

JOANNA ULATOWSKA

Academy of Special Education, Warsaw

Institute of Applied Psychology

INDICATORS OF DECEPTION IN DIFFERENT LIE SCENARIOS

The current study was designed to assess the presence of deception indicators in truthful and deceptive statements. Four independent raters watched 80 statements on three different topics and evaluated the presence of 11 different cues to deception. It was hypothesized that it would be impossible to accurately differentiate between truthful and deceptive statements based on raters' evaluation and that the ratings of credibility would be based on stereotypical beliefs about cues to deception rather than on the objective indicators of deception. Moreover, different deception topics would result in different patterns of indicators. The results partially supported the hypothesis – the raters' evaluations did not make it possible to differentiate truth from lies; however, it was usually the objective cues that were used to predict the credibility of statements. Moreover, different accounts resulted in different patterns of cues to deception.

Keywords: deception, cues to deception, deception detection.

INTRODUCTION

Research results show that lying is part of everyday interpersonal communication and happens to most of us (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996). The ability to detect deception and assess credibility is essential to efficient work in many professions. But is there a permanent set of behaviors whose observation allows us to conclude that someone is trying to deceive us?

Indicators of Deception

Studies on the phenomenon of lying distinguish between actual (objective) and subjectively perceived cues to deception (Granhag, Andersson, Strömwall, & Hartwig, 2004; Strömwall, & Granhag, 2003; Vrij & Semin, 1996). The former are behaviors that occur when lying, identified based on experimental studies and observation of people lying in real situations; the latter are behaviors that observers stereotypically associate with lying, irrespective of whether they are actual indicators of lying or not.

The list of actual indicators of deception is usually compiled on the basis of experimental laboratory studies in which participants are asked to lie on a selected topic. Much fewer studies analyze real situations whose participants lied (e.g., police interrogations; cf. Vrij & Mann, 2001a) or behaviors of people who made statements in the media that later turned out to have been lies (Vrij, 2000; Vrij & Mann, 2001b). In the recent decades numerous studies have been conducted that aimed to determine the objective cues to deception. The largest and the most frequently investigated group of deception indicators has been nonverbal and paraverbal behaviors. Meta-analyses of research on deception indicators, performed by Vrij (2000), DePaulo and colleagues (2003), as well as Sporer and Schwandt (2007) yielded rather ambiguous results, and the only indicators that were found to be related to lying in a considerable number of studies were the reduced number of arm, hand, finger, leg, and foot movements. This behavior may be explained by the cognitive load experienced by liars, which inhibits their overall motor activity. Sporer and Schwandt (2007) also show that liars less often nod. According to the analyses performed by Vrij (2000), by DePaulo and colleagues (2003), as well as by Sporer and Schwandt (2007), other nonverbal behaviors, such as eye contact avoidance, auto-manipulation, or blinking had no permanent and coherent connection with lying.

Meta-analyses carried out by Vrij (2000), DePaulo et al. (2003) as well as Sporer and Schwandt (2006) show that one of the regular and recurring deception indicators is a high pitch of voice, which most probably results from emotional tension. The effects found were not large, however; it should be stressed that differences in this indicator between liars and truth tellers are relatively small (a few Hertz) and detectable with specialist equipment (Sporer & Schwandt, 2006; Vrij, 2000).

According to the data collected by Vrij (2000), the connection between lying and such paraverbal indicators as speech rate, errors, or hesitations is not clear. Some studies suggest that speech rate is slower when lying and that errors and hesitations are more numerous; others show opposite results. The author of the

meta-analysis ascribes this divergence to different research methodologies and to the complexity of lies used in them. Meta-analyses performed by DePaulo et al. (2003) as well as by Sporer and Schwandt (2006) revealed no differences in speech rate between liars and truth tellers, either.

According to the cognitive approach, described below, and particularly with the model referring to the functioning of the working memory, liars sometimes make long pauses when speaking (Vrij, 2000), probably because of the higher cognitive load they experience. Long pauses during lying were also found by Vrij and Mann (2001a) in one of the few studies analyzing lies from outside the laboratory. An analysis of interrogations of a man accused of murder, whose guilt was unquestionable, revealed longer pauses, slower speech rate, and more irregularities in his speech in moments when he was lying, both before and during the admission of guilt.

Researchers point out that there is no verbal behavior that typically and regularly accompanies lying; still, the results of studies concerning verbal cues to deception are relatively consistent (as opposed to those concerning nonverbal or paraverbal cues) (Vrij, 2000). The meta-analysis of 28 studies performed by Vrij (2000) showed that liars have a tendency to use a greater number of negative statements as well as that their statements are shorter and contain fewer self-references. Moreover, deceptive statements are judged to be less credible and less direct. There is no strong evidence that liars provide less relevant data or use overgeneralizations.

The analysis of 152 indicators carried out by DePaulo and colleagues (2003) confirmed the findings of Vrij (2000) concerning statement length – liars speak more briefly and give fewer details. Partial confirmation that statements made by liars are shorter was also found by Sporer and Schwandt (2006) – this relationship was significant at the tendency level.

