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Development and validation of the Brief Assessment of Distress about Pain

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Abstract

Background: The experience of pain is a complex interaction of somatic, behavioural, affective and cognitive components. Negative psychological states (e.g., anxiety, fear and depression) are intertwined with pain and contribute to poorer outcomes for individuals suffering from chronic and acute pain by exacerbating the overall experience of pain and leading to increased dysfunction, disability, and distress. A need exists for efficient assessment of aversive emotional states that are associated with pain.

Methods: A multistage developmental process included expert judges, two undergraduate samples, and a chronic pain patient sample. The 4-item Brief Assessment of Distress about Pain (BADP) scale was developed to assess anxiety, fear, and depression related to pain, as well as an overall evaluation of distress about pain.

Results: Principal components analyses indicated that the BADP consisted of one factor. Inter-scale correlation coefficients revealed that the BADP was highly related to other measures that assess similar constructs, suggesting evidence for convergent validity. Intra-scale correlation coefficients indicated that the items of the BADP were only moderately associated with each other. Findings also supported evidence for discriminative validity, test–retest reliability, and internal consistency of the BADP.

Conclusions: The BADP has good psychometric properties as a measure of negative affectivity related to pain. The scale's single negative affectivity item may be useful for screening. The BADP helps address a gap in the literature with regard to a brief measure assessing fear, anxiety, depression, and negative affect in relation to pain. Demonstrated utility in a patient sample indicates the measure is suitable for further clinical study.

Significance: The BADP provides an efficient, psychometrically-supported means to assess affective distress (i.e., anxiety, fear, depression, and negative affect) associated with pain.

1 | INTRODUCTION

Acute and chronic pain are exacerbated by negative affective states such as anxiety, fear, and depression (Gross & Collins, 1981; Liebeskind & Paul, 1977; McNeil et al., 2014; Morley et al., 1999; Woo, 2010). Many tools presently used to assess pain and affect focus on one or two emotional states and their relation to pain (e.g., fear of pain and pain-related

anxiety) and do not differentiate, or properly depict the construct(s) one is attempting to measure.

Contemporary views argue for a nuanced understanding of the complex relations among pain, anxiety and fear (Felicione et al., 2021; Gross & Collins, 1981; Rhudy & Meager, 2000). Based on theory about discrete emotions (e.g., Lazarus & Lazarus, 1996), and appreciating extant approaches to an evolving mechanistic understanding of emotions and the neuronal circuitry in defensive emotional states (LeDoux & Brown, 2017; Tovote et al., 2015), the approach in the present study was to assess selected emotional states (i.e., anxiety, fear, and depression) demonstrated to be particularly clinically relevant to pain.

Anxiety and fear are conceptualized here as distinct states that affect pain responsivity independently and interactively (Rhudy & Meager, 2000). Anxiety typically is more distal in time and more cognitively-based than fear (McNeil et al., 2014), as when a person with chronic musculoskeletal pain worries about whether their pain will prohibit their return to work. Fear is an immediate, in-the-moment state, just prior to and during a threat, associated with fight, flight, or freezing (McNaughton, 2011; Sylvers et al., 2011), as when someone with chronic low back pain stops at the top of a flight of concrete stairs before attempting to walk down.

Depression is conceptualized in terms of its somatic, cognitive, and affective components that can include sleep pattern disruption, weight change, fatigue, loss of interest in activities, and interpersonal difficulties (Lerman et al., 2010). With direct (e.g., decreased activity) and indirect (e.g., decreased coping) effects on pain, depression also may interact with other negative emotional states in exacerbating pain.

Although anxiety, fear, and depression can be defined as distinct emotional constructs, they may interact in an additive, synergistic, or competitive manner, and influence experience and expression of pain (McNeil & van Wijk, 2005; Vowles et al., 2006). Overall, negative affective states such as anxiety, fear, and depression modulate the onset, duration, intensity, and exacerbation of pain and associated suffering (Beesdo et al., 2010; Janssen, 2002). The overlap between negative affective states and acute and chronic illnesses may or may not involve pain. Mechanisms driving disease-related emotional distress may differ from those that arise outside of disease-related antecedents (Hudson & Moss-Morris, 2019).

