The effect of lying on intentional versus unintentional facial expressions

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Abstract

Given the absence of a consensus within the literature regarding nonverbal cues that make lie detection possible, the present research aims to test whether the facial expressions of women involved in deceitful interactions differ from those involved in truthful interactions. This comparison is made both on the factor lie versus truth and on the characteristics of the situation: prepared versus spontaneous lie. The interactional situation is inspired by the “$ 20 for a lie” experiment [J Abnorm Soc Psychol 58 (1959) 203–210]. The nonverbal behaviour-coding scheme used was based on the cues identified by Ekman et al. In line with our hypotheses, the number of behaviours observed (all categories combined) was significantly higher in the deceitful interaction and even more so in the spontaneous lie condition. Moreover, there was a noticeably higher proportion of intentional behaviours in liars than in truth-tellers. Finally, the proportion of fake smiles and smiles of embarrassment was also markedly higher in liars. The correspondence between these results and those already reported in the literature is discussed, as well as the possibility of using some of the cues studied as indicators in applied settings.

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Mots clés : Mensonge ; Indices non verbaux du visage ; Comportements du menteur ; Intentionnalité versus non intentionnalité ; Sourires

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1. Introduction

Research aiming to identify cues for lie detection, or at least for suspecting that a person is hiding something, came to light at the end of the sixties (Ekman and Friesen, 1969; Undeutsch, 1967), with a further specific development in the 1980s (Yuille, 1989; Zuckerman et al., 1981). Three perspectives were thus developed, irrespective of one another, without an aim for any real synthesis (except in some work, notably by Biland et al., 1999; Ekman, 1986, 2001; Vrij, 2000; Zuckerman et al., 1981).

“The first” consists of significant physiological measures of emotions correlated to the utterance of a lie. The technique used in this framework is the polygraph (Kleiner, 2002), widely used in North America though controversial elsewhere. “The second” perspective is concerned with teasing out verbal indicators, which emerge from the content analysis of statements. German forensic psychology was at the origin of the Statement-Validity Analysis (SVA) technique (Steller and Köhnken, 1989) that essentially rests on the content analysis of the statements, Criteria-Based Content Analysis (CBCA). The CBCA is based on the hypothesis that testimony from a real-life experience differs, in terms of its content and quality, from statements based on fabrication or fantasy. The analysis is carried out on 19 criteria, which correspond to the general characteristics of the statements, the specific content, any original content, to content related to motivation and to specific elements of the offence. More recently, this perspective also looked at the definition of a set of indicators based on Reality-Monitoring theory (Johnson and Raye, 1981; Masip et al., 2005). According to this theory, the events that actually took place are going to be reflected in words of the witness especially by sensory information. On the contrary, events that come from the witness’ imagination will be reflected in information with a number of internal cognitive details, as well as the perfection of a procedure that achieved a certain success in the actual practice of judicial inquiries, the Scientific-Content Analysis (SCAN) developed by Sapir (for a review see Masip et al., 2002). The SCAN technique is not designed to identify if a suspect is lying, it simply sheds light on the parts of a declaration, which demand future clarification during a hearing. The matter at issue would be to analyse the written declaration on the basis of speech choices by the person (words used, punctuation, grammatical structure, general organisation, presentation of facts, etc.). “The third” perspective, developed in order to extract lying indicators, is concerned with the analysis of a liar’s nonverbal behaviour, in particular his facial expressions (for a review see Biland, 2004).

In the end, after more than thirty years of research, the results drawn are fairly mixed. Whatever the approach taken, when individuals relate an event, few indicators in the literature appear to reliably determine whether they are lying or telling the truth. There is therefore a need, in each of the three aforementioned perspectives, of continuing efforts to identify reliable criteria. In this article, the approach will be focused on the nonverbal indicators of lying, without resorting to physiological measures, most likely to translate both the emotions of the liar and his attempts to control expressions or else the cognitive overloads involved in a lying situation. Various models have been developed to account for the behaviour of the liar, in particular nonverbal facial expressions. The review that follows is intended to appraise the main studies from these three categories of lying analysis.

Many researchers (Buller and Burgoon, 1996; DePaulo et al., 2003; Zuckerman et al., 1981) consider that a lie produces, in the person who manufactures it, both a physiological arousal, specific negative emotions (guilt, fear of being exposed) as well as positive (the delight in dupery), an attempt to control (exercised by the issuer on his behaviour and speech) and a cognitive overload. Every author focuses their research on at least one of these notions and the weight that it (or they) occupies in interacting with others. The different models all have an integrative aim and objective to predict whether it can be assumed that the person observed is lying or telling the truth. The predictions appear, however, contradictory as the model favours the arousal and emotions associated with the utterance of a lie or rather the attempt versus the difficulty in controlling emotional expressions of lying.