According to DePaulo and colleagues (2003), another significant deception indicator is the number of spontaneous corrections that liars make in their statements; they also less frequently report gaps in memory. The result reporting a greater number of negations used by liars was also confirmed; such statements were judged to be less credible and less logical.

The research outlined above showed that there is no such thing as “the typical behavior of a liar”: certain behaviors are just more likely to occur when a person is lying. It turns out, however, that most people have their own well-established, though stereotypical, image of a liar. Vrij’s (2000) review of over 30 studies shows that the cues people associate with deception include gaze aversion, a high number of movements (including illustrators and fidgeting), high

pitch of voice, errors and hesitations in speech, slower speech rate, longer latency period, and long pauses. A large proportion of these subjective indicators, however, have little to do with actual cues to deception and are symptoms of nervousness. Most people believe that lying causes nervousness and requires greater mental effort, which is why they look for this kind of behaviors in liars (Vrij, 2000). Yet, typical signs of nervousness not always accompany deception – deceivers often manage to hide them (Köhnken, 1989; as cited in: Granhag et al., 2004). The phenomenon of people being guided by the observed indicators of nervousness when estimating credibility may serve as an example of representativeness heuristic in use (Stiff, Miller, Sleight, Mongeau, Garlick, & Rogan, 1989). Bond, Omar, Pitre, Lashley, Skaggs, and Kirk (1992) propose an explanation of the existence of subjective indicators of deception that does not consist in looking for signs of nervousness. They suggest that when assessing credibility, we pay attention not only to whether the person observed behaves nervously but also to whether their nonverbal behavior violates expectations or not. According to their expectancy-violation model, both avoiding eye contact and persistently looking the interlocutor straight in the eyes may seem suspicious (Bond et al., 1992). These findings were confirmed, among others, by Desforges and Lee (1995).

Theoretical Approaches to the Phenomenon of Deception

Zuckerman, DePaulo, and Rosenthal (1981) identified four factors that may be related to the occurrence of deception indicators. These are: (1) emotional reactions, (2) arousal (3) cognitive effort, (4) attempted behavioral control. Depending on which of the processes that accompany lying is emphasized, four theoretical approaches to the phenomenon of deception have been distinguished: the emotional approach, the content complexity (cognitive) approach, the attempted control approach, and the self-presentational perspective. Each of these processes affects the liar's behavior and highlights different aspects of deceptive behavior (Vrij, 2000). The researchers stress, however, that this division is rather a conventional one and the processes described may occur simultaneously.

1. The emotional approach predicts that lying may arouse various kinds of emotions (Ekman, 2003), the most frequent of which are fear (of being caught lying), excitement (about the possibility of misleading someone), and a sense of guilt (for the same reason). The occurrence and intensity of these emotional states depends on the circumstances in which deception takes place as well as on

the liar's personality – e.g., people with a high level of Machiavellianism feel no remorse for lying and, consequently, will not exhibit visible signs of this emotion (Vrij, 2000). However, when these emotions do appear, they may affect the liar's behavior: a sense of guilt may result in averting one's eyes, while fear and excitement will manifest themselves in an increased number of movements or stammers and speech errors (Vrij, 2000).

2. The content complexity (cognitive) approach assumes that lying is a cognitively difficult task. In order to sound credible, liars have to be consistent in what they say and not contradict themselves. They have to remember what they have told the deceived person before and predict what the person might know about a given issue. A task as cognitively difficult as this one leads to cognitive load, which results in more hesitations and errors in liars' statements as well as in a slower speech rate and longer pauses. Moreover, liars make fewer arm and leg movements (Vrij, 2000). In recent years, the cognitive approach has been supplemented by advocates of including the contemporary models of working memory as well as research on autobiographical memory in explaining the theories of making up lies (Sporer & Schwandt, 2006 and 2007).

3. The attempted control approach. It is possible that liars realize that, when they lie, signs of emotion or cognitive load may appear and give them away. In order to avoid that, they try to control their behavior and suppress undesirable signs of deception (Vrij, 2000). As a result, then – as indicated above in the analysis of emotional processes – liars are tense but do not show nervousness (Vrij, 1995). They try to react “normally” and give an impression of credibility. Therefore, on the one hand, liars may behave rather stiffly and their speech may appear to be planned, while on the other hand they may give an impression of being relaxed, their speech flowing smoothly and without stammering. Yet, this approach predicts that despite attempts to control behavior some signs of emotional tension or intellectual effort may not be suppressed and will give the liar away (Vrij, 2000); in addition, the liar has to know the cues to deception that he or she should control (Vrij, 1995).

4. The self-presentational perspective. The approach proposed by DePaulo and colleagues (2003) may help to interpret behaviors that accompany everyday, mostly trivial, lies. It predicts that all communication, deceptive as well as truthful, has a self-presentation aspect and that deception indicators are usually poorly visible (DePaulo et al., 2003). There are, however, certain conditions that make them more easily noticeable. These conditions are: high motivation to conceal the truth, no possibility of preparing the lie beforehand, long duration of the liar's speech, and intimate relationship between the liar and the person being deceived.