Numerous assessment instruments, including short-forms, have been developed to evaluate the relation between fear and/or anxiety and pain (e.g., Fear of Pain Questionnaire-III [FPQ-III; McNeil & Rainwater, 1998], Pain Anxiety Symptoms Scale [PASS; McCracken et al., 1992], Fear-Avoidance Beliefs Questionnaire [FABQ; Waddell et al., 1993] and the Tampa Scale for Kinesiophobia [TSK-1; Woby et al., 2005]).

What is needed now, however, is an instrument that accounts for the overlap, or complex shared variance of these constructs, that also incorporates theory and empirical evidence relating to the simultaneous distinct nature of the constructs as they relate to pain. The aim here was to develop a valid, reliable, and brief assessment tool that would assess pain-related negative affective states (i.e., fear, anxiety, depression, and overall negative affect), each with one item in a single instrument. Thus, the following three studies were conducted to establish a four-item scale to assess each of the three constructs (i.e., fear, anxiety, and depression) in relation to the experience of pain, and to include an overall, omnibus item representing negative affect towards the experience of pain. The first study included the development of 60 initial potential items, outlined the administration to an undergraduate sample, and the rationale for the selection of the four final items. The second study included the administration of items to another undergraduate sample in an effort to replicate findings from the first study and to include a measure of test–retest reliability. The third study involved administering the Brief Assessment of Distress and Pain (BADP) items to a chronic pain patient sample to further test psychometric properties.

2 | STUDY 1

2.1 | Method

2.1.1 | Developing the BADP scale

Theoretical, empirical and practical/ease-of-use issues were considered in all steps of the development of the BADP. The initial version of BADP was developed using pertinent stages described by DeVellis (2017). These stages include defining the construct, generating items, a review by experts, evaluating, and optimizing the scale (DeVellis, 2017). The *a priori* goal was to produce a four-item scale, with one item representing each of the three constructs related to pain (i.e., anxiety, fear, and depression) and overall negative affect.

2.1.2 | Development of construct, definitions and item pool

The operational definitions and initial 60 items (i.e., 15 items each for fear, anxiety, depression, and negative affect) were generated by a panel of nine members that included one faculty member, five doctoral students, and three advanced undergraduate students from the Anxiety, Psychophysiology and Pain Research Laboratory at West Virginia University. The items were developed on the basis of existing literature, prior

definitions, and what is known about the complex interactions and relations among anxiety, fear, distress, and pain (Felicione et al., 2021; Gross & Collins, 1981), and expert opinion.

2.1.3 | Expert review of item pool

An international panel of 11 individuals (academics, health and mental health professionals) who specialize in emotion and pain were selected to serve as expert judges for evaluating the initial 60 items. Each judge was provided with the operational definition of each construct and the item pool, and was asked to rate each item as *essential*, *useful but not essential*, or *not necessary* (Lawshe, 1975). To examine the agreement among each of the judges pertaining to each item, the content validity ratio (CVR) was calculated for each item (Lawshe, 1975). Values range from −1 to +1 with more positive values indicating ratings of essential. Further, more positive scores also indicate a greater degree of content validity. Items that did not meet the criteria of 0.75 were deleted or revised (Lawshe, 1975). Taking the judges' ratings and recommendations into account, an initial 20-item version of the BADP was developed. These 20 items represented five items each for the pain-related constructs (i.e., anxiety, fear, and depression) and overall negative affect. The Flesh–Kincaid readability test was used to assess the readability and comprehension level (i.e., grade level) of the initial 20 items and subsequently used in selecting the final four items (Kincaid, Fishburne, Rogers, & Chissom, 1975). Additional information about calculations and the CVR ratios are in the supporting information.

2.1.4 | Participants

The initial administration of the 20 items included data collection via a web-based survey distribution system (SONA), with a sample consisting of undergraduate students from West Virginia University ($n = 503$). The inclusion criterion specified that all participants be 18 years of age or older and report being able to read, write and comprehend the English language. The necessary sample size was estimated using the 10:1 ratio (10 participants for 1 item) recommended by Costello and Osborne (2005), and Lingard and Rowlinson (2006).