In proposing the first experiment aiming to investigate lying (Ekman and Friesen, 1969) and the conceptualization of the role of emotions experienced by the liar (Ekman, 1975, 1986, 1993), Ekman et al. made a decisive contribution to this field. They introduced a dichotomization regarding the identification of nonverbal (gestures and expressions) and verbal indicators (voice pitch, speech fluidity, pauses, swallowing, clicking of the tongue) and cues. The set of nonverbal and verbal indicators correspond to behavioural “leaks”, which are totally beyond the control of the issuer, while the cues are those behaviours whose change in number or duration can be observed. The latter are the trademarks of lying: with each passing moment the individual loses control over the expression of his behaviours because the task is so complex. This theory seems to exclude the operationalisation of deception of a nonemotional nature, since only the emotion provoked could give access to the liar’s real emotions of the liar and to their nonverbal effects (DePaulo et al., 2003). These researchers argue that it is possible to distinguish a person who tells the truth from one who lies by taking into account the emotions specific to the deceptive situation, in particular fear and guilt. Thus, the cues linked to “fear” would be: a higher vocal tone, quicker speech, louder voice, more pauses and consequently a greater number of speech errors. The cues relating to “guilt” refer to the sorrow generated by this feeling. The liar who feels guilty would have a low-pitched tone of voice, slow speech and look downwards.

Other cues, linked to positive emotion, usually betray the excitement felt of successfully duping the person faced by the liar. The voice is more acute, stronger, has a more rapid speech and a higher number of illustrative gestures. Also, the presence of false smiles when the subject claims to live a pleasurable experience has been demonstrated experimentally (Ekman et al., 1988). This laboratory research is undoubtedly the one where the stakes are the most important. The participants in this experiment were student nurses. The study was presented as a test of communication competence. In the condition “sincere testimony”, subjects watched a pleasant film and had to describe their feelings concerning it. In the condition “false testimony”, subjects watched a film showing amputations and other surgical
acts. They were instructed to hide their negative thoughts and to describe the film as if it was pleasant. The stake here was for the student nurses to succeed, or fail, in hiding their negative thoughts. Indeed, later on in their careers, they would be required to hide their fears, distress or disgust in order to obtain the cooperation of patients or family and in appearing confident and optimistic.

Furthermore, it has been shown that the preparation of a lie is a critical moment. Indeed, if the liar delivers his story too well, the receiver will notice since it will resemble a speech. Finally, when an individual tries to hide an actual emotion, expressions of a very short duration microexpressions appear (Ekman, 1989). These expressions, less than 1/25 second in length, are full of heart-felt emotions, but their extremely fleeting aspect prevents their identification in a real-world setting. They seem, however, to have an effect on the receiver. Thus, the approach based on experienced emotions would predict an overall increase in movements in a lying situation.

Zuckerman et al. (1981) advocate a global model for the study of nonverbal (but also verbal) consequences of lying, arguing that it is necessary to observe all the phenomena involved to be able to say what appears or disappears at the same time. They therefore take into account the evidence resulting from arousal, emotions, cognitive overload and the subject’s attempt to control his behaviour. The cues concerning arousal are behaviours that are relatively beyond a person’s control (i.e., pupil dilation, increase in blinking, speech impediments and increase in vocal pitch). Cues pertaining to emotions will lead to a lack of spontaneity in the subject’s behaviour. The liar will thus tend to give evasive answers to take a meandering approach to answer questions and he will find it very difficult to maintain good eye contact with his interlocutor. The task is indeed complex for the liar: he must be careful what he says and what he shows. This cognitive overload will affect speech (e.g., longer response time, hesitation), physiological responses (e.g., pupil dilation) and illustrative gestures (i.e., all hand gesturing when speaking). Finally, Zuckerman et al. found that the “attempt to control” experienced by the liar will give his whole production, verbal and nonverbal, a stilted aspect, less spontaneous than if he were telling the truth. Altogether, this model, formulated in terms of cognitive complexity, supports the idea that in a lying situation we should observe a drop in movements because the subject is trying to excessively control each revealing behavioural cue.

