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Meta-Analysis of SIMS Scores of Survivors of Car Accidents and of Instructed Malingerers

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Abstract

***Objective:** To compare scores on the Structured Inventory of Malingered Symptomatology (SIMS) of normal controls, survivors of motor vehicle accidents (MVAs), and of malingerers instructed to feign post-MVA symptoms.*

***Method:** Mean score and SD was calculated by combining published data on 9 samples of normal controls (combined N=500). Similarly, mean score and SD was calculated by combining published data of 4 samples of persons instructed to feign post-MVA symptoms (combined N=88). Then, ANOVAs were calculated to compare SIMS data of 4 groups: (1) the combined sample of 500 normal controls, (2) 47 patients with minor injuries from MVAs (data published by Capilla Ramírez et al. in 2014), (3) 23 patients injured in high impact MVAs (data published in Cernovsky et al. in 2019), and (4) the combined sample of 88 instructed malingerers.*

***Results:** The ANOVAs were calculated separately for the SIMS total score and then also separately for each of the 5 SIMS scales. The results of these ANOVAs were all significant and, with a few exceptions, post-hoc tests followed the following pattern: (1) the controls obtained significantly lower scores than either of the two groups of patients and also than the instructed malingerers, (2) patients with minor injuries scored lower than those injured in high impact MVAs and also lower than instructed malingerers, (3) patients injured in high impact MVAs had SIMS scores similar to persons instructed to feign post-MVA symptoms (with some exceptions).*

***Discussion and Conclusions:** The overall meta-analytic pattern indicates that patients injured in high impact MVAs and persons instructed to feign post-MVA symptoms tend to obtain similar SIMS scores (with some exceptions) and that both groups score higher than normal controls. This is consistent with the previously published findings that the SIMS consists only of items describing legitimate medical symptoms (SIMS scales NI, AM, AF, P) and of arithmetic and logical tasks and items assessing general knowledge (SIMS LI scale). The SIMS is a pseudoscientific test that fails to differentiate legitimate medical patients from malingerers.*

Keywords: *car accidents, malingering, SIMS, post-concussion syndrome, whiplash.*

Introduction

The Structured Inventory of Malingered Symptomatology (SIMS)[1,2] is marketed and misunderstood as a test for detection of malingering medical symptoms. While malingerers can indeed obtain high scores and be detected by the SIMS, this test has no capacity to differentiate malingerers from legitimate patients because 4 of its 5 scales, i.e., the Psychosis (P), Affective Disorders (AF), Neurologic Impairment (NI), and Amnestic Disorder (AM) scales list legitimate medical symptoms[3,4,5] that could be endorsed by both patients and malingerers at similar rates[3,4,7]. It has been shown that the 5th SIMS scale, i.e., Low Intelligence scale (LI), consists mainly of arithmetic and logical reasoning tasks or tasks assessing general knowledge on which patients tired by chronic illness, or those with the post-concussion syndrome, or persons whose attentional focus is disrupted by chronic pain may perform worse than uninjured persons[6,7]. Briefly, the SIMS is a false test that should have never been used on real patients. Its use has flagrantly iatrogenic consequences, e.g., if applied to war veterans or persons with industrial or vehicular injuries such as those involving symptoms within the post-concussion whiplash spectrum.

Perhaps one of its most frequent uses is presently on patients injured in motor vehicle accidents (MVAs). It has been shown in a recent study that more than 50% of the 75 SIMS items are those descriptive of symptoms in post-concussion and whiplash spectrum[8], i.e., symptoms frequently experienced after high impact car accidents or also by soldiers after explosions. Furthermore, the SIMS also contains the Low Intelligence scale that includes arithmetic and logical reasoning tasks on which post-MVA patients or soldiers with the post-concussion syndrome may perform more poorly than healthy normal controls with the result of being falsely classified as malingerers[8].