The final number of participants included in the analyses was 415 after removing those who had missing data on certain demographic variables ($n = 41$), those outside of one standard deviation above or below the mean on survey completion time ($n = 14$), and those who declined to answer items included in analyses or who missed reliability check items ($n = 33$). The mean age of the participants was 19.9 years ($SD = 1.8$). The majority of the sample was single or without a current romantic partner (56.6%). The ethnic composition of the sample was predominantly white (91.9%), including Black/African American (2.9%), Hispanic/Latino (0.7%), American Indian (1.0%), Other (0.5%), and Mixed (3.0%). A portion of the undergraduate sample held part-time employment (42.0%) or were unemployed (37.9%). The rest of the sample held full-time employment (5.0%), volunteered (2.4%), or listed 'other' (12.7%) for employment. Their families' income was grouped as follows: $0–20,000 (7.2%), $20–40,000 (13.2%), $40–60,000 (16.1%), $60–80,000 (14.9%), $80–100,000 (12.3%), or $100,000 or more (26.7%).

2.1.5 | Measures

The initial 20 BADP items included response options that were Likert-type scales from 0 to 4 with 0 being 'Not at all' and 4 being 'Extreme'. Participants also completed a battery of other assessments and a demographic and health questionnaire.

2.1.6 | Fear of Pain Questionnaire-III

The FPQ-III is a 30-item measure that assesses fear associated with pain. The instrument examines three domains of fear related to pain: *Minor*, *Medical* and *Severe*. Each item is scored on a 5-point Likert-type scale ranging from 1 = *Not at all* to 5 = *Extreme*. Items are scored by summing subscales scores and producing an overall total score (McNeil & Rainwater, 1998). The FPQ-III has high test–retest reliability and internal consistency for the total scale and each of the three subscales (McNeil & Rainwater, 1998).

2.1.7 | Pain Anxiety Symptoms Scale

The PASS is a 40-item scale that assesses the experience of fear and anxiety in relation to the experience of pain. The scale measures four domains of fear and anxiety and their relationship to pain: *Somatic Anxiety*, *Cognitive Anxiety*, *Fear,* and *Avoidance*. Each item is scored on a 6-point Likert-type type scale ranging from 0 = *Never* to 5 = *Always*. All items are summed for a total score indicative of overall fear/anxiety in relation to pain; subscales also are scored. The overall measure and each subscale show high internal consistency and indicators of validity (McCracken et al., 1992).

2.1.8 | Beck Depression Inventory-II

The Beck Depression Inventory-II (BDI-II) is an updated version of the original BDI (Anastopoulos & Shelton, 2001; Beck

et al., 1996) and assesses general severity of depression. It is a self-report instrument that contains 21 items scored on a 4-point Likert scale. The BDI-II has well-established psychometric properties (Beck et al., 1996; Storch et al., 2004) including evidence for test–retest reliability (Sprinkle et al., 2002).

2.1.9 | Ag scale of the Fear Questionnaire

The agoraphobia (Ag) scale of the Fear Questionnaire consists of five items that assess the avoidance of agoraphobic situations (Marks & Mathews, 1979). It is scored on a 9-point Likert-type scale, with a range of 0 to 40. Psychometric data for the Fear Questionnaire are available and support its utility in differentiating agoraphobic concerns (Oei et al., 1991). The Ag scale was included as a measure of discriminative validity, as the overlap between Ag and distress about pain was presumed to be minimal.

2.1.10 | Demographic and health questionnaire

The demographic and health questionnaire collected information on participant age, relationship status, race/ethnicity, employment and family income. There also was a *yes-no* question about current chronic pain (i.e., > 6 months).

2.1.11 | Validity/reliability items

There were four items interspersed in the assessment battery to assess that respondents were adequately reading and accurately responding to the items. This approach has been used in prior online and web-based studies to assess response validity and reliable responding (e.g., James & Meloy, 2017).

2.2 | Procedure

Procedures adhered to American Psychological Association ethical guidelines for the proper treatment of human research participants, as well as the informed consent process and approval of the research by the Institutional Review Board at West Virginia University. Volunteer undergraduate participants ($n = 503$) from a variety of Psychology courses were recruited through advertisements within the Department of Psychology at West Virginia University. All participants gave written informed consent and completed a demographic questionnaire and a battery of assessments inclusive of the BADP, FPQ-III, PASS, and Ag scale. The assessment battery was completed through a web-based online survey system (SONA; www.sona-systems.com); participants received course extra credit for their involvement.

