Stress and Detecting Deception: An Investigation of the Effect of Mild Psychological Stress on Deception Detection Accuracy

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Abstract

The present study investigated the influence of the anticipation of giving a public speech on performance on a deception detection task. Our manipulation – telling participants that they have to give a public speech – is believed to induce acute mild psychological stress. This stress, in turn, is suggested to make people rely more on their intuitions. Relying on an intuitive processing style has been found to lead to better deception detection performance, and therefore we hypothesized that participants' accuracy in detecting deception would be positively affected by being under acute mild psychological stress. 166 participants watched eight short video fragments in which a target person was talking about his or herself in front of the camera. Participants had to judge whether the targets were telling the truth or not (i.e., a direct veracity judgment) and whether the target person was trustworthy (i.e., an indirect veracity judgment). While judging the targets, participants in the experimental condition anticipated giving a public speech, whereas participants in the control condition had to think about their last holiday. The results showed that participants in the experimental condition were not better in judgments of veracity or judgments of trustworthiness compared to the control condition. These results indicate that stressed people are not better in deception detection compared to unstressed people. Possible explanations for not confirming the assumed hypotheses are discussed, as well as suggestions for future research on the influence of acute mild psychological stress on trustworthiness in liars and truth-tellers.

Keywords: acute mild psychological stress, deception detection, intuition, indirect veracity judgment, direct veracity judgment, trustworthiness

Stress and detecting deception: An investigation of the effect of mild psychological stress on deception detection accuracy

People are not good at detecting deception. The results of a review of Bond and DePaulo (2006) show that people have 54% chance to make a correct lie-truth classification. This is slightly above chance level, because 50% accuracy is expected by chance alone. This low percentage of a correct lie-truth classification can be due to the fact that people do not know to which aspect of the body or the face they have to pay attention when detecting deception (Ekman & Friesen, 1974). However, research indicates that there are a few ways to improve accuracy in detecting deception. Some studies suggest greater accuracy in deception detection when using indirect measures compared with direct measures (Vrij, Edward, & Bull, 2001). Other studies suggest there might be a significant improvement of deception detection performance when using an intuitive processing instead of a more deliberative processing style (Albrechtsen, Meissner, & Susa, 2009). Anticipatory stress can lead to less deliberative processing (Starcke, Wolf, Markowitsch, & Brand, 2008) and as a consequence, people under acute stressful circumstances may rely more on their intuitions. This study investigates whether this, in turn, might lead to more accuracy in deception detection.

People often pay attention to the wrong cues when detecting deception in others. On the one hand, people report reliable cues, but it is remarkable that they do not use these cues to detect deception (Forrest, Feldman, & Tyler, 2004). An example of such a reliable cue which really distinguishes between truths and lies, but which people do not use to detect deception, is the fact that liars showed a longer latency period (DePaulo, Lindsay, Malone, Muhlenbruck, Charlton, & Cooper, 2003). Besides this, liars use fewer illustrators, more speech hesitations and fewer hand and finger movements (DePaulo et al., 2003). At the other hand, observers use cues

like fidgeting with fingers, shifts in posture or eye contact avoidance to infer that the person being judged is lying, but none of these behaviours have been shown to be unambiguous cues to deception (Forrest et al., 2004). In other words, those believed cues do not show correspondence between the cues that really distinguish truths from lies (Anderson, DePaulo, Ansfield, Tickle, & Green, 1999). Taken together, people notice some of the right cues to detect deception, but they concentrate on other cues when shaping a judgment about whether someone is lying or telling the truth.

Research has found several methods to improve accuracy of deception detection. For instance, it might be useful to use indirect questions rather than direct questions. In the study of Vrij et al. (2001) police officers were shown video fragments in which a target person was either lying or telling the truth. Hereafter, police officers were randomly assigned to one of two types of judgments. The indirect method contained questions like 'Does the person have to think hard?', whereas the direct method contained questions like 'Is this person lying?'. Only by using the indirect method police officers did pay attention to the cues that were actual indicators of deceit (Vrij et al., 2001). A distinction can also be made between subjective (e.g., active versus a passive voice, facial pleasantness and eye contact) and objective impressions (e.g., the coding of occurrences by independent researchers). Results of a review by DePaulo et al. (2003) show that subjective impressions discriminated between a liar and a truth-teller, whereas the objective impressions did not. It thus seems that the use of indirect questions and subjective impressions are factors that could make an improvement in deception detection.

