



Research paper

Are visual analogue scales valid instruments to measure psychological pain in psychiatric patients?

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ARTICLE INFO

Keywords:

Psychological pain
Visual analogue scale
Validation
Suicide attempt
Suicidal ideation

ABSTRACT

Objective: The Psychological-Physical-Pain Visual Analogue Scale (PPP-VAS) was thought to probably help in identifying patients at risk of suicide. However, no data on its validity to measure psychological pain was available. Our main aim was to investigate the convergent validity of the PPP-VAS using two well-validated scales of psychological pain, the Orbach and Mikulincer Mental Pain scale (OMMP) and the Holden et al. Psychache Scale.

Methods: This multicentre study recruited a total of 1618 adult psychiatric inpatients and outpatients in Italy. Psychological pain was evaluated using the OMMP, Holden et al., and PPP-VAS scales. Psychiatric status, suicidal status, physical pain, depression, and hopelessness were also assessed.

Results: A structural equation model (SEM) using the items of psychological pain from the PPP-VAS showed that items loaded significantly on the psychological pain factor and showed good fit. Similarly, a second SEM model using the three scales of psychological pain showed acceptable fit and converged into a psychological pain construct. Correlations between the PPP-VAS and depression, hopelessness, and physical pain showed moderate correlations ($r = 0.43$ to $r = 0.67$). Finally, psychological pain evaluated with the PPP-VAS was significantly related with recent suicidal ideation in all patients (OR [95 % CI] = 1.07 [1.05, 1.09]) and recent suicide attempts in moderately to severely depressed patients, OR [95 % CI] = 1.01 [1.02, 1.03].

Conclusion: The PPP-VAS showed good psychometric properties in evaluating psychological pain. The characteristics of the PPP-VAS makes this scale a great option for its use in clinical practice to detect patients at risk of suicide.

1. Introduction

Pain, specifically psychological pain, is a central variable in suicide. Indeed, some theoretical approaches explain the suicidal act as a behaviour to escape from unbearable psychological pain (Gunn, 2017; Shneidman, 1993). Other models, like the three-step theory of suicide (3ST) (Klonsky and May, 2015), suggest that psychological pain joins with hopelessness in the development of suicidal ideation. A meta-

analysis including 20 cross-sectional studies showed that higher levels of psychological pain imply higher odds of having current or lifetime suicidal ideation or attempting suicide independently of depression (Ducasse et al., 2018). These associations appear regardless of both the kind of population investigated (i.e., both in healthy and clinical populations) and the instrument used to measure the psychological pain (Verrocchio et al., 2016).

Due to the association with suicide, the interest in creating valid and

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<https://doi.org/10.1016/j.jad.2024.05.017>

Received 29 November 2023; Received in revised form 24 April 2024; Accepted 2 May 2024

Available online 3 May 2024

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reliable instruments to measure psychological pain has increased. According to Shneidman (1993), psychological pain is an aversive introspective experience resulting to dread, despair, fear, grief, shame, and/or guilt feelings that come from frustrated basic psychological needs like affiliation, love, or protection. Based on this definition, Holden et al. (2001) developed the Psychache Scale, a 13-item, widely used scale validated in samples of undergraduate students (Verrocchio et al., 2016). Further attempts to operationalize psychological pain resulted in the development of the Orbach and Mikulincer Mental Pain scale (OMMP) (Orbach et al., 2003a). The OMMP is a 44-item scale measuring nine dimensions that constitute the psychological pain experience, including lack of control, irreversibility of pain, emotional flooding, estrangement, confusion, social distancing, freezing, narcissistic wounds, and emptiness.

However, in clinical practice and epidemiological studies, it can be difficult for distressed individuals to use questionnaires with several items. For this reason, Olié et al. (2010) developed the Physical and Psychological Pain Visual Analogue Scale (PPP-VAS). The PPP-VAS is based on conceptualizing psychological pain as a subjective and introspective experience (Meerwijk and Weiss, 2013; Shneidman, 1993). On the PPP-VAS, participants respond according to the following sentence, “Please score the level of your psychological pain”, using a visual analogue scale (VAS) from 0 to 10. The PPP-VAS assesses psychological pain using three items for current psychological pain and mean and maximum ratings in the prior 15 days. Thus, the PPP-VAS may be considered a state measure, while the other measures of psychological pain could be considered trait measures. Furthermore, the PPP-VAS assesses physical pain in a similar way. Several studies have proven the potential of the PPP-VAS in detecting recent, past, and future suicide attempts (Alacreu-Crespo et al., 2022, 2020, 2019; Olié et al., 2010; Pompili et al., 2022a). The PPP-VAS in combination with the Beck Depression Inventory (BDI-II) showed that high pain/high depression patients have more hopelessness, more severity in their psychiatric characteristics, and are more prone to have greater suicidal ideation than patients with low pain/high depression or low depression (Pompili et al., 2022b).

