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Need for Cognition and the Process of Lie detection

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Abstract

Four experiments investigated the influence of Need for Cognition on the process of lie detection. According to the basic assumptions of dual process models, only higher Need for Cognition leads to the use of verbal information when making judgments of veracity. People with lower Need for Cognition predominantly use stereotypical nonverbal information for their judgments. In both Experiments 1 and 2, participants saw a film in which nonverbal cues (fidgety vs. calm movements) and verbal cues (low vs. high plausibility) were manipulated. As predicted, when Need for Cognition was lower, only the nonverbal cues influenced participants' judgments of veracity. In contrast, participants with higher Need for Cognition also used the verbal cues. Experiments 3 and 4 tested the hypothesis that higher Need for Cognition leads to better discrimination of truthful from deceptive messages. Both experiments found that participants with higher Need for Cognition achieved higher accuracy at classifying truthful and deceptive messages than participants with lower Need for Cognition.

Keywords: credibility attribution, lie detection, need for cognition, detection of deception, lay judgment

Need for Cognition and the Process of Lie Detection

In a recent comprehensive meta-analysis of more than 200 studies, Bond and DePaulo (2006) found that people without special training achieved an accuracy rate of 54% when judging the veracity of true or invented statements. People overall were better at correctly rating truths as nondeceptive (61%) than lies as deceptive (47%). These general results were in line with previous (meta-analytic) reviews that reported accuracy rates in the range of 45 to 60% (Aamodt & Custer, 2006; Ekman & O'Sullivan, 1991; Koehnken, 1990; Vrij, 2000).

One of the reasons for these low accuracy rates may be that people rely on invalid cues when evaluating the veracity of statements. When people are asked about their beliefs regarding deception (e.g., Akehurst, Koehnken, Vrij, & Bull, 1996; Hocking & Leathers, 1980; Reinhard, Burghardt, Sporer, & Bursch, 2002; Stroemwall & Granhag, 2003; The Global Deception Research Team, 2006; Zuckerman, Koestner, & Driver, 1981), they often mention cues that are not related to deception according to recent meta-analyses (DePaulo, Lindsay, Malone, Muhlenbruck, Charlton, & Cooper, 2003; Sporer & Schwandt, 2006, 2007). For example, Akehurst et al. (1996) found that laypersons associated deception with an increase in pauses and nervous facial expressions. Laypersons also believed that liars avoid eye contact and show more self-manipulating behaviours, hand and leg movements, and an overall nervous bodily expression. The content of a deceptive statement was believed to be characterized by less logical consistency, more superfluous and fewer relevant details, and more spontaneous corrections.

These stereotypic beliefs are found in many countries around the world (The Global Deception Research Team, 2006). While several studies found that these beliefs about deception were highly correlated with judgments of veracity (Apple, Streeter, & Krauss, 1979; Bond, Kahler, & Paolicelli, 1985; Frank & Ekman, 2004; Kraut, 1978; Reinhard et al., 2002; Riggio & Friedman, 1983; Streeter, Krauss, Geller, Olson, & Apple, 1977; Zuckerman et al., 1981), only few of these nonverbal or paraverbal cues are in fact related to deceptive behaviour. For example, DePaulo et al. (2003) found no evidence that liars avoid eye contact or show more gaze aversion than truth tellers. Also, liars did not show more active body, hand, arm, or foot movements than truth tellers. When it comes to the content of deceptive

statements, beliefs about cues of deception were more in line with the actual cues of deception. DePaulo et al. found that lies made less sense than truths: they were less plausible, less logically structured, more discrepant and ambivalent and contained fewer details than truths. And in fact, people believe that deceptive messages are less logically consistent and less detailed than true messages.

The findings that verbal beliefs about deception were more in line with the actual cues of deception correspond with the meta-analytic results from Bond and DePaulo (2006), who found that people were more accurate at discriminating lies from truths in audiovisual presentations, audio presentations, or transcripts than in video-only presentations. Giving people only the possibility of using nonverbal stereotypes (in video-only presentations) for their judgments of veracity impaired their ability to discriminate lies from truths.

Finally, there is no strong evidence that individual differences could explain differences in the ability to detect deception (c.f., Aamodt & Mitchell, 2006; Bond & DePaulo, 2008). For example, Aamodt and Mitchell (2006) found in their meta-analytic review no significant relationship between detection accuracy and individual differences such as age, education, sex, experience, confidence, or personality traits such as neuroticism, extraversion, or self-monitoring. However, Aamodt and Mitchell concluded that there were not enough studies investigating the influence of personality traits on accuracy of deception detection to make a final judgment.

The Process of Lie Detection

While a number of theories have been developed to explain why people may behave differently when they are lying as opposed to telling the truth (e.g., Buller & Burgoon, 1996; DePaulo et al., 2003; Ekman, 1992; Ekman & Friesen, 1969; Sporer, 2004; Sporer & Schwandt, 2006, 2007; Vrij, 2000; Zuckerman & Driver, 1985; Zuckerman et al., 1981), the process of lie detection by laypersons has received little attention until most recently (Bond & DePaulo, 2006; Forrest & Feldman, 2000; Frank & Ekman, 1997; Reinhard & Sporer, 2008; Stiff, Miller, Sleight, Mongeau, Garlick, & Rogan, 1989). For example, researchers use the basic assumptions of dual process models, like the elaboration likelihood model (ELM; Petty & Wegener, 1999) or the heuristic-systematic model (HSM; Chaiken, Liberman, & Eagly,

1989; Chen & Chaiken, 1999), to explain the process of credibility judgments (Forrest & Feldman, 2000; Reinhard & Sporer, 2008; Stiff et al., 1989).

The ELM and HSM, like other dual-process theories (for an overview, see Chaiken & Trope, 1999), differentiate two modes of information processing. The effortful central route processing implies that persons use all issue-relevant information, especially the content of a message, to develop or change an attitude. This process requires higher cognitive motivation and higher cognitive ability and capacity. Persons with lower motivation and/or lower cognitive ability/capacity use the effortless peripheral route processing. For example, they use easy judgmental rules (heuristics) such as “experts’ statements can be trusted” or “consensus opinions are correct” to form their opinion. The degree of cognitive effort individuals are willing or able to invest in this process may depend on situational variables (such as distraction or personal relevance) and on dispositional differences in cognitive motivation (e.g., Need for Cognition, NFC). Cacioppo and Petty (1982) defined NFC as an individual’s tendency to engage in and enjoy effortful cognitive endeavors. NFC is defined as a *cognitive motivation* rather than an intellectual capacity. Cacioppo, Petty, Feinstein, and Jarvis (1996) reviewed over 100 studies on individual differences in NFC and their consequences. Differences in NFC (as measured on a scale developed by Cacioppo & Petty, 1982) correspond with behavioral differences in how people approach cognitive tasks. Individuals with a high NFC are better than individuals with a low NFC at remembering previously presented information (e.g., Boehm, 1994; Cacioppo, Petty, & Morris, 1983; Lassiter, Briggs, & Bowman, 1991). Furthermore, they are more likely to be persuaded by strong arguments (e.g., Cacioppo et al., 1983; Priester & Petty, 1995), take greater pleasure in difficult tasks, and show a stronger propensity to search for new information (Cacioppo et al., 1996). NFC is only modestly related to intelligence, with more intelligent individuals scoring only slightly higher in NFC (for a summary see Cacioppo et al., 1996). Further, and most interesting, affecting the intensity of cognitive endeavor, NFC is connected with how individuals process information. Those with a high NFC tend to process information via a *central route* characterized by accurate balancing of all relevant information before judging, whereas those with a low NFC tend to process via a *peripheral route* and use less case-

specific information and more peripheral cues (e.g., source characteristics such as the attractiveness of a source; see Petty & Cacioppo, 1986).