This perspective distinguishes five types of cues to deception: (1) liars are less direct than truth tellers, which means a deceptive statement will contain fewer details and a liar will give the impression of trying to prevent themselves from saying something; (2) a liar will seem to be less convincing, he or she will be less confident and their speech less fluent; (3) a liar will give a less positive and less friendly impression; (4) a liar will be more tense than a truth teller, and (5) deceptive statements will contain fewer usual errors and fewer unusual details than truthful statements.

Present Study

Summing up the theoretical approaches explaining liars' behavior, it can be noticed that the cues to deception they enumerate often contradict one another; e.g., the emotional approach predicts an increase in the number of movements whereas two other approaches predict its decrease. Vrij (2000) stresses, however, that reasons for the appearance of a given pattern of behaviors are different in each of the approaches. The approaches described above also suggest that for evident cues to deception to appear the occurrence of emotional arousal or cognitive load is necessary. It is impossible to identify a behavior that will always accompany deception, and different individuals may exhibit different cues to deception. In addition, behavior during deception may be affected by many situational factors. Vrij (2000) enumerates a few: the complexity of the lie, the possibility of planning the lie beforehand, the liar's motivation, the stake of the lie, the observer's suspiciousness, or individual differences between liars. Yet, previous research rarely focused on comparing the intensity of various verbal and nonverbal cues in different lie scenarios. It seems that different contexts of deception may trigger different mental processes and set different cognitive requirements to both liars and truth tellers. The present study, which takes into account the results of previous research and the theoretical approaches to behavior in a deception situation, was conducted with the aim of verifying the following hypotheses:

1. The rating of the presence of verbal and nonverbal cues performed solely on the basis of observation of liars and truth tellers will not be reliable and it will not be possible on their basis to decide who is lying.

The point of departure for advancing this hypothesis is the previous research, demonstrating that differences in the behavior of liars and truth tellers are very small.

2. Lies concerning different topics will be rated differently in terms of the presence of behavioral cues to deception.

The point of departure for this hypothesis are the various theoretical approaches to lying, which assume that the different mental processes that accompany lying lead to the occurrence of different behavioral reactions.

3. The subjective impression of credibility will be affected to a greater degree by wrong subjective cues to deception than by actual cues.

This hypothesis is based on earlier studies concerning knowledge on cues to deception (e.g., Strömwall & Granhag, 2003; Vrij, Akehurst, & Knight, 2006; Vrij & Semin, 1996).

METHOD

Raters

Assessment concerning the presence of deception indicators was performed by four raters. These people were students of psychology at one of Warsaw's universities (women, aged 20-22 years), interested in the issues of deception but not having experience or broad knowledge in this field. The raters went through brief training concerning indicators whose presence they were to estimate; namely, it was explained to them what each behavioral indicator meant, and examples were provided. The aim of this procedure was to ensure that all the raters would be assessing the same behaviors. They were not informed, though, whether these were actual or subjective indicators of deception. Raters worked on their own and had not been informed which of the people assessed were lying. They received remuneration for their work.

Materials

The footage used in the study was recorded during a special session (for a detailed description of the recording procedure, see: Ulatowska, 2009). Twenty-five young people (aged 20-30 years) invited to test their deception skills took part in the recording. The participants were informed that, in accordance with the procedure, they would have to lie or tell the truth on several topics. In order to increase the chance of occurrence of cues to deception in participants, the stake connected with lie detection consequences was raised – the possibility of winning a financial prize was introduced into the procedure, with the prize to

be won if the participants' statements were rated as credible by the experimenter (PLN 100 in addition to the PLN 10 that had been promised for participation in the experiment). The experimenter did not know, at any stage of the recording, if a given person was lying or telling the truth. Additionally, all participants were reminded several times that only very intelligent individuals, with strong will and emotional self-control, could succeed in deceiving an expert – which was also supposed to increase their motivation (Elaad, 2003). The individuals participating in the recording knew that they were being filmed and that the recordings would be used for research purposes. During the recording, participants were sitting and being filmed in such a way that their entire silhouettes were visible.

The first two statements – an opinion on a selected social issue (e.g. a total ban on smoking in public places) and an interrogation about mock crime (theft of money) – were filmed in accordance with the procedure proposed by Frank and Ekman (1997, 2004). In the first stage, the participants filled in a questionnaire concerning their opinions on socio-political events. Next, the experimenter's assistant informed them that they would take part in a mock theft procedure: in one of the rooms in the laboratory building there was a wallet with PLN 100 in it that, in a moment, they would have a chance to "steal". Half of the participants could choose whether to take the money or not. The participants were instructed to look inside the wallet and, if they decided to take the money, to hide it in a pocket so that nobody could see it. The other half of the participants had to take the money and hide it, too. Participants were instructed that in the next part of the procedure each individual would be interrogated about theft by a lie detection expert and, from that moment on, their task was to deny having taken the money or having it on them. Then, each participant entered the room with the wallet and was left there alone for about a minute. Next, a participant was invited into the interrogation room, where he or she answered the experimenter's questions (Frank & Ekman, 1997).