2.3 | Results

Data from all 20 items of the BADP provided by the undergraduate students were subjected to intra-class correlations (i.e., BADP items correlated with other BADP items) and inter-class correlations (i.e., BADP items correlated with other scale items such as FPQ-III, PASS or BDI-II). That is, the Pearson correlation coefficients were examined within the items from each domain of the BADP (e.g., fear, anxiety, depression and negative affect) as well as across other assessments scales (e.g., FPQ-III, PASS, BDI-II, and Ag).

In an effort to examine the quality of items and provide evidence for item reduction, a principal component analysis (PCA) was conducted utilizing varimax rotation. Patterns of factor structure and item loadings were examined and used in the overall decision for the selection of items to be included in the final brief version.

Table 1 lists the 20 items, along with the results of their Flesh–Kincaid readability analyses, which were selected from the initial 60 items that included 15 items in each of the four domains. The readability ease test (MyByline Media, 2013) is based on the mathematical formula that assesses average sentence length and the average number of syllables per word. Easier to read sentences have higher readability ease scores. Scores of 90–100 are at a 5th grade level. Scores of 60–70 are at an 8–9th grade level. Scores of 0–30 are at a college or graduate level. Inter-class correlation analysis results are displayed in Table 2; the subscales of the BADP were related to the majority of the subscales and full scales of the other assessments included in the battery. Supporting information includes intra-scale correlations for the BADP.

In terms of the PCA results, the Kaiser–Meyer–Olkin measure verified the sampling adequacy for the analysis, KMO = 0.97, which is within the 'superb' range (Field, 2009). The combination of the KMO and Bartlett's test of sphericity indicated that the data were adequate to conduct a PCA. Bartlett's test of sphericity χ^2 (190) = 6,687.45, $p < .001$, indicated that correlations between items were sufficiently large for PCA. A scree plot (Fabrigar & Wegener, 2012) is provided in the supporting information. Three components were accounted for using the *eigenvalues greater than 1.0* rule of thumb. A cut-point of 0.40 (Hinkin, 1995; Hinkin, 1998) was utilized for the examination of the factor loadings of the BADP items as shown in Table 3.

2.3.1 | Selection of final four items

After reviewing the results from the expert judges, and the intra- and inter-class correlations, each of the items was examined in detail in light of theory that describes both differences and similarities in emotional states associated with pain (Felicione et al., 2021; Gross & Collins, 1981), empirical data from the

TABLE 1 Flesch–Kincaid readability tests

BADP item	Grade level	Readability ease
1. Thinking ahead about something painful, I get really worried	10.2	37.9
2. All in all, I get emotionally upset about pain.	7.5	56.7
3. I feel hopeless about situations in which I am not able to control or reduce pain.	8.3	63.6
4. I fear situations that are physically painful.	9.0	42.6
5. Just before I experience something painful, I get really uptight.	9.5	44.4
6. The fact that I might feel pain causes me to feel sad.	1.8	100.0
7. Pain causes me to have strong negative feelings.	5.2	71.8
8. It is difficult to not be afraid of pain.	3.6	84.9
9. I worry about feeling pain	5.2	66.4
10. I feel sad about the thought of feeling pain.	2.3	94.3
11. The fact that I could feel pain in the future worries me a lot.	3.3	95.9
12. I am emotionally upset when I experience pain	9.6	40.0
13. I am scared of feeling pain.	0.5	100.0
14. When I am in pain, I feel hopeless.	2.2	92.9
15. I feel really nervous when I think about being in pain.	3.7	87.9
16. I feel a sudden sense of fear I am about to feel pain	3.0	96.0
17. Being in pain makes me feel sad.	0.0	100.0
18. I am really troubled when I think about my pain.	3.6	86.7
19. It is hard to not be worried about my pain.	2.4	95.1
20. All in all, pain causes me to feel emotionally distressed.	7.1	61.3

Note: These results are based upon Study 1. Final selected items are bolded.
Abbreviation: BADP, Brief Assessment of Distress about Pain.

analyses, and readability ratings, focusing on content validity. Utilizing all of this information, together with theory, four items were selected (one from each subscale) judged by the research team to be best overall. The final four items, which summed together created a total score, correlated moderately with the other measures as demonstrated in Table 4. The supporting informationprovides correlation results for these participants, separated as to chronic pain status. There were 48 (11.6%) of the participants who reported experiencing chronic pain. Overall, the undergraduates with chronic pain had higher correlations with pain-related measures of emotion than did their counterparts without chronic pain. Adequate evidence for reliability was demonstrated via coefficient alpha for the BADP total score ($\alpha = 0.79$). See the appendix for the final version of scale.