There is some support for the usefulness of applying dual process theories to the field of deceptive communication research (Forrest & Feldman, 2000; Reinhard & Sporer, 2005, 2008, 2010; Stiff et al., 1989). For example, in three experiments, Reinhard and Sporer (2008) tested the assumption that only high, in contrast to low, task involvement/cognitive capacity leads to central processing of verbal information when individuals judge the credibility of a statement. For example, in Experiment 1 they found that highly involved participants used all judgment-relevant information. They judged a statement as more credible when the source showed no nonverbal cues of deception (e.g., no gaze aversion, adaptors, or posture shifts) and when the statement was plausible. In contrast, participants with low task involvement used only nonverbal information for their credibility attribution. Experiments 2 and 3 found that the manipulation of cognitive load had a parallel effect on the process of credibility attribution. These results from Reinhard and Sporer (2008) underpin the assumption that stereotypical nonverbal cues are easier to use than verbal content in credibility judgments. This finding is in line with the theoretical arguments of dual process theories that assume that stereotypical nonverbal cues (e.g., gaze aversion) can be more easily used in a heuristic way (e.g., “gaze aversion is a sign of lying”) than verbal content cues. To elaborate and use verbal cues (e.g., plausibility) on the central route, judges have to direct their attention to the verbal information of the entire statement. Thus, to know in the end how plausible a statement is or if relevant/important details are mentioned in the statement, a judge must listen to most of the content of the statement. A simple quantitative strategy to just count or guess the number of details would be qualitatively different from such a deep elaboration process. This argument is based on the important distinction of the ELM between quantitative and qualitative effects along the Elaboration Continuum. For example, Petty and Cacioppo (1984) found that under higher motivation the quality of arguments influenced attitude change and under lower motivation the pure quantity or number of arguments - independent of their quality - affected the attitude change. In contrast, judging the credibility based on one or more salient nonverbal cues (e.g., gaze aversion) or on a first impression of

the nonverbal behavior (e.g., overall fidgety) should be much easier. Support for this assumption also comes from research on stereotypes and person perception (e.g., Brewer, 1988; Brewer & Harasty Feinstein, 1999; Fiske, Lin, & Neuberg, 1999; Fiske & Neuberg, 1990). For example, Fiske et al. (1999) assume, that some stereotypical cues can be used automatically when they are highly available and when they have an important cultural meaning. Based on this assumption, one might expect that nonverbal stereotypical cues of deception can be used in an automatic way.

The Present Research

As stated above, the degree of cognitive effort individuals are willing or able to invest in the process of credibility attribution may depend on situational variables (such as distraction or situational relevance) and on dispositional differences in cognitive motivation (e.g., NFC). NFC was found to be an essential variable in dual process models to explain the formation of attitude judgments (cf., Cacioppo et al., 1983; Cacioppo et al., 1996; Priester & Petty, 1995).

The aim of this paper is to test for the first time the basic hypothesis derived from dual process theories, namely that individual differences in the tendency to process information systematically (NFC) moderate the use of verbal information in judgments of veracity. Therefore, in Experiments 1 and 2 verbal and nonverbal cues in simulated statements about an apartment for rent (Experiment 1) or about a broken appointment (Experiment 2) were directly manipulated and NFC of individuals judging the veracity was assessed. Experiments 3 and 4 further tested whether NFC influenced not only the attribution of credibility (i.e., veracity judgments which may be correct or incorrect), but also the actual accuracy of deception judgements (classifying lies and truths correctly). It was assumed that people with lower NFC would be less accurate because they only used nonverbal stereotypes for their judgments (see Bond & DePaulo, 2006). First, however, a test of the moderating role of NFC on the use of verbal information in judgments of veracity was conducted in Experiment 1. To that end, a videotaped conversation was designed in which both verbal and nonverbal cues were manipulated orthogonally. This experimental procedure for directly manipulating verbal and nonverbal cues was also used in recent studies in research on credibility attribution (e.g., Freedman, Adam, Davey, & Koegl, 1996; Reinhard & Sporer, 2005, 2010; Stiff et al., 1989).

Although this procedure provides the opportunity to directly test whether people use verbal or nonverbal information for their credibility attribution, it does have limitations. Actual judgments of truth and deception, which are commonly of interest in the field of deception research, could not be tested with this procedure. Actors show verbal and/or nonverbal cues to appear high or low in credibility, but they do not actually tell the truth or a lie.

In line with the basic assumptions of dual-process models, it was expected that higher NFC would lead to central processing and to the use of both verbal and nonverbal information in judging veracity. In contrast, lower NFC should lead to peripheral processing and to the use of only nonverbal information.

Method

Participants

Ninety-four female and 66 male students at the University of Giessen (mean age = 23.3) participated for departmental credit.

Design

The design was a 2 x 2 between-subjects design, with verbal information (truthful cues vs. deceptive cues) and nonverbal information (truthful cues vs. deceptive cues); 40 participants were randomly assigned to each of the four cells in the design.

Stimulus Material

Four parallel versions of a short film (two minutes long) about a conversation between a woman (Anna) looking for a successor to take over her current rental contract for her apartment, and another woman (Maria) looking at the apartment were created. The two women were amateur actresses who volunteered to participate in the film.¹ The camera was set up in such a way that in each version of the film one could see only Anna, but hear the voices of both Anna and Maria.

Verbal cue manipulation. Manipulated was the verbal information of Anna's statements about the apartment. Consistent with the findings of previous studies (Kraut, 1978; Stiff & Miller, 1986; Stiff et al., 1989), the truthful statements were manipulated so as to be judged more consistent and more plausible than the deceptive statements.²

Nonverbal cue manipulation. In addition, three nonverbal cues – gaze aversion, adaptors, and posture shifts – were used to simulate truthful and deceptive nonverbal behaviour. Previous research found these cues to be related to laypersons' credibility judgments (Miller & Stiff, 1993; Stiff et al., 1989; Vrij, 2000; Zuckerman & Driver, 1985; Zuckerman et al., 1981). The actress displayed more gaze aversion, more adaptors, and more posture shifts when simulating deceptive nonverbal information.³

Procedure

The experiment was labelled a study dealing with lying in everyday life. Participants were told that a little information about their personality would be assessed, that they would watch a short film, and would then be asked a few questions about it.

First, participants responded to items that assessed NFC. The German version of the NFC scale (Bless, Wänke, Bohner, Fellhauer, & Schwarz, 1994) was used. It contains 33 items such as "I prefer my life to be filled with puzzles that I must solve," or "The notion of thinking abstractly is appealing to me." Items were answered on a seven-point scale ranging from 1 (completely disagree) to 7 (completely agree). The scale showed a high internal consistency ($\alpha = .92$).

Participants were given the following information:

"Now we will show you a typical situation of everyday life: Anna is 26 years old and just finished her studies in business administration in Giessen. She lives in a one-room apartment in downtown Giessen. Two weeks ago, Anna was offered a good job in a different city and she will start her new job next month. Looking for a successor to take over her current rental contract, she has an appointment with Maria, who is looking for an apartment. We will now show you a short film about the inspection of the apartment. Afterwards, we will ask you some questions."

Next, participants watched one of the four stimulus films on a 25-in color monitor and completed a brief questionnaire. At the end, participants were fully debriefed and asked not to discuss the study with others.

Measures

The veracity judgment was measured with five items on a 9-point scale (“Anna was.... credible, honest, reliable, sincere, and truthful;” $\alpha = .91$). The perception of the verbal cues was assessed with five items on a 9-point scale (“The verbal message of Anna was . . . very plausible, consistent, coherent, structured, specific;” $\alpha = .78$). The perception of the nonverbal cues were measured with five items on a 9-point scale (“Did Anna frequently hold eye-contact with Maria during the conversation?;” “How often did Anna look at Maria during the conversation?;” “How many body movements did Anna show during the conversation with Maria?;” “How often did Anna move during the conversation with Maria?;” “Did Anna handle objects during the conversation with Maria?;” $\alpha = .88$).

Results

Regression analyses with verbal cue (coded “0” for deceptive cues and “1” for truthful cues), nonverbal cue (coded “0” for deceptive cues and “1” for truthful cues), NFC, the two-way interaction terms (NFC x Verbal, NFC x Nonverbal, Verbal x Nonverbal), as well as the three-way interaction term were used to predict judgments of veracity, the evaluation of verbal information, and the evaluation of nonverbal information. NFC as a predictor was standardized.

Manipulation Checks

The NFC scores were independent of the manipulation of verbal cues, nonverbal cues, and the interaction of verbal and nonverbal cues (all $ts < 1$). The mean NFC score was 4.44 ($SD = 1.35$).

