



Original Article

# Brøset Violence Checklist (BVC) versus Dynamic Appraisal of Situational Aggression-Inpatient Version (DASA-IV): their sensitivity, specificity and accuracy as a predictor of violence in 24 hours among schizophrenia patients

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## ABSTRACT

**Background:** Brøset Violence Checklist (BVC) and Dynamic Appraisal of Situational Aggression-Inpatient Version (DASA-IV) are risk assessment instruments of violence that nurses can use in psychiatric services, but their accuracy of the instruments in predicting violent behavior in 24 hours need to be tested.

**Objective:** This study aims to examine the sensitivity and specificity of BVC and DASA-IV instruments in predicting violent behavior within 24 hours and which is more accurate.

**Method:** This is a diagnostic study with a cross-sectional approach. The sample of this study was 112 patients. The respondents' behaviors were observed, based on parameters assessed by BVC and DASA-IV as well as recording incidents of violent behavior using AOS (Aggression Observation Short) as the gold standard. Sensitivity, specificity, and Receiver Operating Characteristic (ROC) tests were conducted to assess the accuracy of the two instruments in predicting violent behavior within 24 hours.

**Results:** 23.2% of the respondents in this study experienced violent behavior in the first 24 hours. BVC has a sensitivity value of 65.4% and specificity of 94.2%. DASA-IV has a sensitivity value of 69.2% and a specificity of 95.3%. The level of accuracy of BVC is 87.9%, and of DASA-IV is 92.2%.

**Conclusion:** DASA-IV is more sensitive, higher in its specificity, and is more accurate in predicting violent behavior within 24 hours in schizophrenic patients compared to BVC.

## INTRODUCTION

The prevalence of people with schizophrenia in 2019, according to the World Health Organization (WHO), is 20 million people worldwide.<sup>1</sup> People with schizophrenia are closely related to the risk of increased violent behavior.<sup>2</sup> The incidence of violent behavior in Chinese psychiatric wards is 15.3%-53.2% among 3941 schizophrenic patients.<sup>3</sup> Studies from 10 countries in Europe illustrate the number of violent behavior of patients around 16-42% in some acute psychiatric and forensic services.<sup>4</sup>

Acute psychiatric wards treat patients with emergency criteria that threaten and endanger health, safety, and the environment from their violent behavior.<sup>5</sup> Violent behavior can occur in the range of 1 to 3 days after treatment. However, the patient's highly fluctuating conditions can cause the violence to occur even only within hours of admission to the inpatient ward.<sup>6</sup> The result of studies indicated that the patients were recorded to show their violent behavior mostly on the first day and had a high score on risk assessment using BVC.<sup>7,8</sup>

Violence risk assessment is a strategy that can be used to reduce the occurrence of violent behavior.<sup>9,10</sup> Some types

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of risk assessment instruments include Historical Clinical Risk Management-20 (HCR-20), Violence Risk Appraisal Guide (VRAG), McNeil Binder Violence Screening Checklist (VSC), but to complete the assessment using them takes a long time.<sup>11-14</sup> Other risk assessments available are BVC and DASA-IV, which nurses can do in predicting violent behavior within 24 hours.<sup>15,16</sup> Short-term prediction instruments based on clinical conditions in acute wards are more feasible than considering historical factors that are not necessarily available in the initial assessment.<sup>15</sup>

Researches have been done to assess the sensitivity and specificity of BVC and DASA-IV, but none of them compared their sensitivity in predicting violent behavior within 24 hours. Previous studies with various psychiatric diagnostic characteristics obtained a sensitivity value of 77% and a specificity of 100% for BVC and 68.1% and 70.0% in its respective values for DASA-IV.<sup>15,17</sup> A study in the Chinese forensics room aimed as a psychometric test for the DASA-IV employed BVC and DASA-IV in their sample, but it did not compare the accuracy level.<sup>18</sup> This study aims to assess the sensitivity and specificity of the BVC and DASA-IV instruments in predicting violent behavior within 24 hours and which one is more accurate between the two.

**METHOD**

**Study Design**

This is diagnostic research with a cross-sectional.

**Setting and Respondent**

The study was done from 12 February until 18 March 2020 in the acute psychiatric ward of the Surakarta Regional Mental Hospital. The population was schizophrenic patients who were hospitalized with a total sample of 112 patients.<sup>19</sup> The criteria for inclusion of samples were those hospitalized recently in acute psychiatric wards and not those with drug abuse. The criteria for exclusion were the patients with fixation at the time of arrival in the acute psychiatric ward and those not transferred from the non-acute ward. The samples were selected using a consecutive sampling based on inclusion and exclusion criteria until the number of samples was reached.

