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ORIGINAL ARTICLE

Destination memory and deception: when I lie to Barack Obama about the moon

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Abstract This study investigates whether deceivers demonstrate high memory of the person to whom lies have been told (i.e., high destination memory). Participants were asked to tell true information (e.g., the heart is a vital organ) and false information (e.g., the moon is bigger than the sun) to pictures of famous people (e.g., Barack Obama) and, in a subsequent recognition test, they had to remember to whom each type of information had previously been told. Participants were also assessed on a deception scale to divide them into two populations (i.e., those with high vs. those with low deception). Participants with high tendency to deceive demonstrated similar destination memory for both false and true information, whereas those with low deception demonstrated higher destination memory for lies than for true information. Individuals with a high tendency to deceive seem to keep track of the destination of both true information and lies to be consistent in their future social interactions, and thus to avoid discovery of their deception. However, the inconsistency between deceiving and the moral standard of individuals with a low tendency to deceive may result in high destination memory in these individuals.

Introduction

Deception, making misleading statements, or blunt lies are behaviors that most societies abhor, and parents, society, and the education system invest a great deal of effort in teaching that such behavior is wrong and must be avoided (Wang, Galinsky, & Murnighan, 2009; Popliger, Talwar, & Crossman, 2011). Yet, it is also true that deception and lies are present in everyday life. A study surveyed 1000 adults who were asked how often they had lied in the last 24 h and the findings revealed an average deception rate of approximately 1.65 lies per day (Serota, Levine, & Boster, 2010), consistent with diary studies reporting similar outcomes (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996). Leaving aside any psychopathological condition and lies in the context of the criminal justice system, most lies in everyday life are considered low-stake white lies that are told to oil the wheels of social interaction, to spare the feelings of others, or to gain some type of minor personal benefit (Abe 2011; Vrij, Mann, & Fisher, 2006; Baker, Porter, ten Brinke, & Udala, 2015; Dunbar et al. 2016). In a similar vein, research highlights several reasons for deceiving such as saving face, avoiding tension or conflict, managing a relationship, or enhancing desirability [for a review, see Levine, Kim, and Hamel (2010)]. However, it is worth noting that when these benefits can be accomplished without deception, people usually do not deceive others, unless they have a psychopathological condition (Levine et al. 2010).

When deceiving, one should remember to whom lies were previously told, otherwise one may include inconsistencies and the deception will probably be discovered. Thus, a relationship can be expected between deception and the ability to remember to whom a piece of information was previously told (i.e., destination memory). To understand better the relationship between deception and destination memory, we highlight studies revealing the social and affective dimensions of destination memory.

The concept of destination memory can be related to the pioneer works of Koriat, Ben-Zur, and Druch (1991) and

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Koriat, Ben-Zur, and Sheffer (1988); these authors coined the term "output monitoring" to describe how one should keep track of one's own responses when telling information to others. In a similar vein, Marsh and Hicks (2002) used the term "target memory" to account for the ability to remember to whom information was previously delivered. In addition, Brown et al. proposed the term "target monitoring" to define the ability to monitor to whom one tells information (Brown et al. 2006). In the present paper, we unify these different terminologies under the general heading of destination memory, as they have been used interchangeably to describe the ability to remember the destination of previously relayed information. Destination memory can be evaluated using procedures developed by Gopie, Craik and Hasher (2010), and Gopie and Macleod (2009). These authors asked participants to tell facts to pictures of famous people and, in a subsequent recognition test, the participants had to decide whether they had previously told that fact to that face or not. Using similar procedures, studies have revealed how destination memory can be influenced by affective and social factors. For instance, a study has demonstrated better destination memory for familiar than for unfamiliar destinations (El Haj, Omigie, & Samson, 2015). Research has also shown that destination memory can be influenced by the emotional attributes of our interlocutors (El Haj, Fasotti, & Allain, 2015; El Haj, Raffard, Antoine, & Gely-Nargeot, 2015), as well as by our ability to infer and predict the cognitive states, thoughts, or intentions of interlocutors (El Haj, Raffard, & Gely-Nargeot, 2016; El Haj, Gely-Nargeot, & Raffard, 2015).

