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Validity of the SIMS scales of neurologic impairment and amnestic disorder

Zack Cernovsky[1*], Yves Bureau[2], James Mendonça[1], Varadaraj Velamoor[3], Stephan Mann[4], Gurpreet Sidhu[5], David M Diamond[6], Robbie Campbell[1], Emmanuel Persad[7], L Kola Oyewumi[8], Michel A Woodbury-Fariña[9]

[1] Department of Psychiatry, Western University, Canada
[2] Departments of Psychology and Medical Biophysics, Western University, Canada
[3] Professor of Psychiatry, Laurentian and Lakehead Universities, and Professor Emeritus of Psychiatry, Western University, Canada
[4] Central Montgomery Behavioral Heath, Norristown, PA, USA
[5] Methadone Clinic, London, Ontario, Canada
[6] Departments of Psychology, Molecular Pharmacology, and Physiology, University of South Florida, USA
[7] Professor Emeritus of Psychiatry, Western University, and Adjunct Professor, Queen's University, Canada
[8] Professor Emeritus, Departments of Psychiatry, Biomedical and Molecular Sciences, and Psychology, Queen's University, Canada
[9] Department of Psychiatry, University of Puerto Rico, USA

Abstract
Background: The Structured Inventory of Malingered Symptomatology (SIMS) has never been scientifically validated to demonstrate that it adequately differentiates legitimate patients from malingerers.
Method: We evaluated the content validity of the Amnestic Disorder (AM) and Neurologic Impairment (NI) scales of the SIMS via expert ratings by 11 experts (7 psychiatrists, 2 psychologists, and 2 neuroscientists). As the next step, SIMS scores of 23 patients injured in high impact car accidents were selected: seminal research of Bennet Omalu suggests that such collisions would rarely occur without cerebral microvascular trauma and axonal shearing. Such patients typically suffer from neurological symptoms in the post-concussion whiplash spectrum. Criterion validity of AM and NI scales was assessed by statistical comparisons of AM and NI data of these 23 presumably legitimate patients to published SIMS data on instructed malingerers (30 malingerers of whiplash and 26 malingerers of post-concussive symptoms) and also to published SIMS data on relatively healthy normal controls responding honestly (N=34).
Results: The review of item content of the AM and NI scales by the 9 expert clinicians and 2 neuroscientists indicated that all their items represent potentially legitimate medical symptoms: none was being judged as specific to malingering. The SIMS AM and NI scores diagnosed close to 75% of our 23 survivors of high impact motor vehicle accidents (MVAs) as "malingerers:" it is unlikely that there were so many true positives. An ANOVA of NI scores showed that neither malingerers of whiplash nor malingerers of post-concussive symptoms differed significantly from legitimate patients ($p>.05$) and that normal controls had significantly lower NI scores than both groups of malingerers and also lower scores than the legitimate patients ($p<.0001$).
An ANOVA of AM scores showed that legitimate patients obtained higher AM scores than malingerers of whiplash ($p=.0002$), but lower scores than malingerers of post-concussive symptoms ($p=.0008$). In this ANOVA, normal controls had significantly lower AM scores than legitimate patients and also lower scores than malingerers of post-concussive symptoms ($p<.001$), but did not differ significantly from malingerers of whiplash ($p>.05$).
Conclusions: The SIMS NI and AM scales obviously lack both in content and criterion validity, i.e., the NI and AM scales list legitimate neuropsychological symptoms and cannot adequately differentiate malingerers from legitimate patients.

