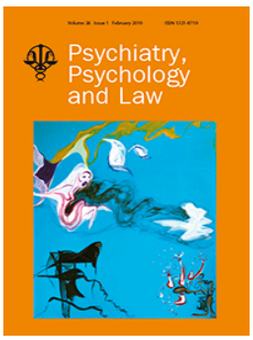

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Verifiability on the run: an experimental study on the verifiability approach to malingered symptoms

Irena Boskovic[a,b], Claudia Tejada Gallardo[a], Aldert Vrij[b], Lorraine Hope[b] and Harald Merckelbach[a]

[a]*Forensic Psychology Section, Maastricht University, Maastricht, The Netherlands;* [b]*Department of Psychology, Portsmouth University, Portsmouth, UK*

Several studies on the verifiability approach found that truth-tellers report more verifiable details than liars. Therefore, we wanted to test whether such a difference would emerge in the context of malingered symptoms. We obtained statements from undergraduates ($N = 53$) who had been allocated to three different conditions: truth-tellers, coached malingerers and naïve malingerers. Truth-tellers carried out an intensive physical exercise and after a short interval wrote a report about their experience and elicited symptoms. The two malingering groups had to fabricate a story about the physical activity and its symptoms. Truth-tellers did not generate more verifiable details than malingerers. However, malingerers reported more non-verifiable details than truth-tellers. Coached and naïve malingerers did not differ in this respect. Relative to truth-tellers, naïve malingerers reported more symptoms-related non-verifiable details, while coached malingerers reported more exercise-related non-verifiable details. Focusing on non-verifiable details may inform the detection of malingered symptoms.

Key words: deception detection; malingering; symptoms; verifiability approach.

Malingering is defined as 'the intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives' (*Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition, DSM–5*; American Psychiatric Association, 2013, APA, p. 726). Malingering may be driven by several incentives, such as financial compensation (e.g. benefits eligibility), legal outcomes (e.g. reducing or avoiding sentences), privileges (e.g. receiving stimulant medication), or other advantages (e.g. avoiding undesirable work). Because malingering may obscure diagnostic decision-making, it is important to rule it out whenever these incentives may play a role in patients presenting with symptoms (Vilar-López et al., 2007). To this end, clinicians or researchers may employ screening instruments and collateral data from different sources (e.g. medical records; Mittenberg, Patton, Canyock, & Condit, 2002).

Currently, the majority of research papers on malingering are concerned with tests and tasks that intend to identify malingerers (for reviews see Smith, 2008; Sollman & Berry, 2011). However, how malingerers talk about their symptoms and whether their speech or written reports may contain cues to malingering (e.g. verbal cues of malingering) has received less attention in the research literature. According to the DSM–5 (APA, 2013),

Correspondence: Irena Boskovic, Forensic Psychology Section, Maastricht University, P.O. Box 616, 6200 MD Maastricht, The Netherlands. Email: irena.boskovic@maastrichtuniversity.nl

malingerers exhibit a lack of co-operation when they are evaluated by medical professionals. This would seem to imply that malingerers are reluctant to talk about their symptoms (see also Worley, Feldman, & Hamilton, 2015). However, there is no empirical evidence to support this assumption, and, in fact, there are even indications to the contrary. In a recent study by Akehurst et al. (2015), participants were instructed to undergo a cold pressor procedure and then either honestly reported or exaggerated their symptoms. To screen for malingering, half of the interviewers used a checklist based on criteria from different verbal veracity assessment methods such as Criteria Based Content Analysis (CBCA; see Blandon-Gitlin, Pezdek, Lindsay, & Hagen, 2009; Steller & Kohnken, 1989) and Reality Monitoring (RM; Johnson & Raye, 1981; see Bogaard, Meijer, Vrij, Broers, & Merckelbach, 2013). Interviewers who used the checklist obtained a 75% correct classification of truth-tellers and a 66% correct classification of the exaggerators. Without the checklist, interviewers performed at a level no better than chance (50%). Interestingly, exaggerators generated *more* unusual details in their accounts than truth-tellers, which runs counter to the clinical impression that malingerers are reluctant to talk about their symptoms.