The more post-MVA symptoms are experienced by the patient, the more likely is he or she to obtain higher SIMS scores than normal healthy persons and thus falsely branded as a malingerer. Even samples of healthy normal persons such as college undergraduates are found to have methodologically unacceptably high rates of false positives[9]. Thus, for example, in the SIMS normative sample (see data on "honest responders on page 24 and 25 in the SIMS manual[2]), the means and standard deviations of these college undergraduates place some of the SIMS stipulated cuttoffs (via z score transformation, with normal distribution assumed) at percentile ranks indicating that the SIMS might misclassify 42.1% of the healthy college students as malingering a "psychosis," 30.9% as malingering "Low Intelligence" (cognitive impairment), and 29.8% as malingering "Amnestic Disorder"[9]. These statistical absurdities have unfortunately not prevented the widespread use of the SIMS in insurance litigations: many psychologists thus indeed (unwittingly) play the role of "a false expert witness."

Since the SIMS is very frequently used in insurance litigations involving survivors of MVAs, the present article describes meta-analyses that compare SIMS scores of these survivors with those of instructed malingerers feigning post-MVA symptoms, and also with data of normal controls.

Method

This study calculated ANOVAs to compare SIMS data of four groups:

(1) meta-analytically combined sample of 500 normal controls,

(2) 47 patients with relatively minor injuries from MVAs,

(3) 23 patients injured in high impact MVAs,

(4) 88 persons instructed to feign (malinger) post-MVA symptoms.

The objective of combining various available samples of normal controls was to create a more representative combined sample of such presumably healthy controls.

Similarly, the objective of combining various available samples of persons instructed to feign post-MVA symptoms was to create a more representative combined sample of this group.

Unfortunately, with respect to the legitimate patients, only one sample of patients with minor post-MVA injuries and only one sample of patients injured in high impact MVAs were available.

Combining Samples of Normal Controls

Mean score and SD was calculated by combining published data on 9 samples of normal controls (combined N=500, see data in Table 1). These 9 samples include: Glen Smith's normative sample[1,2] of 34 undergraduates instructed to respond honestly to the SIMS (Glenn Smith is the author who developed the SIMS), two samples of normal controls (N=174 and N=30) reported in SantamaríaFernández [10], 20 normal controls in a study by Giger's team[11], 30 in a study by Clegg's team[12], and a sample of 16 doctoral university students described by Rogers et al.[13] who formed a group of normal controls (honest responders). The meta-analysis also included 3 samples of university students reported in a study by Edens, Otto, and Dwyer[14]. In Edens's study, all participants completed the SIMS twice: at first with the instruction to respond honestly and then again to feign a medical condition. The first group (N=65) were to feign depression, the second (N=59) psychosis, and the third (N=72) a cognitive impairment[14]. Only the data on honest responses by Edens's 3 groups (i.e., from the first round of their SIMS sessions) were included in our meta-analysis.

The meta-analytic combining of means from several samples involved calculation of the weighted mean as described in Downie and Heath (p. 38-39)[15]. Downie and Heath also provide a formula for properly averaging standard deviations (p. 51)[15].

The combined means and SDs for SIMS total score and also for its 5 scales are reported in the bottom line of Table 1.

Table 1. *Pooled Normal Controls (9 samples, combined N=500)*

Control Samples:	N	SIMS total	NI	AM	LI	AF	P
SantamaríaFernández (2014), page 192-194[10]	174	7.4 (3.1)	0.7 (1.0)	0.7 (1.1)	1.8 (1.3)	3.8 (1.7)	0.4 (0.7)
SantamaríaFernández (2014), page 223-226[10]	30	7.3 (3.0)	0.7 (0.9)	0.7 (1.2)	1.5 (1.2)	3.8 (1.8)	0.6 (0.7)
Smith & Burger (1997)[1], Widows & Smith (2005)[2]	34	7.7 (3.7)	1.0 (1.0)	1.2 (1.5)	1.4 (1.2)	3.3 (2.0)	0.8 (1.0)
Giger et al. (2010)[11]	20	5.8 (3.7)	0.9 (0.8)	0.8 (0.8)	1.2 (1.0)	2.2 (2.2)	0.8 (1.1)
Clegg et al., (2009)[12]	30	7.7 (2.9)	1.3 (1.6)	0.5 (0.8)	1.4 (1.5)	4.4 (1.5)	0.2 (0.4)
Rogers et al., (2005)[13]	16	7.6 (5.0)	0.6 (1.3)	0.7 (0.9)	0.9 (0.9)	5.1 (3.0)	0.3 (0.6)
Edens et al., (1999)[14], group 1	65	7.8 (4.5)	1.0 (1.3)	0.9 (1.4)	1.7 (1.5)	3.8 (1.9)	0.5 (0.8)
Edens et al., (1999)[14], group 2	59	8.1 (3.8)	0.9 (1.0)	1.1 (1.5)	1.8 (1.5)	3.9 (1.8)	0.4 (0.7)
Edens et al., (1999)[14], group 3	72	7.9 (4.7)	0.9 (1.2)	0.8 (1.6)	2.0 (1.5)	3.5 (1.9)	0.7 (1.4)
Combined Sample of Controls	500	7.6 (3.8)	0.9 (1.1)	0.8 (1.3)	1.7 (1.4)	3.7 (1.9)	0.5 (0.9)