Keywords: malingering, SIMS, post-concussion syndrome, whiplash, motor vehicle accident

1. Introduction

The Structured Inventory of Malingered Symptomatology (SIMS) published by Smith & Burger in 1997 [1], is widely used by psychologists contracted by car insurance companies to examine if insurance claimants feign their medical or psychological symptoms. Although the SIMS has already been adopted by psychologists in other countries, via translations into German, Dutch, Spanish, Italian, Portuguese, and Turkish, there has not yet been any scientifically satisfactory validation study that would demonstrate that the SIMS indeed differentiates malingerers from legitimate patients. In fact, psychological experts such as the van Impelen, Merckelbach, Jelicic, and Merten [2] noted already in 2014 (see page 1353) that some SIMS items are legitimate medical symptoms, in particular memory problems, tinnitus, head injury, and sleep difficulties, and also depressive symptoms that might reflect genuine psychopathology.
In a recent study [3], 7 psychiatrists and 3 clinical psychologists with more than 35 years of experience each reviewed the items of Affective Disorders scale of the SIMS and determined that they all represent legitimate symptoms of depression, i.e., no items that could differentiate malingerers from depressive patients. This conclusion is consistent with results of Kobelt, Göbber, Bassler, and Petermann [4] who found that the number of patients who failed the SIMS cutoff score (i.e., SIMS total score > 16) among patients with depression was disproportionally high

relative to other clinical groups (57% vs. 4%–24%).

The SIMS failure extends also to the Psychosis scale. In a study by Cernovsky, Mendonça, Oyewumi, Ferrari, et al. [5], 3 clinical psychologists and 3 psychiatrists with more than 35 years of clinical experience each, rated the items of the SIMS Psychosis scale and concluded that none of its items would adequately differentiate malingerers from acutely psychotic patients.

The SIMS "validation" as described by Smith & Burger [1] and Widows & Smith [6] only consisted of comparing undergraduates instructed to respond honestly to those instructed to malinger one of the medical conditions: Neurological Impairment, Amnestic Disorder, Low Intelligence, Psychosis, and Affective Disorders. Accordingly, the SIMS may differentiate persons who report medical symptoms (instructed malingerers) from those who do not report them. However, considering the logical rules of test construction, it appears that the SIMS may fail to differentiate legitimate patients from malingerers because both groups report medical symptoms.

Even a casual perusal of SIMS items in the NI and AM SIMS scales shows some obviously legitimate neuropsychological symptoms such as "*The major problem I have is with my memory*," "*I have difficulty remembering the day of the week*" or "*…today's date,*" "*My major problem is that my brain is injured*," and "*There is a constant ringing in my ears."* The assertion by Widows and Smith [6] in their SIMS manual, that SIMS items are "*highly atypical in patients with genuine psychiatric or cognitive disorders*" is erroneous and misleading. It appears that the test "validation" procedure of comparing only persons instructed to feign medical symptoms to other healthy persons instructed to respond honestly is methodologically insufficient and substandard. A comparison to legitimate medical patients seems necessary in a truly scientific development of such tests.

When Glenn Smith and Gary Burger [1] introduced their dubious validation procedure in 1997, they called it an "analogue validation" and they have never provided credible evidence via proper criterion groups that their SIMS test adequately does differentiate malingerers from legitimate patients. Their "analogue" procedure has been since adopted by other authors, e.g., by Parks, Gfeller, Emmert, & Lammert [7].

The present study focuses on SIMS scores of persons injured in motor vehicle accidents (MVAs). High frequencies of post-concussion and whiplash symptoms in survivors of MVAs were documented by data collected with Gutierrez questionnaire (see Gutierrez, Nosonova, Cernovsky, Fattahi, & Tenenbaum [8]). An analysis of conceptual overlap (see Cernovsky, Ferrari, & Mendonca [9]) of all the 75 items of the SIMS with items of Rivermead [10] and PMNS [11] scales showed than more than 50% of SIMS items deal with legitimate signs of whiplash or post-concussion syndrome. If the SIMS items indeed list mainly only legitimate symptoms, including many of post-concussion and whiplash syndrome, then post MVA patients might obtain elevated scores on the Neurologic Impairment (NI) and Amnestic Disorder (AM) scales of the SIMS.