However, there are still doubts about the reliability and validity of the PPP-VAS for evaluating psychological pain. To date, only Jollant et al. (2019) has evaluated the divergent validity of the original version of the PPP-VAS, reporting low to moderate correlations with measures of depression, anxiety, and hopelessness and good divergent validity between depressed and non-depressed patients. However, no study has directly evaluated the convergent validity of the PPP-VAS with other well-validated psychological pain scales. In a recent clinical study, Pompili et al. (2022a, 2022b) reported a strong correlation ($r = 0.60$) between the PPP-VAS's “worst” psychological pain within the last 15 days and the OMMP.

Thus, we aimed to investigate the construct validity of the PPP-VAS in patients at higher risk of suicide. To reach our goal, we administered other measures of psychological pain, hopelessness, and depression. We used structural equation modelling (SEM) to assess the fit of two-factor models. The first model included the PPP-VAS mental pain items loading all on a latent dimension (measurement model 1), which predicts the presence of suicidal ideation and behaviour (structural model 1). Measurement model 1 could inform us whether all mental pain items load significantly on a single factor (i.e., mental pain). In contrast, structural model 1 could inform us whether the PPP-VAS mental pain is predictive of suicidal ideation and attempt (criterion-related validity). The second model included three first-order factors (i.e., PPP-VAS mental pain, OMMP, and Holden et al.'s Psychache Scale), with all items of the scales loading significantly on a different factor, which in turn loaded significantly on a single second-order factor (measurement model 2). The second-order factor (i.e., mental pain) predicted recent suicide attempts and ideation (structural model 2). Measurement model 2 could inform us whether the PPP-VAS, OMMP, and Psychache scales measure different facets of mental pain (divergent validity), while measurement

model 2 could inform us whether mental pain, independent of specific methods, could predict suicide risk.

We also aimed to study the relationships between PPP-VAS scores and depression and hopelessness. We hypothesized that PPP-VAS scores are significantly and positively associated with depression and hopelessness severity. Finally, we hypothesized that psychological pain measured by the PPP-VAS is related to the presence of recent suicidal ideation and suicide attempt.

2. Methods

2.1. Participants

This was a multicentre observational study. Participants were 1618 adult patients (60.3 % female, age mean \pm SD = 43.58 \pm 14.92 years old) treated in 21 psychiatric inpatient and outpatient departments in Italy. Researchers from each centre were asked to recruit patients with psychiatric disorders, either inpatients or outpatients, and provide a sample of both suicide attempters and patient controls without a suicide attempt history. Patients were recruited from December 2017 to March 2020. Suicide attempt was defined as a self-destructive act with some degree of intent to end life and the appearance of some identifiable injuries (Silverman et al., 2007). The occurrence of suicidal ideation or suicide attempt was evaluated using the Columbia–Suicide Severity Rating Scale (C-SSRS) (Posner et al., 2011). Suicidal ideation or attempt was considered recent when it had occurred in the past 3 months. From the total, 270 patients had recent suicidal ideation and 1348 had not; 279 patients attempted suicide recently, and 1339 had not.

Patients were assessed for psychiatric diagnoses according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria. Diagnoses were confirmed using the Structured Clinical Interview for DSM-IV Axis 1 disorders (SCID-I) (Gorgens, 2011). The inclusion criteria were age \geq 18. Exclusion criteria were having any condition preventing the patient to complete the assessment, including the presence of severe neurological diseases (e.g., dementia, delirium, or Parkinson's disease), cognitive impairment or poor Italian language proficiency, and the presence of cognitive and motor disability caused by somatic illnesses. Also, patients with manic symptoms, delusions, or hallucinations at the moment of assessment were excluded from the study.

The study was conducted in accordance with the World Medical Association Declaration of Helsinki. The project was submitted to the Internal Review Board of Sant'Andrea Hospital (RIF.CE: 4646_2017) by the study coordinator and to the internal review boards of the participating centres by local researchers. Patients participated voluntarily and provided written informed consent.

2.2. Procedure

For inpatients, at admission, a routine interview was carried out by a psychiatrist to diagnose psychiatric disorders and suicidal behaviour, supported by the semi-structured SCID-I (Gorgens, 2011) for an Axis 1 disorder diagnosis and the C-SSRS (Posner et al., 2011) to detect suicidal ideation and suicide attempt.

