Predicting Suicide Attempts With the SAD PERSONS Scale: A Longitudinal Analysis

James M. Bolton, MD; Rae Spiwak, MSc; and Jitender Sareen, MD

ABSTRACT

Objective: The SAD PERSONS scale is a widely used risk assessment tool for suicidal behavior despite a paucity of supporting data. The objective of this study was to examine the ability of the scale in predicting suicide attempts.

Method: Participants consisted of consecutive referrals (N = 4,019) over 2 years (January 1, 2009 to December 31, 2010) to psychiatric services in the emergency departments of the 2 largest tertiary care hospitals in the province of Manitoba, Canada. SAD PERSONS and Modified SAD PERSONS (MSPS) scale scores were recorded for individuals at their index and all subsequent presentations. The 2 main outcome measures in the study included current suicide attempts (at index presentation) and future suicide attempts (within the next 6 months). The ability of the scales to predict suicide attempts was evaluated with logistic regression, sensitivity and specificity analyses, and receiver operating characteristic curves.

Results: 566 people presented with suicide attempts (14.1% of the sample). Both SAD PERSONS and MSPS showed poor predictive ability for future suicide attempts. Compared to low risk scores, high risk baseline scores had low sensitivity (19.6% and 40.0%, respectively) and low positive predictive value (5.3% and 7.4%, respectively). SAD PERSONS did not predict suicide attempts better than chance (area under the curve = 0.572; 95% confidence interval [CI], 0.51–0.64; *P* value nonsignificant). Stepwise regression identified 5 original scale items that accounted for the greatest proportion of future suicide attempt variance. High risk scores using this model had high sensitivity (93.5%) and were associated with a 5-fold higher likelihood of future suicide attempt presentation (odds ratio = 5.58; 95% CI, 2.24–13.86; *P* < .001).

Conclusion: In their current form, SAD PERSONS and MSPS do not accurately predict future suicide attempts.

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Corresponding author: *James M. Bolton, MD, PZ430-771 Bannatyne Ave, Winnipeg, Manitoba, Canada, R3E 3N4 (jbolton@hsc.mb.ca).*

Suicide is a leading cause of death worldwide.[1] Despite the prioritization of suicide prevention policies,[2] the rate of suicide and suicidal behavior has not diminished.[3,4] Suicide attempts are among the most important risk factors for suicide completion.[5–8] Therefore, identifying individuals who are at risk of future suicide attempts is of high clinical importance, since it provides the opportunity for the delivery of timely health services that may prevent a person from completing suicide in the future.

Unfortunately, the prediction of later suicide attempts is very difficult.[9,10] Several risk factors have been identified[11–13] but suffer from poor positive predictive value.[14] A clinically appealing prospect has been to develop a simple risk assessment checklist that predicts a person's future risk of suicide based on a scale score. A prominent example is the SAD PERSONS scale, originally developed in 1983.[15] The scale is a mnemonic consisting of 10 risk factors based on literature review. Although the original study proposed the scale as a method to assess suicide risk, it was not evaluated in this regard. Since then the SAD PERSONS scale has had widespread implementation as a clinical and education tool for assessing suicide risk. It has been used in numerous countries around the world, including the United States, Canada, Taiwan, the United Kingdom, and other European nations.[16–23] It has also been widely taught to medical, nursing, and counseling students as a method for determining a patient's risk for suicide.[16,24,25] The pervasive application of the scale is contrasted by a very limited base of supporting evidence.[26] A systematic review found only 10 published studies that have evaluated the scale, with major methodological differences, small samples and sampling bias, and contrasting results.[27] No study has formally evaluated whether the SAD PERSONS scale can accurately predict future suicidal behavior in the emergency psychiatry setting.

The objective of the current study was to examine the ability of the SAD PERSONS scale, and its modified version (the Modified SAD PERSONS scale [MSPS]), to accurately assess current suicide attempts and predict future suicide attempts. With a sample size of over 4,000, a prospective follow-up period of 2 years, and physician assessment of suicidal behavior, this study was positioned to overcome many of the limitations of existing research. On the basis of previous literature, we hypothesized that scores on the SAD PERSONS scale would be correlated with suicide attempts but that the predictive accuracy of the scale would be poor.

METHOD

Setting

Data for this study come from the SAFE Database Study (Suicide Assessment Form in Emergency psychiatry), a large multisite study examining risk factors for suicide. This study is being conducted in the emergency departments of the 2 largest tertiary care hospitals in the province of Manitoba, Canada. Psychiatric services for these 2 teaching hospitals are provided 24 hours daily by psychiatric residents and staff psychiatrists associated with the Department of Psychiatry at the University of Manitoba.