Mirroring the research on the social and affective dimensions of destination memory, a recent study has demonstrated a relationship between destination memory and deception (El Haj, Antoine, & Nandrino, 2016). In this work, participants were given a destination memory task in which they had to decide to whom proverbs had previously been told. They were also given a five-item scale about deception (e.g., "I sometimes tell lies if I have to"). Although the results showed a positive significant correlation between deception and destination memory, one major shortcoming of this study was that deception was evaluated with a scale about the tendency to deceive and not with an experimental task in which participants had to deceive. In our view, such a task would provide a reliable evidence base for determining whether destination memory would be influenced by deception, thus contributing to a better understanding of the correlation between destination memory and the tendency to deceive, as revealed by the previous study (El Haj, Antonie et al., 2016).

Therefore, to assess deceivers' ability to remember to whom lies have previously been told, we designed a task in which participants had to deceive or tell the truth to different destinations, and then remember to whom each type of information had been told. Besides this experimental assessment, the tendency to deceive was further investigated with a deception scale. We expected higher destination memory in participants with a high tendency to deceive than in those with a low tendency to deceive. We also expected higher destination memory for lies than for true information in participants with a high tendency to deceive.

Method

Participants

The study included 44 native French speakers (26 women and 18 men, mean age 26.86 years, SD 7.76, mean years of formal education 14.27, SD 4.91). All participants were recruited on a voluntary basis and were debriefed following the study. Informed consent was obtained in accordance with the principles laid down by the Helsinki Declaration. All participants had normal or corrected-to-normal vision and hearing, and exclusion criteria were a history of psychiatric, neurological, or learning disorders.

Cognitive and clinical assessment

Cognitive and clinical characteristics of the participants were assessed with tests of episodic memory, working memory, anxiety, and depression. In the episodic memory task (Grober & Buschke, 1987), participants had to retain 16 words, each describing an item belonging to a different semantic category. After a 20-s distraction phase, participants had to recall as many words as they could, the maximum score being 16 points. In the working memory task, participants had to repeat a string of numbers in either the same (i.e., forward spans) or reverse order (i.e., backward spans). Anxiety and depression were assessed with the Hospital Anxiety and Depression Scale consisting of seven items for anxiety and seven items for depression (Zigmond & Snaith, 1983). Each item was scored by the participants on a four-point Likert scale from zero (not present) to three (considerable) and the cutoff was set at >8/21 points (Hermann, 1997). The cognitive and clinical performances of participants are presented in Table 1.

Deception scale

The Paulhus Deception Scale (Paulhus, 1998), and more precisely the Impression Management Subscale that assesses the tendency to impress others, was used. The latter consisted of five statements assessing lying and deception. These statements are (1) "I sometimes tell lies if I have to", (2) "There have been occasions when I have taken

Table 1 Means and (standard deviations) of the cognitive and clinical assessment in participants with a high tendency to deceive and in those with a low tendency to deceive

	Participants with high deception	Participants with low deception
Episodic memory	11.04 (2.66)	11.64 (2.62)
Working memory		
Forward	7.20 (1.34)	7.59 (1.43)
Backward	5.21 (1.25)	5.43 (1.27)
Anxiety	5.12 (1.24)	5.33 (1.11)
Depression	4.01 (2.11)	4.15 (2.11)

The maximum score on the episodic memory task was 16 points; performances on the forward and backward spans refer to the number of correctly repeated digits; the cutoff for anxiety and depression was >8/21

advantage of someone", (3) "I always obey laws, even if I'm unlikely to get caught", (4) "I always declare everything at customs", and (5) "I never take things that don't belong to me". These items have already been translated into French in a study assessing the validity of the Paulhus Deception Scale in a French population (Tournois, Mesnil, & Kop, 2000). In our study, participants had to answer each of the five statements on a five-point Likert-type scale ranging from never (1) to always (5). Scores on the last three statements were reversed so that a high value (total score for the five statements = 25 points) reflected high tendency to deceive.

It should be noted that the deception scale was assessed after the Hospital Anxiety and Depression Scale and was thus presented as a general clinical assessment tool.