Some insurance contracted psychologists may still falsely presume that cerebral concussions occur too rarely without visible head injuries and without a complete and prolonged loss of consciousness. Neuropathological research by Bennet Omalu [12, 13] on players of American football demonstrated that cerebral damage in concussions occurs with sudden acceleration or deceleration of the head even in persons who neither sustained visible head injuries nor fully lost consciousness. These persons, within minutes after their concussion, may still be able to perform some simple physical tasks such as those involved in playing football. However, microvascular injuries and axonal shearing with subsequent neurotoxicity do occur in such incidents while the gray and the white parts of the brain slide over each other during the sudden excessive acceleration or deceleration of the skull.

The present study assesses both the content and criterion validity of the "Neurologic Impairment" (NI) and "Amnestic Disorder" (AM) scales of the SIMS (see their items listed in left columns of Table 1 and Table 2). Each of these scales consists of 15 True-False items. Responses in the "malingering direction" count one point each. The cutoff score for the Neurologic Impairment is > 2 points and the same cutoff is also used for the Amnestic Disorder scale. Thus, endorsing more than 2 items classifies the patient as malingering a neurological impairment or amnestic disorder, respectively. If the scores on SIMS NI and AM scales are high not only in malingerers, but also in legitimate patients such as those who sustained whiplash and cerebral concussion in a high impact motor vehicle accident (MVA), then these two SIMS scale have no criterion validity, i.e., also no practical clinical value for differentiating malingerers from legitimate patients.

Table 1: Content of the Neurologic Impairment Scale of the SIMS

Items from SIMS Scale of malingering Neurologic Impairment	% endorsement by post-MVA patients (N=23)	Examples of other neurological conditions in which the symptom is present legitimately
1. Sometimes I lose all feeling in my hand so that it is as if I have a glove on. (T)	21.7%	Multiple sclerosis (e.g. activation of chronic symptoms due to Uhthoff phenomenon or pseudo-exacerbation), peripheral mononeuropathy
5. Food doesn't taste the same as it has in the past. (T)	34.8%	Hyposmia due to synucleinopathies (e.g., in Parkinson disease, multiple system atrophy, dementia with Lewy bodies), anosmia in post-concussion syndrome
20. My major problem is that my brain is injured. (T)	30.4%	TBI in general, aftermath of MVAs or cerebrovascular accidents (CVAs)
26. Walking is difficult for me because of my problems with balance. (T)	52.2%	Sensory ataxia (e.g., in diabetes, chronic alcoholism, B12 or E deficiency, CVA, synucleinopathies, cerebellar disease
29. Sometimes when writing a phone number, I notice that the numbers come out backwards even though I don't mean to do it. (T)	21.7%	Post-CVA dysgraphia
35. Sometimes my muscles go limp for no apparent reason so that my arms and legs feel as if	47.8%	Cataplexy, periodic paralyses (channelopathies)

they weigh a ton. (T)		
39. I have pain in my body which seems to feel like bugs crawling under the surf ace of my skin. (T)	30.4%	Formication such as in polyneuropathies (e.g., in diabetes, HIV, amyloidosis), post-herpetic neuralgia, side-effect of drugs such as Wellbutrin, Ritalin
44. There is a constant ringing in my ears. (T)	34.8%	Ménière disease, noise-related hearing loss, or otosclerosis
50. I have difficulty recognizing written and spoken words. (T)	30.4%	Post-CVA receptive aphasia
54. There has been no change in my sense of smell. (F, i.e., reverse scoring)	34.8%	Hyposmia due to synucleinopathies, Parkinsons
59. Although I am able to move them with no difficulty, I have noticed several parts of my limbs are numb. (T)	43.5%	Sensory polyneuropathies
64. At times my leg, below the knee, goes limp and I'm unable to move it. (T)	26.1%	Hereditary neuropathy with liability to pressure palsies (HNPP)
66. I work slowly and produce a small amount because my activities are so limited. (T)	39.1%	Impaired motor function such as in CVA, parkinsonism, multiple sclerosis
71. Once a week I suddenly find myself cold even though the actual temperature is warm. (T)	43.5%	Centrally mediated spontaneous periodic hypothermia
74. I find lately that I suffer from headaches and dizziness just before I forget something. (T)	30.4%	Impaired concentration in severe migraines