Sample of Persons with Relatively Minor Injuries from their MVAs

This sample consists of 47 whiplash patients (presumably an injury from MVA), described as "bona fide" in a study by Capilla Ramírez[16]. These patients were pre-selected by Capilla Ramírez's team as follows: "Como criterios de inclusión, los pacientes debían cumplir los siguientes requisitos: poseer una exploración física AP y lateral sin alteraciones de la columna cervical, aunque admitimos la hipolordosis cervical; EMG sin signos clínicos de afectación radicular; y, finalmente, una RM sin lesiones que justificaran la clínica dolorosa cronificada que presentaban los pacientes[16]." In English translation: "Inclusion criteria specified that all patients had the following: normal results in their physical examination; AP and lateral radiography not indicating changes in cervical spine (though patients with cervical hypolordosis were not excluded); EMG without clinical signs of radiculopathy; and finally, MRI without lesions that would justify the chronic pain complaints clinically presented by these patients." Such patients with only minor injuries might report fewer symptoms on lists of essentially legitimate medical symptoms such as the SIMS than do instructed malingerers. Hence, in the study by Capilla Ramírez'steam[16], their patients' mean total SIMS score of 10.4 (SD=5.3) falls below the cutoff> 14, i.e., within the normal range," and was indeed significantly lower than the mean score of a sample of instructed malingerers.

Sample of Patients Injured in High Impact MVAs

This sample has been already described in our previous study[4] as follows "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[17], 6.3 (SD=1.3) on the average pain item of the Brief Pain Inventory[18], and 23.7 (SD=3.0) on Morin's Insomnia Severity Index[19]. 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[18] 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[20], with mean=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.[4]"

As already mentioned in our prior publication[4], some psychologists may still erroneously assume that "cerebral concussions occur too rarely without visible head injuries and without a complete and prolonged loss of consciousness. Neuropathological research by Bennet Omalu[21, 22] 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. [4]"

Combining Samples of Persons Instructed to Feign Post-MVA Symptoms

Mean scores and SDs on SIMS scales were calculated by meta-analytically combining published data of 4 samples of persons instructed to feign post-MVA symptoms (combined N=88, see data inTable 2). These 4 samples of instructed malingerers (presumably healthy normal persons instructed to feign post-MVA symptoms) include:

- 30 persons from a study published in 2014 by a team led by Capilla Ramírez[16] who were all instructed to feign whiplash symptoms (no post-concussive symptoms),
- 26 persons from a study published in 2017 by a team led by Parks[23] who were all instructed to feign post-concussive symptoms,
- 16 persons instructed to malinger whiplash and other post MVA symptoms, but were *warned to feign cautiously*, to avoid detection (data published by Merten et al.[24] in 2008), and
- 16 persons instructed to malinger whiplash and other post MVA symptoms, but were *not warned to feign cautiously*, to avoid detection (data published by Merten et al.[24] in 2008).