Study Population

The study population included consecutive adult referrals to psychiatric services (N = 4,019). There were no exclusionary criteria. The study period was

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Clinical Points

- Clinicians should not rely solely on the SAD PERSONS scale to assess suicide attempt risk.
- Previous suicide attempts and psychiatric care remain strong risk factors for future suicide attempts.
- Risk scales should be evaluated before widespread clinical implementation.

2 years, from January 1, 2009 to December 31, 2010. This provided a recruitment time of 18 months, allowing for at least 6 months of follow-up for all participants.

Baseline Patient Assessment

Each individual in the study was assessed by a psychiatric resident, and the assessment was supervised by an attending psychiatrist. The assessment included a comprehensive psychiatric interview (collection of demographic information, review of the presenting condition, assessment of psychiatric conditions, and review of previous psychiatric contact, medical history, and developmental issues). After assessment, the physician completed the SAFE Database Study form, which included 3 clinician-assessed standardized scales: the SAD PERSONS scale,[15] the Modified SAD PERSONS scale,[21] and the Columbia Classification Algorithm of Suicide Assessment (C-CASA).[28]

Baseline Measures

SAD PERSONS scale. The 10-item scale is a mnemonic, with each letter corresponding to a potential risk factor for suicide (eAppendix 1). Each item is scored as 1 if present and 0 if absent, based on the current presentation. Original risk cutoff points included 4 score categories (0–2, 3–4, 5–6, and 7–10).[15] These have more recently been condensed into 3 categories of suicide risk, described as low, moderate, and high risk (0–4, 5–6, and 7–10, respectively),[29] and these categories were used in the current study.

Modified SAD PERSONS scale. Hockberger and Rothstein[21] showed that a modified version of the SAD PERSONS scale improved concordance between psychiatrists and non-psychiatrists on the outcome of patient disposition. The MSPS replaced the "sickness" item with "stated future intent" and weighted specific risk factors. Four scale items are weighted with scores of 2 to give a total possible score of 14 on the 10-item scale (eAppendix 1). Cutoff points determined by the same authors were described as low (0–5), moderate (6–8), and high (9–14) risk.[21]

Columbia Classification Algorithm for Suicide Assessment. The C-CASA was developed as a standardized scale to accurately classify suicidal behavior in 8 mutually exclusive categories.[28] The classification of suicidal behavior is based on clinical judgment. A significant advantage of the scale is that it differentiates between suicide attempts with intention to die and self-harm behaviors in which the individual did not intend to die. Based on the C-CASA, 2 groups of interest were established: people presenting with suicide attempts and a reference group with no suicidal ideation or behavior. Suicide attempts are defined by the C-CASA as "a potentially self-injurious behavior, associated with at least some intent to die, as a result of the act. Evidence that the individual intended to kill him/herself, at least to some degree, can be explicit or inferred from the behavior or circumstance. A suicide attempt may or may not result in actual injury."[28(p1037)] The reference group of no suicidal ideation or behavior excluded all other presentations classified by the C-CASA; only presentations without any suicidal ideation, suicidal behavior, preparatory acts toward imminent suicidal behavior, or any type of self-injury were included in the reference group. The 2 main outcome measures in the study included current suicide attempts and future suicide attempts. Current suicide attempts included people with an index presentation that featured a suicide attempt as assessed by C-CASA. Future suicide attempts were defined as people who had an index presentation (including suicidal and nonsuicidal presentations) and then presented within the next 6 months with a suicide attempt. This time frame was chosen based on its use in previous studies examining the prediction of future suicidal behavior.[10,30]

Statistical Analysis

Data were analyzed using SPSS 17.0 Statistical Software (Predictive Analytics SoftWare [PASW] version 17.0 for Windows, SPSS Inc, Chicago, Illinois). In order to assess both current and future suicide attempts, total scores for both SAD PERSONS and MSPS tools were calculated, and binary logistic regression analyses were conducted to determine if total scores predicted either current suicide attempt or future suicide attempt. Binary logistic regression analyses were also used to determine if risk groups (low, moderate, and high risk scores) predicted current or future suicide attempt. Sensitivity, specificity, positive predictive values and negative predictive values were calculated using the previously established risk cutoff points. Comparisons were made between high and low risk scores (moderate risk scores removed to compare presentations with presumably clearly identifiable levels of risk) and then with moderate risk scores combined with either low risk or high risk scores (the latter approach had been used in a previous study[21]).