Another approach that may help in identifying malingered symptom reports is the verifiability approach (Nahari & Vrij, 2014). It is based on the idea that liars want to provide statements that are rich in details, because they believe that such statements will be convincing. At the same time, they are reluctant to include too many details because they fear that too many details will provide leads for investigators. One way to resolve this dilemma is to provide an abundance of details that an investigator cannot check (i.e. unverifiable details). Research has shown that relative to truth-tellers, liars do indeed provide fewer details that can be verified and more details that cannot be verified (Nahari, Leal, Vrij, Warmelink, & Vernham, 2014; Nahari, Vrij, & Fisher, 2014a, 2014b). This so-called verifiability effect has been observed in mock crimes (Nahari et al., 2014a, 2014b) and in false insurance claims settings (Harvey, Vrij, Nahari, & Ludwig, 2017; Nahari et al., 2014; Vrij, Nahari, Isitt, & Leal, 2016).

The verifiability approach states that the verifiability of provided details distinguishes liars from truth-tellers (Nahari et al., 2014). This focus on potential checkability deviates from traditional verbal veracity assessment methods (i.e. CBCA and RM) that primarily look at aspects such as the quantity of perceptual details and the reproduction of dialogues in the reports of liars and truth-tellers. The difference between the verifiability approach and CBCA in terms of ability to detect deception becomes more pronounced when individuals have prior knowledge about how the veracity assessment method works (Nahari et al., 2014). That is, the effectiveness of the CBCA approach as a tool for detecting fabricated statements is impaired when interviewees are informed beforehand about the working of CBCA (Vrij, Akehurst, Soukara & Bull, 2002). In contrast, the verifiability effect appears to become stronger after interviewees have been given an information protocol informing interviewees that their statements might be checked for verifiable details (Harvey et al., 2016; Vrij et al., 2016).

In two exploratory studies (Boskovic, Bogaard, Merckelbach, Vrij, & Hope, 2017), we examined the verifiability effect in the context of malingered symptoms. Previous verifiability studies were primarily oriented towards coding external details (e.g. perceptual, spatial, temporal), without including subjective details such as emotions or cognitive operations because of their unverifiable status (Nahari, Vrij, & Fisher, 2012). Like emotions, symptoms are subjective experiences. However, there is an important difference between emotions and symptom reports. As a rule, genuine symptoms lead to specific behaviours associated with those symptoms (e.g. going to/calling the doctor, taking medications, restricted activity, not going to work/studies, complaining to others, googling symptoms) that can be documented,

witnessed or carried out with another person. For example, 58% of people experiencing common symptoms (e.g. headaches) tend to use medication (prescribed or not), 48% make complaints to a friend or a family member, 24% reduce activity, and 5% actually consult a medical professional (Verbrugge & Ascione, 1987). Thus, the behavioural sequelae of their symptoms are, in principle, verifiable.

In our exploratory studies (Boskovic et al., 2017), we asked people to describe genuine physical symptoms or to fabricate an account about these symptoms. When participants were not informed about the details they should provide, a heightened number of non-verifiable details (rather than a lack of verifiable details) was typical for fabricated symptom reports. Previous verifiability studies also noted that liars provide more non-verifiable details than truth-tellers (Vrij et al., 2016). In our studies, the abundance of non-verifiable details in fabricated symptom reports was so pronounced that it led to a marked difference between malingerers and honest participants in the length of their symptom descriptions, with malingerers' statements being significantly longer (Boskovic et al., 2017). This pattern (i.e. longer statements by deceptive interviewees) contradicts many deception studies (see DePaulo, 2003; Vrij, 2000), but is in accordance with people's belief that deceptive reports include more details rather than fewer (Granhag, Andersson, Strömwall, & Hartwig, 2004). Our finding is also consistent with that of Akehurst et al. (2015) who observed that exaggerators provide more unusual symptom descriptions than do truth-tellers.

In our exploratory work, we also evaluated the information protocol (i.e. instructing participants that details might be checked). This manipulation did not reduce the volume of verifiable details in malingerers as opposed to truth-tellers. Instead, malingerers reported false verifiable details and in particular reported false witnesses who they claimed could confirm their stories. Thus, we did not observe the typical verifiability effect. This discrepancy with previous verifiability studies might be related to the differences in investigated contexts (malingering symptoms versus lying about events or actions). For example, providing a false witness in a criminal context requires a conspirator who is willing to confirm a false alibi. Things are quite different for malingerers. They do not need to reveal that they are being deceptive to those who might be asked to confirm their story (e.g. friends, family). Thus, a malingerer can lie about his/her symptoms in front of others, which makes it easier to create a convincing account with false verifiable details.