After a week, stabilized patients were admitted to the study procedure and completed a battery of questionnaires including the PPP-VAS (Olié et al., 2010), the Holden et al. (2001) Psychache Scale, the OMMP (Orbach et al., 2003a), the Beck Hopelessness Scale (BHS) (Beck et al., 1974), and the BDI-II (Beck et al., 1996). Sociodemographic (gender, age, marital and occupational status, living accommodation) characteristics were evaluated using ad-hoc schedules.

Outpatients were administered all the assessments during a scheduled appointment.

2.3. Instruments

The PPP-VAS is a six-item self-administered questionnaire that evaluates current, usual (within the last 15 days), and maximal (within the prior 15 days) psychological and physical pain. The VAS is a straight horizontal line labelled “no pain” on the left (score = 0) and “worst pain” on the right (score = 10). Patients answer according to the sentence, “Please score the level of your psychological/physical pain”, without any explicit definition of psychological/physical pain. Scores from the three psychological pain items and the three physical pain items are summed separately. The range of the total score for both psychological pain and physical pain is 0–30. The Cronbach’s (CR) alphas were 0.91 for physical pain and 0.92 for psychological pain in our sample.

The Holden et al. (2001) Psychache Scale is a 13-item self-administered questionnaire that evaluates usual psychological pain on a 5-point Likert scale from 1 = “never” to 5 = “always”. Internal consistency was $\alpha = 0.96$ for this scale in our sample. Using 3-items from the Holden Psychache Scale it is possible to calculate the Unbearable Psychache Scale (UP-3) (Pachkowski et al., 2019). In our sample, internal consistency of UP-3 was $\alpha = 0.93$.

The OMMP is a 44-item self-administered questionnaire that evaluates nine dimensions of usual mental pain on a Likert scale from 1 = “strongly disagree” to 5 = “strongly agree”. The nine dimensions are lack of control, irreversibility of pain, emotional flooding, self-estrangement, confusion, social distancing, freezing, narcissistic wounds, and emptiness. Internal consistency of the total scale was $\alpha = 0.98$, and internal consistency values of the sub-scales were $\alpha = 0.60$ for social distancing, $\alpha = 0.74$ for self-estrangement, and $\alpha = 0.83$ – 0.94 for the remaining sub-scales in our sample. A reduced version of the OMMP containing only 8 items can be used (OMMP-8) (Casanova et al., 2021). This version retains three sub-scales from the original: experience of irreversibility $\alpha = 0.82$, emotional flooding $\alpha = 0.82$ and narcissistic wounds $\alpha = 0.76$.

The BHS is a 20-item self-report questionnaire that evaluates hopelessness using true-false statements. Internal consistency of the scale was $\alpha = 0.93$.

The BDI-II is a 21-item self-administered questionnaire that evaluates depression severity. In each of its items, the person must choose from a set of four alternatives ordered from least to most serious the sentence that best describes their condition during the last 2 weeks. Each item is scored from 0 to 3 points, depending on the alternative chosen. Internal consistency of the scale was $\alpha = 0.88$.

The C-SSRS is a rating scale evaluating lifetime and recent suicidal ideation, non-suicidal self-injury, and suicide attempts in individuals aged 12 years and older (Posner et al., 2011). The C-SSRS rates an individual’s degree of suicidal ideation on a scale from “wish to be dead” to “active suicidal ideation with a specific plan and intent”.

The SCID-I is a psychiatric structured interview (Gorgens, 2011) used to diagnose Axis I disorders based on the DSM-IV-TR (American Psychiatric Association, 2000). The SCID-I is used in routine examination as a complementary tool to support the diagnosis established by psychiatrists.

2.4. Analysis

Two models were tested using SEM with a robust estimator (DWLS) on polychoric matrices of correlations with the statistical software JAMOVI 2.3.24. An SEM model is composed of two parts: (1) a measurement model analysing how variables (items) measure a latent variable (i.e., the factor), accounting for measurement error; and (2) a structural model, which uses path analysis and analyses hypothetical dependencies between the latent factor (e.g., included as a predictor) and external variables (e.g., included as dependent variables which are regressed on the predictors). An SEM model could be used to test at the same time whether the measurement model (e.g., dimensionality of a questionnaire) and the structural model (e.g., the ability of

questionnaire scores to predict external variables) are able to explain data variance with limited errors. Considering the ability of SEM models to assess a variable accounting for measurement error, results derived from the use of SEM models can outperform those based on regression modelling (de Rooij et al., 2023).