Other research has also found improvement in deception detection. It seems to be more efficient to use an intuitive processing style to get to an accurate judgment in detecting deception compared to a deliberative processing style. In other words, when people think less hard about it,

they become better in deception detection. This can be explained with dual process theory, which is an integrative approach in decision making that in cooperates two modes of thinking, namely an intuitive processing style and a deliberative processing style (Epstein, Pacini, Denes-Raj, & Heier, 1996). Albrechtsen et al. (2009) describe the intuitive processing style as an affective or experiential mode that is effortless, spontaneous, and holistic in nature. In contrast, they describe the deliberative processing style as requiring conscious effort and as a generally slower, more analytic process. Albrechtsen et al. (2009) investigated with which mode the participants showed a greater performance in deception detection when watching videos. In a first experiment participants were randomly assigned to either a thin-slicing or a control condition. Participants of both conditions were instructed to watch 10 videos of inmates of a correctional facility and to distinguish between true and false confession statements provided by them. The difference between these two conditions was the fact that the participants in the control condition viewed each video in its entirety, which was a video of three minutes, whereas the participants in the thin-slicing condition viewed only 15 seconds of each video. The idea behind these thin-slicing videos was the fact that people had to rely on their intuition, because they had not seen the whole video. The results showed that participants in the thin-slice condition were significantly more accurate in their judgments compared to participants in the control condition. Thereby, only the thin-slice condition performed above chance levels, while the control condition performed at chance levels.

In the second experiment of Albrechtsen et al. (2009) participants were randomly assigned to one of three conditions. In the concurrent task condition participants had to complete a perceptual-memory task while viewing the videos. Participants in the control condition only had to watch the videos without any distraction. After watching each video, both groups had to

make a veracity judgment. Participants in the verbal reasoning condition watched the same videos, but they were first asked to come up with a list of reasons in support of their belief that the statement was true or false before they provided their judgment. The results showed that participants in the concurrent task condition were significantly more accurate in differentiating between true and false statements when compared to the control and verbal reasoning conditions. Taken together, both experiments of Albrechtsen et al. (2009) confirm the idea that using an intuitive processing style improves deception detection performance.

Other research confirms the idea that intuitive processes can significantly improve deception detection performance. An example is the experiment of Feeley and Young (2000). Participants in this study also had to watch a videotape with six communicators, after which they had to judge whether they were telling the truth or not. One condition was given an additional cognitive task during the videotapes to limit their cognitive capacity, whereas the other condition only had to watch the videotapes. The results showed that the condition with limited cognitive capacity was more accurate in detecting deception compared to the control condition. They also reported more vocal cues and fewer verbal cues to support their judgement compared to the control condition. The results of these different experiments (Albrechtsen et al., 2009; Feeley & Young, 2000) confirm the idea that intuitive processes can significantly improve deception detection performance.

During acute mild psychological stress, it is arguably even more important to know on whom you can rely compared to during a normal situation when you are not experiencing stress. In terms of evolution, people need to be able to tell whom they can trust in order to survive, especially so in an uncertain situations. These uncertain situations can lead to a so called ‘fight-or-flight response’ (Cannon, 1914). This neural stress reaction occurs immediately after stress

exposure (Het, Rohleder, Schoofs, Kirschbaum, & Wolf, 2009). It leads to a release of the catecholamines adrenaline and noradrenaline from the adrenal medulla, which in turn causes various reactions within the sympathetic nervous system, such as increases in blood pressure, heart rate, pulse and electrodermal activity (Het et al., 2009). These reactions occur immediately after inducement of the stressor and return to baseline 10 minutes after removing the stressor (Het et al., 2009).

Automatic processing is also a consequence of the fight-or-flight response, which may be beneficial in terms of evolution (Starcke & Brand, 2012). Acute mild psychological stress can induce amygdala activation which has effects on other brain regions such as the prefrontal cortex and hippocampus, which leads to impairing memory retrieval (Weerda, Milde, Wolf, & Thiel, 2014). As a consequence, humans do not always make strategic decisions that are well calculated in stressful situations (Starcke & Brand, 2012). Taken together, due to changes in the underlying neural systems, people rely less on a deliberative processing style when they are exposed to acute stress conditions. Instead they seem to rely more on their automatic, intuitive processing style.