The absence of a typical verifiability effect (i.e. honest people reporting more verifiable details than malingerers) in our exploratory studies might have been caused by truth-tellers' symptoms not being salient enough. That is, truth-tellers may have described mild symptoms that had no behavioural sequelae. Furthermore, their statements were based on retrospective self-reports, and we could not determine whether their symptoms were also present at the moment they described them (Boskovic et al., 2017).

With this in mind, we wanted to test whether a verifiability effect occurs when symptoms are actually elicited in truth-tellers, while malingerers only fabricate a story about them. Eliciting symptoms allows for controlling the time and duration of the symptoms in truth-tellers. This way, truth-tellers share an identical experience and report about acute symptoms shortly after they have occurred, which makes symptom reports less dependent on memory (e.g. Miranda, Gold, Gore, & Punnett, 2006). Thus, in the current study, participants either took part in or imagined taking part in an exhausting activity (running up and down the stairs) and were then told to report about the activity. Several studies have found that liars often use details of previous experiences when lying (i.e. embedded lies; Leins, Fisher, & Ross, 2013), and that malingerers mostly report about symptoms they are familiar with (Dandachi-FitzGerald & Merckelbach, 2013). Thus, successful malingerers may embed a lie about an activity (e.g.

Gnisci, Caso, & Vrij, 2010; Nahari & Vrij, 2014) and its symptoms in an event that they really experienced at one time. Thus, we coached one malinger group to use embedded lies (e.g. recalling previous experiences of running and related symptoms and report them as current symptoms) to investigate the efficacy of that strategy. Naïve malingerers were not given any specific instructions how to malinger the physical symptoms of running. We predicted that truth-tellers would produce more verifiable details and a higher proportion of verifiable details, whereas malingerers would generate more non-verifiable details (Hypothesis 1). Furthermore, we expected to find differences between the two malingering groups, such that an embedded lies-strategy would enable coached malingerers to fabricate more verifiable details about their experience than naïve malingerers (Hypothesis 2).

Method

Participants

A total of 53 (42 women) university students participated in the study. Their average age was $M = 21.13$ years ($SD = 2.56$), with a range from 18 to 29 years. Participants were assigned to three different conditions: truth-tellers ($n = 18$), naïve malingerers ($n = 17$) and coached malingerers ($n = 18$). Students were compensated with either a course credit point or a voucher valued €7.50. The study was approved by the standing ethical committee of the Faculty of Psychology and Neuroscience, Maastricht University (ECP-157 01 10 2015).

All participants were pre-screened for health problems and poor physical condition. None of 18 participants who were assigned to the physical exercise condition reported any serious health issues, nor were they taking medication at the time of the experiment. The majority ($n = 16$) exercised more than three times a week, while two people reported working out only once a month. In the malinger groups ($n = 35$), three participants reported having health problems, and four were taking medications. In total, 33 participants exercised regularly, while two participants reported not being physically active.

Procedure

Truth-tellers had to perform two tasks. The first task intended to induce symptoms, while the second gave participants the opportunity to exhibit certain symptom-related behaviours (e.g. talk to a friend about it, go to the nearby pharmacy). The first task was carried out in small groups in the stairways of a university building, which was next to the hospital (a picture of the stairs is given in Appendix 1). Participants were instructed to run down and up the stairs, from the third floor to the ground floor, twice, as quickly as they could. This exercise was followed by a 30-min break (second task) in which participants could go wherever they wanted in (e.g. library, café, restaurant, pharmacy, home). After their return to the laboratory, they needed to write a statement about their experience during the physical exercise, including descriptions of their symptoms, and all the details about the exercise itself, and about what they did during the break. They were instructed to describe the experience (e.g. surroundings, their actions, and symptoms during the exercise and the break) including as many details as possible.