We tested three SEM models. A first SEM model test included the three items of psychological pain from the PPP-VAS loading on a common latent factor (measurement model 1) that predict recent suicide attempt and ideation (structural model 1). A second hierarchical SEM model included psychological pain items from the PPP-VAS and all items from the Holden et al. scale and the OMMP to create three latent variables of psychological pain (one for each scale) that converge on a latent variable of psychological pain (measurement model 2) and predicts recent suicide attempts and ideation (structural model 2). A third hierarchical SEM model included psychological pain items from the PPP-VAS and all the items of the short version of the Holden scale and the OMMP, the UP-3 and the OMMP-8, to create five latent variables of psychological pain (one for each scale) that converge on a latent variable of psychological pain (measurement model 3) and predicts recent suicide attempts and ideation (structural model 3). The fit of the hierarchical model could suggest that the items of the three questionnaires are able to reliably measure different facets (the first-order factors) of the same construct (second-order factor), which in turn could significantly predict suicidal ideation and behaviour. To evaluate the models’ fit, we considered a nonsignificant chi-squared (χ^2) test and other robust indices, including the comparative fit index (CFI) and the non-normed fit index (NNFI), where values >0.95 imply a good fit and values >0.90 imply an acceptable fit (Hair et al., 2009; Marsh and Hau, 1996). We also considered the root mean square error of approximation (RMSEA) and standardized root mean square residual (SMRS) (Hu and Bentler, 1999), with a confidence interval (CI) of 90 %, where <0.05 values imply a good fit, values between 0.05 and 0.08 imply an acceptable fit, and values >0.08 imply a marginal or poor fit (Browne and Cudeck, 1992; Hair et al., 2009).

According to Hair et al. (2009), we evaluated convergent validity for the PPP-VAS and reported the average extracted variance (AVE; i.e., the amount of items’ variance captured from the construct when compared to variance due to measurement error), CR values, and standardized factor loadings. AVE values 0.5 or greater, CR values 0.7 or greater, and standardized factor loadings 0.5 or greater supported convergent validity (Fornell and Larcker, 1981; Hair et al., 2009). In this study, we defined convergent validity as the ability of PPP-VAS items to satisfactorily and reliably measure mental pain (i.e., satisfactory internal consistency and sufficient items’ variance captured from the construct, and significant correlations between the construct and any items). Divergent validity was assessed comparing the PPP-VAS AVE and the variance in common between the PPP-VAS and other questionnaires assessing mental pain. For satisfactory divergent validity, a questionnaire should have more variance captured from its factor than the variance it shares with questionnaires measuring the same/similar constructs.

Then, we calculated the total PPP-VAS psychological pain score and Pearson correlations between these scores and PPP-VAS physical pain and concurrent measures (the questionnaires assessing depression and hopelessness, and the OMMP sub-scales). A receiver operating characteristic (ROC) curve analysis was performed using the three scales of psychological pain, using recent suicidal ideation or recent suicide attempt as the outcome variable. ROC curve accuracy was evaluated using the area under the curve (AUC), interpreted as “excellent” >0.090 , “good” 0.080–0.090, “fair” 0.070–0.080, “poor” 0.060–0.070, and “fail” 0.060–0.050 (Nahm, 2022). To compare if a questionnaire outperformed the others in the classification of the outcomes, we performed pairwise comparisons (Hanley and McNeil, 1982).

Moreover, to assess the independent association between the PPP-VAS and suicide risk while controlling for the effects of physical pain, depression, and hopelessness, we used logistic regression models. Using PPP-VAS psychological pain as the predictor and recent suicidal ideation

or recent suicide attempt as dependent variables, we adjusted by physical pain, depression, and hopelessness. Results from this analysis could inform us about the incremental validity of PPP-VAS scores in predicting suicidal ideation and behaviour while controlling for levels of depression and hopelessness. For this analysis, we preferred regression analysis over SEM because the complexity of an SEM model accounts for measurement errors from all the questionnaires scores included in the analysis. Finally, the alpha significance level was fixed at 0.05.

3. Results

3.1. Sociodemographic and clinical characteristics of the sample

The study sample was composed of 976 (60.3 %) women and 642 (39.7 %) men. Most were single (49.9 %), employed (48.6 %), and lived with family or friends (66.9 %). From the total sample, 1094 (67.6 %) were outpatients. Regarding the current primary diagnosis, 14.8 % had schizophrenia or psychosis, 20.9 % had bipolar disorder, 29.6 % had depressive disorder, 4.0 % stress and trauma related disorders, 9.8 % eating disorders, and 10.5 % were in remission. Table 1 shows a summary of the sociodemographic and clinical variables.

