading questions” were adapted from Frank and Ekman (2004) and included, “did you steal the money?”, “why should I believe you?” and “are you lying to me now?” Using these procedures, *N* = 12 mock crime videos were created for use in the present research, 6 were genuine (6 deceptive) and 5 were male (7 female). On average, interrogations lasted 97 seconds (*SD* = 21.62 seconds) and captured a frontal view of the participant from the shoulders up.

Four variables were measured to assess whether the high-stakes crime manipulation was successful in producing pleaders who showed evidence of deception in cognitive impairment (a Stroop task; Stroop, 1935), emotional distress (self-reported on 4 items: afraid, frightened, scared, jittery), physiological stress (salivary cortisol reactivity: time 1 taken 10 minutes after arrival and time 2 taken ~27 minutes after the manipulation), and nonverbal tells associated with deception (8 reliably coded deception variables taken primarily from DePaulo et al., 2003: less speaking time, faster speech rate, more nervous, more lip presses, less cooperativeness, more vocal uncertainty, more one-sided shoulder shrugs). The 4 variables were *z*-scored and combined to produce a deception-stress composite variable. As expected, deceptive pleaders showed more evidence of deception-related stress ($M = .53$; $SD = .57$) than did truth-tellers ($M = -.53$; $SD = .33$), $F(1,11) = 15.50$, $p < .01$; $d = 2.28$.

Indirect Measure of Automatic Deception Detection. The IAT was used as a measure of indirect deception detection (see Ask, Granhag, Juhlin, & Vrij, 2013 for use of the same paradigm to reveal true and false intentions). “Accurate deception detection” was operationalized as a mental association between the liar or truth-teller and congruent deception-related concepts. The principle underlying the IAT is that stimuli sharing conceptual features are more mentally associated. In this context, we were interested in whether observing someone tell a lie would, outside of awareness, activate mental concepts associated with deception. In the current research, after viewing videos of genuine and deceptive pleaders, we tested whether participants were more likely to conceptually link deceptive pleaders’ faces with deception-related concepts (untruthful, dishonest, invalid, deceitful) relative to truth-related concepts (truthful, honest, valid, genuine);

and truthful pleaders' faces more with truth-related concepts (relative to deception-related concepts). Specifically, participants watched pairs of pleader videos (one liar, one truth-teller) and completed an IAT juxtaposing the two targets. In the IATs, pleaders' pseudonyms were displayed in the upper left and upper right hand corner of the screen along with the words TRUTH and LIE. Still photographs from each video and words associated with lies and truths were presented in the middle of the screen and classified into the right- or left-hand category. A 5-block IAT format with counterbalancing and scoring procedures by Greenwald, Nosek, and Banaji (2003) was used. Each IAT provided an effect size (*d* score) representing strength of association between liars and deception concepts, and truth-tellers and truth concepts (relative to incongruent pairings). Indirect deception detection was measured as the average *d* score across the 6 IATs with higher values (i.e., those above zero) indicating greater accuracy.

Direct / Self-Report Measures of Deception-Detection. As is typical in deception detection research, participants indicated in a forced-choice format whether each person was lying or telling the truth (Bond & DePaulo, 2006).

Procedure

Participants viewed pairs of pleader videos presented in the middle of a computer screen, approximately 4” x 4” in size. A unique pseudonym was displayed across the top of the screen (above the video) for each pleader (e.g., “John”; pseudonyms were balanced for length and commonality within and across pairs). Participants then saw pleaders' images on the screen and completed a direct, self-report judgment of whether each person was: “Lying?” or “Telling the truth?”. Following the self-report judgment task, participants completed an IAT. This was repeated 6 times—once for each pair of truthful and deceptive pleader videos, for a total of 12 videos[1].