Both malingering groups were told about truth-tellers' assignment and were instructed that they had to convince researchers they were truth-tellers. Malingerers were given a general description of truth-tellers' exercise (where and when it happened) and of the instruction to take a break of 30 minutes after the exercise. They were students, and so they were familiar with the environment in which the study took place (e.g. where the stairs were, the writings and pictures on the walls, the close-by library, hospital and shops in which students could have gone during the break). Malingerers were instructed to fabricate a statement that included as many details as possible about their actions and bodily

sensations and overall experience during the running and the break. However, while one group was just told to fabricate the statements (naïve malingerers), the coached malingerers were given additional instructions how to fabricate their statements. First, they were instructed to recall the last time they had performed an intense physical activity (e.g. running, mountain climbing). Second, they were asked to write everything they could remember about the symptoms they experienced during that activity, but to pretend that they experienced those physical symptoms during and after participation in this study (running down and up the stairs). Thus, coached malingerers were explicitly instructed to use a previous experience to lie about the target experience in the current procedure. They were also instructed to confabulate (embed lies) about all the details of the exercise and about what they did during the break. As in the other conditions, participants were encouraged to describe the experience providing as many details as possible (see Appendix 2).

Written instructions for all tasks were handed to participants and were also read aloud by the researcher. After reading the instructions, the researcher again repeated the instructions, and participants were invited to ask questions. Participants were told that they could earn an extra credit point or voucher (€7.50) if they were able to convince the researchers that they had, indeed, carried out the whole experiment (running and break).

Measures

Coding

One coder evaluated all statements, while a second, independent coder coded a randomly selected 25% of statements. Both coders were blind to the three different conditions. In coding the statements, particular details were excluded, such as information about the researchers or anything that had been part of the instructions. We excluded paraphrases of the instructions to avoid artificially raised levels of verifiable details among all three groups.

Following Nahari and Vrij (2014), all details were coded as either *verifiable* or *non-verifiable*. For a detail to be coded as verifiable, it had to meet one of the following criteria. The activities (a) were documented and therefore potentially checkable (e.g. the receipts for drinks or food; descriptions of writings on the stairs or pictures on the walls); (b) involved an action carried out together with (an) other identified person(s) (rather than alone or with a stranger who could not easily be traced; e.g. identifying a person in the group who participated in the exercise as well); (c) pertained to something that was witnessed by (an) other identified person(s) (e.g. complaining to a friend during the break about the symptoms); (d) recorded, as mentioned by the examinee, on CCTV cameras (e.g. being in the library/pharmacy/nearby shops); (e) used potentially traceable technology (e.g. use of cash machine, bank cards, phone, tablet, computer); or (f) could be checked by blood analysis and medical tests (e.g. taking specific pills). The remaining details were classified as unverifiable.

Inter-rater agreement between the two coders, measured with inter-class correlation coefficients (ICCs), was excellent for both the verifiable (.99) and non-verifiable (.97) details.

Symptom-related, exercise-related and neutral details

We looked at overall frequencies of verifiable and non-verifiable details. However, because we were primarily interested in statements about feigned and genuine symptoms and their behavioural expressions, we also carried out a more fine-grained analysis and coded three categories: (a) symptom-related, describing the symptoms (e.g. ‘sweating’; ‘pain in legs’; ‘shaking in front of Barry’); (b) exercise-related, if details were referring to running (‘I came second’; ‘I changed the tempo’; ‘I bumped into my ex-tutor while running’); and (c) neutral, describing

activities that were not related to the symptoms or to the exercise, but still provided insight in participants' behaviour during the break ('I called my boyfriend'; 'bought a sandwich'; 'sat on the sofa').

All three types of details were coded as verifiable or non-verifiable. ICCs indicated strong agreement between the coders (all ICCs > .79 and <.99).

Results

Number of verifiable and non-verifiable details

Table 1 summarizes the main results. There was no main effect of a group with respect to the number of verifiable details, $F(2, 50) = 0.78$, $p = .46$. To test whether coached malingerers would include more verifiable details in their accounts than naïve malingerers (Hypothesis 2), we contrasted the two malingering groups with regard to their verifiable details. Contrary to our prediction, the difference was not significant, $t(33) = 1.32$, $p = .25$, $d = 0.39$. Neither did truth-tellers differ from naïve malingerers, $t(33) = 0.17$, $p = .87$, or coached malingerers, $t(34) = 1.18$, $p = .25$, in terms of verifiable details.

There was a significant main effect of a group with respect to the number of non-verifiable details, $F(2, 50) = 7.82$, $p = .001$, $\eta^2 = .24$. Follow-up *t tests* indicated that naïve malingers and coached malingerers produced significantly more non-verifiable details than truth-tellers [$t(33) = 3.30$, $p = .002$, $d = 1.11$; $t(34) = 3.93$, $p = .001$, $d = 1.31$, respectively]. The two malingering groups did not differ with respect to the number of non-verifiable details, $t(33) = 0.15$, $p = .88$. Thus, the pattern of non-verifiable and verifiable details across groups only partially supports Hypothesis 1.