Table 2. *Pooled Malingerers of post-MVA symptoms (4 samples, combined N=88)*

Samples of Malingerers:	N	SIMS total	NI	AM	LI	AF	P
Instructed malingerers of whiplash only: Data from CapillaRamírez et al.[16] (2014)	30	16.4 (6.8)	5.3 (2.9)	0.9 (1.5)	1.7 (1.4)	7.6 (2.0)	1.0 (1.7)
Instructed malingerers of post-concussion syndrome: Data from Parks et al.[23] (2017)	26	26.2 (11.8)	4.5 (2.6)	8.9 (5.4)	3.4 (3.3)	8.4 (2.9)	1.1 (2.5)
Instructed malingerers of whiplash + other post MVA symptoms, warned to feign cautiously, to avoid detection: Data from Merten et al.[24] (2008)	16	20.1 (8.7)	3.4 (2.1)	5.1 (3.2)	2.9 (2.3)	7.4 (2.3)	1.2 (1.8)
Instructed malingerers of whiplash + other post MVA symptoms, not warned to avoid detection: Data from Merten et al.[24] (2008)	16	31.6 (11.3)	6.7 (2.8)	8.2 (3.8)	4.6 (3.2)	9.6 (2.0)	2.4 (3.2)
Combined Sample of Malingerers	**88**	**22.7 (11.1)**	**5.0 (2.8)**	**5.4 (5.0)**	**2.9 (2.7)**	**8.2 (2.4)**	**1.3 (2.3)**

As already explained, the meta-analytic combining of means from several samples involves calculation of the weighted mean as described inDownie and Heath (p. 38-39)[15]. Downie and Heath also provide the formula for properly averaging standard deviations (p. 51)[15].

Statistical Procedure

As already explained, we compared statistically the following four groups:

(1) meta-analytically combined sample of normal controls (N=500),

(2) patients with minor whiplash injuries from MVAs (N=47),

(3) patients injured in high impact MVAs (N=23), and

(4) meta-analytically combined sample of healthy persons instructed to feign post-MVA symptoms (N=88).

The means and SDs of these four groups are listed in Table 3.

These four groups were compared in ANOVAs with respect to their total SIMS score and separately also with respect to their scores on each of the 5 scales of the SIMS.

Table 3. *Means and SDs of our four groups compared in ANOVAs*

ANOVA Groups:	N	SIMS total	NI	AM	LI	AF	P
Combined sample of controls	500	7.6 (3.8)	0.9 (1.1)	0.8 (1.3)	1.7 (1.4)	3.7 (1.9)	0.5 (0.9)
Patients with relatively minor injuries from MVAs - data from CapillaRamírez et al.[16] (2014)	47	10.4 (5.3)	2.3 (2.3)	0.5 (1.1)	2.3 (1.4)	5.0 (2.2)	0.3 (0.6)
Patients injured in high impact MVAs - data from Cernovsky et al.[4] (2019)	23	26.5 (16.0)	5.2 (3.9)	5.0 (4.4)	4.8 (4.4)	7.7 (2.2)	3.7 (5.3)
Combined sample of persons instructed to feign post-MVA symptoms	88	22.7 (11.1)	5.0 (2.8)	5.4 (5.0)	2.9 (2.7)	8.2 (2.4)	1.3 (2.3)

Results and Discussion

The ANOVAs were calculated for the SIMS total score and then separately for each of the 5 SIMS scales.

ANOVAs of SIMS Scores of 4 Groups (the Groups as Listed in Table 3)

The results of these ANOVAs (see Table 4) were all significant and, with a few exceptions, the post-hoc tests indicate the following pattern in the results: the controls obtained significantly lower scores than the two groups of patients and also than the instructed malingerers.