Results & Discussion

Direct (Self-Report) Deception Detection Accuracy was Poor

As expected and consistent with decades of past research, when deciding whether 12 different pleaders were lying versus telling the truth, participants were unable to discern lies from truths. Accuracy was only 46.83% (*SD* = 13.54). This accuracy rate was significantly below chance (50%), $t(71) = -1.97$, $p = .053$, $d = -.23$. No participant gender differences were evident, *p*s > .05. In short, participants' explicit decisions were consistently poor; deception detection accuracy was below chance and consistent with the claim that something about consciously considered self-report judgment leads to poor deception-detection accuracy. One dominant theory is that consciousness derails deception detection accuracy because it relies on incorrect and stereotypic (i.e., "top down") cues. For example, many people think gaze-aversion is associated with lying—it isn't (DePaulo et al., 2003). Liars sometimes engage in *more* eye contact than truth-tellers—potentially accounting for below-chance accuracy rates (Mann, Ewans, Shaw, Vrij, Leal, & Hillman, 2013).

Indirect (Unconscious) Deception-Detection Accuracy was Better

Mean *d* scores for each participant ($M = .06$, $SD = .19$) were found to be significantly greater than zero, $t(71) = 2.63$, $p = .011$, $d = .32$, indicating that in less consciously accessible and controllable parts of the mind, viewing a liar automatically activates concepts associated with deception, while viewing a truth-teller automatically activates truth-related concepts (see Figure 1). This finding was particularly true for female participants whose less-conscious cognitions

[1] In both experiments, participants completed the TIPI (Gosling, Rentfrow & Swann, 2003) and a short demographic questionnaire after completing all judgments. No variables besides gender and age were considered or analyzed. No additional conditions were run nor critical DVs measured.

were significantly more “accurate” (*M* = .10; *SD* = .17) than male participants’ (*M* = -.03; *SD* = .20), *t*(70) = -2.74, *p* < .01, *d* = -.65. This gender finding is interesting given that no research has shown a female advantage in the explicit detection of deception delivered by strangers (although limited research suggests that women are better at detecting lies of their friends and romantic partners; e.g., McCornack & Parks, 1990). Sex differences in person-perception accuracy tend to show a female advantage around more intuitive judgments (i.e., “gut” or “less conscious” judgments; Hall, 1978)—consistent with the result reported here.

Experiment 2

With Experiment 1 in hand, results suggested that when less conscious processing is allowed to render a decision about whether a person is lying or telling the truth, accuracy is revealed. However, Experiment 1 contained methodological limitations inherent to the IAT. First, videos were watched two-at-a-time after which an IAT was taken juxtaposing the two videos—a sequence that was repeated six times. Importantly, each pair included one liar and one truth-teller. The contrast in pleader sincerity could have artificially increased accuracy; this alternative explanation needed to be ruled out. Second, the images of liars and truth-tellers presented in the context of the IAT were supraliminal. A stricter test of the unconscious deception detection hypothesis would be to use subliminally presented images to test for unconscious and automatic concept activation. Thus, Experiment 2 used a semantic classification task as the indirect measure of deception detection accuracy and images of liars and truth-tellers were presented subliminally after viewing the videotaped pleaders.

Method

Participants

Sixty-six undergraduates (42 female) at the University of California, Berkeley, were recruited to the economics lab (xLAB) at Haas Business School. The mean age was 20.33 years old (*SD* = 1.82); all participated for $16 in compensation.

Materials

Observing the Pleader Videos. The same set of twelve pleas (6 genuine, 6 deceptive) were presented in randomized pairs in Experiment 2. Importantly, however, videos were randomly linked which resulted in two different (truth-lie) and four same (two truth-truth; two lie-lie) veracity pairings.