Proportion of verifiable details

Across the sample, verifiable details were reported by 28 participants (52.8%). From the total number of details reported, only 4.4% were verifiable. As in previous studies on verifiability, we calculated for each participant the proportion of verifiable details – that is, the ratio between the total number of checkable details and overall number of details (verifiable details/total of details). Next, we ran a one-way analysis of variance (ANOVA). The three groups did not differ regarding the proportion of verifiable details reported, $F(2, 50) = 2.07$, $p = .13$, $\eta^2 = .08$.

Symptom-related, exercise-related and neutral verifiable and non-verifiable details

Table 2 shows the means and standard deviations of the three types of details across groups. The groups differed significantly in terms of symptom-related non-verifiable,

Table 1. Different detail categories and number of words in truth-tellers and naïve and coached malingerers.

	Group		
	Truth-tellers ($n = 18$) *M* (*SD*)	Naïve malingerers ($n = 17$) *M* (*SD*)	Coached malingerers ($n = 18$) *M* (*SD*)
Verifiable details	6.78 (9.85)	7.41 (12.27)	3.67 (5.38)
Proportion of verifiable details	.07 (.11)	.04 (.06)	.02 (.02)
Non-verifiable details*	91.72 (38.19)	147.00 (59.10)	149.72 (49.43)
Length of the statements*	264.44 (100.77)	411.00 (154.39)	427.11 (157.43)

Note: Length of statements = number of words.
*$p < .01$.

Table 2. Groups on symptom-related, exercise-related and neutral verifiable and non-verifiable details.

Codes		Truth-tellers *M* (*SD*)	Naïve malingerers *M* (*SD*)	Coached malingerers *M* (*SD*)
Verifiable	Symptom-related	1.00 (4.00)	1.76 (5.32)	.34 (1.44)
	Exercise-related	2.22 (4.71)	1.82 (4.33)	1.45 (2.64)
	Neutral	3.56 (7.75)	3.82 (6.89)	1.89 (4.69)
Non-verifiable	Symptom-related*	37.95 (22.51)	66.47 (36.36)	48.12 (21.01)
	Exercise-related**	43.28 (22.84)	63.53 (32.32)	81.00 (33.08)
	Neutral	10.67 (6.24)	17.00 (14.55)	20.62 (21.27)

*$p < .01$. **$p < .001$.

$F(2, 50) = 4.88$; $p = .01$, $\eta^2 = .16$, and exercise-related non-verifiable details, $F(2, 50) = 7.26$, $p = .001$, $\eta^2 = .23$. Post hoc comparisons using Bonferroni procedure indicated that naïve malingerers provided significantly more symptom-related non-verifiable details than truth-tellers ($p = .01$), and coached malingerers reported significantly more exercise-related non-verifiable details than truth-tellers ($p = .001$). The two malingering groups did not differ with regard to the number of symptom-related and exercise-related non-verifiable details ($p = .16$; $p = .26$, respectively).

No significant group differences emerged for number of symptom-related verifiable, $F(2, 50) = 0.59$, $p = .56$, exercise-related verifiable, $F(2, 50) = 0.17$, $p = .84$, and neutral verifiable and non-verifiable details [$F(2, 50) = 0.45$; $p = .64$; $F(2, 50) = 1.94$; $p = .15$, respectively].

Length of statements

We calculated the total number of words for each of the three groups (length of statements). The three groups did differ with regard to this parameter, $F(2, 50) = 7.36$, $p = .002$, $\eta^2 = .23$. Both naive malingerers and coached malingerers produced longer statements than truth-tellers [$t(33) = 3.34$, $p = .002$, $d = 1.13$; $t(34) = 3.69$, $p = .001$, $d = 1.23$, respectively]. Follow-up t tests indicated that the two malingering groups did not differ from each other with respect to statement length, $t(33) < 1.0$.

Discussion

The principal aim of this research was to investigate whether the verifiability approach (Nahari & Vrij, 2014) could be used to discriminate effectively between truth-tellers, naïve malingerers and coached malingerers. Their reports concerned a physical exercise and the symptoms it elicited. Additionally, we examined whether an explicit strategy of embedding lies in previous true experiences would result in coached malingerers providing more verifiable details and, in doing so, would render their reports more convincing than those of naïve malingerers.