**The Instrument and Measurement**

The research instruments were BVC, DASA-IV, and the gold standard used AOS. The measurements were made three times in the first 24 hours by enumerators from the nurse on duty. Each assessment parameter was given a value of 0 if there is no change in behavior and 1 point for an increase in behavior. BVC instrument data were categorized as low risk if the score was 0, the moderate risk was 1-2, and the high risk was more than 2.<sup>15,20</sup> For DASA-IV instruments, it was low if the score was 0-1, moderate with a score of 2-3, and the high risk with a score of more

than.<sup>21</sup> The AOS instrument data was based on observations of patients who did a violent behavior (verbal, threatening, or harmful).<sup>22</sup> The enumerators had been tested for Kappa reliability with the result of a high level of agreement.

**Data Analysis**

The data analysis included sensitivity, specificity, and ROC tests to assess the instruments' accuracy in predicting violent behavior in schizophrenic patients in 24 hours.

**Ethical Consideration**

This study has been passed as ethical by the Health Research Ethics Committee of Dr. Moewardi Hospital Surakarta with number: 174/1 / HREC / 2020.

**RESULTS**

Characteristics of the respondents with a majority of males, the dominant age cohort is late adulthood, and education is a high school (Table 1). Tables 2 and 3 show the test results of sensitivity, specificity, positive predictive value, and negative predictive value from the BVC and DASA-IV instruments. Twenty-six respondents (23.2%) out of 112 respondents committed violent behavior. The BVC instrument has a sensitivity value of 65.4%, specificity of 94.2%, a positive predictive value of 77.3%, and a negative predictive value of 90.0%. The DASA-IV obtained a sensitivity value of 69.2%, specificity of 95.3%, a positive predictive value of 81.8%, and a negative predictive value of 91.1%.

**Table 1.** The characteristics of the respondents

Characteristics	Frequency	Percentage
<b>Sex</b>		
Male	63	56.2 %
Female	49	43.8 %
<b>Age (years)</b>		
Early teens (12-16)	2	1.8 %
Late teens (17-25)	15	13.4 %
Early adult (26-35)	35	31.2 %
Late adult (36-45)	41	36.6 %
Early elderly (46-55)	19	17.0 %
<b>Education</b>		
Non-educated	5	4.5 %
Elementary	31	27.7 %
Middle	31	27.7 %
High	42	37.5 %
Higher education	3	2.7 %

The ROC curve between the BVC and DASA-IV is shown in figure 1. Figure 1 shows the difference in AUC value between BVC and DASA-IV, showing DASA-IV is higher than BVC. The BVC value is 87.9% (95% CI: 79.4% - 96.5%), p-value of 0.001, and the DASA-IV value is 92.2% (95% CI: 87% -97.3 %), p-value 0.0001. This indicates that

DASA-IV is a more accurate instrument in predicting violent behavior of schizophrenic patients within 24 hours, compared to BVC.

**Table 2.** Sensitivity and specificity test of BVC

		AOS		
		Positive	Negative	Total
BVC	Positive	17	5	22
	Negative	9	81	90
	Total	26	86	112

Sensitivity :  $[A : (A+C)] \times 100\% = [17 : 26] \times 100\% = 65.4\%$

Specificity :  $[D : (B+D)] \times 100\% = [81 : 86] \times 100\% = 94.2\%$

Positive predictive value:  $[A : (A+B)] \times 100\% = [17 : 22] \times 100\% = 77.3\%$

Negative predictive value:  $[D : (C+D)] \times 100\% = [81 : 90] \times 100\% = 90.0\%$