Regarding suicidal behaviour, 686 (42.4 %) participants had a lifetime suicide attempt; from them, 279 (17.2 %) were recent. Patients were classified as having or not having suicidal ideation according to a score of 2 (suicidal thoughts) or more on the C-SSRS; 943 (58.3 %) had lifetime suicidal ideation, and 460 (28.4 %) had recent suicidal ideation. Table 2 shows a summary of the suicidal status of the participants.

Table 1
Sociodemographic and clinical characteristics of the sample.

Variables	N = 1618	%
Sex		
Men	642	39.7
Women	976	60.3
Age – Mean, SD	43.58	14.92
Marital status		
Married	533	33.1
Divorced or widowed	274	17.0
Single	804	49.9
Total	1611	
Job		
Employed	775	48.6
Unemployed	588	36.8
Other	233	14.6
School attainment		
≤8 yr	537	33.5
=13 yr	803	50.1
≥16 yr	263	16.4
Living situation		
Alone	315	19.5
Family or friends	1080	66.9
Other	219	13.6
Outpatients	1094	67.6
DSM-5 diagnosis		
Remission	169	10.5
Schizophrenia and other psychoses	238	14.8
Bipolar disorder	336	20.9
Depressive disorder	476	29.6
Anxiety disorder	121	7.5
Stress-trauma related disorder	65	4.0
Eating disorder	157	9.8
Other	46	2.9

Table 2
Suicide status according to the C-SSRS.

Variables	N	%
Lifetime suicidal ideation		
None	507	31.3
Wish to be dead	168	10.4
Suicidal thoughts	86	5.3
Suicidal thoughts with method (but without specific plan or intent to act)	157	9.7
Suicidal intent (without specific plan)	190	11.7
Suicidal intent with specific plan	510	31.5
Lifetime suicide attempt	686	42.4
Recent suicidal ideation		
None	987	61.0
Wish to be dead	171	10.6
Suicidal thoughts	87	5.4
Suicidal thoughts with method (but without specific plan or intent to act)	103	6.4
Suicidal intent (without specific plan)	103	6.4
Suicidal intent with specific plan	167	10.3
Recent suicide attempt	279	17.2
Lifetime non-suicidal self-harm	494	30.5
Recent non-suicidal self-harm	256	15.8

3.2. Psychometric properties of the PPP-VAS

An SEM model with PPP-VAS items loading all on a latent factor (mental pain), and suicidal ideation and attempt regressing on mental pain showed good fit to the data, $\chi^2_4 = 6.20, p = .184$; CFI = 1.00; TLI = 1.00; RMSEA [90 % CI] = 0.018 [0.00, 0.045], SRMR = 0.018. PPP-VAS items all loaded significantly ($p < .001$) on the latent factor (betas between 0.814 and 0.990; AVE = 0.833; CR = 0.94), and the PPP-VAS mental pain factor was significantly ($p < .001$) predictive of suicidal ideation (beta = 0.486) and attempt (beta = 0.211). All these results support a good convergent validity of the PPP-VAS (i.e., betas >0.70, AVE > 0.50, and CR > 0.70) and criterion-related validity.

A second model including PPP-VAS, OMMP, and Holden et al.'s Psychache Scale items all loading on three different first-order dimensions, which loaded on a second-order factor, had acceptable fit to the data (CFI = 0.994, TLI = 0.994; RMSEA [90 % CI] = 0.066 [0.065, 0.067], SMRS = 0.044), with a significant chi-squared test, $\chi^2_{1707} = 13,813, p < .001$. All items loaded consistently on the respective dimensions: PPP-VAS: betas between 0.902 for item 1 and 0.958 for item 2; OMMP: betas between 0.468 for item 1 to 0.866 for item 11; Psychache Scale: betas between 0.657 for item 4 to 0.923 for item 12. AVEs were all >0.50 (0.864, 0.559, and 0.716, respectively, for the PPP-VAS, OMMP, and Psychache Scale). Correlations between the latent factors were all significant and > 0.40 (PPP-VAS–OMMP: $r = 0.692$; PPP-VAS–Psychache Scale: $r = 0.767$; OMMP–Psychache Scale: $r = 0.856$). The AVE associated with the PPP-VAS was greater than the shared variances with the OMMP and Holden et al.'s Psychache Scale, suggesting satisfactory divergent validity.