Indirect Measure of Deception Detection. A semantic classification task following Draine and Greenwald (1998) was used. Each trial began with a 500ms fixation point (+) in the center of the screen, followed by the subliminally-presented stimulus (< 17ms or, 1 screen refresh) which was forward- and backward-masked by abstract faces taken from Cunningham et al. (2004)—masks were presented for 200ms (see Figure 2 for trial sequence). Stimuli were one of the four still images extracted from each of the previously watched pleas and subliminal presentation ensured that any target-sincerity spreading activation was unconscious.[2] One of eight target words (truthful, honest, valid, genuine, untruthful, dishonest, invalid, deceitful) then appeared in the center of the screen until the participant sorted the word into the TRUTH or LIE category (appearing in the upper right and left corner of the screen, counterbalanced). All test blocks included 64 trials. The practice block, however, was only 8 trials long and did not include subliminal primes; instead, a black screen appeared between the presentation of the fixation point

[2] At the end of the experiment, participants completed a subliminal threshold sensitivity task (to gauge whether participants' perceptual threshold was above or below the duration used for subliminal presentation). Participants were unable to discriminate male and female faces above the level of chance (*M* = 48.35, *SD* = 15.14) suggesting that faces were indeed presented below conscious perception, $t(65) = -.88$, $p = .38$.

and each target word. These trails familiarized participant with the task using a red-X-incorrect-feedback procedure.

Procedure

Participants viewed two pleaders (in random pairs and presented in random order) and then completed a semantic classification task in which subliminal stimuli were faces of the two previously seen pleaders. Participants then saw pleaders' images on the screen and completed explicit self-report judgments of sincerity. This procedure was repeated for six video-pairs.

Results & Discussion

Direct (Self-Report) Deception-Detection Accuracy was Poor

Consistent with our hypothesis and evidence from traditional deception detection paradigms (Bond & DePaulo, 2006), participants could not discern lies from truths. In Experiment 2, participants performed at chance when a direct measure harvested judgment from consciousness (*M* = 49.62%; *SD* = 48.36), *t*(65) = -.27, *p* = .79, *d* = -.01.

Indirect (Unconscious) Deception-Detection Accuracy was Better

Automatic deception-detection, as represented by a *d* score for each participant (*M* = .03, *SD* = .11) was significantly greater than zero, *t*(65) = 2.26, *p* = .027, *d* = .27, demonstrating that subliminally-presented faces of liars and truth-tellers *activated* and *facilitated* congruent concepts.[3]

Are Indirect Deception-Detection Measures *More Accurate* than Direct Measures?

In order to directly compare direct and indirect measures of deception-detection accuracy, we conducted a mini meta-analysis of Experiments 1 and 2, comparing effect sizes (plotted in Figure 1) with a *z* test. The average effect size for indirect (unconscious) measures was *r* = .28 and *r* = -.11 for direct (self-report) measures. As expected, automatic associations were

[3] Unlike in Experiment 1, however, no gender differences were evident, *t*(64) = 1.67, *p* = .10.

significantly more accurate than controlled, deliberate decisions, $z = -3.32$, $p < .001$. Together, these findings support our hypothesis that: (1) viewing a liar automatically, and unconsciously, activates deception-related concepts (and viewing a truth-teller activates truth concepts), and (2) indirect measures of deception-detection yield more accuracy than historically used, direct self-reports.

General Discussion

Across 2 experiments, indirect measures of accuracy in deception detection were superior to traditional, direct measures, providing strong evidence for the idea that, although humans can't consciously report who is lying and who is telling the truth, somewhere on a less conscious level we do actually have a sense of when someone is lying. The current results are consistent with research on primates who lack self-awareness and yet demonstrate the ability to detect deception (Wheeler, 2010). It is also consistent with evidence that both cognitively-taxed humans and certain parts of the brain can discern liars from truth-tellers (Albrechtsen, et al., 2009; Etcoff et al., 2000). Further, findings provide long sought-for support for the evolutionary perspective that accurate deception detection is adaptive and should be favored (Krebs & Dawkins, 1984).