Verbal cues. In line with the assumptions, only the term of verbal cue manipulation showed a statistically significant effect in the equation ($B = 1.45$, $t(158) = 7.90$, $p < .001$). No other effect was significant with $ps > .20$. Participants evaluated the verbal information of the statements as significantly more consistent in the truthful cue ($M = 4.91$, $SD = 1.16$) than in the deceptive cue condition ($M = 3.47$, $SD = 1.16$), $r = .53^4$.

Nonverbal cues. The regression analysis revealed that the term of nonverbal cue manipulation showed a statistically significant effect in the equation ($B = -1.75$, $t(158) = -8.79$, $p < .001$). No other effect was significant with $ts < 1$. As predicted, participants

evaluated the overall behaviour of Anna as significantly less believable in the deceptive cue condition ($M = 5.42$, $SD = 1.33$) than in the truthful cue condition ($M = 3.67$, $SD = 1.18$), $r = .57$.

Judgment of Veracity

A multiple linear regression analysis was applied to investigate the mechanisms underlying judgments of veracity. It was postulated that verbal cues determine judgments of veracity differently depending on NFC. Accordingly, for the prediction of judgments of veracity, a significant coefficient was expected from the interaction terms of NFC and verbal cues. Moreover, nonverbal cues should determine judgments independently of NFC.

The results of the regression can be seen in Table 1. Displayed are the unstandardized regression coefficients (B), the standard errors, and the standardized regression coefficients (β). R for the regression was significantly different from zero, $F(7, 152) = 7.51$, $p < .001$. Altogether, 25.7% (22.3% adjusted) of the variability in judgments of veracity was predicted by the independent variables. Interestingly, the interaction term showed a statistically significant effect in the equation. The coefficient of the interaction term “NFC x Verbal cues” was $\beta = .42$. The corresponding B (0.77) indicates the amount of change in the slope of the regression of verbal cue manipulation on judgments of veracity when Need for Cognition changes by one unit. The predicted values of judgments of veracity for deceptive and truthful verbal cues were analyzed following the simple slope procedure suggested by Aiken and West (1991). Statistical testing revealed the simple slope for individuals with a higher NFC (1 SD above M) to be positive and different from zero, $t(152) = 4.76$, $p < .001$. Judgments of veracity incline with increasing truthfulness of verbal information. In contrast, for individuals with lower NFC (1 SD below M), there was no statistically significant change in the judgments of veracity with changing truthfulness of verbal information, $t < 1$. Moreover, the coefficient of the term “nonverbal cues” was significant, but not the interaction term “NFC x Nonverbal cues” ($t < 1$), indicating that independent of NFC participants used the nonverbal cues for their judgments.⁵

Discussion

The results were in line with the hypothesis, derived from dual process theories, that participants' NFC moderates the use of verbal cue information when making judgments of veracity. The higher participants' NFC, the more verbal cues were used to judge veracity. Participants with higher NFC used the consistency and plausibility of the statement to make a judgment. In contrast, participants with lower NFC were not influenced by the consistency and plausibility of the verbal cues. They relied exclusively on the nonverbal cues, with lower judgments of veracity when the source displayed the nonverbal stereotypes of a liar, in this case more gaze aversion, adaptors, and posture shifts. As expected, the use of nonverbal cues was not moderated by participants' NFC. Independent of NFC, all participants used the nonverbal cues for their judgments of veracity. This is in line with both the ELM and the HSM, which assume that the two processing modes may co-occur (Chaiken & Maheswaran, 1994; Maheswaran & Chaiken, 1991; Maheswaran, Mackie, & Chaiken, 1992; Petty & Cacioppo, 1984; Petty & Wegener, 1999).

In Experiment 2, four different versions of a new film with different actors and a different scenario were used in which verbal and nonverbal cues were manipulated to replicate the findings of Experiment 1. Individuals with low NFC are less likely to engage in effortful information processing (see Cacioppo et al., 1996). This may lead them to use nonverbal cues for their judgments of veracity. In the following, this interpretation was empirically investigated by explicitly inducing different types of information processing. Petty and Cacioppo (1981; see also Petty & Wegener, 1999) argued that in addition to an individual's cognitive motivation, the ability to engage in effortful cognitive processing is also important. For example, in situations where two tasks have to be completed simultaneously, the individual's cognitive capacity is reduced. Therefore, one can assume that in such situations all individuals – independent of their need for cognition – will fail to engage in effortful cognitive endeavors when making veracity judgments. Furthermore, limiting cognitive capacity via a secondary task is a method of directly testing the hypothesis that using verbal cues requires more cognitive endeavor than using nonverbal cues. Therefore, in Experiment 2 participants' cognitive capacity was directly manipulated via a

secondary task technique (see Paas, Tuovinen, Tabbers, & Gerven, 2003) to examine the assumptions that, first, under high cognitive load participants use only nonverbal cues but not verbal cues for their veracity judgments independent of their NFC. In contrast, and in line with the basic assumptions of dual-process models, for participants under low cognitive load, it is expected that individuals' higher NFC leads to central processing and to the use of both verbal and nonverbal information for their judgments of veracity. Lower NFC should lead to peripheral processing and the use of only nonverbal information.

Method

Participants

One hundred-twenty-four female and 124 male students at the University of Giessen (mean age = 23.9) participated as volunteers in partial fulfilment of departmental requirements. The study lasted 20 minutes.

Design

The design was a 2 x 2 x 2 between-participants design, with verbal information (truthful cues vs. deceptive cues), nonverbal information (truthful cues vs. deceptive cues), and participants' cognitive load (low vs. high) completely crossed. Thirty-one participants were randomly assigned to each of the eight cells in the design.

Procedure

Participants were seated alone in front of a computer and were reminded that the study examined memory processes. All instructions were provided on screen. First, NFC was measured with the same items used in Experiment 1 ($\alpha = .89$). Next, participants in the high cognitive load group were given the following instruction: "On the next screen you will see a nine-digit number for 60 seconds. Please try to keep this number in mind during the following assignment and questions. You will be asked to recall the number later. We will compare the recalled number with the actual number." The next screen then displayed the number (823967284) for 60 seconds. This task was absent in the low cognitive load condition.

To maintain the salience of the cover story, participants in both conditions received four questions on autobiographical memory ("How many courses in biology did you take in high

school?;" "How many friends did you have during your time at high school?;" "How many bicycles have you had have until now?;" and "How many papers have you presented during your time at university?").

Participants were then treated identically to the procedure in Experiment 1, with the exception that they watched a different film. Four parallel versions of a short film of about five minutes about an argument between a woman (Sabine) and her boyfriend (Carsten) concerning a broken appointment were created. The woman and the man were amateur performers who volunteered to participate in the film. The camera was set up in such a way that in each version of the film one could only see Carsten, but hear the voices of both Carsten and Sabine. The verbal content of Carsten's statements was manipulated as to why he did not keep the appointment. Parallel to the material used in Experiments 1 and 2, the truthful statements were manipulated so as to be judged more consistent and more plausible than the deceptive statements.⁶ In addition, three nonverbal cues – gaze aversion, adaptors, and posture shifts – were used to simulate truthful and deceptive nonverbal behaviour. The actor displayed more gaze aversion, more adaptors, and more posture shifts when simulating deceptive nonverbal information.⁷

The veracity judgment, the perception of the verbal cues, and the perception of the nonverbal cues were measured with the same items used in Experiment 1 ($\alpha = .96, .96,$ and $.97$). Finally, participants answered four questions on their self-perceived distraction while answering the questions concerning autobiographical memory and the questions about the film (manipulation check; $\alpha = .81$). One example item: "I felt distracted while seeing the film and answering the questions." These questions were answered on a scale ranging from 1 (completely disagree) to 9 (completely agree).

Results

Manipulation Checks

The NFC scores were independent of the manipulation of load, verbal cues, and nonverbal cues (all $ps > .25$). Interactions of these three independent variables did not influence NFC scores (all $ts < 1$). The mean NFC score was 4.99 ($SD = 0.69$).