Destination memory

Material

To assess destination memory, 24 celebrity faces and 24 different pieces of information were used. Celebrities' faces (e.g., Barack Obama) were taken from a large pool derived from previous research assessing their familiarity (El Haj, Kessels et al. 2016; El Haj, Gandolphe, Allain, Fasotti, & Antoine, 2015b). Half of the 24 pieces of information were true (e.g., Rome is the capital of Italy; it takes 24 h for the Earth to complete one full rotation; the heart is a vital organ) and the other half were lies (e.g., the moon is bigger than the sun; London is the capital of France; there is no unemployment anywhere). The true/false aspect of all the information was controlled in a separate sample of ten young adults (six women and four men) who rated each piece of information on a five-point scale (−2 = very false, −1 = false, 0 = I do not know, +1 = true, +2 = very true). These subjects reported a mean of −1.41 (SD = 0.55) for the lies and a mean of 1.62 (SD = 0.36) for the true information.

Materials were presented on a laptop computer with a 15-inch LCD display. Stimuli presentation and response recording were controlled by the software package Psychopy (Peirce, 2007).

Procedures

Procedures included a study phase, an interpolated phase, and a recognition phase. Prior to the study phase, participants were informed that the task required either telling the truth to or deceiving celebrities. Participants were also informed that their destination memory, namely their memory for the association between information and celebrities, would be tested. However, no mention was made of the deception hypothesis. The study phase involved 24 trials: each began with a 1-s white fixation cross followed by a piece of information presented in white Times New Roman 40-point font, below a (12 × 12 cm) colored picture of a celebrity. Each piece of information was preceded by the label "tell her/him the truth" or "deceive her/him". Participants had to tell out loud the celebrity the information, with no time constraint, and then press any key to continue with another white fixation cross for 1 s. The information–face correspondence was similar for all participants, while the order of presentation of the 24 information–face pairs was randomized. This study phase was followed by the interpolated phase in which they had to read aloud strings of three-digit numbers for 1 min. Then they proceeded to the recognition phase in which the 24 previously presented pieces of information and faces were paired into 12 intact pairs (six face–true information pairs + six face–lies pairs) and 12 pairs re-organized into new pairs (six face–true information pairs + six face–lies pairs). Pairs were presented in random order, one pair at a time, with the information below the celebrity. For each pair, the participants had to decide, with no time limit, whether they had previously told that information to that celebrity or not. Responses were given by pressing a green key for "yes" and a red key for "no". After each decision, a blank screen was displayed for 250 ms followed by the next test trial. Performance on the destination memory task was measured by the proportion of hits (correct "yes" responses) minus the proportion of false alarms (incorrect "yes" responses). Three destination memory scores were considered: general destination memory for all the 24 pieces of information, destination memory for the 12 true pieces of information, and destination memory for the 12 lies. Hence, regardless of the truthfulness/deception modality, a score of 1 meant that the participant recognized all the pairs correctly, with no false alarms.

Results

Statistics

Data obtained on the evaluation of destination memory are shown in Fig. 1. To investigate destination memory in participants with high or low deception, a median split was established on the scores obtained on the deception scale to divide the participants into two populations. Destination memory was then compared for true and lies in participants with high tendency to deceive vs. those with low tendency to deceive; comparisons were established with non-parametric tests due to the non-normal distribution of the data. For all tests, the level of significance was set at $p \leq 0.05$, and p values between 0.051 and 0.10 were considered trends, if any. Effect size was calculated using Cohen's d criterion (Cohen, 1992) (0.20 = small, 0.50 = medium, 0.80 = large).

Median split

A median split was carried out on the scores on the deception scale, dividing participants into those with a high (score > 6.00, $n = 14$) or low (score < 6.00, $n = 23$) tendency to deceive. It is important to note that (1) seven participants obtained a score equal to the median, and (2) for all participants, the mean score on the deception scale was 7.70 (SD = 3.85).