Table 4. *ANOVAs of SIMS scores*

ANOVA of SIMS total scores: F(3,654)=203.5, p<.0001
Tukey HSD Post-hoc Tests: normal controls vs patients w. minor injuries: Diff=2.8000, 95%CI=0.3786 to 5.2214, p=0.0158 normal controls vs high impact patients: Diff=18.9000, 95%CI=15.5154 to 22.2846, p=0.0000 normal controls vs instructed malingerers: Diff=15.1000, 95%CI=13.2653 to 16.9347, p=0.0000 patients w. minor injuries vs high impact patients: Diff=16.1000, 95%CI=12.0613 to 20.1387, p=0.0000 patients w. minor injuries vs instructed malingerers: Diff=12.3000, 95%CI=9.4326 to 15.1674, p=0.0000 high impact patients vs instructed malingerers: Diff=-3.8000, 95%CI=-7.5168 to -0.0832, p=0.0429
ANOVA of SIMS Neurologic Impairment (NI) scores: F(3,654)=184.5, p<.0001
Tukey HSD Post-hoc Tests: normal controls vs patients w. minor injuries: Diff=1.4000, 95%CI=0.7368 to 2.0632, p=0.0000 normal controls vs high impact patients: Diff=4.3000, 95%CI=3.3730 to 5.2270, p=0.0000 normal controls vs instructed malingerers: Diff=4.1000, 95%CI=3.5975 to 4.6025, p=0.0000 patients w. minor injuries vs high impact patients: Diff=2.9000, 95%CI=1.7939 to 4.0061, p=0.0000 patients w. minor injuries vs instructed malingerers: Diff=2.7000, 95%CI=1.9147 to 3.4853, p=0.0000 high impact patients vs instructed malingerers: Diff=-0.2000, 95%CI=-1.2179 to 0.8179, p=0.9577

ANOVA of SIMS Amnestic Disorder (AM) scores: F(3,654)=119.0, p<.0001
Tukey HSD Post-hoc Tests: normal controls vs patients w. minor injuries: Diff=-0.3000, 95%CI=-1.2087 to 0.6087, p=0.8304 normal controls vs high impact patients: Diff=4.2000, 95%CI=2.9298 to 5.4702, p=0.0000 normal controls vs instructed malingerers: Diff=4.6000, 95%CI=3.9114 to 5.2886, p=0.0000 patients w. minor injuries vs high impact patients: Diff=4.5000, 95%CI=2.9843 to 6.0157, p=0.0000 patients w. minor injuries vs instructed malingerers: Diff=4.9000, 95%CI=3.8239 to 5.9761, p=0.0000 high impact patients vs instructed malingerers: Diff=0.4000, 95%CI=-0.9949 to 1.7949, p=0.8816
ANOVA of SIMS LI Low Intelligence (LI) scores: F(3,654)=30.8, p<.0001
Tukey HSD Post-hoc Tests: normal controls vs patients w. minor injuries: Diff=0.6000, 95%CI=-0.1087 to 1.3087, p=0.1298 normal controls vs high impact patients: Diff=3.1000, 95%CI=2.1094 to 4.0906, p=0.0000 normal controls vs instructed malingerers: Diff=1.2000, 95%CI=0.6630 to 1.7370, p=0.0000 patients w. minor injuries vs high impact patients: Diff=2.5000, 95%CI=1.3180 to 3.6820, p=0.0000 patients w. minor injuries vs instructed malingerers: Diff=0.6000, 95%CI=-0.2392 to 1.4392, p=0.2550 high impact patients vs instructed malingerers: Diff=-1.9000, 95%CI=-2.9878 to -0.8122, p=0.0000
ANOVA of SIMS Affective Disorder (AF) scores: F(3,654)=146.7, p<.0001
Tukey HSD Post-hoc Tests: normal controls vs patients w. minor injuries: Diff=1.3000, 95%CI=0.5120 to 2.0880, p=0.0001 normal controls vs high impact patients: Diff=4.0000, 95%CI=2.8985 to 5.1015, p=0.0000 normal controls vs instructed malingerers: Diff=4.5000, 95%CI=3.9029 to 5.0971, p=0.0000 patients w. minor injuries vs high impact patients: Diff=2.7000, 95%CI=1.3857 to 4.0143, p=0.0000 patients w. minor injuries vs instructed malingerers: Diff=3.2000, 95%CI=2.2669 to 4.1331, p=0.0000 high impact patients vs instructed malingerers: Diff=0.5000, 95%CI=-0.7095 to 1.7095, p=0.7114
ANOVA of SIMS Psychosis (P) scores: F(3,654)=38.7, p<.0001
Tukey HSD Post-hoc Tests: normal controls vs patients w. minor injuries: Diff=-0.2000, 95%CI=-0.7947 to 0.3947, p=0.8224 normal controls vs high impact patients: Diff=3.2000, 95%CI=2.3687 to 4.0313, p=0.0000 normal controls vs instructed malingerers: Diff=0.8000, 95%CI=0.3494 to 1.2506, p=0.0000 patients w. minor injuries vs high impact patients: Diff=3.4000, 95%CI=2.4081 to 4.3919, p=0.0000 patients w. minor injuries vs instructed malingerers: Diff=1.0000, 95%CI=0.2958 to 1.7042, p=0.0015 high impact patients vs instructed malingerers: Diff=-2.4000, 95%CI=-3.3129 to -1.4871, p=0.0000