Table 2: Content of the Amnestic Disorder Scale of the SIMS

Items from SIMS Scale of malingering "Amnestic Disorder":	**% endorsement by post-MVA patients (N=23)**	**Examples of neurological conditions in which the symptom is present legitimately**
9. I can remember what I was doing one hour ago. (F, i.e., reverse scoring)	26.1% ("False")	The post-concussion syndrome, exposure to neurotoxic chemicals such as toluene, carbon monoxide, manganese, cyanotoxins, early stage dementia, CVA, toxic encephalopathy. In some patients, severe depression may be associated with difficulties storing and retrieving new information.
12. I have difficulty remembering my address. (T)	21.7%	
15. The major problem I have is with my memory. (T)	30.4%	
18. More than three times a day I find myself getting up to get something only to forget what it was. (T)	69.6%	
22. Recently I've noticed that my memory is getting so bad that there have been entire days that I cannot recall. (T)	34.8%	
25. At times I've been unable to remember the names or faces of close relatives so that they seem like complete strangers. (T)	43.5%	
27. I have difficulty remembering the day of the week. (T)	34.8%	
30. I have difficulty remembering today's date. (T)	43.5%	
33. My past life and important events became a blur to me almost overnight. (T)	30.4%	
36. I have difficulty remembering my phone number. (T)	34.8%	Severe post-concussion syndrome, exposure to high levels of neurotoxic chemicals, CVA, extreme fatigue due to severe insomnia, concentration impaired by unrelenting severe pain, dementia, TBI, delusions, severe thought disorder.
40. I cannot remember whether or not I have been married. (T)	17.4%	
45. I was told of an angry meeting I had with someone, but I do not recall any of it. (T)	21.7%	
49. While driving, I sometimes forget how to get home. (T)	26.1%	
53. When I can't remember something, hints do not help. (T)	47.8%	
61. I have difficulty remembering my birth date. (T)	17.4%	

Content validity is the degree to which the content of test's items matches the conceptual content domain of the target construct [14]. It is obvious from the Table 1 that the 15 item SIMS Neurologic Impairment scale cannot cover the entire vast field of possible subjective neurological symptoms, or more accurately, their malingering. The content review is an essential part of test validation process. As explained in the 2014 *Standards for Educational and Psychological Testing* [14] of the American Psychological Association on page 14, "*Important validity evidence can be obtained from an analysis of the relationship between the content of a test and the construct it is intended to measure.*" This key construct, in the SIMS, is "malingering." Accordingly, this study examines whether or not the items of SIMS "Neurologic Impairment" (NI) and "Amnestic Disorder" (AM) scales indeed appear, to experts with long clinical experience in the field, as likely to be endorsed only by malingerers rather than also by patients with related legitimate neurologic conditions. The goal of scientific psychology is to avoid the harm of labelling legitimate patients as malingerers because this is likely to deprive such patients of therapy and of other legally owed benefits in insurance litigations.

Method

Content Analyses

In Study 1, our group of 11 raters systematically reviewed all 15 items of SIMS Neurologic Impairment scale and also all 15 items of SIMS Amnestic Disorder scale (see the left columns of Table 1 and of Table 2) to decide whether they represent symptoms that would be endorsed only by malingerers or perhaps if they could be symptoms also experienced by sufferers of legitimate medical conditions, e.g., persons with the post-concussion whiplash syndrome

from car accidents. These 11 expert raters included 2 psychologists and 7 psychiatrists, each with more than 35 years of clinical experience with psychiatric patients, as well as 2 neuroscientists who also have an extensive clinical experience. Briefly, all 11 raters have had the dual professional role both as clinicians and as scientists: all have published extensively in the medical field.