A third model including PPP-VAS, OMMP-8 and UP-3 items all loading on five different first-order dimensions, which loaded on a second-order factor had acceptable fit to the data (CFI = 0.998; RMSEA [90%CI] = 0.057[0.052, 0.062], SMRS = 0.040), with a significant chi-squared test ($\chi^2_{272} = 452, p < .001$). All items loaded consistently on the respective dimensions (PPP-VAS: betas between 0.850 for item#1 and 0.970 for item#2; OMMP-8: betas between 0.656 for item#1 on NW to 0.905 for item#29 on IRR; UP-3: betas between 0.902 for item#10 to 0.954 for item#11). All first-order factors loaded significantly on the second-order factor (betas between 0.648 for OMMP-8 NW and 0.883 for OMMP-8 IRR. PPP-VAS beta was 0.764). AVEs were all >0.50 (0.767, 0.691, and 0.627, respectively for IRR, EF, and NW OMMP-8 dimensions, and 0.845 and 0.873 for PPP-VAS and UP-3). Correlations between the latent factors were all significant and > 0.40 (PPP-VAS–OMMP-8: $r = 0.692$; PPP-VAS–UP-3: $r = 0.767$; OMMP-8–UP-3: $r = 0.856$). AVE associated with PPP-VAS was greater than the

shared variances with the OMMP-8 dimensions and UP-3, suggesting satisfactory divergent validity.

The average PPP-VAS mental pain score was 15.78 (SD = 9.18; 25° | 50° | 75° percentile = 8 | 17 | 23); 9.6 % of the sample reported scores of 0, and 6.9 % reported scores of 30. The PPP-VAS scores were significantly and positively correlated with physical pain ($r = 0.43, p < .001$), depression ($r = 0.67, p < .001$), and hopelessness ($r = 0.46, p < .001$). All correlations were < 0.75 , showing that psychological pain diverged from the three constructs (Voorhees et al., 2016).

The PPP-VAS was positively correlated with all the OMMP sub-scales (all p values $< .001$), showing OMMP loss of control ($r = 0.66$), OMMP irreversibility ($r = 0.61$), and OMMP freezing ($r = 0.61$) strong relationships, and for the rest of the scales, moderate relationships, from OMMP narcissistic wounds ($r = 0.49$) to OMMP emotional flooding ($r = 0.59$). See Table 3.

3.3. Receiver operating characteristics curve of the three psychological pain scales

The ROC curves showed that the three scales of psychological pain had fair discrimination for recent suicidal ideation: PPP-VAS: AUC = 0.77; Holden et al.: AUC = 0.77; OMMP: AUC = 0.75. Regarding recent suicide attempt, ROC curves for the three scales showed poor discrimination: PPP-VAS: AUC = 0.61; Holden et al.: AUC = 0.61; OMMP: AUC = 0.61. A pairwise AUC comparison showed insignificant results ($ps > 0.050$), showing that none of the scales outperformed the others when evaluating recent suicidal ideation or recent suicide attempt (Fig. 1).

3.4. Total PPP-VAS to predict recent suicidal ideation and attempt

An adjusted logistic regression model showed that higher psychological pain was related with higher odds of having recent suicidal ideation, $b = 0.071, SE = 0.01, p < .001, OR [95\% CI] = 1.07 [1.05, 1.09]$. However, the adjusted logistic regression model showed no significant relation between PPP-VAS psychological pain with recent suicide attempts, $b = 0.013, SE = 0.01, p < .225, OR [95\% CI] = 1.01 [0.92, 1.03]$. We did a sensitivity analysis using only patients with moderate or severe depression levels according to a score > 20 on the BDI-II. Patients with moderate or severe results totalled 815 (recent suicidal ideation = 176). In patients with moderate to severe depression, higher psychological pain was associated with higher odds of recently attempting suicide, $b = 0.052, SE = 0.02, p < .001, OR [95\% CI] = 1.06 [1.02, 1.09]$.

4. Discussion

The present study specifically investigated whether the PPP-VAS is a valid instrument for measuring psychological pain in clinical and research contexts. A model that summarizes the PPP-VAS in a single measure of psychological pain showed good fit, indicating that the PPP-VAS can measure a single construct. Moreover, the two SEM models involving other well-validated scales to measure psychological pain showed that PPP-VAS items measure the same construct in two other scales and in the short versions of these scales. Moreover, the results showed that all three scales had divergent validity, measuring different facets of mental pain. The psychological pain factor in both SEM models was related to recent suicidal ideation and suicide attempt. The PPP-VAS showed significant positive relationships with physical pain, depression, and hopelessness, but the strength of the relationships was not significant enough to be considered the same construct. Finally, the PPP-VAS was related to recent suicidal ideation in all patients, and with recent suicide attempts only in patients with moderate to severe depression.

Our results show that the PPP-VAS has good psychometric properties to measure the psychological pain construct. Indeed, PPP-VAS items showed great construct validity, making it possible to create a composite of the three items to create a psychological pain measure. In contrast to

Table 3 Pearson correlations between the PPP-VAS and BDI, BHS, physical pain, and OMMP.