Since the Psychosis (P) scale is not relevant to assessments of post-MVA symptoms and since a systematic review by van Impelen's team already concluded that the P scale does not perform adequately with psychotic patients (those with schizophrenia), only a few comments are given here on results of the post hoc tests involving the Psychosis (P) scale of the SIMS. It is not clear why patients injured in high impact MVAs and also the instructed malingerers scored higher on the P scale than normal controls and also than patients with minor injuries. Perhaps a careful item by item statistical comparisons of the 4 ANOVA groups would provide some insight into the results involving the P scale scores in similar samples of injured patients and of malingerers. Unfortunately, individual item responses in SIMS studies of malingerers published by other authors (those forming our meta-analytical sample of malingerers) are not available to us at this time, only their published means and SDs.

Other noteworthy exception to the main trend in post-hoc tests in our ANOVAs is the lack of differences on the Amnestic Disorder (AM) scale and on the Low Intelligence (LI) scale between normal controls and patients with minor injuries, perhaps because the patients with only minor post-MVA injuries experienced less frequently post-concussive symptoms (especially impaired memory and concentration, and slow speed of thinking) than the high impact patients, and thus, the scores of those with only minor injuries are more similar to normal controls.

Special attention is given in the next paragraphs to the findings of lower total SIMS scores and also lower scores on SIMS Low Intelligence (LI) scale in the instructed malingerers than in patients injured in high impact MVAs: these differences were significant in the post-hoc tests at p<.05.Perhaps, with respect to the difference in SIMS total scores,the malingerers were less experienced or less familiar with the full post-MVA spectrum of symptoms than persons actually suffering from such symptoms on a daily basis, and thus the malingerers might report less symptoms on the SIMS. Similarly, the malingerers of whiplash may obtain more normal scores on the arithmetic and logical tasks of the Low Intelligence (LI) scale because they did not anticipate that post-MVA symptoms often also include impaired cognitive processing. The"warned"or cautious malingerers (such as in the study by Merten et al.[24]) might perhaps also carefully avoid errors on simple arithmetic and logical tasks. However, yet some other hypothetical comments could also be pertinent, as follows.

Combined Sample of Instructed Malingerers of Post-Concussive Symptoms and of Instructed but "Unwarned" Malingerers

Compared to whiplash, cerebral concussion is likely to be associated with higher scores on SIMS Amnestic Disorder (AM) and Low Intelligence (LI) scales due to impaired memory, impaired concentration, and slow speed of thinking.

It appears from an investigation of the content overlap of SIMS items with those of the Rivermead post-concussion syndrome scale[20] and the PMNS scale[17] (see tabular summaries in Cernovsky et al.[8]),that this overlap is somewhat more extensive for the post-concussion syndrome than for symptoms of whiplash only.

In the malingering study led by CapillaRamírez[16], 30 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*") [16].The instructions to these persons did not list any post-concussive symptoms such as impaired memory, impaired concentration, or slow speed of thinking.