On a more interpersonal perspective, or even in terms of discourse pragmatics, some researchers take into account the interaction that has been established between those who lie and those who receive the lie (Buller and Burgoon, 1996). In fact, those who intend to deceive another have to be careful not to betray through their speech and behaviour, but must also vigilantly observe the reactions of their interlocutor. If the interlocutor appears suspicious, the liar must realise this and adapt his speech and behaviour accordingly. This angle of observation of cheating is no longer satisfied with individual psychological variables (DePaulo et al., 2003), but includes the processes involved in interpersonal communication. Thus, the management of the interaction and, in particular of the interlocutor’s reactions, is added to the tasks already burdening the liar. It has been demonstrated that the suspicion that an interviewer exhibits during an exchange can result in the “manufacture of a suspect” (Akehurst and Vrij, 1999). Regardless of whether the person is lying or sincere, they will be more nervous if their interlocutor is nervous himself. Even though the perspective proposed by Buller and Burgoon (1996) is interesting, its essential shortcoming is that it does not predict specific behaviours that might more or less appear during an untruthful interaction. Instead, it describes the liar, within the interaction, as an individual who will accentuate all immediate behaviours, spontaneously demonstrating his involvement in the conversation. The liar will also be an individual who will be calm and cold-blooded, charming, express himself easily and dominate the interaction. The patterns of behaviours vary depending on a number of factors, such as the expectations of the liars, their goals, motives and relationship with the “target”.

Finally, the latest model proposed (DePaulo and Bell, 1996; DePaulo and Kashy, 1998; Kashy and DePaulo, 1996) restores the ecological dimension of lying by regarding it as a daily activity (e.g., the idea by Goffman, 1973a, b). That is to say, it is an act, which is, all things considered, commonplace and ordinary (we would lie twice a day on average according to DePaulo et al., 1996). The originality of this model comes from the idea that both liars and nonliars must carefully control their self-presentation. Indeed, the liar, like the honest person, gives an appearance of sincerity. The liar, however, will use much more deliberate behaviours since the task of the liar is to continuously play a role, the role of a person who has a so-called quality or another (Pontari and Schlenker, 2000). Indeed, when honest people (or truth-tellers) attempt to convince us of something, they adopt a specific attitude at particular times (e.g., when the feeling that they want us to share is difficult to communicate). For their part, liars will always have this attitude, they will always be focused on attempting to convince. This focused attention will be consuming a large amount of mental resources. A liar’s communication performance will therefore be diminished. It will seem less engaged, less involved in the interaction.

Having concluded the overview of the key concepts, it is evident that despite the models of reference noted, which suggest classes of indicators allowing lie detection, the cognitive process has overwhelmingly focused on very specific indicators. Finally, if one wanted to synthesise this research stream, what answer could be formulated to the question: what behaviours are systematically presented by a person who is lying? According to a review of about 44 studies that have examined the characteristics of a nonverbal lie, the answer is somewhat discouraging (Vrij, 2000, pp. 36–37).

Overall, what is suggested by the different approaches is that the presence of emotions and the excessive control of expressions can be indicators of lying, but none radically supports the idea that there are cues that are systematically found in a liar. In addition, no indicator is systematically more prevalent among liars compared to truth-tellers. The problem arises especially for the study of facial expression indicators, which lead to contradictory results. The face is, in fact, the main carrier of emotions really felt by an individual (de Bonis, 1988, 1996; Feyereisen and de Lannoy, 1985). It is also, however, the
“best nonverbal liar” because it is at the facial expression level that the attempt to control is exercised (Ekman, 1986; Ekman, 1992). A possible approach to lying would then be to focus on a few nonverbal cues (i.e., facial expressions) that are difficult to falsify.

Ekman produced a fine description of facial expressions depending on the emotions felt by the liar. It is based, in particular, on gaze direction (e.g., downward gaze in the expression of sadness, gazing away when one feels fear), the asymmetry of an expression (i.e., the expression of a sincere emotion is barely asymmetric) and its duration (an expression of sincere emotion is short-lived) (Ekman, 1986, 2001). These indicators appear difficult to falsify because they are not controllable and carried out independently of the subject’s will (Zuckerman et al., 1981). They can thus be referred to as “unintentional indicators”. Indeed, a subject would be able to deliberately produce an expression, but have difficulty controlling its duration or symmetry. Besides, indicators produced in an unintentional manner, it would also be important to study those arising from an intention to deceive, that is, “intentional indicators”. The liar, more so than an honest person, seeks to convince its target and will do so by using a sample of expressions that support his speech. He will smile more, but the smiles will not be genuine, rather false smiles (e.g., lacking the lowering of the eyebrows). He will use more manipulative hand–face or facial gestures that punctuate speech (e.g., manipulating fidgeting, such as winks, raising eyebrows, etc.).

If intentional expressions are expected to be more frequent in the liar than in the honest person, we would also expect an increase of unintentional expressions in a lying situation. Indeed, the expression of several behaviours could slip by the liar, such as downwards gazing, which is characteristic of the shame felt, smiles of embarrassment if he realises he’s having difficulty to convince, or else, blinking.