Variables	Pearson correlations															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1. VAS psychological pain	1															
2. VAS physical pain	0.43***	1														
3. BDI	0.66***	0.36***	1													
4. BHS	0.46***	0.22***	0.59***	1												
5. Holden Psychache Scale	0.73***	0.34***	0.78***	0.56***	1											
6. OMMP total	0.68***	0.32***	0.81***	0.63***	0.84***	1										
7. OMMP irreversibility	0.61***	0.31***	0.70***	0.59***	0.74***	0.91***	1									
8. OMMP loss of control	0.66***	0.30***	0.79***	0.62***	0.82***	0.96***	0.84***	1								
9. OMMP narcissist wounds	0.49***	0.24***	0.63***	0.49***	0.62***	0.96***	0.66***	0.77***	1							
10. OMMP emotional flooding	0.85***	0.28***	0.66***	0.47***	0.72***	0.81***	0.66***	0.77***	0.59***	1						
11. OMMP freezing	0.61***	0.28***	0.75***	0.57***	0.75***	0.88***	0.76***	0.85***	0.69***	0.65***	1					
12. OMMP self-estrangement	0.55***	0.30***	0.67***	0.47***	0.70***	0.85***	0.75***	0.78***	0.62***	0.69***	0.73***	1				
13. OMMP confusion	0.56***	0.29***	0.70***	0.49***	0.71***	0.83***	0.70***	0.78***	0.56***	0.68***	0.73***	0.74***	1			
14. OMMP social distancing	0.60***	0.23***	0.65***	0.58***	0.67***	0.81***	0.73***	0.75***	0.59***	0.57***	0.73***	0.65***	0.65***	1		
15. OMMP emptiness	0.56***	0.23***	0.59***	0.47***	0.63***	0.76***	0.64***	0.69***	0.62***	0.62***	0.63***	0.62***	0.63***	0.65***	1	

Note: BDI = Beck Depression Inventory; BHS = Beck Hopelessness Scale; VAS = Visual analogue scale; OMMP = Orbach and Mikulincer Mental Pain Scale. *** $p < .001$.

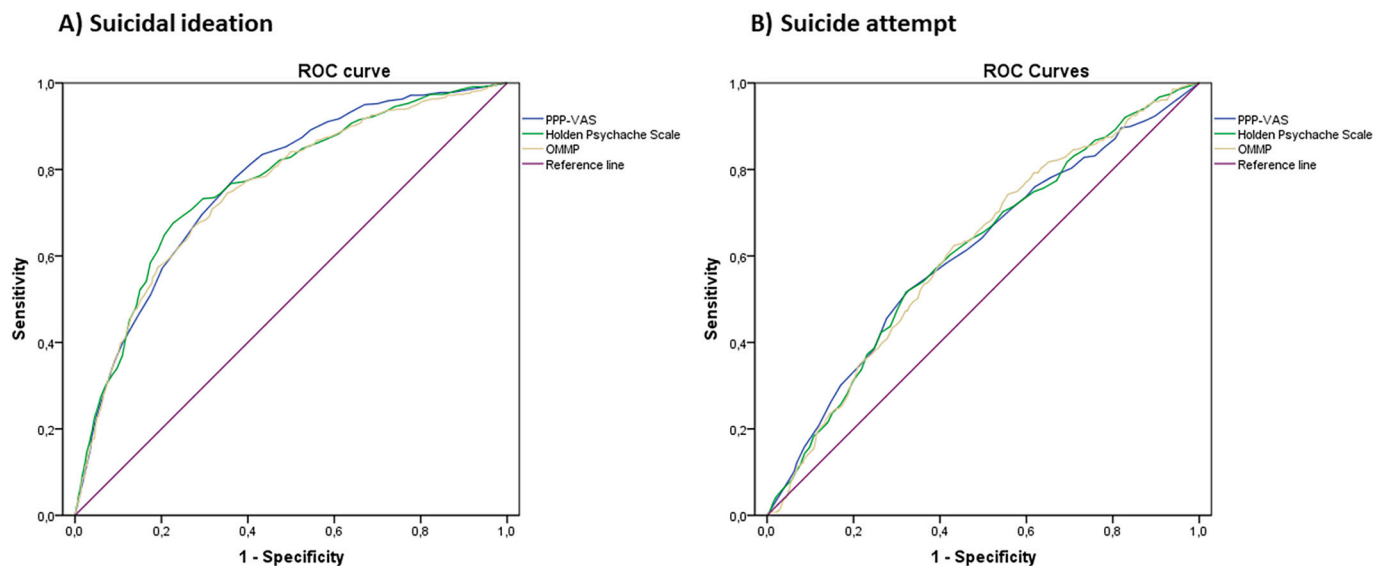


Fig. 1. Receiver operating characteristics (ROC) curves of the psychological pain scales for predicting: A) suicidal ideation; B) suicide attempt.