Cognitive load. The findings show that the experimental distraction manipulation was successful: cognitive load had a strong effect on the perceived distraction, only the term load was statistically significant ($B = 0.74$, $t(232) = 3.81$, $p < .001$). Perceived distraction was higher for participants with high compared to those with low cognitive load ($M = 5.26$, $SD = 0.79$ vs. $M = 4.46$, $SD = 0.72$). In the high load condition, 87% of participants remembered at least seven digits correctly and 70.5% remembered all nine digits correctly. These results show that participants – at least partly – directed their attention to the second task (see Paas et al., 2003, for a detailed description of secondary task techniques and cognitive load). The mean number of correct digits was not significantly correlated with NFC, $r = .08$, n.s.

Verbal cues. In line with the assumptions, only the term of verbal cue manipulation showed a statistically significant effect in the equation ($B = 0.90$, $t(232) = 3.05$, $p < .005$). No other effects were significant with $ts < 1$. Participants evaluated the verbal information of the statements as significantly more consistent in the truthful cue ($M = 5.56$, $SD = 0.97$) than in the deceptive cue condition ($M = 4.77$, $SD = 1.31$), $r = .32$.

Nonverbal cues. The regression analysis revealed that the term of nonverbal cue manipulation showed a statistically significant effect in the equation ($B = -1.04$, $t(232) = -2.94$, $p < .001$). No other effects were significant with $ps > .20$. As predicted, participants evaluated the overall behaviour of Carsten as significantly less believable in the deceptive cue ($M = 4.73$, $SD = 1.23$) than in the truthful cue condition ($M = 3.69$, $SD = 1.52$), $r = .35$.

Judgment of Veracity

A multiple linear regression analysis with cognitive load (coded “0” for low load and “1” for high load), verbal cue (coded “0” for deceptive cues and “1” for truthful cues), nonverbal cue (coded “0” for deceptive cues and “1” for truthful cues), NFC, the two-way interaction terms (NFC x Verbal, NFC x Nonverbal, Verbal x Nonverbal, Load x NFC, Load x Verbal, and Load x Nonverbal), the three-way interaction terms (NFC x Verbal x Nonverbal, NFC x Verbal x Load, Load x Verbal x Nonverbal, and NFC x Load x Nonverbal), as well as the four-way interaction term were used to predict judgments of veracity. NFC as a predictor was standardized. Verbal cues were postulated to determine judgments of veracity differently depending on load and NFC. Accordingly, for the prediction of judgments of veracity, a

significant coefficient was expected from the interaction term of load, NFC, and verbal cues. Moreover, nonverbal cues should determine judgments independently of NFC and load.

The results of the regression can be seen in Table 2. Displayed are the unstandardized regression coefficients (B), the standard errors, and the standardized regression coefficients (β). R for the regression was significantly different from zero, $F(15, 232) = 7.91, p < .001$. Altogether, 33.8% (29.6% adjusted) of the variability in judgments of veracity was predicted by the independent variables. Interestingly, the interaction term showed a statistically significant effect in the equation. The coefficient of the interaction term “Load x NFC x Verbal cues” was $\beta = .37$ ($t(232) = -2.28, p < .05$). To investigate the nature of this interaction, the recentering procedure suggested by Cohen, Cohen, West, and Aiken (2003) was used. The influence of verbal cues and NFC on the veracity judgments for the high load condition could be seen when high load was coded to be “0” and low load to be “1.” In a regression, veracity judgment was predicted by load, verbal cues, nonverbal cues, NFC, the two-way interaction terms, the three-way interactions, and the four-way interaction. As expected, only the variable nonverbal cues was significant ($p < .005$); neither the interaction of NFC and verbal cues nor the main effect of verbal cues was significant ($ts < 1$), indicating that participants under the high load condition did not use the verbal cues for their veracity judgments (see right column of Table 2). Second, to test the influence of verbal cues and NFC on veracity judgments for the low load condition, the same regression analysis was run with low load coded to be “0” and high load to be “1”. As expected, the interaction of NFC and verbal cues was found to affect judgments of veracity significantly ($\beta = .74, p < .001$) (see left column of Table 2). Statistical testing revealed the simple slope for individuals with a higher NFC (1 SD below M) to be positive and different from zero, $t(332) = 3.46, p < .001$. Judgments of veracity inclined with increasing truthfulness of verbal cues. In contrast, for individuals with a lower NFC (1 SD above M), there was no statistically significant change in their judgments with increasing truthfulness of verbal cues, $t = -1.43, p > .15$.⁸

Discussion

The results clearly confirm the hypothesis that under low cognitive load participants with higher NFC followed the central route (systematic processing) and relied on both the verbal

cues and the nonverbal cues to judge credibility. In contrast, participants with lower NFC used nonverbal but not verbal cues for their veracity judgments. However, these dispositional differences concerning cognitive motivation do not affect the relationships between the variables in all situations. Experimentally inducing high cognitive load eliminated the influence of verbal cues on judgments of veracity independently of NFC.

The results from the manipulation check support the idea that inducing a high load makes it difficult to process relevant information via the central route: participants felt more distracted than those in the low load condition. Moreover, the number of recalled digits correctly indicates that the participants paid attention to the recall task, reducing the cognitive capacity available for the expectancy rating. In line with the hypothesis, the results showed that individuals with a high NFC do not always use verbal cues to judge the veracity, but only if the situation allows them to choose the central route of information processing. Independent of NFC, the judgments of participants under high cognitive load were uninfluenced by verbal cues. Independent of the consistency and plausibility of the statement, all participants relied exclusively on the nonverbal cues to make their credibility attribution. More credibility was attributed in the truthful nonverbal cue than in the deceptive nonverbal cue condition.

While judgments of veracity are interesting per se, an even more important question is whether these judgments are accurate. In other words, does cognitive motivation (e.g., NFC) also influence the accuracy of deception judgments? Based on the meta-analyses from DePaulo et al. (2003) and Bond and DePaulo (2006), one would expect that higher cognitive motivation should increase the accuracy of deception judgments. There are two lines of arguments for this assumption.

First, although a few salient verbal cues were found to be associated with actual deception, the stereotypes about the nonverbal behaviour of a liar had no basis in fact. Many studies found that people, oriented toward verbal cues, expect that lies are discrepant, ambivalent, less plausible, and contain fewer details than the truth (e.g., Akehurst et al., 1996; Reinhard et al., 2002; The Global Deception Research Team, 2006; Vrij, 2000). For example, Reinhard et al. (2002) showed that participants who were assessing the veracity of

other people's statements listed logical consistency (i.e., perceived plausibility) and the number of details among the most important reasons why they thought a given statement was truthful. These cues believed to be associated with deception were also somewhat associated with actual deception (c.f. DePaulo et al., 2003).

In contrast, the stereotype that lying is associated with an increase in the nonverbal behaviour of the body and extremities is not supported by research studying actual indicators of deception. The meta-analyses by DePaulo et al. (2003) and by Sporer and Schwandt (2007) found no or only minor evidence that liars show more posture shifts, head movements, and hand, arm, or foot movements than truth tellers. Also, the belief that liars display less eye contact (i.e., gaze aversion) than truth tellers is not supported by empirical data (DePaulo et al., 2003). Even though there are also some actual nonverbal cues of deception, especially those indicators that might be more difficult to control (c.f., Ekman, 1992; Zuckerman et al., 1981), most of these actual nonverbal cues are not in accordance with laypersons' stereotypical beliefs about deception. Thus, one would expect laypersons who are using nonverbal cues in a stereotypical way not to achieve higher detection accuracy.

Second, Bond and DePaulo (2006) have argued that people who could only use video images for their judgments should be less accurate because they only use their (nonverbal) liar stereotypes. In fact, the results of the meta-analysis by Bond and DePaulo showed that people were more correct at discriminating lies from the truth in audiovisual presentations, audio presentations, or transcripts than in video-only presentations. Using only visual cues leads to less accurate judgments of deceit.

In accordance with these two lines of argument, it can be predicted that people with higher NFC would be more correct in their judgments of truth and deception than people with lower NFC. This should be the case because higher NFC should lead to a more intensive use of verbal cues with, simultaneously, less reliance on nonverbal (stereotypical) cues. In contrast, people with lower NFC should use more nonverbal cues but fewer verbal cues. To test this hypothesis, Experiment 3 assessed participants' NFC and had participants judge videotapes of people being deceptive or honest about their attitudes about films.