After a few minutes break, the procedure moved on to the next conversation, which concerned opinions on socio-political issues. The topic was assigned to each participant on the basis of the questionnaire filled in at the beginning of the study – the topic chosen was one that the participant had the most extreme opinions on (either for or against). The participant was informed about the topic they were to talk on and that they had only 2 minutes to prepare for the conversation. After the 2 minutes elapsed, the experimenter returned to the room and conducted a conversation on the assigned topic (Frank & Ekman, 1997).

The last task was to give a truthful and deceptive description of four people that the participant knew: two people they liked and two others that they disliked

(DePaulo & Rosenthal, 1979; Eyal, 2003). These were to be non-guided, free narrative statements, and the participants had 30 seconds to prepare for each of them. The statements were filmed by the experimenter's assistant. After the completion of the procedure, the participants were debriefed and they were given the remuneration for participating in the experiment.

The recordings of those individuals who did not fully understand the instructions – e.g. spoke the truth when their task was to lie or openly admitted that they were lying – were eliminated from further analysis. The material used in the main study was 20 statements concerning theft, 20 statements concerning opinion, and 40 randomly selected statements concerning the descriptions of acquaintances. Half of the films on each topic contained lies and the other half contained truth.

Rating Procedure

Each of the raters watched all 80 statements and, after watching each one, made a subjective assessment of the presence of behavioral cues to deception. The selection of 11 deception indicators that were used in the study was made based on the findings of the meta-analyses and studies on actual and subjective cues to deception discussed above. Moreover, they had to be possible to estimate exclusively on the basis of observation, without the aid of any equipment. Raters used a 9-point scale to estimate the following: (a) the length of pauses in a statement, (b) the number of pauses; (c) the number of details, (d) the number of leg movements, (e) the number of arm movements, (f) the number of head movements, (g) facial expression intensity, (h) eye contact, (i) the pitch of voice, (j) the number of spontaneous corrections, (k) the number of contradictory pieces of information, (l) the general impression of credibility. Lower values on the scale always meant lower intensity of a particular indicator. They made their estimations individually and could watch each statement many times. Additionally, all the statements were transcribed and, for lies concerning theft and opinions¹, objective measurements were performed of the number of words (using word count statistics in MS Word) as well as the duration of statements (together with questions) in seconds. Mean Cohen's Kappa coefficient of inter-rater reliability calculated for the scores of all the variables re-coded to a two-category scale (low vs. high values) revealed an average level of agreement between raters

¹ Such analyses would not be reliable for lies concerning person description, since the recordings of those statements were edited to have a similar length.

(Kappa = .45). The levels of inter-rater agreement in studies on deception indicators are often average, though (cf. Vrij, 2005; Vrij, Granhag, Mann, & Leal, 2011).

RESULTS

Objective Rating Analysis

As mentioned above, analysis of objectively measured factors – that is, the length of statements and the number of words – is possible only for two topics: mock theft and opinion on social issues. In addition, because the procedure of conversation on these topics differed in the number of questions (11 and 7 questions, respectively; cf. Frank & Ekman, 1997), direct comparison of raw results for the two deception topics would not be methodologically legitimate. Therefore, in the first stage, separate analyses were conducted using Student's *t*-test comparing raw data. Analysis showed that in the case of opinions on social issues the statements of truth tellers were significantly longer (97.5 vs. 86.7 sec.; $t(78) = 2.47, p < .05, d = 0.56$) and contained more words than liars' statements (163.5 vs 137.7; $t(78) = 2.1, p < .05, d = 0.47$). In the case of mock theft, statistically significant differences were also found between liars and truth tellers, both in statement length ($t(78) = -3.23, p < .05, d = 0.73$) and in the number of words ($t(78) = -3.74, p < .001, d = 0.85$), but, unlike in the case of the interview concerning opinions, truthful statements were shorter (96.8 and 126.2 sec., respectively) and contained fewer words (82.7 vs. 126.2).

The next step was to make allowance for the number of questions so as to enable comparing objective assessments concerning the two deception topics. For this purpose, calculations were made to determine the mean number of words uttered in response to individual questions (the quotient of the number of words and the number of questions) and mean speech rate (the quotient of the number of words and statement length). Next, using these two rates, a two-way analysis of variance was performed in a 2 (veracity: lie vs. truth) x 2 (lie scenario) design. For the number of words rate, a main effect of lie scenario was found, $F(1, 156) = 149.92; p < .001; \eta^2 = .49$. Individuals answering a question concerning opinions uttered more words ($M = 21.94; SD = 7.51$) than those answering a question concerning theft ($M = 9.50; SD = 5.10$). The main effect of statement veracity was not significant, $F(1, 156) = 0.04; ns$, which means that statements of liars ($M = 15.18; SD = 6.71$) and those of truth tellers ($M = 16.16;$

$SD = 10.43$) had similar length. What was significant was the interaction effect, $F(1, 156) = 14.39$; $p < .001$; $\eta^2 = .08$. Simple effects analysis revealed that, in the case of both topics, liars differed significantly ($p < .05$) from truth tellers in the number of words uttered. Moreover, liars as well as truth tellers differed significantly ($p < .001$) depending on whether they spoke about theft or about opinions. These results are shown in Figure 1.