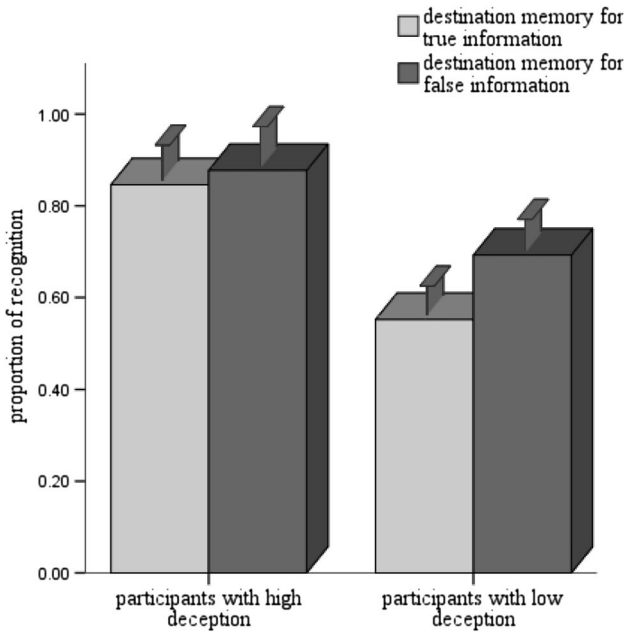

Fig. 1 Destination memory for true and falsified information in participants with a high tendency to deceive and in those with a low tendency to deceive. *Error bars* are 95% within-subjects confidence intervals

High destination memory in participants with a high tendency to deceive

For all participants, the Wilcoxon signed rank-sum test showed higher destination memory for lies ($M = 0.76$, SD = 0.17) than for true information ($M = 0.66$, SD = 0.18) ($Z = -3.38$, $p = 0.001$, Cohen's $d = 0.57$), an outcome that was also observed in participants with a low tendency to deceive ($Z = -2.86$, $p < 0.01$, Cohen's $d = 0.97$) but not in those with a high tendency to deceive ($Z = -0.89$, $p > 0.10$). Mann–Whitney's U tests showed higher mean destination memory in participants with a high tendency to deceive ($M = 0.86$, SD = 0.12) than in those with a low tendency to deceive ($M = 0.62$, SD = 0.11) ($Z = -4.25$, $p < 0.001$, Cohen's $d = 2.08$). Mann–Whitney's U tests also showed higher destination memory for lies in participants with a high tendency to deceive than in those with a low tendency to deceive ($Z = -3.19$, $p < 0.001$, Cohen's $d = 1.20$), as well as higher destination memory for true information in participants with a high tendency to deceive than in those with a low tendency to deceive ($Z = -4.47$, $p < 0.001$, Cohen's $d = 2.14$).

Complementary analysis

To control whether differences between participants with high deception and those with low deception were not due to general differences on memory or anxiety/depression, we compared the performances of both populations on the tests of episodic memory, spans, anxiety, and depression. Analysis showed no significant differences for any of these tests ($p > 0.10$). We also carried out regression analysis in all the 44 participants. The dependent variable was destination memory for true information and the predictor variable was scores on the deception scale. The deception scores contributed significantly to destination memory for true information ($\beta = 0.43$, adjusted $R^2 = 0.36$, $t = 8.56$, $p < 0.001$). The same analysis was carried out for destination memory for false information, and scores on the deception scale contributed significantly to this memory ($\beta = 0.61$, adjusted $R^2 = 0.16$, $t = 11.13$, $p < 0.001$).

Discussion

This paper investigated destination memory for true information and lies in participants with a high or low tendency to deceive. Consistent with our hypothesis, higher destination memory was observed in participants with a high tendency to deceive than in those with a low tendency to deceive. However, and unlike our expectation, a higher

destination memory for lies than for true information was observed in participants with a low tendency to deceive, but not in those with a high tendency to deceive.

When deceiving, one should remember to whom lies were previously told, otherwise one may include inconsistencies and the deception will probably be discovered. Consistent with this assumption, our findings demonstrated high destination memory for both truth and lies in participants with a high tendency to deceive. In our view, deceivers keep track of the destination of both truth and lies to avoid telling the truth in future interactions with the person to whom lies were previously told, and vice versa. In other words, remembering the destination of truth and lies may be useful for deceivers as they consider emitting both kinds of information in the present and future social interactions. This assumption is of interest as it may explain not only why our participants with a high tendency to deceive demonstrated higher destination memory for both true statements and lies than participants with a low tendency to deceive, but also why the participants with a high tendency to deceive demonstrated similar destination memory for both false and true information.