3 | STUDY 2

3.1 | Method

3.1.1 | Participants

The BADP was administered to a second sample of undergraduate students from West Virginia University ($n = 141$) to allow for additional psychometric testing including confirmatory factor analysis (CFA) and test–retest reliability. Inclusion criteria were as in Study 1; data from two participants were excluded due to missing questions in analyses, leaving a sample of 139 participants. Of these participants, there were nine (6.5%) who reported experiencing chronic pain.

3.1.2 | Procedure

Data for this study were collected in classrooms using a paper-and-pencil format. One week passed between the first and second administration of the items. Along with the BADP items, demographic and health information and responses to the Fear of Pain Questionnaire-9 (FPQ-9; McNeil et al., 2018) were collected. This shorter, 9-item version of the FPQ-III, the FPQ-9, has demonstrated evidence for reliability and validity, and mirrors the structure of the FPQ-III in that it has same three subscales, each with three items (McNeil et al., 2018). A total of 108 participants responded at time two. As in Study 1, written informed consent was obtained; this research was approved by the Institutional Review Board at West Virginia University.

TABLE 2 Inter-scale correlation coefficients by Brief Assessment of Distress about Pain (BADP) subscale

Fear items	**FPQ-III**	**PASS**	**BDI-II**
4	0.45	0.57	0.12
5	0.38	0.49	0.20
8	0.40	0.56	0.19
13	**0.46**	**0.55**	**0.20**
16	0.44	0.60	0.24
Fear items total	0.51	0.66	0.23
Anxiety items	**FPQ-III**	**PASS**	**BDI-II**
1	0.38	0.53	0.18
9	0.38	0.58	0.22
11	**0.40**	**0.48**	**0.18**
15	0.45	0.57	0.18
19	0.37	0.57	0.25
Anxiety items total	0.49	0.67	0.25
Depression subscale items	**FPQ-III**	**PASS**	**BDI-II**
3	0.45	0.60	0.32
6	0.31	0.53	0.27
10	0.38	0.55	0.23
14	0.32	0.62	0.34
17	**0.32**	**0.50**	**0.25**
Depression items total	0.42	0.68	0.35
Overall negative affect items	**FPQ-III**	**PASS**	**BDI-II**
2	0.39	0.64	0.31
7	**0.30**	**0.59**	**0.29**
12	0.35	0.61	0.26
18	0.35	0.59	0.25
20	0.36	0.61	0.29
Overall negative affect items total	0.41	0.71	0.33

Note: Study 1; $n = 415$. All correlations were significant at $p < .01$. Final items selected are bolded.

Abbreviations: BADP, Brief Assessment of Distress about Pain; BDI-II, Beck Depression Inventory-II; FPQ-III, Fear of Pain Questionnaire-III; PASS, Pain Anxiety Symptoms Scale.

3.1.3 | Analyses

Utilizing the four final items selected in the previous study, a CFA was conducted ($n = 139$) in MPlus (Muthén & Muthén, 1998–2017) using a full-information maximum likelihood estimator (MLR). Measures of overall model fit (root mean square error of approximation [RMSEA], comparative fit index [CFI], Tucker–Lewis index [TLI], and standardized root mean square residual [SRMR]) were examined to provide evidence for overall construct and factor validity. Rules of thumb for adequate model fit included RMSEA ≤ 0.06, CFI/TLI ≥ 0.95 and SRMR ≤ 0.08 (Hu & Bentler, 1998, 1999).