The results of our study can be summarized as follows. First, both malingering groups provided significantly more non-verifiable details than truth-tellers. More precisely, compared with truth-tellers, coached malingerers produced more non-verifiable information describing the exercise itself, whereas naïve malingerers generated more non-verifiable details about their symptoms. This might be a result of differences in the instructions, or shows how malingerers had different strategies compared with truth-tellers in presenting themselves as honest. We have no ready explanation for this pattern, and it requires replication to determine whether differences in types of non-verifiable details between malingerers and truth-tellers is a robust phenomenon.

Second, truth-tellers and malingerers did not differ in terms of number or proportion of

verifiable details reported. Furthermore, the use of embedded lies as a strategy did not contribute to more (false) verifiable statements by participants in the coached malingering condition, while truth-tellers generated verifiable details at a low base rate The low overall production of verifiable details (4.4%) suggests that even for truth-tellers, reporting verifiable details when describing the physical exercise and the symptoms it elicited was an arduous task. Together with our previous findings (Boskovic et al., 2017), our results indicate that in the context of symptoms reporting, an extensive number of non-verifiable details might be more of a red flag for malingering than the lack of verifiable details. The increased number of non-verifiable details in malingerers' reports fits with some clinical observations about the way malingerers talk about their symptoms. For example, Resnick and Knoll (2005) noted malingerers' tendency to provide vague descriptions of their symptoms. Our findings are also consistent with those of Akehurst et al., 2015, who found malingerers to produce more unusual details than truth-tellers.

Closely related to their tendency to report more non-verifiable details than truth-tellers, malingerers' reports were significantly longer than those of truth-tellers. This replicates our previous results (Boskovic et al., 2017). It appears that malingerers in the current study tried to avoid reporting information that might have enabled the researchers to detect that they did not actually participate in the symptom-eliciting exercise or in the break that followed the exercise. Thus, they compensated for the absence of specific information by providing more non-verifiable details (e.g. Vrij et al., 2016). On the other hand, truth-tellers did not generate an abundance of verifiable details, possibly because they believed that their honesty would shine through. The 'illusion of transparency' that truth-tellers might have has been described in several domains (e.g. interrogations; Hartwig, Granhag, & Strömwall, 2007; Savitsky & Gilovich, 2003).

The current study, as well as previous work (Akehurst et al., 2015; Boskovic et al., 2017), indicates that, if anything, malingerers produce more lengthy reports about their symptoms than do truth-tellers. This pattern is difficult to reconcile with the DSM–5 assumption that malingerers are uncooperative and reluctant to talk about their symptoms (Rogers, 2008). It also contradicts the widespread belief that malingerers will experience difficulties when elaborating their fabricated symptoms and that their symptom reports will, therefore, be brief and less convincing (Ali, Jabeen, & Alam, 2015).

One limitation of our study was the lack of consequences for providing false verifiable details. To illustrate, one of the naïve malingerers wrote: 'I am obese and I have a herniated disc.' In theory, the health history and current health state of an individual are checkable (Nahari & Vrij, 2014), and so this was scored as a verifiable detail. However, we did pre-screen every participant for any health problems, and this participant did not report these problems in advance of the study. Thus, he provided a false verifiable detail. Given the absence of consequences for deceiving the interviewer, it is possible that participants were not particularly concerned about lying about a witness alibi or other verifiable details. The verifiability approach is likely to be more effective in settings where serious consequences for providing false verifiable details are present. Therefore, future research might want to examine verifiability effects in clinical settings where there are real consequences associated with the detection of malingering. A second limitation is that the exercise that participants had to perform was familiar to everyone, and therefore an easy starting point for confabulation and malingering. It might be worthwhile to explore verifiability effects with less common symptoms (e.g. hearing voices) in order to determine whether genuine patients report more verifiable details than malingerers.

One could argue that due to the subjective nature of symptoms, the verifiability

approach cannot be used as a tool to detect malingering. However, even everyday symptoms often have behavioural consequences that are open to verification (e.g. telling a family member or friend about the symptom; Verbrugge & Ascione, 1987). Moreover, there are types of psychopathology that include both subjective symptoms and verifiable elements. Based on our studies so far, we expect that the verifiability approach is not a powerful tool to detect feigned symptoms per se. However, it might well be that the verifiability approach is effective in screening for confabulated stories about trauma exposure. This issue requires further study.