In the current suicide attempt analyses, only records from people with index presentations of suicide attempts (outcome of interest) and no suicidal thoughts or behavior (reference group) were included. For individuals with multiple presentations, only the first was used in order to maintain the statistical assumption of independence of observation. For future suicide attempts, analyses included only the records of people with a suicide attempt within 6 months of index presentation (outcome of interest) and records from the reference group (individuals with multiple visits [but no future suicide attempt] as well as individuals with only 1 presentation). Among individuals with a future suicide attempt, their SAD PERSONS or MSPS score from the emergency department presentation immediately prior to their suicide attempt was used. For individuals with

Table 1. Associations Between SAD PERSONS and MSPS Scale Scores and Current Suicide Attempts in Adult Referrals to Psychiatric Services in the Emergency Departments of 2 Tertiary Care Hospitals

	SAD PERSONS (n = 1,520)				Modified SAD PERSONS (MSPS) (n = 1,440)			
Risk Group	Score Range	No Suicidal Behavior, n (%)	Suicide Attempt, n (%)	Odds Ratio (95% CI)	Score Range	No Suicidal Behavior, n (%)	Suicide Attempt, n (%)	Odds Ratio (95% CI)
Total score	0–10	1,120 (73.7)	400 (26.3)	1.46 (1.36–1.58)***	0–14	1,055 (73.3)	385 (26.7)	1.60 (1.50–1.71)***
Low risk	0–4	794 (70.9)	198 (49.5)	1.00	0–5	817 (77.4)	150 (39.0)	1.00
Moderate risk	5–6	304 (27.1)	139 (34.8)	1.83 (1.50–2.35)***	6–8	236 (22.4)	129 (33.5)	2.98 (2.26–3.93)***
High risk	7–10	22 (2.0)	63 (15.8)	11.48 (6.90–19.12)***	9–14	2 (0.2)	106 (27.5)	288.67 (70.50–1182.05)***
		Risk Group Comparisons				Risk Group Comparisons		
Statistical Measure		High vs Low	Moderate and High[a] vs Low	High vs Moderate and Low[b]		High vs Low	Moderate and High[c] vs Low	High vs Moderate and Low[d]
Sensitivity	…	0.241	0.505	0.158	…	0.414	0.610	0.275
Specificity	…	0.973	0.709	0.980	…	0.997	0.774	0.998
Positive predictive value	…	0.741	0.383	0.741	…	0.981	0.497	0.981
Negative predictive value	…	0.800	0.800	0.765	…	0.845	0.845	0.791

***$P < .001$.
[a]Moderate and high risk scores for the SAD PERSONS range from 5–10.
[b]Moderate and low risk scores for the SAD PERSONS range from 0–6.
[c]Moderate and high risk scores for the MSPS range from 6–14.
[d]Moderate and low risk scores for the MSPS range from 0–8.

multiple future suicide attempts, only the first contributed to the analyses.

Backward stepwise logistic regression was used to determine the most parsimonious predictive models for both current and future suicide attempts by selecting the individual items of both scales that independently explained the greatest proportion of variance in the outcome. Receiver operating characteristic (ROC) curve analyses were conducted to determine optimum cutoff points for assessing both current and future suicide attempts using the original SAD PERSONS tool, the MSPS, as well as the models yielded by the stepwise regressions. Area under the curve (AUC) statistics, as well as sensitivity, specificity, positive predictive values, and negative predictive values were determined for the newly calculated cutoff points. Area under the curve accuracy scores were interpreted as low (0.5–0.7), moderate (0.7–0.9), and high (> 0.9) based on existing literature.[31] Binary logistic regression analyses were also conducted to examine the association between the ROC-determined cutoff points and suicide attempts. The prevalence of missing data for the scales ranged from 14.6%–18.5%. Analyses of missing data showed that individuals with missing data for SAD PERSONS and MSPS scale items were not statistically different from those individuals with available data. Missing data were therefore removed from the analyses.

Ethical Approval

The study was approved by the Research Ethics Board of the University of Manitoba.

RESULTS

Sample Description: Demographics and Suicidal Behavior Type at Presentation

Over the course of the study period, there were 4,019 presentations to emergency psychiatric services at the 2 hospitals, with men accounting for just over half of the presentations (51.6%). Based on mutually exclusive C-CASA categorization, 566 (14.1%) of the presentations were suicide attempts in which the person intended to die. Of these, 244 (43.1%) were men and 322 (56.9%) were women. Suicidal ideation featured in 1,258 presentations (31.3%), and 1,721 presentations (42.8%) had no suicidal ideation or behavior. The remaining 474 presentations (11.8%) were classified within the remaining C-CASA categories (for example, "self-injurious behavior, no suicidal intent"). Eighty-seven people (2.2%) were seen again by psychiatry with a suicide attempt within 6 months of their previous assessment. Of these, 41 (47.1%) were men, and 46 (52.9%) were women. The mean scale scores for the SAD PERSONS and MSPS were 4.06 (standard deviation = 1.68) and 5.26 (standard deviation = 2.52), respectively.