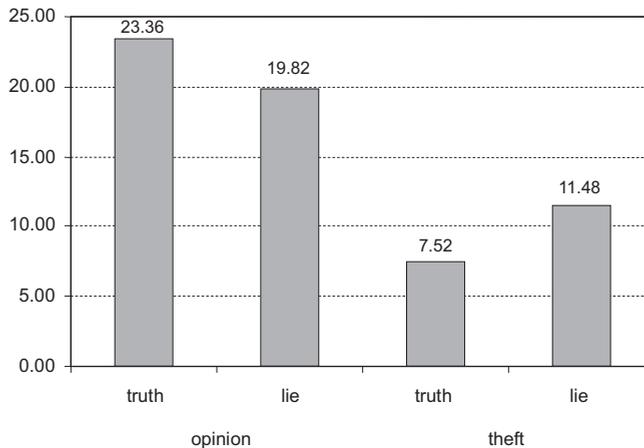


Figure 1. Mean rate of uttered words as a function of lie scenario and statement veracity.

A similar analysis was performed for mean speech rate. ANOVA showed a significant main effect of lie scenario, $F(1, 156) = 164.89$; $p < .001$; $\eta^2 = .51$. Individuals speaking on the topic of theft uttered an average of 0.94 words per second ($SD = 0.34$), whereas those expressing opinions uttered an average of 1.62 words per second ($SD = 0.34$). Also significant was the main effect of statement veracity, $F(1, 156) = 4.30$; $p < .05$; $\eta^2 = .03$. Liars uttered slightly fewer words per second ($M = 1.30$; $SD = 0.41$) than truth tellers ($M = 1.26$; $SD = 0.53$). The interaction effect turned out to be significant, too, $F(1, 156) = 9.30$; $p < .05$; $\eta^2 = .06$. Simple effects analysis showed that only in the case of statements on theft did liars differ significantly ($p < .001$) from truth tellers in terms of speech rate. What is more, the speech rate of truth tellers as well as liars differed significantly ($p < .001$) depending on whether they spoke on the topic of theft or expressed opinions. The respective means are presented in Figure 2.

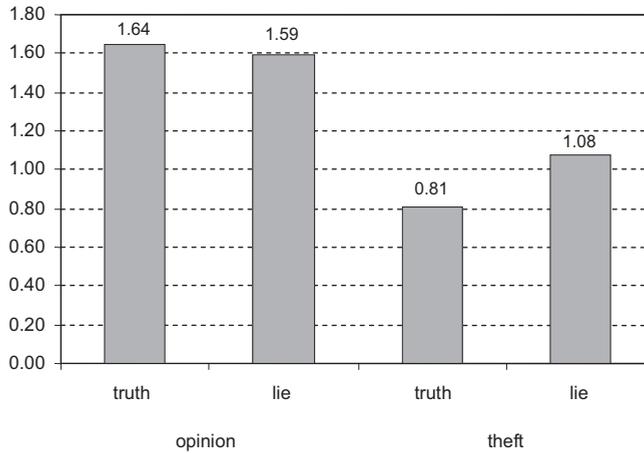


Figure 2. Mean speech rate as a function of lie scenario and statement veracity.

Subjective Rating Analysis

In order to check differences in the intensity of particular cues to deception between individuals lying and those telling the truth on three different topics, a series of two-way analyses of variance was carried out, in a 2 (veracity: lie vs. truth) \times 3 (lie scenario) design. Only in the case of the general credibility indicator was a significant main effect of statement veracity found. Truth tellers ($M = 5.98$) were rated as more credible than liars ($M = 5.12$). Mean ratings and ANOVA results are presented in Table 1.

A significant main effect of deception topic was found in the case of six cues: the number of arm and head movements, facial expression intensity, eye contact, as well as the number of contradictory pieces of information and the number of pauses. Individuals describing their acquaintances made significantly more arm movements ($M = 4.55$; $SD = 2.46$) than individuals speaking about theft ($M = 3.05$; $SD = 2.01$) or expressing opinions ($M = 3.36$; $SD = 1.97$). An identical pattern of factors was found for head movements (description: $M = 4.91$; $SD = 2.17$; opinion: $M = 3.75$; $SD = 1.95$; theft: $M = 3.66$; $SD = 1.95$). Also in terms of facial expression intensity individuals speaking on their liking for acquaintances ($M = 5.24$; $SD = 2.06$) received significantly higher ratings than individuals expressing opinions on social issues ($M = 4.44$; $SD = 2.22$).