**Table 3.** Sensitivity and specificity test of DASA-IV

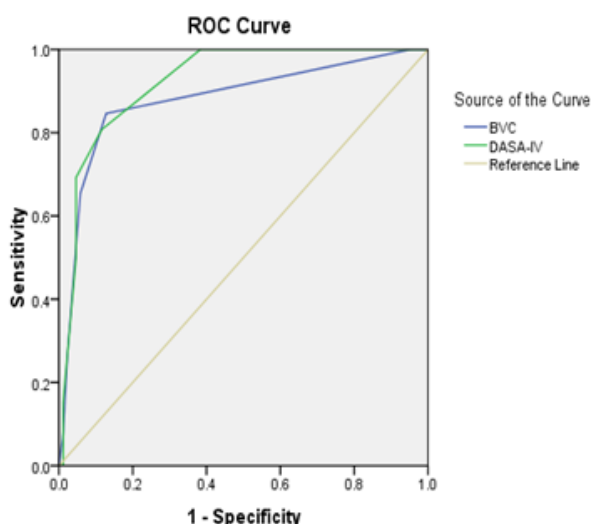
		AOS		
		Positive	Negative	Total
DASA-IV	Positive	18	4	22
	Negative	8	82	90
	Total	26	86	112

Sensitivity :  $[A : (A+C)] \times 100\% = [18 : 26] \times 100\% = 69.2\%$

Specificity :  $[D : (B+D)] \times 100\% = [82 : 86] \times 100\% = 95.3\%$

Positive predictive value :  $[A : (A+B)] \times 100\% = [18 : 22] \times 100\% = 81.8\%$

Negative predictive value:  $[D : (C+D)] \times 100\% = [82 : 90] \times 100\% = 91.1\%$



**Figure 2.** The ROC curve of BVC and DASA-IV

**DISCUSSION**

The study obtained the values of AUC, sensitivity, the specificity of BVC, and DASA-IV, which are in line with previous studies. The BVC study in a Chinese psychiatric ward with patients' characteristics of 70% schizophrenics resulted in an AUC of 85%, sensitivity of 62.8%, and specificity of 96.2%.<sup>23</sup> DASA-IV research on acute wards

in England showed an AUC of 84%, sensitivity of 77% and specificity of 82%.<sup>16</sup> Another study in Chinese forensic wards revealed the values of DASA-IV with AUC scores of 97.3% (95% CI: 0.953 - 0.992,  $p < 0.001$ ).<sup>18</sup> DASA-IV shows an AUC result classified as very good while the BVC is classified as useful.<sup>24</sup> If the DASA-IV score is used to diagnose the occurrence or non-occurrence of violent behavior in 100 patients, then appropriate conclusions will be obtained in 92 patients and BVC in 88 patients.

The parameters of the DASA-IV instrument show a more dynamic assessment according to changes in behavior (clinical conditions) of the patient so that they reflect more relevant risk factors. In contrast, the BVC parameters contained three passed behavioral assessments and did not lead to intervention management or plan, namely verbal and physical threats, and object destruction. DASA-IV is a predictive instrument developed to help in planning the management of a patient's violent behavior. For example, nurses can use communication styles to ease the emotions of those who are irritable and impulsive. Meanwhile, for the patients that are sensitive to provocation, they can restructure dysfunctional beliefs and understand that such actions are not right. If the patient is difficult to be directed and angry for rejection, the nurse needs to improve communication and understand their expected behavior.<sup>25</sup>

Some studies have mentioned the advantages of DASA-IV instruments. It can be received with moderate to reliable prediction accuracy.<sup>21,25</sup> Its scores are more accurate in identifying possible violent behaviors than clinical assessments without tools.<sup>17</sup> It helps nurses to plan violence prevention interventions when risk levels increase.<sup>26</sup> It is advantageous and relevant for predicting violent behavior and communicating clinical conditions to other professionals.<sup>27</sup> Another advantage of DASA-IV is that it is easy to use by experienced and inexperienced nurses.<sup>28</sup> The result of the DASA-IV application of 20 nurses in the Arizona psychiatric emergency department shows that 90% of nurses felt assisted in identifying violent risk behaviors. 85% of them had increased their awareness of violent behavior, 85% was helped to plan interventions, 75% had reduced restraint rates, and 70% wanted to continue using the method.<sup>29</sup>

Several DASA-IV parameters have been used in the research field written in the operand report: impulsive, irritable, and unwillingness to follow directions but not yet in the form of structured risk assessment. This study has a limitation that it cannot control the intervention factors provided by nurses and doctors that aim to reduce the patient's aggressive behavior. The intervention is a standard procedure that must be performed by doctors and nurses, for which the doctors will give medication, and the nurses will perform the nursing care standards.

## CONCLUSIONS AND RECOMMENDATION

DASA-IV is proven to be more accurate in predicting violent behavior in schizophrenic patients within 24 hours than BVC. DASA-IV is appropriate to be used by nurses as an instrument of risk assessment for violent behavior in acute psychiatric wards.

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