Method

Participants

Fifty female and 48 male students at the University of Mannheim (mean age = 23.0) participated as volunteers in partial fulfillment of departmental requirements. The study lasted 20 minutes.

Design

The design was a 2 x 2 x 2 x 2 mixed-model design. Sex of participants was a between-participants factor, and type of message (truthful vs. deceptive), valence of attitude (like vs. dislike), and sex of targets were within-participants factors. Valence of attitude, sex of participants, and sex of targets were included as control factors but were not expected to influence the results.⁹

Stimulus Material

Thirty-six female and 36 male students at the University of Mannheim participated in a study labelled “personal attitudes.” In the truth condition, half of the participants were asked to take about one minute to describe a movie they really liked or disliked. The participants in the deception condition were asked to describe a film they actually liked (disliked) as though they really disliked (liked) it. The camera was positioned about three meters in front of the chair on which the participant was seated. The procedure allowed for the head and upper body of the participants to be seen. All participants were instructed to appear as truthful as possible, and told that they could receive an extra reward of five Euro if the interviewer who was blind to the experimental conditions believed that they indeed liked or disliked the movie. The length of the messages did not differ across the conditions. Asking people to describe objects or other people they like/dislike in a truthful or deceptive way is a common method for creating true or deceptive messages about personal attitudes, and it was used, for example, by DePaulo, Rosenthal, Green, and Rosenkrantz (1982), DePaulo and Rosenthal (1979), and Frank and Ekman (1997). Three sets with 24 messages were created, each containing 12 truthful and 12 deceptive messages. Valence of attitudes and sex of sender were balanced.

Procedure

Participants were informed that the study dealt with the ability to discriminate true from deceptive messages. Next, participants were told that they would watch 24 messages of students describing movies they really liked or disliked. Participants were told that some of these messages were in fact true, as the reporting students did like or dislike the movie. They were also told that some of these messages were not true, as the students described a movie they liked (disliked) as though they disliked (liked) it. Each participant was presented one of the three sets of 24 messages. The messages were presented on a laptop (14-inches). Participants then saw each of the 24 messages, and immediately after watching each message participants classified it as a lie or the truth. After judging all messages, participants were asked whether they had used nonverbal or verbal information for their lie-or-truth judgments ($\alpha = .95$: “I based my judgment more on . . .;” “In watching the messages, I tended to pay more attention to . . .;” scale from 1 = nonverbal behaviour to 7 = verbal content). Participants were also asked to judge the overall validity of nonverbal and verbal information to detect deception ($\alpha = .73$: “I think . . . is the more valid information to detect deception;” “Overall , . . . is more reliable to make judgments of veracity;” scale from 1 = nonverbal behaviour to 7 = verbal content). Next, participants responded to items that assessed NFC. The German version of the NFC-scale (Bless et al., 1994; $\alpha = .90$) was used. At the end of the experiment, demographic data (age and sex of participants) were assessed and participants were debriefed.

Results

The mean NFC score was 4.79 ($SD = 0.73$). The NFC scores were not different depending on the set of messages participants received and sex of participants (all $ps > .30$).

Percentage Judged True

Overall, participants classified 53.73% ($SD = 11.65$) of the 24 messages as true. This value was significantly different from 50%, $t(97) = 3.22$, $p < .005$, indicating a truth bias. Furthermore, NFC had no significant influence on the percentage of messages judged true, $r = -.06$; $t(97) = -.06$, $p > .56$.

Judgments of Truth and Deception

Overall, participants achieved a detection accuracy of 54.88% ($SD = 12.97$). Participants were better at detecting true messages ($M = 58.67$) than deceptive messages ($M = 51.11$), $t(97) = 3.21, p < .005$.

A multiple linear regression analysis with NFC and sex of participants was used to predict detection accuracy (in %). NFC as a predictor was standardized. R for the regression was significantly different from zero, $F(1, 96) = 11.85, p < .001$. Altogether, 11.0% (10.1% adjusted) of the variability in detection accuracy was predicted by the independent variable. In line with the hypothesis, the NFC term showed a statistically significant effect in the equation. The coefficient of NFC was $\beta = .33, t(96) = 3.44, p < .005$. The corresponding B of 4.30 ($SD = 1.25$) indicates the amount of change in the slope of the regression of detection accuracy when need for cognition changes by one unit. Sex of participants did not affect detection accuracy, $t < 1$.¹⁰

Separate regression analysis with detection accuracy for true or deceptive messages as a dependent variable found that NFC was a significant predictor for detection accuracy of true messages ($\beta = .20, t(96) = 2.02, p < .05$), as well as for detection accuracy of deceptive messages ($\beta = .29, t(96) = 3.01, p < .05$).

Indeed, the number of messages judged true was positively correlated with detection accuracy of true messages ($r = .69, p < .01$), and negatively correlated with detection accuracy of true messages ($r = -.65, p < .01$).

Self-reported Use of Verbal and Nonverbal Information

The mean value for self-reported use of nonverbal or verbal information was 4.70 ($SD = 1.02$). As expected, NFC was a significant predictor of self-reported use of nonverbal or verbal information, $\beta = .37, t(96) = 3.90, p < .001$. Higher NFC leads to more use of verbal information.

Perceived Validity of Verbal and Nonverbal Information

The mean value for self-reported use of nonverbal or verbal information was 3.95 ($SD = 0.40$). As expected, NFC was no significant predictor of perceived validity of nonverbal or verbal information, $\beta = -.04, t(96) = -0.35, p = .73$.

Mediation of Detection Accuracy

The regression analyses supported the hypothesized mediational effect of self-reported use of verbal or nonverbal information on detection accuracy. In step one, NFC predicted detection accuracy ($\beta = .33, p < .005$); in step two, participants' reported use of verbal or nonverbal information predicted participants' detection accuracy ($\beta = .45, p < .001$); and in step three, the relationship between NFC and detection accuracy was reduced to nonsignificance when reported use of verbal or nonverbal information was regressed on the situational familiarity and reported use of verbal or nonverbal information ($\beta = .19, p = .052$). In addition, the Sobel's test (Sobel, 1982), indicating that the mediator (reported use of information) carries the influence of NFC on prediction of detection accuracy, was significant ($z = 2.78, p = .005$). In line with the assumptions, the reverse mediation was not found.

Discussion

The results support the assumption that higher NFC leads to better detection of deception. Moreover, participants with higher NFC were able to discriminate both the deceptive messages and the true messages more correctly than participants with lower NFC. Participants with higher NFC also indicated that they were more likely to use verbal content compared to participants with lower NFC. Moreover, the results of Experiment 3 showed that the self-reported use of nonverbal or verbal information mediated the effect of NFC on the accuracy of deception judgments at least partially. In contrast, no evidence was found that differences in NFC were associated with differences in the evaluation of the validity of nonverbal or verbal information to detect deception. In their meta-analysis, Bond and DePaulo (2006) found that across all studies judges classified about 56% of the messages as true. In Experiment 3 also a small bias for truth-judgments was found. This bias for truth judgments leads overall to more correct classifications of true messages than of deceptive messages. Overall, participants with higher rates of truth judgments were no better at detecting truth and deception. Participants with higher rates of truth judgments were, of course, better at detecting true messages correctly, but at the same time they were worse at detecting deceptive messages correctly. Most interestingly, NFC was not correlated with a bias for truth-judgments. The results clearly demonstrated that the effect of NFC on the

accuracy of deception judgments could not be explained with a bias for truth judgments. In fact, the results found evidence that the higher accuracy rates of participants with higher NFC could be explained with the stronger use of verbal information when judging the veracity of the messages. First, participants with higher NFC reported more use of verbal cues than did participants with lower NFC when judging the veracity of the messages. Second, and most important, the effect of NFC on detection accuracy was in fact reduced when the self-reported use of verbal or nonverbal information was controlled for. Critically, it could be argued that the effect of NFC on detection accuracy still was marginally significant when it was controlled for the use of verbal or nonverbal information. To strengthen the arguments, a fourth experiment was conducted to replicate the findings of Experiment 3 with different true and deceptive messages.

Method

Participants

Thirty female and 57 male students at the University of Mannheim (mean age = 24.7) participated as volunteers in partial fulfilment of departmental requirements. The study lasted 40 minutes.