Table 2. Backward Stepwise Regression Model for Current Suicide Attempts (n = 1,437)[a]

Covariates	Adjusted Odds Ratio[b] (95% CI)
Sex, male	0.64 (0.44–0.94)**
Age (< 19 y or > 45 y)	0.68 (0.46–1.01)
Depression or hopelessness	2.38 (1.63–3.50)***
Previous attempts or psychiatric care	1.54 (1.05–2.25)**
Ethanol or drug abuse	3.51 (2.39–5.15)***
Rational thinking loss	0.13 (0.08–0.23)***
Organized plan or serious attempt	314.4 (72.1–1370.6)***
Sickness	0.62 (0.38–1.02)
Stated future intent	82.3 (25.5–265.8)***
Total score[c]	1.90 (1.73–2.09)***

**$P < .01$; ***$P < .001$.
[a]Model contains scale items selected in stepwise regression.
[b]Adjusted odds ratios show the association between scale items and current suicide attempts, simultaneously adjusted for other scale items.
[c]Total score shows the association between increasing number of model items and current suicide attempts.

Current Suicide Attempt

Table 1 shows the relationship between scale scores and current suicide attempts. Using the previously defined risk

Table 3. Associations Between SAD PERSONS and MSPS Scale Scores and Future Suicide Attempt Presentations Within 6 Months

	SAD PERSONS (n = 2,846)				Modified SAD PERSONS (MSPS) (n = 2,713)			
Risk Group	Score Range	No Suicidal Behavior, n (%)	Suicide Attempt, n (%)	Odds Ratio (95% CI)	Score Range	No Suicidal Behavior, n (%)	Suicide Attempt, n (%)	Odds Ratio (95% CI)
Total score	0–10	2,766 (97.2)	80 (2.8)	1.19 (1.05–1.36)**	0–14	2,637 (97.2)	76 (2.8)	1.18 (1.08–1.28)***
Low risk	0–4	1,741 (62.9)	41 (51.2)	1.00	0–5	1,604 (60.8)	33 (43.4)	1.00
Moderate risk	5–6	847 (30.6)	29 (36.3)	1.45 (0.90–2.36)	6–8	757 (28.7)	21 (27.2)	1.35 (0.78–2.35)
High risk	7–10	178 (6.4)	10 (12.5)	2.39 (1.18–4.84)**	9–14	276 (10.5)	22 (28.9)	3.87 (2.23–6.75)***
		Risk Group Comparisons				Risk Group Comparisons		
Statistical Measure		High vs Low	Moderate and High[a] vs Low	High vs Moderate and Low[b]		High vs Low	Moderate and High[c] vs Low	High vs Moderate and Low[d]
Sensitivity	…	0.196	0.488	0.125	…	0.400	0.567	0.289
Specificity	…	0.907	0.629	0.936	…	0.905	0.608	0.895
Positive predictive value	…	0.053	0.038	0.053	…	0.074	0.042	0.074
Negative predictive value	…	0.977	0.977	0.974	…	0.980	0.980	0.978

**$P < .01$; ***$P < .001$.
[a]Moderate and high risk scores for the SAD PERSONS range from 5–10.
[b]Moderate and low risk scores for the SAD PERSONS range from 0–6.
[c]Moderate and high risk scores for the MSPS range from 6–14.
[d]Moderate and low risk scores for the MSPS range from 0–8.

Table 4. Backward Stepwise Regression Model[a] (n = 2,703) for Predicting Future Suicide Attempt Presentations Within 6 Months

Covariates	Adjusted Odds Ratio[b] (95% CI)
Previous attempts or psychiatric care	4.08 (2.01–8.28)***
Ethanol or drug abuse	1.75 (1.08–2.82)**
Stated future intent	2.00 (1.22–3.14)**
Age (< 19 y or > 45 y)	0.50 (0.29–0.86)*
Rational thinking loss	0.34 (0.17–0.69)**
Total score[c]	1.36 (1.09–1.70)**

*$P < .05$; **$P < .01$; ***$P < .001$.
[a]Model contains scale items selected in stepwise regression.
[b]Adjusted odds ratios show the association between scale items and future suicide attempts, simultaneously adjusted for other scale items.
[c]Total score shows the association between increasing number of model items and future suicide attempts.

cutoff points, with low risk as the reference, showed that both medium and high risk scores on both scales were associated with suicide attempts. However, half of the individuals presenting with a suicide attempt were categorized as low risk by the SAD PERSONS scale, and one-quarter of people scoring in the high risk SAD PERSONS category had no suicidal behavior. Compared to low risk scores, the sensitivity of high risk scores on SAD PERSONS and MSPS for identifying current suicide attempts was 24% and 41%, respectively.