Characterizing human deception detection as an error-fraught process, no more accurate than chance, is a misleading summary of scientific insight on the topic, given interdisciplinary findings and the results presented here. But how does consciousness interfere with our natural ability to detect deception? Researchers propose it is because our conscious minds know the cultural stereotypes about the nonverbal display of deception—which happen to be *wrong* (Vrij, Granhag, & Porter, 2010). From a dual process perspective, our results—in combination with insights from Albrechtsen et al. (2009) and Hartwig and Bond (2011)—suggest that accurate deception detection is an unconscious process, made inaccurate either by consolidation with, or "correction" by, conscious decision-rules (Gilbert, 1999). Accurate deception detection, then, may occur in instances where decisions about sincerity are naturally indirect. For example, future research might consider whether women would be less inclined to accept a second date from a deceptive, relative to a genuine, male suitor. Future investigations should also seek ecological validity, examining automatic deception detection in face-to-face interactions and for real pleaders who were (or were not) convicted of crimes.

In short, while the detection of lies is of great importance in personal, professional, and civic domains. Past research concluded that conscious determinations of deception rarely exceed chance—a dismal conclusion that contradicts evolutionary theory. Our findings suggest however, that accurate lie-detection is, indeed, a capacity of the human mind, potentially directing survival and reproduction-enhancing behavior from below introspective access.

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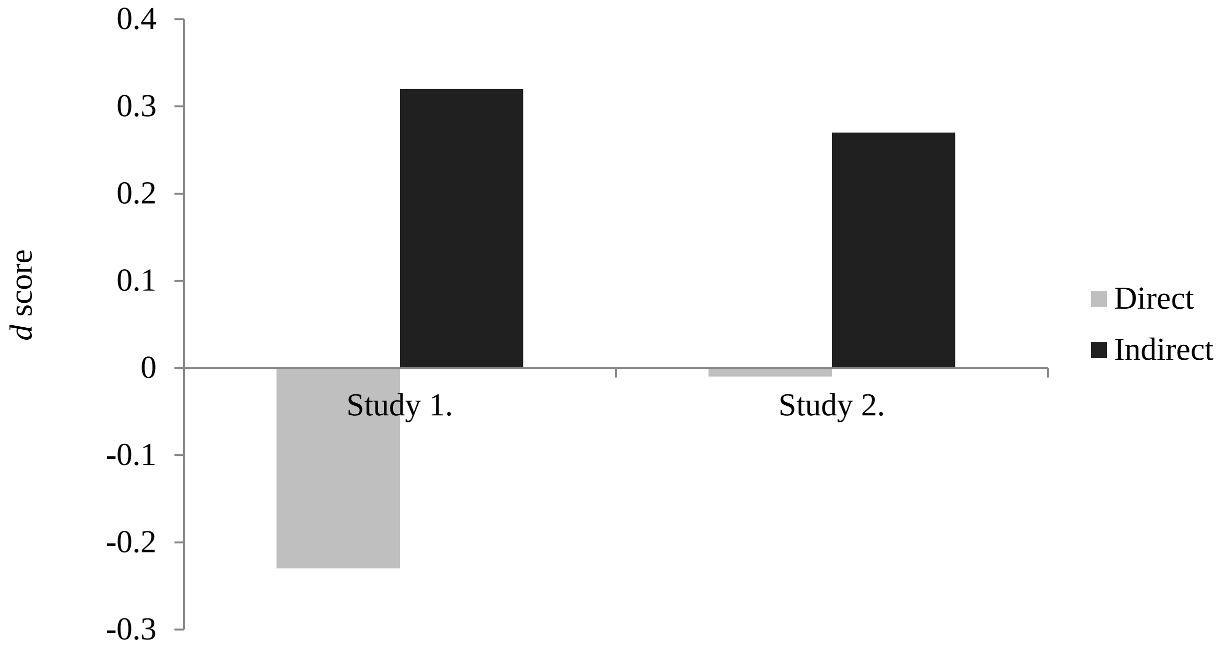

Figure 1. Effect sizes (*d* scores) of analyses testing for the presence of discrimination between liars and truth-tellers, using direct and indirect (IAT or SCT, in Experiments 1 and 2 respectively) tasks.