Design

The design was a 2 x 2 x 2 mixed-model design. Sex of participants was a between-participants factors, and type of message (truthful vs. deceptive) and sex of targets were within-participants factors. Both sex of participants and sex of targets were included as control factors but were not expected to influence the results.

Stimulus Material

The stimulus material was taken from a study by Sporer and Walther (2006), who investigated differences between 36 invented and 36 truthful accounts in a quasi-experimental design. Half of the participants (all high school students of a small university town in Germany) were asked to describe their driving test, which they had taken several weeks earlier, in front of a digital camera. The other half was still preparing for the exam, but had not yet taken the test. Participants were told that they should report the driving test with as much detail as possible and not just in a few sentences. The camera was positioned about

three meters in front of the chair on which the participant was seated. The procedure allowed the head and upper body of the participants to be seen.

All students were instructed to appear as truthful as possible, and were told that they could receive an extra reward of five Euros if the interviewer who was blind to the experimental conditions believed that they had taken the test. Of these 72 accounts, 20 accounts of females and 20 of males (mean age = 18.5 years) were selected. The average length of the messages provided by the targets was about two minutes. The length of the messages did not differ as a function of truth status. Five sets of eight messages, each containing four truthful and four deceptive messages, were created.

Procedure

Participants were first informed that the study dealt with the ability to discriminate true from deceptive messages. First, NFC was measured with the same items as used in Experiment 1 to 3 ($\alpha = .91$). Next, participants were told that they would watch eight messages of students describing their driving test. Participants were told that some of these messages were in fact true, as the reporting students did in fact complete their driving test. They were also told that some of these messages were not true, as the students had not yet completed their driving test. Each participant was presented one of the five sets of eight messages.¹¹ The messages were presented on a laptop (14-inches). Participants then saw each of the eight messages, classifying each message as a lie or the truth immediately after seeing it. Participants were then asked whether they had used nonverbal or verbal information for their lie-or-truth judgments with the same two items as used in Experiment 3 ($\alpha = .95$). At the end of the experiment, demographic data (age and sex of participants) were assessed and participants were debriefed.

Results

The mean NFC score was 4.99 ($SD = 0.77$). The NFC scores were not different depending on the set of messages participants received and sex of participants (all $ps > .29$).

Percentage Judged True

Overall, participants classified 49.57% ($SD = 16.99$) of the 24 messages as true. This value was not significantly different from 50%, $t < 1$, indicating that, overall, participants had

no bias for truth judgments. Furthermore, NFC was not correlated with the percentage of messages judged true, $r = -.07, p > .56$.

Judgments of Truth and Deception

Overall, participants achieved a detection accuracy of 53.31% ($SD = 20.74$). Participants were no better at detecting true messages ($M = 53.74$) than deceptive messages ($M = 52.87$), $t < 1$.

A multiple linear regression analysis with NFC and sex of participants was used to predict detection accuracy (in %). NFC as a predictor was standardized. R for the regression was significantly different from zero, $F(1, 85) = 17.44, p < .001$. Altogether, 17.0% (16.0% adjusted) of the variability in detection accuracy was predicted by the independent variable. In line with our hypothesis, the NFC term showed a statistically significant effect in the equation. The coefficient of NFC was $\beta = .41$ ($t(85) = 4.18, p < .001$). The corresponding B of 8.56 ($SD = 2.05$) indicates the amount of change in the slope of the regression of detection accuracy when Need for Cognition changes by one unit. Sex of participants did not affect detection accuracy, $t < 1$.

Separate regression analysis with detection accuracy for true or deceptive messages as a dependent variable found that NFC was a significant predictor for detection accuracy of true messages ($\beta = .33, t(85) = 3.21, p < .005$), as well as for detection accuracy of deceptive messages ($\beta = .30, t(85) = 2.90, p < .005$).¹²

Self-reported Use of Verbal and Nonverbal Information

The mean value for self-reported use of nonverbal or verbal information was 4.18 ($SD = 1.80$). As expected, NFC was a significant predictor of self-reported use of nonverbal or verbal information, $\beta = .70, t(85) = 8.93, p < .001$. Higher NFC led to more use of verbal information.

Mediation of Detection Accuracy

The regression analyses supported the hypothesized mediational effect of self-reported use of verbal or nonverbal information on detection accuracy. In step one, NFC predicted detection accuracy ($\beta = .41, p < .001$); in step two, participants' reported use of verbal or nonverbal information predicted detection accuracy ($\beta = .55, p < .001$); and in step three, the

relationship between NFC and detection accuracy was reduced to nonsignificance when reported use of verbal or nonverbal information was regressed on the situational familiarity and reported use of verbal or nonverbal information ($\beta = .06, t < 1$). In addition, the Sobel's test (Sobel, 1982), indicating that the mediator (reported use of information) carries the influence of NFC on prediction of detection accuracy, was significant ($z = 3.64, p < .001$). In line with the assumptions, the reverse mediation was not found.

Discussion

Experiment 4 replicated the finding of Experiment 3 that higher NFC leads to better detection of deception with different true and deceptive messages. Participants with higher NFC were able to discriminate both the deceptive messages and the true messages more correctly than participants with lower NFC. In line with the hypothesis and the findings of Experiment 3, participants with higher NFC also indicated that they were more likely to use verbal content compared to participants with lower NFC. Moreover, the results of Experiment 4 showed that the self-reported use of nonverbal or verbal information mediated the effect of NFC on the accuracy of deception judgments. In Experiment 4, no bias for truth-judgments was found and also no evidence that higher accuracy of participants with higher NFC can be explained by a bias for truth judgments.

General Discussion

Need for Cognition and the Use of Verbal and Nonverbal Cues

In four experiments, the role of NFC on judgments of veracity and the accuracy in detecting deception was investigated. In the first two experiments, clear support for the hypothesis that NFC moderates the use of verbal information in judgments of veracity was found. The results of Experiments 1 and 2 were in line with the assumption that higher, in contrast to lower, NFC leads to the use of verbal cues and nonverbal cues when judging the veracity of a message. Nonverbal cues were used when NFC was lower. This assumption was tested and confirmed with different experimental materials. Different stimulus materials were designed for Experiments 1 and 2 to simulate truthful and deceptive verbal and nonverbal information. Combined with the findings of Reinhard and Sporer (2008), these studies demonstrate that

cognitive motivation moderates the use of verbal and nonverbal cues when the veracity of a message is judged.

Need for Cognition and Accuracy of Deception Judgments

Experiments 3 and 4 provided first evidence that higher NFC leads to more accurate judgments of truth and deception. The results were consistent across the two experiments using different true and deceptive messages. The higher participants' NFC, the higher their accuracy rates. Moreover, these results were independent of the position of the NFC measure. One might argue that measuring individuals' NFC at the beginning of the procedure could have contaminated later responses to the major dependent variables. Experiment 3 could rule out this concern. Experiment 3 and, especially, Experiment 4 were also able to demonstrate that self-reports about the use of verbal or nonverbal information mediated the accuracy of deception judgments.

Thus, Experiments 3 and 4 provided first evidence for the assumption that higher NFC leads to higher accuracy of deception judgments. In a meta-analytic review about individual differences in detecting deception, Aamodt and Mitchell (2006) found no significant relationship between detection accuracy and individual differences such as age, education, sex, experience, or confidence. Moreover, in this review, personality traits such as neuroticism, extraversion, or self-monitoring were found to have no or only a very small relationship to detection accuracy. While the last two experiments found clear evidence that higher NFC leads to higher accuracy of deception detection, more studies with true and deceptive messages on different topics are necessary to test the general validity of this assumption. Moreover, variables such as motivation or senders' preparation (see Bond & DePaulo, 2006) might moderate the influence of NFC on the process of lie detection. These theory-driven findings should also hold potential for applications in many different areas where judgments of veracity and detecting deception play a role, from everyday life to legal settings.