Table 2 displays the results of the backward stepwise regression analysis of the individual items of both scales and their relationship to current suicide attempt. Nine of the original items were retained in the final model. Two of these were significantly negatively correlated with current suicide attempts (male sex, rational thinking loss) and another 2 showed a trend toward negative correlation (age < 19 years or > 45 years, sickness). Increasing scale scores were associated with current suicide attempt (adjusted odds ratio [OR] = 1.90; 95% CI, 1.73–2.09; $P < .001$).

Future Suicide Attempt

Scoring in the high risk category of both scales was correlated with future suicide attempts when compared to individuals who were classified as low risk at baseline (Table 3). Comparing high risk to low risk scores revealed low sensitivity values, with rates of 19.6% for SAD PERSONS and 40.0% for MSPS, indicating a large false-negative rate. Combining moderate risk scores with high risk scores improved sensitivity to 48.8% and 56.7%, respectively, but at a cost of reduced specificity (62.9% and 60.8%, respectively). Positive predictive values were very low for both scales. At most, only 5.3% and 7.4% of people categorized at baseline as high risk using SAD PERSONS and MSPS, respectively, presented with a suicide attempt within the next 6 months.

The regression modeling for future suicide attempts is presented in Table 4. Backward stepwise regression selected 5 scale items to include in the predictive model. Similar to the modeling for current suicide attempts, age and rational thinking loss were negatively correlated with future suicide attempts. The reference groups for these 2 variables were reversed and the regression analysis was repeated. Age 19–45 years was correlated with future suicide attempt presentations (adjusted OR = 2.01; 95% CI, 1.17–3.45; $P < .05$), as was the absence of rational thinking loss (adjusted OR = 1.71; 95% CI, 1.20–2.44; $P < .01$). Reversing the reference groups increased the odds between scale scores and suicide attempts from 1.36 (95% CI, 1.09–1.70; $P < .01$) to 1.69 (95% CI, 1.37–2.10; $P < .001$).

ROC Analysis

Table 5 displays the ROC analysis for SAD PERSONS, MSPS, and the stepwise regression models (with revised reference groups) in terms of their relationship with current and future suicide attempts. In the assessment of current suicide attempts, the 9-item stepwise model yielded the highest AUC (0.874; 95% CI, 0.85–0.89), with an optimum cutoff point of 4. This model and cutoff point also provided the highest sensitivity, specificity, positive predictive values, and negative predictive values when compared to MSPS and SAD PERSONS. When predicting future suicide attempt presentations

Table 5. Receiver Operating Characteristic Analysis for the Assessment of Current Suicide Attempts and Prediction of Future Suicide Attempt Presentations Within 6 Months

Scale	n	Cutoff Point[a]	Odds Ratio[b] (95% CI)	Area Under the Curve (95% CI)	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
SAD PERSONS (10 items)								
Optimum cutoff for current suicide attempt	1,520	3	2.40 (1.87–3.09)***	0.657 (0.63–0.69)***	0.733	0.438	0.330	0.830
Optimum cutoff for future suicide attempt	2,846	2	1.92 (0.95–3.86)	0.572 (0.51–0.64)	0.888	0.196	0.031	0.984
Modified SAD PERSONS (MSPS) (10 items)								
Optimum cutoff for current suicide attempt	1,440	3	2.45 (1.87–3.31)***	0.738 (0.71–0.77)***	0.813	0.364	0.318	0.842
Optimum cutoff for future suicide attempt	2,713	3	1.74 (0.97–3.13)	0.613 (0.55–0.68)**	0.816	0.283	0.032	0.982
Final models								
9-item risk model, optimum cutoff for current suicide attempt	1,450	4	17.99 (12.53–25.83)***	0.874 (0.85–0.89)***	0.904	0.656	0.488	0.950
5-item risk model, optimum cutoff for future suicide attempt	2,771	1	5.58 (2.24–13.86)***	0.665 (0.61–0.72)***	0.935	0.279	0.036	0.993