Analyses of rates of probable false positives

As the next step, in Study 2, we estimated the rates of false positives obtained with the SIMS NI and AM scales and with the SIMS total score. For this, we used de-identified archival clinical data of 23 survivors of high impact motor vehicle accidents (MVAs) in which their vehicle was damaged so extensively that it was subsequently deemed not worthy of repair. Such accidents are too rare without involving injuries such as those of a neuropsychological nature, especially symptoms in the post-concussion whiplash spectrum. The sample of our patients consists of 8 males and 15 females, age 19 to 60 years (mean age=38.0, SD=12.8), with education from 10 to 18 years (mean=14.1, SD=1.9). Their average scores were 17.2 (SD=11.0) on the Post-MVA Neurological Symptoms scale [11], 6.3 (SD=1.3) on the average pain item of the Brief Pain Inventory [15], and 23.7 (SD=3.0) on Morin's Insomnia Severity Index [16]. Their scores on the Insomnia Severity Index were known for 22 of the 23 patients: they were in Morin's categories of moderate insomnia for 6 patients (27.3%) and severe insomnia for 16 patients (72.7%). Such levels of insomnia are consistent with these patients' pain scores on the Brief Pain Inventory [15] because pain tends to disrupt sleep extensively.

All patients in this sample could be classified as experiencing some degree of the post-concussion syndrome (scores ranging from 24 to 58 on the Rivermead scale [10], with the average at 37.4, SD=13.2).

The time elapsed since the patient's MVA ranged from 7 to 217 weeks, with the average at 81.5 weeks (SD=55.8), however, all still experienced active post-accident symptoms. All still retained a lawyer to represent them to their car insurance company in disputes about payments for treatments and other benefits. The physical nature of their vehicular collision (high impact, with their car damaged to the extent of being deemed not worthy of repair) makes the accusation of malingering less plausible, even though some distressed patients may strongly emphasize their symptoms for fear of otherwise receiving no treatments or help.

Some of the data on the first 16 of these 23 patients was already reported in our earlier study dealing with SIMS scale of malingering the Affective Disorder [3].

Statistical Comparisons to Published Data on Malingerers and on Normal Controls

As the next step, in the Study 2, we located two original publications that provide statistical data on SIMS AM and NI scores of instructed malingerers who were specifically asked to feign neuropsychological post-MVA symptoms. Our goal was to statistically compare their data (means on AM and NI scales, SDs) to our own data on the 23 legitimate post-MVA patients. Two samples of malingerers of post-MVA symptoms are used in our study. The first sample includes 30 healthy adults, see SIMS data published by Capilla Ramírez, González Ordi, Santamaría Fernández, & Casado Morales in 2014 [17].

These healthy persons were instructed to feign the following whiplash symptoms: intense pain in the nape and in the rest of the neck, and in the shoulders, an intense dizziness that interferes with walking safely, headaches, fear, and irritability (in the original Spanish text "*dolores intensos en la nuca, el cuello y los hombros ..... fuertes mareos que te impiden caminar con seguridad, dolor de cabeza, miedo e irritabilidad*"). It is important to note that persons in this group were not asked to feign memory problems. This was likely to result in lower scores on the AM scale than on the NI scale because the AM scale seems to mainly consist of items descriptive of memory impairment, see Table 2.

The second sample of malingerers consists of 26 undergraduates instructed to feign post-concussive symptoms, see Parks et al. [7]: these undergraduates were provided with a DSM4 based list of post-concussive symptoms to study. Thus, their task also included feigning impaired memory, i.e., presumably also some memory problems such as those described in the items of the AM scale.

We also compared the scores of our 23 legitimate post-MVA patients to data published in the SIMS manual on 34 normal controls [6]. These controls were undergraduate students and presumably all in sufficiently good health to function at the college level. They were instructed to respond to SIMS items honestly.