A liar’s ability to control his own nonverbal expressions should depend on whether he’s had an opportunity to prepare the lie or not. In fact, a liar who fervently hopes that what he says is taken as truthful and who will do everything to avoid getting caught will prepare a lie if he has the opportunity. Overall, researchers have found that although liars are able to control certain behaviours during a prepared lie, they have more difficulty doing so during a spontaneous lie (Matarazzo, Wiens, Jackson & Manaugh, 1970). Greene et al. (1985) noted an effect of preparation on the control of nonverbal signals emitted by the subject. This effect relates to the response time and duration of eye contact. In a review conducted by Zuckerman et al. (1981), the comparison of low and high-level of planning revealed that intense preparation was associated with a greater number of changes in posture, fewer gestures, more smiles and shorter response times. We can therefore expect that a spontaneous lie will reveal more unintentional expressions associated with lying than a prepared lie.

This research seeks to identify the types of indicators that might prove more predictive of lying behaviours than just a list of indicators taken separately. Thus, we were initially concerned with the overall volume of behaviours, with the assumption that a liar will produce both more intentional and more unintentional behaviours than a person telling the truth. We will then be concerned with the first cue: the proportion of intentional behaviours on the overall expressed behaviours (intentional and unintentional). This cue seems likely to account well for the simultaneous nature of both the intentional and unintentional behaviours and of the prevalence, in the liar, of a strategy aimed at convincing his interlocutor about the leakage due to a lack of control.

The second cue, more specific, will concern smiles. These are often addressed as a set even though there is a major difference between real smiles and other forms of smiles, especially false ones (Ekman et al., 1988; Chartrand and Gosselin, 2005). Thus, it is expected that the liar would produce fewer authentic smiles (associated with positive emotions), but more false smiles (produced voluntarily in the absence of positive emotion) and smiles of embarrassment (which reflect the emotion felt by the subject facing an embarrassing situation). A genuine smile can be identified as it involves the activity of a muscle at the lower part of the face, the zygomatic major. This causes the simultaneous and relatively symmetrical stretching of the lips, raising of the cheekbones and a swelling of the lower eyelid and folds of skin around the outside of the eyes, making part of them less visible. It is relatively easy to distinguish a fake smile because it is less symmetrical and will not operate muscles of the upper half of the face. A smile of embarrassment has the characteristics of a genuine smile, but is accompanied by a gaze directed downwards or to the side. A ratio will be calculated to determine the rate of false smiles and smiles of embarrassment on all the smiles produced. It is expected that these cues will be more prevalent when the interaction situation will be prepared rather than spontaneous.

2. Method

2.1. Overview

The famous experiment “20 dollars for a lie” by Festinger and Carlsmith (1959) was used as a basis for this experiment. This experimental situation has the advantage that subjects are not asked explicitly to lie: they are asked to present an off-putting task (a task they do not do themselves) as being an appealing one to the next subject. This prevents the situation where a subject refuses the request as a matter of principle or because of having great difficulty in doing what is expected of him because he mistakenly believes he is a bad liar.

As in the original experiment by Ekman and Friesen (1969), participants who told the truth were reinforced by their interlocutor who would appear convinced, while the subjects who lied would be confronted with the doubts of the person they were facing. Each condition, control and experimental, was reinforced. The participants were asked, for instance, to be sincere in one case and not in the other (sequence 1), then an unexpected question from a confederate (sequence 2) prompted them, in the third sequence, to continue their discourse with the feeling of being heard when telling the truth or of sinking into their lying a little more when they have lied as a result of doubts raised by the interlocutor.
2.2. Participants

Sixty-one female subjects\(^1\) were recruited to participate in this experiment, but only thirty were chosen for analysis. The high experimental-dropout rate was as a result of technical problems (five subjects were not recorded) and subjects wearing glasses or using an object during interaction (three subjects). This loss was also amplified by the experience itself. Seven subjects were unable to complete the task since despite their willingness; they were unable to succeed in lying. Some refused categorically to lie (two subjects), while others questioned the presence of cameras or monitors (two subjects), and three subjects confessed about the deception to the confederate. For nine subjects, their presence in the company of the confederate was too short to collect enough data (less than 30 seconds).

2.3. Material

The experiment took place in an apparently ordinary room. A table and chairs were arranged in the room. A wooden plaque was placed on the table, with about fifty rubber plugs sticking out. A two-way mirror was facing the table and a camera was set behind it. On the right side of the table, a microphone was hidden. The control of the experiment sequence was done via a monitor located in a control room, separated by a two-way mirror, adjacent to the experimental room.