**$P < .01$; ***$P < .001$.
[a]Cutoff point is grouped in the low risk category. For example, for SAD PERSONS, current suicide attempts (cutoff point = 3), low risk scores are 0–3, and high risk scores are 4–10.
[b]Odds ratios show the association between high risk scores and suicide attempts, with the reference group being low risk scores.

within 6 months, SAD PERSONS had an AUC of 0.572 (nonsignificant), suggesting the scale was no better than chance. The MSPS showed better performance in the prediction of future suicide attempt presentations with a significant, albeit low accuracy AUC of 0.613 (95% CI, 0.55–0.68). Scores of 4 or more were not associated with suicide attempts in regression analysis. The 5-item model outperformed the other 2 with an AUC of 0.665 (95% CI, 0.61–0.72), although again this value reflected a low accuracy for predicting future suicide attempt presentations. An optimum cutoff point of 1 yielded a very good sensitivity of 0.935 but a low specificity (0.279). Scores of 2 or greater on the 5-item model were significantly associated with future suicide attempt presentations (OR = 5.58; 95% CI, 2.24–13.86; $P < .001$).

DISCUSSION

This study provides the most comprehensive evaluation of the SAD PERSONS and MSPS scales in their ability to assess and predict suicide attempts. These are commonly used scales that have been widely implemented in clinical settings to assess suicide risk despite very little evidence to support their use. Using a very large sample of physician-assessed patients, this study reveals that neither the SAD PERSONS nor the MSPS reliably assesses or predicts suicide attempts. Although this study was limited to examining suicide attempts as an outcome, and thus further studies are required to examine their ability to predict suicide, these results cast a doubtful shadow on the utility of these scales in the assessment of suicidal individuals.

In their current form, the SAD PERSONS and MSPS do not perform well in the assessment of current suicide attempts, and especially in the prediction of future suicide attempts. One reason may be the chosen cut-points for risk categorization. These provide a maximum sensitivity of 51% and 61% respectively for SAD PERSONS and MSPS when assessing current suicide attempts, showing that almost half of suicide attempts are missed at the time of presentation. Likewise, baseline risk assessment will incorrectly classify almost 50% of individuals who attempt suicide within the next 6 months as low risk. For the purposes of suicide prevention, a low false-negative rate is perhaps the most important psychometric of a risk scale. Both scales also had very low positive predictive values for future suicide attempts. The clinician thus faces a difficult challenge if using the scales to decide on patient disposition, since only a small minority of identified high risk individuals will attempt suicide within 6 months.

Another possible reason for their suboptimal performance is the chosen items assessed in the scale. In their current form, SAD PERSONS and MSPS include several items that do not independently account for the variance in suicide attempts. When predicting future suicide attempt presentations, only 5 original scale items were selected in stepwise regression modeling. Interestingly, age (< 19 or > 45 years) and rational thinking loss were significantly negatively correlated with future suicide attempts, and thus their reference groups were actually associated with risk of future suicide attempt. The stepwise models, composed of fewer items (and for some variables, reversed reference groups), showed greater performance than SAD PERSONS and MSPS in identifying current attempts and predicting future attempts. The refined 5-item model showed an impressive 94% sensitivity rate when using a cutoff score of 1, with individuals with scores of 2 or more being over 5 times more likely to attempt suicide within 6 months. There are several possible explanations for these findings. One is that some original scale factors are not associated with suicide attempts. They may instead be associated with completed suicide, or may not be involved at all in suicidal behavior. Another explanation is that these items are associated with suicide attempts but are collinear with other factors that account for a higher degree of variance. It is also possible that some items may be associated with external factors that reduce a person's risk of subsequent attempt. For example, an individual presenting to psychiatric services with rational thinking loss may be more likely to receive treatment that reduces their risk of attempting suicide. This may explain the counterintuitive findings observed in the stepwise analyses.

Findings from this study suggest that a previous suicide attempt or history of psychiatric care, substance abuse, stated future suicidal intent, ages 19–45 years, and an absence of rational thinking loss are 5 important risk factors for future suicide attempt presentations within 6 months. Receiver operating characteristic analyses demonstrated that a scale based only on these factors had improved sensitivity for future suicide attempts when compared to SAD PERSONS and MSPS. However, it showed low positive predictive values and overall low accuracy, suggesting that it is insufficient to accurately predict suicide risk.