Relying on intuition thus seems to be emerging under stressful conditions. If uncertainty is high, the intuitive processing style may play a more prominent role compared to the deliberative processing style. In other words, people think less hard when they are in stressful circumstances. Starcke et al. (2008) found that anticipatory stress can lead to a decrease of the usage of a deliberative processing style. In their study, participants in the experimental condition were told that after they had finished some neuropsychological tests, they had to prepare a public speech about their cognitive abilities in front of two psychologist, while in actuality, this was a cover story employed to elicit anticipatory stress. The supposed task of the psychologists was to ask questions regarding discrepancies between their public speech and their results of the

neuropsychological tests. However, before participants had to give their actual speech, participants were given several decision making tasks. Participants in the control condition only had to think about their last holiday, after which they went to the same decision making tasks. The results showed that stress can lead to disadvantageous decision making measured with the Game of Dice Task (GDT), which is a decision making task in which explicit and stable information about outcome contingencies is provided. These results indicate that there is a decrease of using a deliberative processing style when people have to deal with anticipatory stress. In line with the dual process theory (Epstein et al., 1996), participants as a consequence seem to rely on their intuitive processing style.

In the current study, participants watched short video fragments in which a target person was lying or telling the truth. The task of the participants was to make a direct veracity judgment, namely whether this person was lying or not, and to make an indirect veracity judgment, namely how trustworthy they thought the target person was. While doing this task, half of the participants were anticipating giving a public speech, whereas the other half was not. The main purpose of this study is to investigate whether stressed people are better in detecting deception than unstressed people, on either direct questions or indirect questions or both. The idea behind our presupposition is the fact that people under stress may rely more on their intuition resulting in more accuracy in deception detection.

Hypotheses

In this study, we will test four hypotheses. The first hypothesis is that overall participants will score slightly above chance level on the direct veracity judgment. We expect this on the basis of the results of previous literature which show that people have 54% chance to make a correct lie-truth classification (Bond & DePaulo, 2006).

The second hypothesis is that overall participants will rate truth-tellers to be more trustworthy than liars (i.e., the indirect judgment). Judgments of trustworthiness are highly automatic, rapid processes which are relevant in many real-world interactions (van ‘t Wout & Sanfey, 2008). These judgments might be better made under stressful circumstances, because under such circumstances the detection of trustworthiness is essential for human survival.

The third hypothesis is that participants in the experimental condition will have a higher percentage of correctly detected targets on the direct questions of veracity than the control condition. We expect this because people do not have a deliberative processing style when they are under stress, but a more intuitive processing style (Starcke et al., 2008), which will result in more correct lie-truth classifications (Albrechtsen et al., 2009).

The fourth hypothesis is that participants in the experimental condition will judge liars to be less trustworthy than truth-tellers, and that this is more pronounced than in the control condition. We expect this because stressed participants rely even more on their intuitive processing style compared with unstressed participants (Starcke et al., 2008), which will result in more accurate judgments of trustworthiness (Albrechtsen et al., 2009).

Method

Participants

One hundred eighty-nine first year students from Tilburg University participated for course credit. They were randomly assigned to either the experimental or the control condition. Twenty-three students were excluded from analyses on the basis of pre-defined exclusion criteria; two for not finishing (1 from the experimental condition and 1 from the control condition); thirteen because of not believing in the manipulation of giving a real presentation; and eight because of recognizing a target person in a fragment of the detecting deception task (3

from the experimental condition and 5 from the control condition). Therefore after exclusions, 166 participants (81% women) were included in the statistical analyses (M_{age} = 19.61 years, SD_{age} = 2.10 years).

Procedure

Participants in the experimental condition were told that they had to deliver a public speech on the topic "how do I evaluate my presentation skills" in front of several psychologists. They were also told that the psychologists would ask some questions following their presentation, with which they would test the participants' skills on neuropsychological functioning. Instructions read that the presentation had to be a maximum of five minutes, in which cheat sheets were not allowed and it was stressed that presenting about this topic is associated with success in post academic carriers. They were given three minutes to prepare for the speech, during which a timer reminded them of the time that was left, the screen then auto advanced to the next page. After this, participants were given a cover story informing them that not everyone could present simultaneously for the audience of psychologists, so they were asked to do an unrelated task before they had to give their actual speech. In the control condition, participants thought about their last holiday for three minutes before they went on to do the detecting detection task.