Table 1
Mean Intensity of Deception Indicators as a Function of Lie Scenario and Statement Veracity as Well as ANOVA Results

Indicator	Topic	Statement veracity		Main effect		
		Truth	Lie	Veracity $F(1, 314) =$	Lie scenario $F(2, 314) =$	Interaction effect $F(2, 314) =$
pause length	Person description	2.3 (1.36)	2.81 (1.8)	1.5; <i>ns</i>	1.3; <i>ns</i>	0.8; <i>ns</i>
	Opinion	2.17 (1.26)	2.28 (1.3)			
	Theft	2.5 (1.59)	2.55 (1.65)			
no. of pauses	Person description (a)	2.49 (1.59)	2.96 (2.14)	2.86; $p = .09$; $\eta^2 = .01$	3.26; $p < .05$; $\eta^2 = .02$	0.24; <i>ns</i>
	Opinion (ab)	2.15 (1.71)	2.59 (2.03)			
	Theft (b)	2.05 (1.2)	2.2 (1.68)			
no. of details	Person description	5.04 (1.87)	5.01 (2)	0.6; <i>ns</i>	1.4; <i>ns</i>	1.6; <i>ns</i>
	Opinion	5.17 (2.23)	4.91 (2.08)			
	Theft	4.15 (2.15)	5 (2.48)			
no. of leg movements	Person description (ab)	1.83 (1.6)	2.01 (1.49)	3.6; $p = .06$; $\eta^2 = .01$	2.3; <i>ns</i>	3.1; $p < .05$; $\eta^2 = .02$
	Opinion (a)	1.96 (1.22)	1.56 (0.72)			
	Theft (b)	2.7 (2.1)	1.85 (1.83)			
no. of arm movements	Person description (a)	4.55 (2.53)	4.56 (2.41)	0.9; <i>ns</i>	14.3; $p < .001$; $\eta^2 = .08$	0.36; <i>ns</i>
	Opinion (b)	3.15 (2.10)	3.69 (1.75)			
	Theft (b)	2.95 (2.01)	3.15 (2.03)			
no. of head movements	Person description (a)	5.10 (2.43)	4.73 (1.88)	3.07; $p = .08$; $\eta^2 = .01$	14.6; $p < .001$; $\eta^2 = .08$	1.1; <i>ns</i>
	Opinion (b)	4.13 (2.21)	3.19 (1.33)			
	Theft (b)	3.65 (1.79)	3.68 (2.13)			
facial expression intensity	Person description (a)	5.4 (2.1)	5.08 (2.01)	1.54; <i>ns</i>	5.16; $p < .05$; $\eta^2 = .03$	3.75; $p < .05$; $\eta^2 = .02$
	Opinion (b)	4.94 (2.36)	3.69 (1.8)			
	Theft (ab)	4.4 (2.06)	5.03 (2.52)			
eye contact	Person description (a)	4.93 (1.96)	4.48 (1.92)	0.12; <i>ns</i>	16; $p < .001$; $\eta^2 = .09$	1.9; <i>ns</i>
	Opinion (b)	5.25 (1.55)	5.5 (1.98)			
	Theft (c)	5.88 (1.79)	6.3 (1.42)			
pitch of voice	Person description	4.86 (1.33)	4.36 (1.54)	0.01; <i>ns</i>	0.31; <i>ns</i>	4.74; $p < .05$; $\eta^2 = .03$
	Opinion	4.63 (1.66)	4.28 (1.61)			
	Theft	4.23 (1.76)	5.02 (1.8)			
no. of spontaneous corrections	Person description (ab)	1.38 (0.88)	1.19 (0.48)	0.1; <i>ns</i>	2.12; <i>ns</i>	2.4; $p = .09$; $\eta^2 = .01$
	Opinion (a)	1.50 (0.85)	1.41 (0.67)			
	Theft (b)	1.1 (9.63)	1.35 (0.83)			
no. of contradictory pieces of information	Person description (a)	1.1 (0.44)	1.34 (0.94)	0.36; <i>ns</i>	4.21; $p < .05$; $\eta^2 = .03$	0.39; <i>ns</i>
	Opinion (a)	1.13 (0.49)	1.28 (0.85)			
	Theft (b)	1.60 (1.41)	1.50 (1.20)			
credibility	Person description	5.94 (2.51)	5.01 (2.49)	7.86; $p < .05$; $\eta^2 = .02$	0.16; <i>ns</i>	0.33; <i>ns</i>
	Opinion	6.08 (2.53)	4.94 (2.92)			
	Theft	5.93 (2.47)	5.43 (2.71)			

Note. *SD* values are given in parentheses; the various letter indices next to deception topics indicate statistically significant differences in the post hoc Duncan test ($p < .05$); no. = number.

The ratings concerning people answering questions on theft ($M = 4.71$; $SD = 2.30$) did not differ significantly from those received by any of the other groups. Maintaining eye contact was the most frequent in the case individuals answering questions concerning theft ($M = 6.09$; $SD = 1.61$), and the rarest in those speaking about acquaintances ($M = 4.70$; $SD = 1.94$). Both these groups differed significantly from people expressing opinions on social issues ($M = 5.35$; $SD = 1.73$). Statements on theft contained significantly more contradictory pieces of information ($M = 1.55$; $SD = 1.30$) than statements concerning opinion ($M = 1.19$; $SD = 0.66$) or person description ($M = 1.22$; $SD = 0.74$). The number of pauses was significantly higher in statements about theft ($M = 2.12$ and $SD = 1.45$) than in those describing an acquaintance ($M = 2.72$ and $SD = 1.89$). However, neither group differed significantly in this respect from the group expressing opinion ($M = 2.32$ and $SD = 1.85$).