Results

Content Analyses

In our Study 1, all 11 expert raters agreed that none of the items comprising SIMS Neurologic Impairment and Amnestic Disorders scales has a reasonable capacity to differentiate malingerers from legitimate medical patients such as patients with post-concussion whiplash syndrome or patients with some other neurological conditions. The agreement was 100%, so no rater agreement statistics was calculated. Examples of legitimate neurological conditions (degenerative diseases, CVAs, etc.) that could account for each of the SIMS items in the NI and AM scales are listed in the right column of Table 1 and Table 2. Those examples are not meant to be an exhaustive listing: they are only a brief reminder that the item's capacity to test for malingering is marred by the particular item's obvious potential reference to some legitimate neuropsychological symptoms.

Several raters pointed out that item 40 "*I cannot remember whether or not I have been married*," and item 61 "*I have difficulty remembering my birth date*," may at times be endorsed by patients who show some measure of normal daily functioning and these raters also suggested that a thorough psychiatric and neurological differential diagnosis would be required to properly rule out severe concussion or other organic conditions. That is, a priori interpretation of these 2 items as reliable "indicators of malingering" is ill advised.

Four of our 23 post-accident patients endorsed the items 61 and 40. None of the other post-MVA patients endorsed these items. The reasons for endorsements of Items 61 and 40 by the four patients are retrospectively difficult to determine, i.e., malingering cannot be ruled out, but it is not the only possible explanation.

Rates of Probable False Positives

In Study 2, the scores of our 23 high impact MVA patients

on SIMS Neurologic Impairment (NI) scale ranged from 0 to 15 with the average at 5.2 (SD=3.9) and their scores on SIMS Amnestic Disorder (AM) scale ranged from 0 to 15 with the average at 5.0 (SD=4.4), see Table 3. As mentioned earlier, the cutoff score for the Neurologic Impairment is > 2 points and the same cutoff is also used for the Amnestic Disorder scale. Patients endorsing more than 2 items on the NI or AM scale are classified as "malingering neurologic impairment" or the "amnestic disorder," respectively [6]. The average scores of our post-MVA patients on the two scales are thus in within the "malingering range." In our sample of 23 patients injured in high impact collisions, 17 (i.e., 73.9%) obtained more than 2 points on the NI scale, and similarly 17 patients (i.e., also 73.9 %) also scored above 2 points on the AM scale. Thus, close to 75% of our post-MVA patients may be misclassified by SIMS scales as malingering "neurologic impairment" or "amnestic disorder."

Total SIMS scores of our 23 post-MVA patients ranged from 9 to 60 with the average at 26.5 (SD=16.0), see Table 3. The cutoff point on SIMS total score recommended in the SIMS manual [6] for malingering is > 14 points: the average score of this sample is within the "malingering" category. Most of our 23 patients (78.3 %) scored above this cutoff and thus are diagnosed by SIMS as "malingerers." In Germany, some psychologists favor using a more conservative cutoff of > 16 points, see discussion by van Impelen, Merckelbach, Jelicic, & Merten [2], yet even with this more lenient criterion, 73.9 % of our 23 patients could be diagnosed as malingerers by their total scores on the SIMS.

Table 3: Mean SIMS scores and SDs of injured patients, controls, and of malingerers

Samples:	N	SIMS total	NI	AM
Injured patients: High impact MVA patients: original data presented here in Study 2.	23	26.5 (16.0)	5.2 (3.9)	5.0 (4.4)
Malingerers instructed to feign post-concussive symptoms: data from Parks et al. (2017) [7]	26	26.2 (11.8)	4.5 (2.6)	8.9 (5.4)
Malingerers instructed to feign whiplash symptoms: data from Capilla Ramírez et al. (2014) [17]	30	16.4 (6.8)	5.3 (2.9)	0.9 (1.5)
Normal Controls: Smith & Burger (1997), [1] Widows & Smith (2005) [6]	34	7.7 (3.7)	1.0 (1.0)	1.2 (1.5)

Note: NI=Neurologic Impairment scale of the SIMS; AM=Amnestic Disorder scale of the SIMS.