In contrast, 26 undergraduates in the study led by Parks[23] were specifically instructed to feign post-concussive symptoms: they were provided with a DSM4 based list of post-concussive symptoms to study. Thus, their task consisted in feigning cognitive impairment. This can explain why their scores on SIMS Low Intelligence (LI) and also on Amnestic Disorder (AM) scales are higher than those of persons instructed to fake whiplash symptoms only (the study led by CapillaRamírez[16]),see Table 2. Since the SIMS appears to overlap somewhat more extensively with the Rivermead scale of the post-concussion syndrome than with whiplash symptoms per se, this could also be the reason for higher total SIMS scores in the Parks's study than in the one led by CapillaRamírez[16].

In Merten's study[24], the average SIMS scores of instructed but unwarned malingerers are higher than those of malingerers warned to avoid detection: the difference was statistically significant for the total SIMS score and for scores on the NI, AM, and AF scales in U tests.

Thus, a combined sample consisting only of Merten's unwarned malingerers (referred to as "naïve" malingerers in Merten's study) and of Parks's malingerers of post-concussive symptoms may have total SIMS scores and also Low Intelligence (LI) scores more similar to those of our 23 patients injured in high impact MVAs. The mean total SIMS score of this combined sample of instructed malingerers (N=42) was 28.3 (SD=11.8) and the mean LI score in that sample was 3.9 (SD=3.3). As shown in Table 5, the difference between this combined sample of malingerers (Parks's and Merten's combined) and the sample of our patients injured in high impact MVAs is no longer significant in the ANOVA. This time, the ANOVA compared the total SIMS scores and Low Intelligence (LI) scores of 4 groups:

(1) malingerers(Parks's and Merten's combined, total N=42),

(2) meta-analytically combined sample of normal controls (N=500),

(3) patients with minor whiplash injuries from MVAs (N=47),

(4) patients injured in high impact MVAs (N=23).

The ANOVA was significant and results of the post-hoc tests are listed in Table 5.

Table 5. *ANOVA on SIMS total scores and LI scores (only Parks's instructed malingerers of post-concussive symptoms and Merten's unwarned malingerers of post-MVA symptoms included to form the combined sample of instructed malingerers, N=42)*

ANOVA of SIMS total scores: F(3,608)=237.1, p<.0001
Tukey HSD Post-hoc Tests: normal controls vs patients w. minor injuries: Diff=2.8000, 95%CI=0.5556 to 5.0444, p=0.0075 normal controls vs high impact patients: Diff=18.9000, 95%CI=15.7629 to 22.0371, p=0.0000 normal controls vs instructed malingerers: Diff=20.7000, 95%CI=18.3367 to 23.0633, p=0.0000 patients w. minor injuries vs high impact patients: Diff=16.1000, 95%CI=12.3566 to 19.8434, p=0.0000 patients w. minor injuries vs instructed malingerers: Diff=17.9000, 95%CI=14.7764 to 21.0236, p=0.0000 high impact patients vs instructed malingerers: Diff=1.8000, 95%CI=-2.0159 to 5.6159, p=0.6177
ANOVA of SIMS Low Intelligence (LI) scores: F(3,608)=39.8, p<.0001
Tukey HSD Post-hoc Tests: normal controls vs patients w. minor injuries: Diff=0.6000, 95%CI=-0.1020 to 1.3020, p=0.1239 normal controls vs high impact patients: Diff=3.1000, 95%CI=2.1188 to 4.0812, p=0.0000 normal controls vs instructed malingerers: Diff=2.2000, 95%CI=1.4608 to 2.9392, p=0.0000 patients w. minor injuries vs high impact patients: Diff=2.5000, 95%CI=1.3292 to 3.6708, p=0.0000 patients w. minor injuries vs instructed malingerers: Diff=1.6000, 95%CI=0.6231 to 2.5769, p=0.0002 high impact patients vs instructed malingerers: Diff=-0.9000, 95%CI=-2.0935 to 0.2935, p=0.2116

In this ANOVA, the total SIMS scores of normal controls were significantly lower than those of patients with minor MVA injuries, and also significantly lower than those of patients injured in high impact MVAs, and also significantly lower than total SIMS scores of the 42 malingerers. Patients with minor injuries had significantly lower total SIMS scores than the 42 malingerers and also significantly lower than patients injured in high impact MVAs. The malingerers and patients injured in high impact MVAs have not differed significantly in their total SIMS scores: these two groups reported similar numbers of post-MVA medical symptoms.