Detecting Deception Task

To investigate detecting deception under stress, participants had to watch eight short fragments in which a target person was talking about themselves in front of the camera. These target persons talked about themselves for on average 30 seconds (e.g., topics such as their personality characteristics, family and leisure time). Every target person told a truth as well as a lie, but these fragments were semi randomly divided over the participants, because every target

person was showed only once to a participant. The task of the participants was to form an overall indirect impression of the trustworthiness of the target person on a slider scale (0 = unreliable, 100 = reliable). The indirect question was assessed on a slider scale without any numbers, in order to elicit an intuitive answer. Thereafter, participants had to form a direct impression whether the target person had lied or not (‘yes’ or ‘no’). The direct question was a more deliberative question with only two response options.

Measurement of stress

After completing the deception detection task, but right before they had to give their actual speech, participants indicated on a slider scale whether they felt negative (0) or positive (100) on that moment. Thereafter, 20 items of the State Anxiety subscale of the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1977) were used to assess anxiety. Participants had to judge the extent to which statements such as “I feel calm” were related to themselves at that moment using a 4-point scale with (1) not at all, (2) a little, (3) quite a lot and (4) very much. These questionnaires were administered in both conditions after the detecting deception task and once again after giving their actual speech in the experimental condition, to indicate whether their stress level had reduced at the end of the experiment.

Besides this, in both conditions some control questions were asked. The first question was the question if the participants knew one of the target persons displayed on the videos. If so, they had to give the name of that person and describe how they were acquainted to the target person. Finally, some demographic information was assessed.

For the control condition, the experiment finished after these questions. In the experimental condition, however, the experimenter brought the participants to the audience of psychologists. One psychologist thanked the participant for waiting and told that – in contrast

with what was described in the assignment – their speech could actually be very short: just a summary of the presentation they prepared would suffice. During the speech the psychologist(s) made some notes on a college block which were (unbeknownst to the participant) mainly about whether the psychologist got the idea that the participant had believed the speech manipulation to be real. After the speech, the psychologists thanked the participant for their speech and gave some compliments about their presentation skills in order to put the participant at ease. The participants then returned to their cubicles and answered again the same 20 items of the STAI (Spielberger et al., 1977) to test whether their stress level had reduced compared to their stress level before their actual speech.

Results

Level of stress during detecting deception task

To test whether there was a difference between the conditions on the one item mood assessment we performed an independent samples t-test. This mood item that was assessed after the detecting deception task revealed that participants in the experimental condition felt worse (M = 53.53, SD = 19.33) than participants in the control condition (M = 64.27, SD = 16.84), $t(163) = -3.814$, $p < .001$, $d = -0.59$, indicating that the stress manipulation was successful. These results suggest that participants in the experimental condition felt worse compared to the control condition during the detecting deception task.

Stress level after the detecting deception task also differed between conditions based on the STAI, because the results of an independent samples t-test showed that participants in the experimental condition (M = 45.13, SD = 11.41) had a higher score than participants in the control condition (M = 36.85, SD = 8.17), $t(142) = 5.340$, $p < .001$, $d = 0.90$. These results suggest that participants in the experimental condition felt more anxious than participants in the

control condition as assessed right after the detecting deception task, from which we assume that the participants were stressed during the detecting deception task.

Detecting deception task

The first hypothesis was that, overall, participants would score slightly above chance level on the direct veracity judgment. The results showed that participants were correct 55% of the time. An one sample t-test indicated that this was significantly different from chance, $t(165) = 3.418$, $p < .001$, $d = 0.53$. These results suggest that, although this performance is slightly above chance level, people are not very good at detecting lies.

The second hypothesis was that, overall, participants would rate truth-tellers to be more trustworthy than liars. The results of a paired samples t-test showed that participants rated truth-tellers to be more trustworthy ($M = 58.67$, $SD = 13.02$) than liars ($M = 56.38$, $SD = 13.84$), $t(165) = -2.044$, $p = .042$, $d = -0.32$. These results suggest that when people have to rate someone's trustworthiness, truth-tellers are seen as more trustworthy compared to liars.

The third hypothesis was that participants in the experimental condition would have a higher percentage of correctly detected targets on the direct questions of veracity than the control condition. The results of an independent samples t-test showed that participants in the experimental condition ($M = 54.06$, $SD= 16.37$) did not score significantly better than the control condition on detecting deception ($M = 55.09$, $SD = 18.23$), $t(164) = - 0.380$, $p = .704$, $d = -0.06$. These results suggest that stressed people are not better in detecting deception than unstressed people when asked directly whether the target person was lying or not.