Correlations to Measures of Post-Concussions Syndrome and of Whiplash

Of interest are Pearson correlations in this sample of 23 patients, of their SIMS scales to scores on the Rivermead Post-Concussion Symptoms Questionnaire [10], Post-MVA Neurological Symptoms scale [11], Insomnia Severity Index [16], and to their scores on the Brief Pain Inventory [15]. Significant correlation was found of SIMS Amnestic Disorder scale (AM) to Rivermead Post-Concussion Symptoms scale (r=.42, p=.22, 1-tailed): both the AM and Rivermead scales deal with legitimate memory or concentration problems. The SIMS Neurologic Impairment (NI) scale correlated significantly with the Post-MVA Neurological Symptoms scale (r=.41, p=.036, 1-tailed): both these scales have items dealing with legitimate neurological problems. These correlations are collateral evidence that, while misrepresented as a test of "malingering," the SIMS lists too many legitimate medical symptoms. The size of correlations reported here is an underestimate due to the statistical effects of restricted range of data (see explanations by Downie and Health [18], pages 101 to 103): for example, all patients reported high levels of post-concussive symptoms and of other post-MVA neurological symptoms, and also high levels of the other post-MVA symptoms such as pain and insomnia. This unduly restricts the variance of their scores.

The SIMS NI scale correlated significantly with age (r=.43, p=.031, 1-tailed): older persons reported more neurological problems. This is consistent with clinical lore.

Statistical Comparisons to Malingerers and to Normal Controls

We conducted ANOVA that included 4 sets of SIMS data on the NI and AM scales obtained from:

(1) Legitimate post-MVA patients (N=23),
(2) Instructed malingerers of post-concussive symptoms (N=26),
(3) Instructed malingerers of whiplash (N=30), and
(4) Normal controls (N=34).

Average scores of these 4 samples are listed in Table 3. The ANOVAs were calculated separately for the NI scores and AM scores.

The readers may notice the low AM scores of the instructed malingerers of whiplash (their instructions did not include feigning memory problems) compared to instructed malingerers of post-concussive symptoms (their instructions included feigning memory problems).

Our results of these ANOVAs, including the Tukey HSD post hoc tests, are summarized in Table 4. The significance level was set to p<.05.

The ANOVA of SIMS NI scores showed that neither malingerers of whiplash nor malingerers of post-concussive symptoms differed significantly from legitimate patients (p>.05) and that normal controls had significantly lower NI scores than the two groups of malingerers and also than the legitimate patients (p<.0001).

An ANOVA of SIMS AM scores (see Table 4) showed that legitimate patients obtained higher AM scores (i.e., they endorsed more of the legitimate memory problems listed in the AM scale) than malingerers of whiplash (p=.0002), but these 23 patients' scores were lower than scores of malingerers of post-concussive symptoms (p=.0008). As pointed out earlier, the tasks of this latter group of instructed malingerers included also feigning memory problems.

In this ANOVA, normal controls had significantly lower AM scores than legitimate patients and also than malingerers of post-concussive symptoms (p<.001), but the controls did not differ significantly from malingerers of whiplash (p>.05).

Table 4: Results of ANOVAs

	Results
ANOVA on SIMS NI scores	F(3, 109) = 18.2, p < .0001
Tukey HSD post hoc tests:	Injured Patients versus Malingerers of Post-Concussive Symptoms: Diff=-0.7000, 95%CI=-2.6985 to 1.2985, p=0.7975
	Injured Patients versus Malingerers of Whiplash: Diff=0.1000, 95%CI=-1.8350 to 2.0350, p=0.9991
	Injured Patients versus Normal Controls: Diff=-4.2000, 95%CI=-6.0849 to -2.3151, p=0.0000
	Malingerers of Post-Concussive Symptoms versus Malingerers of Whiplash: Diff=0.8000, 95%CI=-1.0707 to 2.6707, p=0.6806
	Malingerers of Post-Concussive Symptoms versus Normal Controls: Diff=-3.5000, 95%CI=-5.3189 to -1.6811, p=0.0000
	Malingerers of Whiplash vs versus Normal Controls: Diff=-4.3000, 95%CI=-6.0488 to -2.5512, p=0.0000
ANOVA on SIMS AM scores	F(3, 654) = 33.4, p < .0001
Tukey HSD post hoc tests:	Injured Patients versus Malingerers of Post-Concussive Symptoms: Diff=3.9000, 95%CI=1.3263 to 6.4737, p=0.0008
	Injured Patients versus Malingerers of Whiplash: Diff=-4.1000, 95%CI=-6.5918 to -1.6082, p=0.0002
	Injured Patients versus Normal Controls: Diff=-3.8000, 95%CI=-6.2274 to -1.3726, p=0.0005
	Malingerers of Post-Concussive Symptoms versus Malingerers of Whiplash: Diff=-8.0000, 95%CI=-10.4091 to -5.5909, p=0.0000
	Malingerers of Post-Concussive Symptoms versus Normal Controls: Diff=-7.7000, 95%CI=-10.0424 to -5.3576, p=0.0000
	Malingerers of Whiplash vs versus Normal Controls: Diff=0.3000, 95%CI=-1.9522 to 2.5522, p=0.9855