the other scales, the PPP-VAS was not created using a theoretical approach (like the Holden et al. scale) or content analysis based on narratives (like the OMMP) (Holden et al., 2001; Olié et al., 2010; Orbach et al., 2003b). PPP-VAS conceptualization relies on the notions that psychological pain is subjective (Shneidman, 1993) and people are able to evaluate their levels of psychological pain with a VAS, like during a physical pain evaluation (Price et al., 1983).

Despite the construct's subjectivity, creating a scale to assess it without including part or all the theoretical conceptions of the construct could give rise to reasonable doubts about its validity. Indeed, even when the use of a VAS for chronic physical pain is common, there has been recent criticism per its validity (Chiarotto et al., 2019). However, results from our second model showed that all three scales of psychological pain converged in the same construct. So, the PPP-VAS measured the same construct of psychological pain as the other two well-validated scales did (i.e., the OMMP and Holden et al. scales). External correlations showed that the three questionnaires diverged sufficiently to measure different aspects of the psychological pain construct. In this sense, the existence of all three scales is worthwhile for measuring this complex construct. More concretely, the PPP-VAS appeared more related to the pain construct with irreversibility, loss of control, and freezing sub-scales from the OMMP. As expected, the PPP-VAS presented moderate correlations with physical pain, depression, and hopelessness. These results were similar to those reported in previous studies (Jollant et al., 2019). Our results show that the three psychological pain scales had similar accuracy to detect recent suicidal ideation or suicide attempt. Therefore, the choice of the scale when evaluating psychological pain to predict suicidal outcomes should be made based on its characteristics and ease of application. In this sense, the PPP-VAS was relatively faster and easier to understand for our participants.

Moreover, psychological pain as measured by the latent factor combining all three psychological pain scales was positively and significantly related with recent suicidal ideation and attempt. This provides evidence that mental pain, independent of the methods used, has good criterion validity, as psychological pain is central in the emergence of suicidal ideation (Klonsky and May, 2015) and in suicide attempts (Shneidman, 1993). Our results showed that when adjusting for depression and hopelessness, psychological pain significantly predicted suicidal ideation, as shown in previous studies (Ducasse et al., 2018; Verrocchio et al., 2016). However, our adjusted models showed that psychological pain predicted recent suicide attempts only in patients with moderate to severe depression. Previous studies had

demonstrated that psychological pain outperformed depression and hopelessness in the prediction of lifetime suicide attempts (Troister et al., 2015; Troister and Holden, 2010). Other studies also showed that the worst psychological pain as measured with a single PPP-VAS item was able to predict recent suicide attempts in psychiatric patients (Pompili et al., 2022a) or patients with depression (Alacreu-Crespo et al., 2022, 2019), when adjusting for depression levels. Thus, the severity of the depression is an essential factor when investigating the relationship between psychological pain and suicide attempts. Perhaps the patients with high psychological pain and high depression levels showed the characteristics of a concrete suicidal population with higher hopelessness levels (Pompili et al., 2022b) and melancholic characteristics stable over time (Alacreu-Crespo et al., 2022).

This study was not free of limitations. The large number of centres and evaluators made evaluation more heterogeneous. In the same vein, some centres recruited fewer patients, influencing the sample's representativeness. In this study, effect size was weak for the relationship of total PPP-VAS scores with suicide attempts, and future research investigating this relationship is needed.

Hence, the results of this study give to the PPP-VAS evidence of its validity to measure psychological pain. The PPP-VAS has several advantages in clinical practice and research: It is fast to complete and easy to explain and use. This permits the use of this tool to routinely assess psychological pain in emergencies and consultations. Thus, the PPP-VAS makes it possible to both detect patients at risk of suicide and prevent their future suicidal behaviour.

Funding

None.

CRediT authorship contribution statement

Adrián Alacreu-Crespo: Writing – original draft, Conceptualization. **Marco Innamorati:** Writing – review & editing, Methodology, Formal analysis, Data curation, Conceptualization. **Philippe Courtet:** Writing – review & editing, Conceptualization. **Study Group on Mental Pain:** Resources. **Andrea Fiorillo:** Writing – review & editing, Supervision, Resources, Project administration, Investigation, Funding acquisition, Conceptualization. **Maurizio Pompili:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization.

Declaration of competing interest

None.

Acknowledgements

None.

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