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- ¹ We are indebted to Anja Koerner and Stavroula Nitsiou for acting in our film.
 - ² In a pretest ($N = 24$), participants (randomly assigned) saw one of the four versions of the short film and evaluated the plausibility of the verbal statements of Anna on five items (plausible, consistent, coherent, structured, specific). The truthful statements ($M = 6.92$) were judged to be significantly more plausible than the deceptive statements ($M = 4.58$), $F(1, 20) = 5.99, p < .05, r = .48$.
 - ³ In another pretest, participants ($N = 24$) saw (randomly assigned) one of the four versions of the short film and were instructed to code the nonverbal behaviors of the actress. In the deceptive nonverbal information condition, participants recorded significantly more adaptors ($F(1, 20) = 15.88, p < .005, r = .67$), less direct eye gaze ($F(1, 20) = 53.97, p < .001, r = .85$), and more posture shifts ($F(1, 20) = 233.06, p < .001, r = .96$) than in the truthful nonverbal information condition ($M_s = 1.58, 9.67, \text{ and } 7.25$ in the untruthful, and $0.08, 0.17, \text{ and } 0.17$ in the truthful conditions, respectively).
 - ⁴ For all effects, the effect size r was reported (cf., Rosenthal, 1994).
 - ⁵ Given tolerance values higher than .13 and VIF values lower than 7.20 no serious problems of multicollinearity in the regression analysis were found (see the suggestions of Cohen, Cohen, West and Aiken, 2003, pp 419).
 - ⁶ In a pretest ($N = 104$), the truthful statements ($M = 5.70$) were judged to be significantly more plausible than the deceptive statements ($M = 5.05$), $F(1, 104) = 6.90, p < .05$.
 - ⁷ Participants in a pretest ($N = 40$) judged the nonverbal behaviours of the actor in the deceptive nonverbal information condition as significantly more deceptive ($M = 4.48$) than in the truthful nonverbal information condition ($M = 5.50$), $F(1, 38) = 8.46, p < .05$.
 - ⁸ Based on the high number of predictor variables in our regression, a model with only main effects, first order interaction effects and the assumed second order interaction was run to eliminate possible problems given high multicollinearity. Given tolerance values higher than .14 and VIF values lower than 6.90 no serious problems of multicollinearity in this regression analysis were found. The predicted second order interaction of load with NFC with verbal information was highly significant in this regression analysis.
 - ⁹ No significant effects of valence of attitude, sex of participants, and sex of targets emerged.
 - ¹⁰ Given tolerance values higher than .50 and VIF values lower than 2.00 no problems of multicollinearity in the regression analysis were found.
 - ¹¹ Type of set did not influence the assumed effects of NFC.
 - ¹² Given tolerance values higher than .99 and VIF values lower than 1.10 no problems of multicollinearity in the regression analysis were found.

Table 1.

Summary of Regression Analysis for Variables Predicting Credibility in Experiment 1 (N = 159)

Variable	B	SE B	β
Nonverbal cues	0.80	0.26	.30**
Verbal cues	0.62	0.26	.24*
NFC	0.03	0.20	.02
NFC \times Verbal cues	0.77	0.32	.42*
NFC \times Nonverbal cues	-0.13	0.27	-.08
Verbal cues \times Nonverbal cues	0.17	0.37	.05
NFC \times Verbal cues \times Nonverbal cues	-0.44	0.40	-.21

Note. * $p < .05$, ** $p < .01$

Table 2.

Summary of Regression Analysis for Variables Predicting Credibility in Experiment 2 (Left Column: 0 = low Load and 1 = high Load; Right Column: 0 = high Load and 1 = low Load)

Variable	Coding of cognitive load (0 = low; 1 = high)			Coding of cognitive load (0 = high; 1 = low)		
	B	SE B	β	B	SE B	β
Nonverbal Cues	0.82	0.32	.28*	0.93	0.31	.31*
Verbal cues	0.71	0.31	.24*	-0.13	0.32	-.05
NFC	-0.60	0.34	-.41	-0.13	0.25	-.09
Load	0.75	0.31	.26*	-0.75	0.31	-.26*
NFC \times Verbal cues	1.66	0.40	.74*	0.45	0.35	.20
NFC \times Nonverbal cues	0.18	0.38	.09	0.10	0.31	.06
NFC \times Load	0.47	0.42	.23	-0.47	0.42	-.22
Load \times Nonverbal cues	0.11	0.45	.03	-0.11	0.45	-.03
Load \times Verbal cues	-0.84	0.44	-.25	0.84	0.44	.25

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Verbal cues × Nonverbal cues	0.21	0.45	.06	-0.09	0.44	-.03
NFC × Verbal cues × Nonverbal cues	0.47	0.55	.14	-0.32	0.45	-.10
NFC × Load × Verbal cues	-1.22	0.53	-.40*	1.22	0.53	.37*
NFC × Load × Nonverbal cues	-0.30	0.63	-.07	0.30	0.63	.07
Load × Verbal cues × Nonverbal cues	-0.08	0.49	-.03	0.08	0.49	.03
NFC × Load × Verbal cues × Nonverbal cues	-0.79	0.71	-.20	0.79	0.71	.12

Note. * $p < .05$.

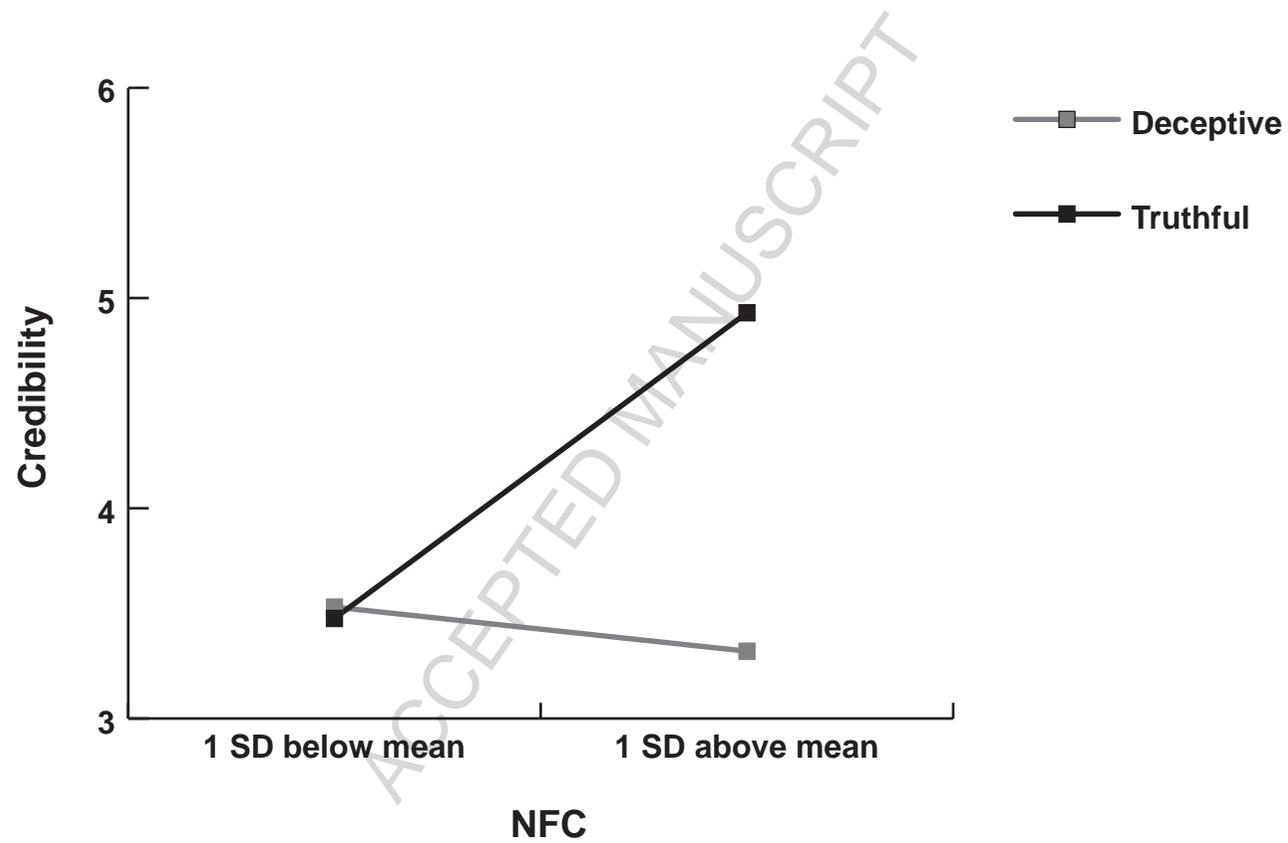


Figure 1. Means of Credibility Judgments as a Function of Participants' NFC and Verbal Cues in Experiment 1.