Discussion

The ratings by experienced clinicians and by neuroscientists showed that the NI and AM scales consist entirely of items representing legitimate medical symptoms. The review of SIMS by van Impelen's group [2] in 2014 has already alluded to some of these flaws in the SIMS. The assertion by Widows and Smith [6] in their SIMS manual, that SIMS items are "*highly atypical in patients with genuine psychiatric or cognitive disorders*" can no longer be taken seriously.

Many SIMS items are descriptive of symptoms within the post-concussion whiplash spectrum. As already mentioned, an analysis of this conceptual overlap by Cernovsky, Ferrari, & Mendonca [9] showed that more than 50% of SIMS items describe legitimate signs of whiplash or post-concussion syndrome. In this manner, both legitimate post-MVA patients and the malingerers feigning typical post-MVA symptoms may obtain NI and AM scores at levels above the diagnostic cutoffs. Our results suggest that the false positive rates, i.e., iatrogenic classification of legitimate patients as "malingerers," may approach 70 to 75%, that is, almost ¾ in samples of presumably legitimate post-MVA patients. Psychologists using the SIMS cause harm to legitimate patients. Whether or not they boldly label legitimate patients as "*malingerers"* or "*suspected malingerers*," or suggest that their SIMS scores indicate some "*exaggeration or magnification of symptoms*," it almost always leads to iatrogenic denials or interminable postponements of therapies or insurance benefits to which these injured persons are lawfully entitled.

Inexperienced psychologists assume that truly legitimate patients would report only a few symptoms instead of endorsing (as if indiscriminately) symptoms in various domains of the SIMS. This is certainly not true about survivors of high impact car accidents: almost all such patients report intense pain, their pain almost always disrupts the sleep, and persistent pain jointly with insomnia undermines their emotional health, in particular with respect to symptoms of depression and anxiety. Almost all these patients experience some degree of post-concussion syndrome which jointly with persistent pain and fatigue impair their concentration, memory, and cognitive processing. Briefly, these patients experience a polytraumatic symptom pattern, see discussion in Gutierrez et al. [8]

Our ANOVAs provide statistical evidence that the Neurologic Impairment (NI) and Amnestic Disorder (AM) scales of the SIMS have no criterion validity to differentiate malingerers from legitimate post-MVA patients. These two scales cannot reliably differentiate legitimate patients from malingerers.

In summary, the SIMS is mainly a list of legitimate medical and psychological symptoms, particularly those typical for post-MVA patients. The more of these legitimate post-MVA symptoms are reported by the patient on the SIMS, the higher is this patient's "malingering" score. Both the legitimate patients and malingerers are likely to report medical symptoms: the SIMS NI and AM scales differentiate the malingerers from relatively healthy persons who do not report more than a few such medical symptoms, but these SIMS scales do not adequately differentiate legitimate patients from malingerers. SIMS scales are flagrantly unable to differentiate these two latter groups. Such dubious tests bring disrepute to the profession of psychology.

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