2.4. Operationalisation of dependent variables

The analysis focused on nonverbal facial behaviour by the subjects. The total number of behaviours (excluding real smiles) was first calculated. Then, nine behaviours were evaluated starting with their frequency of occurrence. These expressions were selected on the basis of the possibility of generating categories reflecting the intentional versus unintentional character of behaviours associated with the lie. Thus, the five following indicators have been chosen to reflect the will of a liar to convince:

- hand–face manipulators;
- facial manipulators (a facial element comes into contact with another facial element);
- facial gestures (winking, slack eyebrows, raised eyebrows or willful frowning);
- fake smiles;
- asymmetrical expressions.

The following four indicators have been chosen to reflect the liar’s loss of control:

- smiles of embarrassment;
- eyes diverted; downward glances;
- blinking.

Based on these nine indicators, a ratio was calculated to measure the proportion of intentional behaviours (the first five indicators) on the overall set of behaviours issued. Using real smiles as a final indicator, another ratio was calculated to measure the proportion of false smiles and smiles of embarrassment on all smiles produced.

2.5. Operationalisation of independent variables

The 30 subjects were divided into two conditions, a control condition (truth) and an experimental condition (lie). The first group of 15 subjects gave their sincere opinions about a tedious task that they had not performed and would have to present to a student like themselves (in fact, a confederate of the experimenter) who was supposed to do the task after their discussion. The confederate was left to freely accept the task or to not carry it out. The second group of 15 subjects lied about this task, saying they had completed it and found it interesting and enjoyable, despite appearing off-putting. They were instructed to make every effort to convince the confederate to carry out the daunting task. The opinion that the experimental subject held about the task was controlled before the confederate arrived. None of the subjects actually carried out the task.

The experiment was conducted in three stages. These three stages comprise the testing of the second independent variable, prepared versus spontaneous lying. During sequence 1 (prepared sequence), after about 10 minutes of preparation time, the subject presented the confederate with the task for which he was volunteering. During sequence 2, the confederate intervened unexpectedly. He said in one case (truth condition): “You are volunteering. During sequence 3 (spontaneous sequence) that the subject, who was “either” reinforced in his feeling of having convinced the confederate “or” being forced to improvise following his lie, responded to the confederate’s statement.

3. Results

A second coding was carried out by a second judge on a random sample of 12 interviews. The inter-rater agreement was 0.83.

The results were analyzed using an analysis of variance according to a mixed plan: two (discourse type: truth versus lie) multiplies by two (sequence type: prepared versus spontaneous), the discourse type was manipulated between subjects, while the sequence type was a within-subject factor. The length of the sequences proved exactly the same for subjects in the control group and the experimental group ($F(1,28)<1$, ns). Similarly, the interaction between the discourse type and the sequence type was not significant ($F(1,28)<1$, ns). The duration only varied according to the sequence type,
sequence 3 (spontaneous) turning out to be nearly twice as short as sequence 1 (prepared): $F(1,28) = 40.79; p < 0.0001$ (sincere: 10 min 39 s versus 5 min 21 s; lie: 10 min 53 s versus 5 min 41 s).

The results concerning nonverbal indicators have therefore been analyzed as raw numbers, without being divided by the duration of interactions. This approach facilitates the potential of using the obtained results in an ecological framework for lie detection.

3.1. Total number of expressed behaviours

According to our first hypothesis, there was a main effect of discourse type (lie versus truth) on the total number of expressed behaviours. The liars showed, in all sequences, a quantity of behaviours significantly greater than those telling the truth ($M_{\text{lie}} = 90.33$, S.D. = 27.81 and $M_{\text{truth}} = 52.93$, S.D. = 15.83; $F(1,28) = 20.58; p < 0.0001; \eta^2 = 0.42$). The effect of the situation type (prepared versus spontaneous) was not significant ($M_{\text{prepared}} = 34.33$, S.D. = 16.04; $M_{\text{spontaneous}} = 37.30$, S.D. = 18.91; $F(1,28) < 1$, ns). There was also a significant interaction between discourse type (lie versus truth) and sequence type (prepared versus spontaneous) on the number of expressed behaviours ($F(1,28) = 6.55; p < 0.02; \eta^2 = 0.19$).

The breakdown of the interaction, as shown in Fig. 1, shows that for the honest participants, there is no significant difference between the two sequence types on the number of expressed behaviours ($M_{\text{prepared}} = 29.13$, S.D. = 11.41 and $M_{\text{spontaneous}} = 23.80$, S.D. = 9.88; $F(1,28) = 1.35$, ns), whereas this difference appears very distinctly for the lying subjects who expressed significantly more behaviours during the spontaneous sequence ($M_{\text{spontaneous}} = 50.80$, S.D. = 15.88 compared to the prepared sequence $M_{\text{prepared}} = 39.53$, S.D. = 18.58; $F(1,28) = 6.03; p = 0.02; \eta^2 = 0.18$).