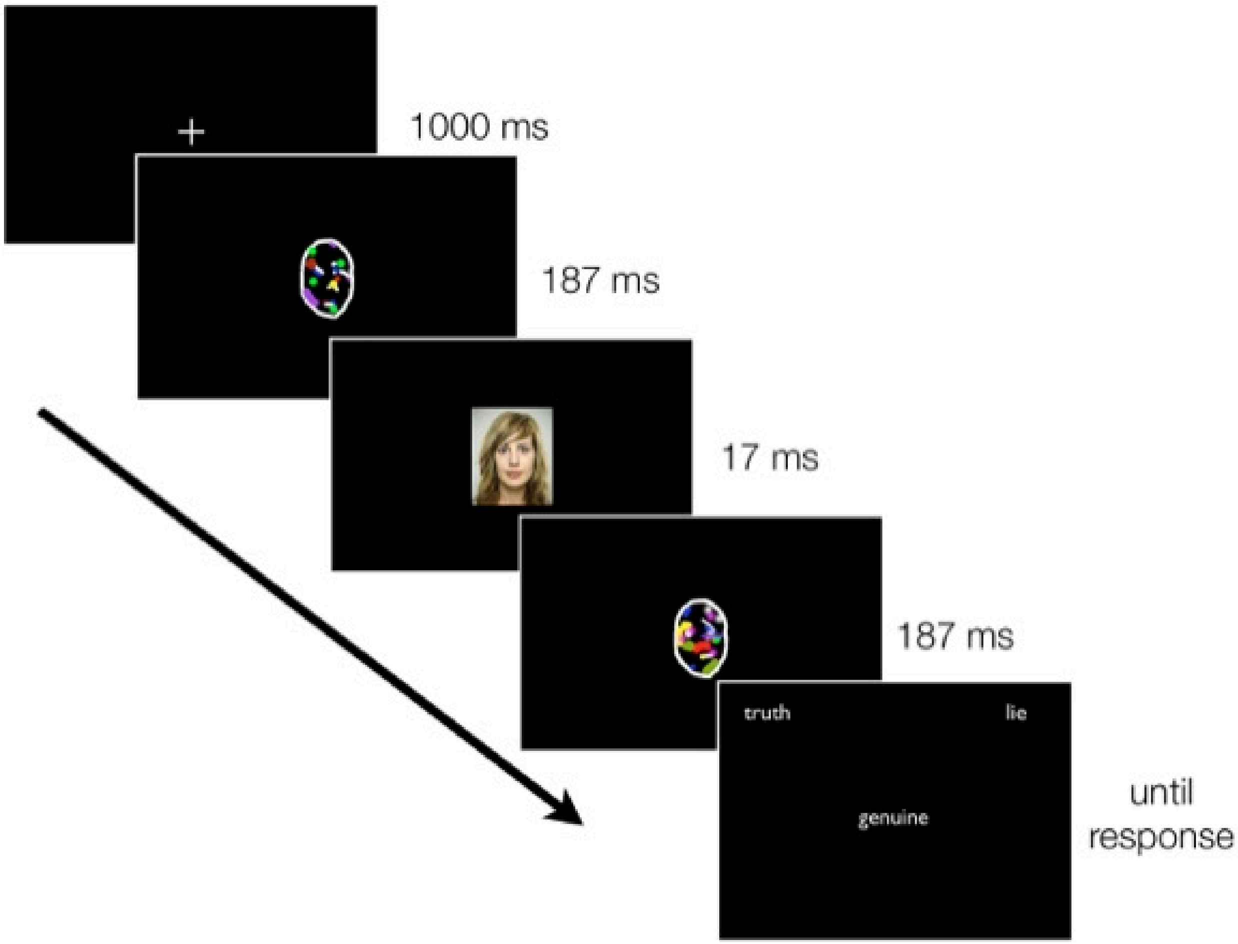

Figure 2. Sequence of stimuli presentation in each test trial of the semantic classification task.