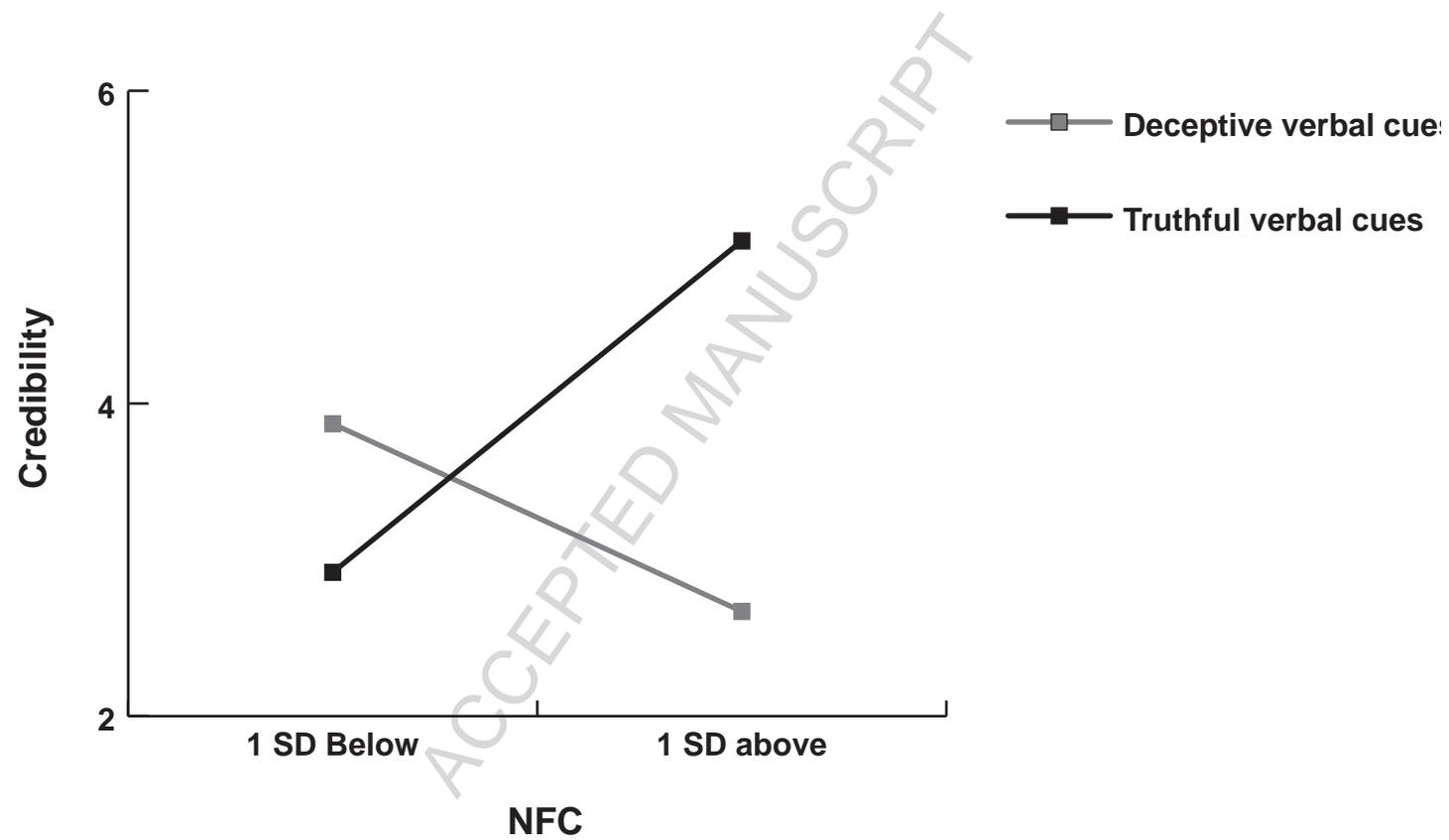


Figure 2. Means of Credibility Judgments as a Function of Participants' NFC and Verbal Cues in Experiment 2.

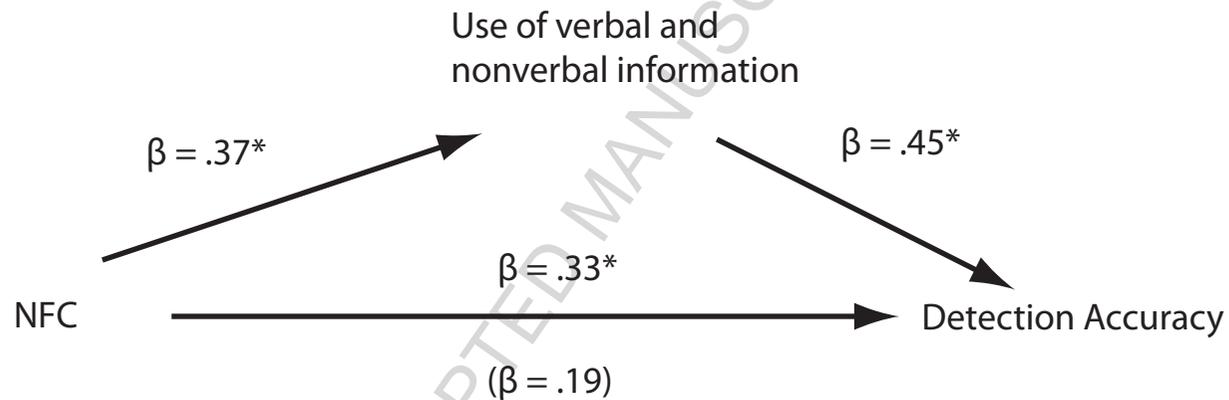


Figure 3. Mediation of NFC effects on detection accuracy (Experiment 3): Uncorrected effects, and effects corrected for use of verbal and nonverbal information, of NFC on detection accuracy. Coefficients appearing above lines are beta weights for uncorrected paths; coefficients in parentheses appearing below lines are beta weights for corrected paths (* $p < .05$)

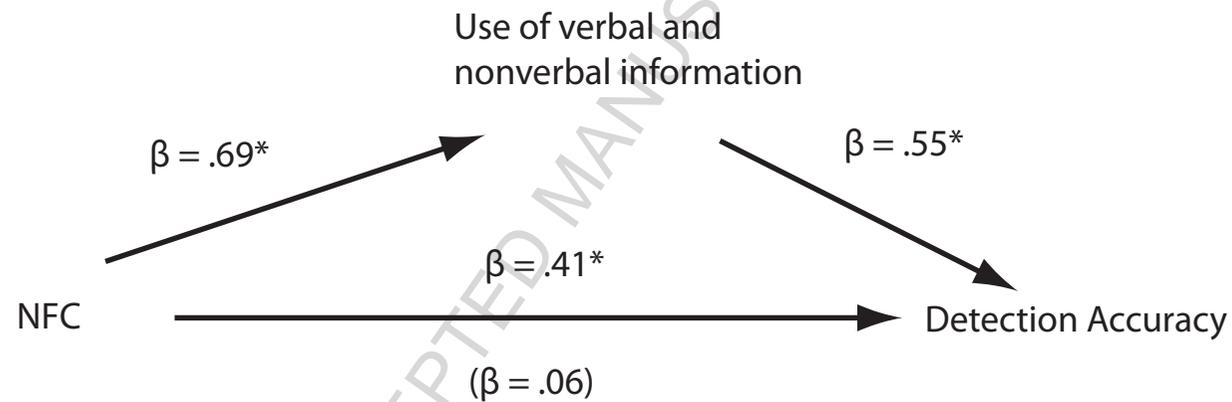


Figure 4. Mediation of NFC effects on detection accuracy (Experiment 4): Uncorrected effects, and effects corrected for use of verbal and nonverbal information, of NFC on detection accuracy. Coefficients appearing above lines are beta weights for uncorrected paths; coefficients in parentheses appearing below lines are beta weights for corrected paths (* $p < .05$)