The fourth hypothesis was that participants in the experimental condition would be more accurate in estimating the trustworthiness of a target person than participants in the control condition. There was a significant main effect of trustworthiness, $F(1, 164) = 4.44$, $p = .037$, η^2

= .026. However, this main effect was not qualified with a significant interaction between condition and trustworthiness in either lies or truths, F (1, 164) = 2.32, p = .130, η^2 = .014. Although the interaction was not significant, we chose to interpret the results of figure 1. If anything, these results suggest that when under stress, participants judged the truth-tellers to be more trustworthy than liars compared to the participants who are not experiencing stress. These results indicate that people under stress are slightly better in making a differentiation between truth-tellers and liars.

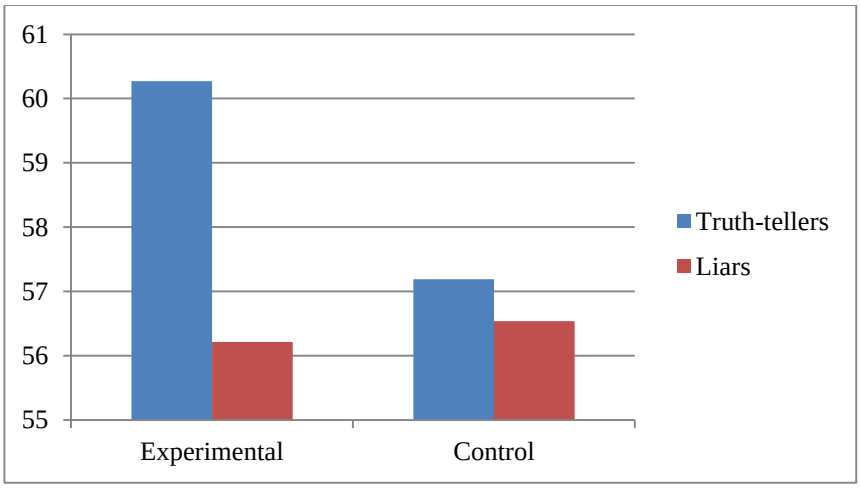

Figure 1. Average rating of trustworthiness of a target person on a 100-point scale

Level of stress after public speech

We performed two independent samples t-tests to ensure participants' mood and anxiety level was restored after the experiment. The general mood of participants in the experimental condition was significant less positive before the presentation (M = 53.53, SD = 2.16) compared to after the presentation (M = 60.29, SD = 2.31), t(79) = -2.958, p = .004, d = -0.67. These results suggest that participants' stress level had reduced at the end of the experiment.

Participants' anxiety level in the experimental condition was significantly higher before the presentation (M = 45.13, SD = 11.41) compared to after the presentation (M = 38.84, SD =

9.56), $t(79) = 5.123$, $p < .001$, $d = 1.15$. These results suggest that participants were less anxious at the end of the experiment.

Discussion

The aim of the present study was to investigate whether people are better in detecting deception when they experience acute mild psychological stress compared to circumstances in which they do not. The present study suggests that overall people score slightly above chance level when detecting deception. This finding confirms the results of previous studies that people are not really good in detecting deception (Bond & DePaulo, 2006). Besides this, the present study suggests that, overall, people see a truth-teller to be more trustworthy than a liar. This finding confirms the results of the previous study of Vrij et al. (2001) which showed that people are better in detecting deception when asking indirectly whether someone is lying or not. However, participants who experienced acute mild psychological stress were not better in judgments of veracity compared to participants in the control condition. There was also no significant difference found in judgments of trustworthiness between the two conditions. However, a pattern emerged showing that people who experienced acute mild psychological stress were better in distinguishing whether a truth-teller was trustworthy compared to people who did not experience acute mild psychological stress.

An explanation for the fact we did not confirm our assumed hypothesis that stress will lead to better lie detection, can be the fact that participants in both conditions saw video fragments of about 30 seconds each instead of an entire video with an obvious beginning and ending. These video fragments can be compared with the thin-slices of the study of Albrechtsen et al. (2009) used in their experimental condition. Although these thin-slices lasted for only 15 seconds while the fragments in the present study were around 30 seconds each, the effect of

these two lengths might be the same. Albrechtsen et al. (2009) used those thin-slices only in the experimental condition of their first experiment with the idea that people will rely on their intuition after seeing these short fragments. However, the present study used 30 second fragments in both the experimental and the control condition which could arguably also be categorized as thin-slices. As a consequence, these video fragments might have led to intuitive processing in both conditions, which made the added effect of stress small. Future research can take into account that both the experimental condition and control condition will watch the entire video instead of video fragments. The only difference between those two conditions will be the idea that participants in the experimental condition experience acute mild psychological stress, whereas the control condition does not.