3.2. Proportion of intentional behaviours

Regarding the proportion of intentional behaviours (corresponding to the following indicators: hand–face manipulators, facial manipulators, facial gestures, fake smiles, asymmetric expressions) compared to the overall expressed behaviours, only a main effect of discourse type was obtained ($F(1,28) = 10.27; p = 0.003; \eta^2 = 0.27$). A distinctly higher proportion of intentional behaviours is thus observed in lying subjects compared to those who told the truth ($M_{\text{lie}} = 41\%$ and $M_{\text{truth}} = 28\%$).

3.3. Proportion of false smiles and smiles of embarrassment

Given the method of calculation applied, five participants were removed from the analysis: respectively, four people in the truth condition and one in the lie condition. These participants expressed no smiles in both types of situations ($n = 1$, in the truth condition) or in one of the two types of situations ($n = 4$). Only a main effect of discourse type was obtained: $F(1,23) = 28.61; p = 0.0001; \eta^2 = 0.55$ [the interaction effect was not significant $F(1,23) < 1$ and the main effect of sequence type was not significant $F(1,23) < 1$]. There was a substantially higher proportion of false smiles and smiles of embarrassment on all the smiles expressed by the lying subjects compared to those who told the truth ($M_{\text{lie}} = 92\%,$ S.D. = 0.08 and $M_{\text{truth}} = 53\%,$ S.D. = 0.37) (Fig. 3).

3.4. Additional analyses: nonverbal indicators taken separately

Despite the lack of consensus in the literature regarding the effect of various measured indicators, an analysis of variance was conducted for each type of behaviour independently. It is noteworthy that, for most indicators, there is an effect on the discourse type (truth versus lie), but no effect on the sequence type (prepared versus spontaneous) or interaction effect between the two variables. Table 1 indicates that discourse type is very significant for asymmetric expressions produced during speech (ratio of 1 to 15 between the number of identified behaviours in subjects who told the truth and those identified in subjects who...
Table 1
Average and standard deviation (S.D.) of expressed behaviours, for each indicator type, according to the discourse type (truth versus lie)

<table>
<thead>
<tr>
<th>Type of behaviours</th>
<th>Discourse type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Truth (n = 15)</td>
</tr>
<tr>
<td>Intentional behaviours</td>
<td></td>
</tr>
<tr>
<td>Hands–face manipulators</td>
<td>1.4 (1.54)</td>
</tr>
<tr>
<td>Facial gestures</td>
<td>12.33 (5.81)</td>
</tr>
<tr>
<td>False smiles</td>
<td>0.86 (0.99)</td>
</tr>
<tr>
<td>Asymmetric expressions</td>
<td>0.2 (0.56)</td>
</tr>
<tr>
<td>Facial manipulators</td>
<td>1.07 (1.28)</td>
</tr>
<tr>
<td>Unintentional behaviours</td>
<td></td>
</tr>
<tr>
<td>Smiles of embarrassment</td>
<td>2.13 (1.96)</td>
</tr>
<tr>
<td>Diverted eyes</td>
<td>2.47 (1.73)</td>
</tr>
<tr>
<td>Downward glances</td>
<td>17.13 (5.36)</td>
</tr>
<tr>
<td>Blinking</td>
<td>15.33 (7.86)</td>
</tr>
<tr>
<td>Proportion of intentional behaviours</td>
<td>0.3 (0.09)</td>
</tr>
<tr>
<td>Real smiles</td>
<td>2.53 (2.07)</td>
</tr>
<tr>
<td>Proportion of false smiles and smiles of embarrassment</td>
<td>(n = 11) 0.57 (0.25)</td>
</tr>
</tbody>
</table>

For each indicator, the higher the score, the greater the number of behaviours expressed.

\* p < 0.05.
\** p < 0.01.
\*** p < 0.001.

lied ($F(1,28) = 6.50; p < 0.02; \eta^2 = 0.19$), for hand-face manipulators (ratio of 1 to 4 $F(1,28) = 5.97; p < 0.02; \eta^2 = 0.18$), for false smiles (ratio of 1 to 8 $F(1,28) = 35.83; p < 0.0001; \eta^2 = 0.56$), for smiles of embarrassment (ratio of 1 to 3 $F(1,28) = 26.22; p < 0.0001; \eta^2 = 0.48$). The results are significant and of a moderate size for facial gestures (ratio of 1 to 2 $F(1,28) = 6.73; p < 0.01; \eta^2 = 0.19$). They are not statistically significant for facial manipulators ($F(1,28) = 1.11, ns \eta^2 = 0.03$) or for blinking $F(1,28) = 3.84; p = 0.056, ns$.