The interaction effect was significant in the case of three indicators: the pitch of voice, the number of leg movements, and facial expression intensity. The pitch of liars' voice was rated as higher only in the case of lies about theft. In the case of other topics, raters judged the pitch of truth tellers' voice to be higher. Also in the case of facial expression intensity statements about theft differed from others – individuals who had “stolen” the money and denied having done it had more intensive facial expressions. The pattern of results for other topics was the opposite. In the case of leg movements, the group that differed from the others was the people describing their acquaintances – individuals telling the truth on this topic performed fewer such movements than individuals who lied. In statements on the remaining topics it was liars who moved their legs less intensively.

Credibility Impression Prediction

It also seemed interesting to check the possibility of predicting the assessments of the impression of credibility on the basis of particular behavioral cues. For this purpose, stepwise regression analysis was performed with general credibility rating as the dependent variable and with the following as predictors: ratings concerning the number and length of pauses, the number of details in statements, the number of leg, arm, and head movements, facial expression intensity, eye contact, the pitch of voice, as well as the number of spontaneous corrections and contradictory pieces of information. The prediction model containing 3 out of 11 predictors turned out to be significant, $F(3, 316) = 23.58$; $p < .001$, and was obtained in three steps. The predictors explained 17.5% of variance in the dependent variable (adjusted $R^2 = .175$). Of the predictors included in the

equation, those that had a significant contribution to predicting credibility were, eye contact, $\beta = .25$; $t = 4.89$; $p < .001$, the number of contradictory pieces of information, $\beta = -.24$; $t = -4.78$; $p < .001$ and the number of details, $\beta = .19$; $t = 3.76$; $p < .001$. The remaining indicators were not significant predictors in this model.

Stepwise regression analysis with general credibility as the dependent variable and individual indicators as predictors was also performed for each deception topic separately.

For person description the model turned out to be significant, $F(4, 155) = 7.08$; $p < .001$, and predictors explained only 13% of variance in the dependent variable (adjusted $R^2 = .133$). The model included 4 out of 11 predictors: the number of contradictory pieces of information, $\beta = -.24$; $t = -3.2$ $p < .05$, the number of spontaneous corrections, $\beta = -.20$; $t = -2.72$; $p < .05$, the number of leg movements, $\beta = -.19$; $t = -2.47$; $p = .05$, and the number of details, $\beta = .18$; $t = 2.32$; $p < .05$.

For opinions on social issues, the prediction model containing 3 out of 11 predictors turned out to be significant, $F(3, 76) = 17.68$; $p < .001$, and was obtained in three steps. Predictors explained 39% of the variance in the dependent variable (adjusted $R^2 = .388$). The predictors included in the model were eye contact, $\beta = .42$; $t = 4.74$; $p = .001$, the number of details, $\beta = .29$; $t = 3.14$; $p < .05$, and the number of head movements, $\beta = .25$; $t = 2.7$; $p < .05$.

For mock theft, the significant model of regression contained 2 out of 11 predictors, $F(2, 77) = 19.28$; $p < .001$, and predictors explained nearly 32% of variance in the dependent variable (adjusted $R^2 = .316$). The predictors that had a significant contribution to predicting results were the number of contradictory pieces of information, $\beta = -.44$; $t = -4.71$; $p < .001$, and eye contact, $\beta = .34$; $t = 3.63$; $p < .05$.

DISCUSSION

As has been proved in hundreds of studies (for review: Vrij, 2008), deception detection based on observation of behavioral cues is extremely difficult. However, the direct aim of the present study was not to detect deception. The aim was to attempt an analysis, both objective and subjective, of truthful and deceptive statements in such a way as to identify the indicators that distinguish those two kinds of statements from each other and to compare the recurrence of these indicators in lies concerning different issues.

In accordance with the hypothesis, when analysis comprised all the topics jointly, it was impossible to distinguish truthful statements from deceptive ones accurately based on either the majority of raters' estimations or the mean number of words uttered in answer to questions. It was only general credibility assessment and speech rate (the number of words uttered per second) that differentiated liars from truth tellers. Neither of these indicators showed a clear pattern in previous studies (Vrij, 2008) but in most of them the estimated credibility of statements was slightly higher in cases of telling the truth (cf. DePaulo et al., 2003). Vrij (2008) explains this by suggesting that making up a credible-sounding lie may simply be difficult. It is also in keeping with the cognitive approach to deception (Vrij, 2000), according to which lying is a cognitively difficult task, especially without the possibility of preparing the lie beforehand, which may lead to the appearance of some cues to deception. In the case of statements analyzed in this study, participants did not know the questions they would have to answer and had either no or little time to prepare their statements (30 seconds or 2 minutes, depending on the topic). It therefore seems that such conditions may indeed have led to high cognitive load in the deception situation and, consequently, may have affected the general impression of credibility.