This study has several limitations that warrant attention. The first is that the outcome in this study was suicide attempts, and thus these findings do not apply to the risk for suicide. It is possible, for example, that scale items found not to be associated with suicide attempts may in fact be important in predicting completed suicide. A second limitation applies to the capture of suicide attempts. The assessment of suicide attempts was restricted to people who presented to the emergency departments at the 2 study hospitals. People may have attempted suicide and not come to hospital, or instead presented to one of the other hospitals in the region. It is also possible that some study participants completed suicide. Suicidal behavior may have also been inaccurately classified during the assessments. In an effort to reduce these sources of bias, this study used a standardized measure to categorize suicidal behavior (the C-CASA), all assessments were conducted by physicians with psychiatric training, and the sample included consecutive referrals to psychiatry. The study was also conducted at the 2 main tertiary care hospitals in the province, which are responsible for the highest number of patient contacts. Finally, there are other unmeasured factors that may have potentially influenced the relationship between initial and subsequent presentations to emergency psychiatric services, such as the type of care received for different mental disorders, or the management of different suicidal presentations.

In conclusion, the SAD PERSONS and MSPS scales do not appear to be effective tools to assess suicide attempt risk. Limited sensitivity and an inability to predict future suicide attempts suggest that they should not be used in isolation to inform clinical decisions regarding patient safety. These results call for thorough evaluation of risk assessment scales and other measures prior to their clinical implementation and use for educational purposes.

Author affiliations: Department of Psychiatry (Drs Bolton and Sareen), Department of Psychology (Drs Bolton and Sareen), and Department of Community Health Sciences (Dr Sareen and Ms Spiwak), University of Manitoba, Winnipeg, Manitoba, Canada.
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Additional information: The SAFE database resides within the Department of Psychiatry, University of Manitoba, Canada. Data can be accessed by request to the corresponding author (James M. Bolton, MD).
Supplementary material: see accompanying pages.

REFERENCES

1. World Health Organization. Suicide Prevention (SUPRE). http://www.who.int/mental_health/prevention/suicide/suicideprevent/en/index.html. Accessed July 22, 2011.
2. US Public Health Service. *The Surgeon General's Call to Action to Prevent Suicide*. Washington, DC: US Public Health Service; 1999.
3. Nock MK, Borges G, Bromet EJ, et al. Suicide and suicidal behavior. *Epidemiol Rev*. 2008;30(1):133–154.
4. Kessler RC, Berglund P, Borges G, et al. Trends in suicide ideation, plans, gestures, and attempts in the United States, 1990–1992 to 2001–2003. *JAMA*. 2005;293(20):2487–2495.
5. Harris EC, Barraclough B. Suicide as an outcome for mental disorders: a meta-analysis. *Br J Psychiatry*. 1997;170(3):205–228.
6. Jenkins GR, Hale R, Papanastassiou M, et al. Suicide rate 22 years after parasuicide: cohort study. *BMJ*. 2002;325(7373):1155.
7. Suominen K, Isometsä E, Suokas J, et al. Completed suicide after a suicide attempt: a 37-year follow-up study. *Am J Psychiatry*. 2004;161(3):562–563.
8. Tidemalm D, Langstrom N, Lichtenstein P, et al. Risk of suicide after suicide attempt according to coexisting psychiatric disorder: Swedish cohort study with long term follow-up. *BMJ*. 2008;337:a2205.
9. Jollant F, Bellivier F, Leboyer M, et al. Impaired decision making in suicide attempters. *Am J Psychiatry*. 2005;162(2):304–310.
10. Nock MK, Park JM, Finn CT, et al. Measuring the suicidal mind: implicit cognition predicts suicidal behavior. *Psychol Sci*. 2010;21(4):511–517.
11. Joiner TE Jr, Brown JS, Wingate LR. The psychology and neurobiology of suicidal behavior. *Annu Rev Psychol*. 2005;56(1):287–314.
12. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1999;56(7):617–626.
13. Nock MK, Hwang I, Sampson N, et al. Cross-national analysis of the associations among mental disorders and suicidal behavior: findings from the WHO World Mental Health Surveys. *PLoS Med*. 2009;6(8):e1000123.
14. Bolton JM, Pagura J, Enns MW, et al. A population-based longitudinal study of risk factors for suicide attempts in major depressive disorder. *J Psychiatr Res*. 2010;44(13):817–826.
15. Patterson WM, Dohn HH, Bird J, et al. Evaluation of suicidal patients: the SAD PERSONS scale. *Psychosomatics*. 1983;24(4):343–345, 348–349.
16. Crawford MJ, Turnbull G, Wessely S. Deliberate self harm assessment by accident and emergency staff—an intervention study. *J Accid Emerg Med*. 1998;15(1):18–22.
17. Bullard MJ. Problems of suicide risk management in the emergency department without fixed, full-time emergency physician. *Changqeng Yi Xue Za Zhi*. 1993;16(1):30–38.
18. Herman SM. Is the SAD PERSONS scale accurate for the Veterans Affairs population? *Psychol Serv*. 2006;3(2):137–141.
19. Cochrane-Brink KA, Lofchy JS, Sakinofsky I. Clinical rating scales in suicide risk assessment. *Gen Hosp Psychiatry*. 2000;22(6):445–451.
20. Ryan J, Rushdy A, Perez-Avila CA, et al. Suicide rate following attendance at an accident and emergency department with deliberate self harm. *J Accid Emerg Med*. 1996;13(2):101–104.
21. Hockberger RS, Rothstein RJ. Assessment of suicide potential by nonpsychiatrists using the SAD PERSONS score. *J Emerg Med*. 1988;6(2):99–107.
22. Kurz A, Moller H-J, Torhorst A, et al. Validation of six risk scales for suicide attempters. In: Moller H-J, Schmidtke A, Weiz R, eds. *Current Issues of Suicidology*. Berlin, Germany: Springer; 1988:174–178.
23. Chen WJ, Chen CC, Ho CK, et al. The suitability of the BSRS-5 for assessing elderly who have attempted suicide and need to be referred for professional mental health consultation in a metropolitan city, Taiwan. *Int J Geriatr Psychiatry*. 2009;24(10):1151–1157.
24. Juhnke GA, Hovestadt AJ. Using the SAD PERSONS scale to promote