With respect to the Low Intelligence scale of the SIMS, significant differences in this ANOVA were as follows. Normal controls and patients with minor MVA injuries did not differ significantly on the LI scale. Patients with minor MVA injuries obtained significantly lower LI scores than patients injured in high impact MVAs. The 42 malingerers obtained higher LI scores than normal controls and also significantly higher LI scores than patients with minor injuries, but not than patients injured in high impact MVAs: the 42 malingerers and patients injured in high impact MVAs have not differed significantly in their SIMS LI scores.

Paucity of Published SIMS Comparisons of Legitimate Patients to Malingerers

Almost no studies were published to demonstrate that the SIMS and its scales would indeed differentiate instructed malingerers from legitimate patients. Since such diagnostic distinction is the purported main goal of the SIMS, the comparative studies of malingerers and legitimate patients would be required for SIMS validation according to test construction standards specified by the American Psychological Association (APA)[26]. Perhaps the closest to proper validation was the SIMS study by CapillaRamírez's[16] which included a known group of 47 bona fide whiplash patients and 30 instructed malingerers of whiplash symptoms. In statistical comparison of these two groups,the malingerers indeed obtained significantly higher SIMS total scores and also higher scores on the Neurologic Impairment (NI), Affective Disorder (AF), and Psychosis (P) scales. However, as explained earlier, the 47 whiplash patients were carefully preselected to exclude those with objectively documented serious injuries and thus they were likely to report less symptoms than do malingerers on lists of legitimate medical symptoms such as the SIMS. A proper SIMS validation congruent with APA standards would require a more adequate group of post-MVA patients, if the SIMS is to be considered as having any capacity to differentiate malingerers from real patients with more serious MVA injuries.

The inability of the SIMS to differentiate malingerers from legitimate patients is referred to as lack of ***specificity***. This essential flaw of the SIMS obviously leads to nefarious iatrogenic consequences such as denials of health care and of lawfully due insurance benefits to injured persons, including survivors of MVAs, persons with injuries from industrial accidents, or war veterans. A systematic review of the SIMS by van Impelen, Merckelbach, Jelicic, and Merten[25] in 2014 has already warned the readers that the SIMS has "**substandard specificity**."

Various marketing texts praise the SIMS for excellent ***sensitivity***, but this only means that the SIMS detects reporting of medical symptoms, whether legitimate or feigned. It unfortunately means, in the case of the SIMS, that it tends to classify as a malingerer almost any legitimately ill person (especially those with more serious injuries) who reports more medical symptoms (those listed in the SIMS) than healthy persons do.

This irreversible flaw originates in the manner in which the SIMS was "validated." Glenn Smith (psychology student at that time) and Gary Burger (his principal faculty advisor) only compared SIMS scores of healthy undergraduates instructed to feign various medical symptoms to healthy undergraduates instructed to respond honestly[1]. Smith and Burger called this an "analogue validation" and, thus, erroneously presumed that it was adequate and successful to introduce their test for the wide distribution to psychologists, for the use on real patients. From a logical perspective, this pseudoscientific validation only demonstrated SIMS's capacity to differentiate the reporters from non-reporters of medical symptoms, but not persons feigning such symptoms from those who legitimately experience and report these symptoms.

Conclusions

The meta-analytic ANOVAs showed that neither the total SIMS scores nor any of its scales could adequately differentiate malingerers from legitimate post-MVA patients, those with more than minor injuries. As shown in other recent publications, content analyses of SIMS items demonstrated that they list legitimate medical symptoms (on scales NI, AM, AF, and LI) or consist of mainly of arithmetic or logical tasks and tasks assessing general knowledge (LI scale). Thus, malingerers and legitimate patients may obtain similarly elevated scores. Legitimate patients are branded as malingerers, especially those who experience and report higher number of symptoms. Patients experiencing and reporting more symptoms are more likely to be classified as malingerers than patients with less symptoms or also than healthy normal controls. The SIMS is essentially an iatrogenic pseudodiagnostic instrument.

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