Another explanation can be the fact that anticipating a public speech is perceived as a challenge. Kassam, Koslov and Mendes (2009) made a difference between two types of stress in their study: stress perceived as a threat and stress perceived as a challenge. The results of their study showed that only when stress is perceived as a challenge, this would lead to an increase in cognitive task performances. The underlying idea is that different emotions experienced during threats or challenges, will lead to those differences in cognitive performance. Future research can make a distinction between different emotions which will lead to different types of stress. This might confirm the idea that when stress is seen as a threat, there is less deliberative processing, which will lead to better deception detection performance.

Another suggestion for future research is the idea to combine several methods to stimulate intuitive processing even more. Results of the studies of Albrechtsen et al. (2009) and Feeley and Young (2000) suggest that limiting cognitive capacity will lead to more accurate judgments in differentiating between true and false statements. In line with these studies

(Albrechtsen et al., 2009; Feeley and Young, 2000) it could be a suggestion for future research to give participants in addition to anticipating a public speech, a concurrent task to limit cognitive capacity. It could be the case that combining these ways of stimulating intuitive processing will lead to more accurate judgments in deception detection compared to the used method in our present study.

Many participants in the current study knew one of the target persons displayed on the videos, because one of the target persons was a first year teacher. As a consequence, a lot of the participants knew this person from giving lectures to first year students in the beginning of the year. Only when participants were more acquainted to him than recognizing him as a teacher, we chose to exclude them partially or completely from the analyses. Because in our opinion only in that case, they could have known that the target person was lying. However, it still could be the case that it eventually has influenced the results, because participants recognized this particular person from class and might therefore have trusted him more while they did not recognize any other target person.

Contrary to often employed stress manipulations such as using cover stories to anticipate giving a public speech (e.g., Starcke et al., 2008), participants in the present study actually had to give a public speech. We used this type of manipulation, with the idea that this would be more threatening than only the anticipation of giving a public speech. As a consequence, the results showed that this was effective as a manipulation of stress during the detecting deception task. This was shown by the results on both the mood assessment and anxiety levels as measured by the STAI.

The pattern emerged in the present study suggests that people who experience acute mild psychological stress are better in distinguishing whether a truth-teller is trustworthy compared to

people who do not experience mild psychological stress. Although the difference found in judgments of trustworthiness between the two conditions was not significant, we chose to interpret these findings, because the pattern was consistent with the direction of our predictions and with findings of others that have assessed veracity indirectly (Vrij et al., 2001). However, additional research is necessary to verify this idea more extensively. Future research could focus on the effects of indirect questions on deception detection under stressful circumstances.

Existence of the emerged effect is consistent with previous research on human morality. Human morality is a key evolutionary adaptation on which human social behaviour has been based (Gintis, Henrich, Bowles, Boyd, & Fehr, 2008). The ability to evaluate others on the basis of moral character seems to be a product of natural selection, because it was likely of fundamental importance during primate and human evolution. Individuals who were able to assess the moral character of those around them, would have been better able to form reliable social relationships with trustworthy individuals who could provide help when needed (Gintis et al., 2008). The emerged effect of the present study suggests that people better distinguish between truth-tellers and liars when they experience acute mild psychological stress. It could be argued that this is due to the need for people to trust the right people to survive in uncertain stressful situations, which leads to higher vigilance or more accurate intuitive judgments of others' character.

In summary, as previous studies suggested, people are not good in detecting deception. The present study investigated whether people are better in detecting deception when they experienced acute mild psychological stress compared to when they did not. Findings suggest that on the one hand people who were experiencing mild psychological stress were not better in detecting deception when asked directly than people who were not under such stress. On the

other hand, when asked indirectly whether someone was trustworthy or not, people who experienced acute mild psychological stress were slightly, although not significantly, better in distinguishing when a truth-teller was trustworthy compared to people who were not. Although these results were not significant, they were in the predicted direction. Future research may investigate whether similar circumstances of a stressful environment make people better in detecting who is trustworthy and who is not.

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