supervisee suicide assessment knowledge. *Clin Supervisor*. 1995;13(2):31–40.
25. Chen YA, Tran C. *The Toronto Notes 2011*. Toronto, ON: Toronto Notes for Medical Students, Inc; 2011.
26. Khan SS. Towards evidence based emergency medicine: best BETs from the Manchester Royal Infirmary. BET 3. SADPERSONS scale in assessing self harm risk. *Emerg Med J*. 2011;28(4):335–336.
27. Warden S, Spiwak R, Sareen J, et al. The SAD PERSONS scale for suicide risk assessment: a systematic review. Poster presented at the Annual Meeting of the American Psychiatric Association; May 14, 2011; Honolulu HI.
28. Posner K, Oquendo MA, Gould M, et al. Columbia Classification Algorithm of Suicide Assessment (C-CASA): classification of suicidal events in the FDA's pediatric suicidal risk analysis of antidepressants. *Am J Psychiatry*. 2007;164(7):1035–1043.
29. Wikipedia. SAD PERSONS Scale. http://en.wikipedia.org/wiki/SAD_PERSONS_scale. Accessed July 22, 2011.
30. Cha CB, Najmi S, Park JM, et al. Attentional bias toward suicide-related stimuli predicts suicidal behavior. *J Abnorm Psychol*. 2010;119(3):616–622.
31. Fischer JE, Bachmann LM, Jaeschke R. A readers' guide to the interpretation of diagnostic test properties: clinical example of sepsis. *Intensive Care Med*. 2003;29(7):1043–1051.

Supplementary material follows this article.

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Supplementary Material

Article Title: Predicting Suicide Attempts With the SAD PERSONS Scale: A Longitudinal Analysis

Author(s): James M. Bolton, MD; Rae Spiwak, MSc; and Jitender Sareen, MD

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List of Supplementary Material for the article

1. **eAppendix 1** SAD PERSONS and Modified SAD PERSONS (MSPS) Scales

Disclaimer

This Supplementary Material has been provided by the author(s) as an enhancement to the published article. It has been approved by peer review; however, it has undergone neither editing nor formatting by in-house editorial staff. The material is presented in the manner supplied by the author.

eAppendix 1. SAD PERSONS and Modified SAD PERSONS (MSPS) Scales

SAD PERSONS

S	Male sex
A	Age <19 or >45
D	Depression
P	Previous attempt
E	Ethanol abuse
R	Rational thinking loss
S	Social supports lacking
O	Organized plan
N	No spouse
S	Sickness

Note: Each item scored as 1 if present

Modified SAD PERSONS Scale (MSPS)

S	Male sex
A	Age <19 or >45
D*	Depression or hopelessness
P	Previous attempts or psychiatric care
E	Excessive ethanol or drug use
R*	Rational thinking loss
S	Single, divorced, or widowed
O*	Organized or serious attempt
N	No social supports
S*	Stated future intent

Note: *items scored as 2 if present, other items scored as 1. Both scales are in the public domain.