As stated above, data concerning speech rate when lying are not clear, either (DePaulo et al., 2003; Sporer & Schwandt, 2006; Vrij, 2008), and these differences can be explained by the research procedure and the complexity of the lies used. In this study it turned out that liars spoke faster than truth tellers. This can be an example of liars attempting to control the impression they make on the interlocutor. They may assume that slower speech rate will make a more credible impression (Vrij, 2008) and, consequently, try to speak fluently and control the pace of speaking.

No single pattern of behavioral indicators was found to be constant and recur in all types of deception. This can mean that, as suggested by researchers (Vrij, 2000), the presence of visible signs of deception may be caused by different mental processes (e.g. cognitive or emotional load) in cases of lies on different topics or in cases of different liars. Additionally, individual differences between speakers, e.g. different ways of reacting in stressful situations or different situational factors such as motivation, may have an influence. It also seems that analysis of statements and assessment of behavioral indicators on that basis, without resort to additional techniques or without the aid of additional equipment, is a difficult task (just like the very detection of deception). For this reason, discerning the subtle differences in behavior between deception topics is extremely difficult. Moreover, the occurrence of particular cues to deception

is influenced not only by the topic but also by the way in which information is elicited from a person suspected of lying. The results show that the intensity of body movements and facial expressions was lower in the procedure of conversation with the experimenter than it was during non-guided free narrative. This may mean that the former type of procedure is more cognitively demanding – which is probable, because the participants did not know the questions they would have to answer.

It also seemed interesting to analyze which cues to deception are connected with inferences concerning general credibility. Regression analysis concerning all types of lies showed that the individuals who gave the impression of being the most credible were those who gave the largest number of details, maintained eye contact, and gave few contradictory pieces of information. Research on actual indicators (Vrij, 2008) shows that only one of those behaviors – namely maintaining eye contact – is not of this kind.

Analyzing each kind of deception separately, it is possible to draw a conclusion concerning the influence of procedure type (conversation vs. non-guided statement) on the deception indicators that occur. In the case of procedures in which participants were supposed to answer the experimenter's questions, the general impression of credibility depended on the lack of contradictions in the statement, providing a sufficient amount of information, and maintaining eye contact, which seems logical from the point of view of talking to a person and having to answer similar questions several times. According to the cognitive approach, lying is an activity during which it is necessary constantly to control one's speech, remembering what one has said earlier, and predict what knowledge the interlocutor has.

In scenarios in which expressing one's own opinion or finding arguments supporting one's opinion was important (person description, opinion on social issues), what made a difference in giving an impression of credibility was mainly providing a large number of details. As mentioned above, this is an actual indicator of deception, and meta-analysis of 29 studies (in laboratory as well as natural conditions) on the effectiveness of the CBCA method revealed that in 76% of them truth tellers included more details in their statements than liars did (Vrij, 2008).

Summing up the obtained results, the hypotheses advanced have been partly confirmed – raters only occasionally indicated the presence of subjective, stereotypical indicators of deception in the observed statements. This result may be due to the use of a specific method of credibility assessment, i.e., a method closer to indirect techniques of lie detection. In these techniques, direct questions (“Is the

person lying or telling the truth?") are accompanied (or replaced) by indirect questions concerning, e.g., whether the observed person is sure of their opinion or whether he or she shows signs of contradictory emotions, etc. (DePaulo & Morris, 2004). Research has shown that on the basis of indirect questions it is possible to differentiate more accurately between lies and truth than on the basis of a direct question (Vrij, Edward, & Bull, 2001). It is possible that the lack of a direct question in the present study resulted in raters focusing on slight differences between the behavior of liars and truth tellers instead of looking for stereotypical indicators of deception. It seems that the obtained results may also be a confirmation of the higher effectiveness of the indirect method of deception detection (e.g., Ulatowska, 2010; Vrij et al., 2001). However, in order for this conclusion to be certain, further studies are necessary, directly comparing the techniques used here with the "traditional" way of detecting deception based on behavioral cues. Moreover, the training of raters should be taken into account. Those that took part in the present study were individuals interested in detecting deception and although they initially had no special knowledge on its actual indicators, they could gain it on their own while making their assessments and, what follows, they may have been guided by objective indicators.

Deception detection based on observation of behavioral cues is the most frequently used technique of credibility assessment (Vrij, 2008). Therefore, the aim of this study was to compare verbal and nonverbal cues in truthful and deceptive statements, without the aid of specialist measurement equipment. It seems, however, that such an approach limits the possibilities of finding the more subtle differences between deception topics as well as between liars and truth tellers. Moreover, in the presented analysis almost exclusively subjective measures were taken into account. Future studies should attempt to use more objective measurement, unaffected by the skills or attitudes of raters and enabling more accurate measurement even of small differences in behavior.

The study presented here was one of few that directly tested cues to deception on various topics. Its results suggest that the topic of statements and the manner of eliciting them should be treated as factors that may modify differences in the behavior of liars and truth tellers and should therefore be taken into account in meta-analyses of actual deception indicators. Perhaps this will make deception detection based on sets of objective indicators adjusted to deception topic more accurate.

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