Conclusion

Based on the current results and those of our previous study, we conclude that non-verifiable details are a better indicator of malingering than lack of verifiable details. Relatedly, unlike the clinical impression that malingerers provide brief accounts of their symptoms, we and others (Akehurst et al., 2015) found that malingerers tend to produce extensive symptom reports.

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Ethical standards

Declaration of conflicts of interest

Irena Boskovic has declared no conflicts of interest
Claudia Tejada Gallardo has declared no conflicts of interest
Aldert Vrij has declared no conflicts of interest
Lorraine Hope has declared no conflicts of interest
Harald Merckelbach has declared no conflicts of interest

Ethical approval

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

Informed consent

Informed consent was obtained from all individual participants included in the study.

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Appendix 1

Stairs at the Faculty of Psychology and Neuroscience at Maastricht University

Appendix 2

Instructions for participants

Instruction for truth-tellers

Welcome to this experiment about perception of internal sensations. During this brief experiment, you will be given two tasks. For the first task, you will have to go down to the ground floor and back to the third floor, twice, walking as fast as you can (running). After the task, you will be given time to rest. We would like you to go to the library, restaurant, have a walk, doing whatever you want. Please return after 30 min. You will be then given paper and pen in order for you to write statements about your sensations and experience during the experiment. You may write not only about what you felt, thought and saw during the exercise, but also about the immediate period thereafter and what you did during the break. It is important that you explain your sensations and your experience with as many details as possible. If you succeed in convincing researchers that you suffered from a high level of physical distress because of this experiment you will be rewarded a bonus credit or an additional €7.5 voucher. All in all, the experiment will last for about 1 hour. You are able to stop during the experiment at any time. If you have any question, please let us know.

Instruction for naïve malingerers

Welcome to this experiment about perception of internal sensations. During this brief experiment, you will be given two tasks. First task is to imagine that you just had an exercise and that you run the stairs from the third floor to the ground floor and back, twice, after which you had a 30 minutes break, in which you could go to the library, restaurant, have a walk, whatever you wanted. Imagine all the sensations you felt and action you took after the exercise. It is crucial to try to imagine that experience with as many details as possible. The second task is to write everything about the exercise (what you felt, thought and saw), as well about the period after the exercise and what did you do and where did you go. Try to convince us that you really had that experience 30 minutes ago. So, try to write a detailed statement about your exercise (running up and down the stairs), about sensations you feel as a consequence of that, and the period after the exercise. It is important that you explain your sensations and your experience with as many details as possible. If you succeed in convincing researchers that you suffered from a high level of physical distress because of this experiment you will be rewarded a bonus credit or an additional €7.5 voucher. All in all, the experiment will last for about 1 hour. You are able to stop during the experiment at any time. If you have any question, please let us know.

Instruction for coached malingerers

Welcome to this experiment about perception of internal sensations. You are the second group in this study. The first group had to do physical exercise before this part of experiment, and it included fast walking (running) the stairs from third to the ground floor and back, twice, as fast as possible. After the exercise they had 30 minutes break during which they had freedom to go and do whatever they want (for example, go to library, restaurant, have a walk, doing whatever they wanted). Basically, your main task will be to write a statement which will convince us that you are a part of the first group. To do so you will be given two tasks. The first task is to recall the last time you had an intense physical exercise (running, walking the stairs) and all the sensations you felt then and thoughts you had. It isn't important when that experience has happened, but it is crucial to try to recall that memory with as many details as possible. The second task is to write everything you can remember about your sensations and thoughts but as if they are consequences of the exercise you just had 30 minutes ago, walking up and down the stairs from zero to the third floor and back, as fast as possible. So, try to write a detailed statement about your previous sensations as if you just had them as a result of this specific activity, even though you didn't have that experience. You should write not only about your sensations and thoughts during the exercise, but also describe the immediate period thereafter and what did you do and where did you go. Again, it is important to explain your sensations and your experience with as many details as possible. If you succeed in convincing researchers that you suffered from high level of physical distress because of this experiment you will be rewarded bonus credit or an additional €7.5 voucher. All in all, the experiment will last for about 1 hour. You are able to stop during the experiment at any time. If you have any question, please let us know.