Downward glances differ from other indicators. Indeed, there is no effect of discourse type ($F(1,28) < 1, ns$) and no effect of sequence type ($F(1,28) = 3.97; p = 0.056, ns$), but there is an interaction effect between the two variables ($F(1,28) = 11.54; p < 0.002; \eta^2 = 0.29$). Contrast analysis indicates that liars are not distinguishable from truth-tellers during the prepared sequence ($F(1,28) = 2.75, ns$), but they provide more downward glances during the spontaneous sequence ($F(1,28) = 6.75; p = 0.015; \eta^2 = 0.19$). This last difference is, however, hardly noticeable ($M_{\text{lie}} = 9.73$ versus $M_{\text{truth}} = 6.26$).

Diverted eyes is also distinct from other indicators. Indeed, there is no effect on discourse type ($F(1,28) = 2.89, ns$) and no interaction effect ($F(1,28) = 1.01, ns$). It is the only indicator where there is a significant and large impact of the sequence type ($F(1,28) = 23.55; p < 0.0001; \eta^2 = 0.46$). During the prepared sequence, subjects displayed nearly four times more diverted eyes than during the spontaneous sequence ($M_{\text{prepared}} = 1.33$ versus $M_{\text{spontaneous}} = 4.86$).

4. Discussion

There is a lack of consensus in the literature on lie detection, specifically referring to the identification of relevant and reliable indicators manifested. The objective of this study was to measure the impact of discourse type (truth versus lie) and sequence type (prepared versus spontaneous) on different behaviours exhibited during the interaction using categories of nonverbal indicators, rather than indicators taken separately. The results obtained in this interaction situation inspired by the experimental situation in Festinger and Carlsmith’s (1959) “$20 for a lie”, show above all that the volume of behaviours exhibited appear significantly more in subjects who lie compared to those who tell the truth (70% more behaviours were observed among liars). This difference is sufficiently clear that it can be detected by an observer, such as a professional and sufficiently reliable – in light of the variance in the “behaviour” variable explained by the variable “discourse type” ($\eta^2 = 0.42$) – to arouse suspicion about the person who produces a high number of behaviours of all kinds. The interaction found between discourse type and the prepared versus spontaneous nature of the interaction sequence supports the idea that the difficulty of unprepared lying causes the liar to express an abundance of behaviours accompanying the discourse.

This profusion seems due particularly to the use of many intentional behaviours: hands–face manipulators, facial gestures, false smiles, as well as asymmetric expressions, which all increase significantly in a deception situation compared to a situation in which the subjects tell the truth. Meanwhile, unintentional behaviours increase slightly among liars, with the notable exception of smiles of embarrassment, which were three times more frequent in a deception situation compared to a truthful one. In total, the proportion of intentional behaviours among all expressed behaviours appears much higher in subjects who lie (41%) than among truth-tellers (28%). These results run counter to lie detection approaches that favour the control of emotional manifestations of the lie as predictors of the intentional inhibiting of behaviours by the liar. Instead, they give support to the theoretical models focusing on the various emotions felt by the liar and the necessity to convince the target of the lie (DePaulo et al., 2003).

The results on the smile cues used in this study reveal both the embarrassment felt by the liar and his motivation to succeed
in lying. The false smiles (intentional) and smiles of embarrassment (involuntary and reflecting sincere emotion) are the two indicators that appear most affected by the discourse variable. This variable accounts for 56% of the variance of fake smiles and 48% of the variance of smiles of embarrassment. We find this effect again with the calculated ratio of false smiles and smiles of embarrassment to all the smiles emitted. The discourse variable accounts for 55% of the variance of this cue. In addition, the difference between the truth and lie conditions appears extremely clear: 53% of smiles expressed by truth-tellers were false smiles or smiles of embarrassment, whereas this proportion was 93% for the liars. In terms of lie detection, this cue looks very promising, especially since no subject in the lie condition produced less than 81% of fake smiles or smiles of embarrassment, whereas only one-fifth of subjects in the truth condition reached such proportions. These observations lead to the conclusion that recording a low or moderate proportion of false smiles and smiles of embarrassment in a person appears to be a reliable indicator of truth-telling, whereas recording a high proportion of false smiles or smiles of embarrassment is seen more as an indication that the person could be lying.