Unlike the participants with a high tendency to deceive, those with a low tendency demonstrated higher destination memory for lies than for true information. Because individuals with a low tendency to deceive are used to telling the truth in their social interactions, any misleading statement or lie may require great cognitive effort: an effort to develop the deceptive information, to inhibit default and automatic honest responses and, in our study, to process the person to whom the information is told. This cognitive effort is likely to result in a deep processing of the situation and, consequently, in high destination memory. The high destination memory may also result from the inconsistency between deceiving and the moral standard of individuals with a low tendency to deceive, or even from their fear of potential shame or stigma if the destination discovers the deception.

One of the most difficult challenges for scientific research on deception is the ecological validity of the tasks used to prompt deception, especially in participants with a low tendency to deceive (Falkiewicz et al., 2015). Most research on deception is based on the Sheffield Lie Test (Spence et al., 2001), in which participants are typically asked to provide "yes" or "no" responses to simple semantic questions (e.g., "Is Paris the capital of Italy?"). Critically, a cue instructs participants to lie or tell the truth. Using this paradigm, it has been shown that lying leads to longer response times than truth telling (Spence & Kaylor-Hughes, 2008; Verschuere, Spruyt, Meijer, & Otgaar, 2011). However, this task does not assess deception in social interactions. The latter issue was assessed to some extent by Abe and Greene (2014) who designed a computerized prediction task in which participants attempted to predict the outcomes of random coin flips and were financially rewarded for accuracy. In some trials, participants were rewarded based on self-reported accuracy, allowing them to gain money dishonestly by lying (for similar procedures, see Baumgartner, Fischbacher, Feierabend, Lutz, & Fehr, 2009; Greene & Paxton, 2009; Sip et al., 2010). Deception in social interactions was also assessed by Falkiewicz et al. (2015) who developed a computerized speed dating task in which participants had to convince dates to have a real date with them. Participants were also encouraged to provide deceptive responses to be consistent with the date's attitude. Although these studies provided an interesting assessment of deception in social interactions, the ability to remember to whom misleading statements had previously been told was not taken into account. Our study contributes to this literature by proposing a task that highlights how individuals with a high tendency to deceive may monitor associations between a piece of information and its destination.

One limitation of our study was the ceiling effect for destination of false information in participants with high deception. The ceiling performance in these participants may even be considered as an alternative explanation for our findings. Future research can address this issue by using unfamiliar destinations. Future research can also consider asking the participants to create their own lies. This consideration is important because lying has been defined as the act of deliberately making a false statement with intent to instill false beliefs into the mind of the information's recipient (Ströfer, Noordzij, Ufkes, & Giebels, 2015; Ekman, O'Sullivan, & Frank, 1999). Hence, by asking participants to tell their own lies, future research may address lying with more appropriate support (i.e., with deliberate lies rather than with simple false information). Finally, future research should avoid the well-known influence of bizarreness. In memory research, the bizarreness effect refers to superior retention of atypical stimuli relative to common ones (McDaniel, Einstein, DeLosh, May, & Brady, 1995; Geraci, McDaniel, Miller, & Hughes, 2013). Because some of our false statements are uncommon (e.g., "London is the capital of France"), their retention may be due to this feature rather than to mechanisms related with deception. The potential effect of bizarreness can be assessed by implanting a control experiment in which participants are required to remember the destination of lies as well as of bizarre, but true, information.

By highlighting destination memory in individuals with a high tendency to deceive, this paper paves the way to studies assessing destination memory in pathological lying. Another issue that future studies might explore is the physiological reactions during remembering the destination of

lies as these may emphasize the emotional and affective aspects of lying in social interactions.

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Compliance with ethical standards

Conflict of interest The authors declare no conflict of interest.

Ethical statement All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent All participants provided written informed consent before participation.

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