These results confirm the findings of Ekman et al. (1988) who, after a review of studies dealing with smiling expressions in a lie, called for a differentiation between true and false smiles. Indeed, confounding each type of smile appears dysfunctional, both on a theoretical level and on a practical level, since one may expect liars to produce fewer true smiles, but would expect more false smiles and smiles of embarrassment.

The value of the variable “prepared versus spontaneous sequence”, which was apparent with regards to the volume of behaviours produced, and incidentally with regards to downwards glances and diverted eyes, has not been confirmed for the other indicators studied. The confederate’s questioning of the lie did not result in the expected increase in unintentional behaviours. It is possible that the instruction pushed the subjects to convince their interlocutor and thereby, to produce a large number of intentional behaviours, while the manifestations of embarrassment and guilt were reinforced. This seems consistent with the increase, among liars, of the total volume of behaviours during the spontaneous sequence.

It is also possible that the situation in which the liar finds himself undergoes no significant qualitative change in the spontaneous sequence compared to the prepared sequence. Several arguments support this observation. The first is that the effect of preparation could continue even when the subject’s claim is challenged. Thus, Buller et al. (1989) have shown that questioning – which aims, during interrogation, to destabilize the interviewee – does not have a marked effect on the nature of the liar’s behaviours. It is as if a liar who prepares his lie holds a number of weapons and counterattacks, which can be used throughout the duration of the interaction, whatever happens.

The initial state in which he puts himself before taking action would serve as a “shield” during the interview, even if flaws were perceptible. This explains why the number of behaviours was greater in liars facing an unexpected question, but that the nature of their behaviours was hardly affected by the prepared versus spontaneous nature of their lie. A second argument could be concerned with the scarce interaction effects in the results of this experiment. It is also likely that the type of lie chosen (altruistic) and the minimal stakes explain that the intentional versus unintentional dimension of the behaviours does not vary as a function of the prepared versus spontaneous character of the lie. We know that in these cases the subject will display strong control (Biland, 2004).

This experiment indicates that subjects in the experimental condition experienced emotions that are characteristic of lying (e.g., shame caused by the guilt felt when it comes to lying in the absence of any important stakes). The subjects were brought to the experiment to tell an altruistic lie (i.e., to please the experimenter), which took the form of an omission (conceal the daunting nature of the task from the confederate) about an opinion. It would be necessary to look at other types of lies, for example a selfish and compromising lie, such as fabricating a factual event or an emotion. It would be reasonable to expect that a person telling such a lie, which involves higher stakes, would experience more difficulty in exercising control over their behaviour and all the more given that they would feel uneasy.

We are therefore in possession of a number of elements that might enable us to move in the direction of recommendations for the professionals concerned. In the field, police officers, judges and customs officers are often called upon to question how much trust one should place in a person suspected of having committed a crime. Professionals in the field could learn several lessons from this research. First, a lie is accompanied by a very high volume of nonverbal behaviours. At least in the context of a lie with limited stakes, this will primarily consist of the use of numerous intentional behaviours, produced in an effort to convince: hands–face manipulators, facial gestures, asymmetric expressions, false smiles. Smiles, however, are worthy of further mention. This experiment clearly showed that we must distinguish between genuine smiles (due to the expression of positive emotion) and false smiles, which are expressed in order to simulate such an expression. Attention should also be paid to the smiles of embarrassment, which are the unintentional expression of a sense of embarrassment. The liars in this experiment provided a very significant amount of false smiles and smiles of embarrassment when they were producing virtually no real smile that would have reflected a positive emotion. However, although we are confirming the results from Ekman et al. (1988), where the stakes were important, it is good to confirm these results in an experimental setting where the subjects must produce a lie through necessity and not because they follow the directives of an experimenter. It is therefore necessary to verify that professionals would be able to identify such indicators in the field as a result of limited training.

In Great Britain, all accusatory hearings have been filmed for over two decades. In France, the accusatory juvenile hear-
ings have been video recorded since 2002. Concerning adults, the video recordings of suspect interrogations have only been in place since June 2008. These recordings are made with a webcam according to a policy adapted to the verification of compliance in criminal proceedings. The technical modalities of such interrogation recordings make their use virtually ineffective for the purposes of detecting lies, especially as laws do not allow for the possibility that police can watch these recordings as their only purpose is for possible appeals that lawyers could submit to the magistrate concerned. It is therefore essential to provide investigators with cues that they are likely to pick out during questioning and not on the basis of viewing the movie sequence. This implies that these cues are not only statistically significant (i.e., that they appear significantly more often among liars than among the truth-tellers), but also account for quantitatively important effects, that is, that they are tangible enough (at least a ratio of 1 to 2 between truth-tellers and liars) to be easily used by those who seek to detect lies, especially in a legal context.

References