TABLE 3 Factor loadings from the principal components analysis (PCA)

BADP item #	**Component 1**	**Component 2**	**Component 3**
1	–	0.71	–
2	–	0.44	0.68
3	–	–	0.58
4	–	0.69	–
5	0.75	–	–
6	0.74	–	0.45
7	**0.44**	–	**0.56**
8	0.58	0.57	–
9	0.68	0.46	–
10	0.71	–	0.48
11	**–**	**0.71**	–
12	–	–	0.79
13	**0.51**	**0.61**	–
14	–	–	0.73
15	0.57	0.63	–
16	–	0.73	–
17	**0.49**	–	0.67
18	0.55	–	–
19	0.58	0.48	–
20	–	–	0.69

Note: Study 1; $n = 415$. A dash (–) indicates factor loading was below 0.40. Final selected items are bolded and are designated as follows in terms of their relation to pain: Item 7—Overall negative affect, Item 11—Anxiety, Item 13—Fear, and Item 17—Depression.

To provide additional evidence of convergent validity, the total score and each of the individual items were correlated with the FPQ-9 total score and subscales (Fear of Severe Pain, Fear of Minor Pain, and Fear of Medical/Dental Pain). In addition, a correlation was conducted between time one and time two administrations of the BADP to provide evidence for test–retest reliability. All correlation analyses were conducted in SPSS 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0.).

3.2 | Results

Results from the CFA on the four BADP items indicated adequate model fit at time one ($n = 139$; RMSEA = 0.085; CFI = 0.988; TLI = 0.963, SRMR = 0.021) and excellent fit at time two ($n = 108$; RMSEA = 0.035; CFI = 0.997; TLI = 0.992, SRMR = 0.023). The correlation between BADP scores at time one and at time two was high ($n = 108$; $r = 0.74$, $p < .01$), demonstrating evidence for test–retest reliability. Measures of internal consistency for the BADP total

TABLE 4 Correlations of BADP final four items and other scales for analysis of convergent and discriminant validity in Study 1

	FPQ-III minor	FPQ-III severe	FPQ-III medical	FPQ-III total	PASS fear	PASS cognitive	PASS avoidance	PASS physiological	PASS total	BDI-II total	Ag
BADP negative affect	0.28**	0.18**	0.31**	0.30**	0.57**	0.54**	0.43**	0.51**	0.59**	0.29**	0.16**
BADP anxiety	0.31**	0.26**	0.41**	0.40**	0.43**	0.42**	0.40**	0.42**	0.48**	0.18**	0.19**
BADP fear	0.31**	0.32**	0.47**	0.46**	0.56**	0.51**	0.38**	0.45**	0.55**	0.20**	0.19**
BADP depression	0.30**	0.20**	0.30**	0.32**	0.50**	0.44**	0.38**	0.40**	0.50**	0.25**	0.24**
BADP total	0.38**	0.31**	0.48**	0.47**	0.66**	0.61**	0.51**	0.57**	0.67**	0.29**	0.24**

Note: Study 1; $n = 415$.

Abbreviations: Ag, Agoraphobia Scale of the Fear Questionnaire; BADP, Brief Assessment of Distress about Pain scale; BDI-II, Beck Depression Inventory-II; FPQ-III, Fear of Pain Questionnaire-III; PASS, Pain Anxiety Symptoms Scale.

*Correlation at the $p < .05$ level.

**Correlation at the $p < .001$ level.

score were good at both time one ($\alpha = 0.85$) and time two ($\alpha = 0.86$). The correlation between the BADP total score and the FPQ-9 total score (at time one) was moderate ($r = 0.54$, $p < .01$), as with the BADP total score with the FPQ-9 subscale scores (Fear of Severe Pain; $r = 0.46$, $p < .01$; Fear of Minor Pain; $r = 0.39$, $p < .01$; Fear of Medical/Dental Pain; $r = 0.49$, $p < .01$), suggesting convergent validity. All correlations between the BADP items and total score with the Ag scale were low, suggesting discriminative validity.

4 | STUDY 3

4.1 | Method

4.1.1 | Participants

To provide a clinical sample, after item development, the BADP was administered to patients ($n = 60$) attending a comprehensive outpatient pain management clinic. The final number of participants included in the analyses was 45 after removing those who had missing data on certain demographic variables ($n = 7$), those who could not complete the surveys independently without assistance ($n = 6$), and those who missed reliability check items ($n = 2$). The mean age of the pain patient sample was 54.4 years 15 ($SD = 11.6$), with 62.2% identifying as female. The racial/ethnic composition of the sample was predominantly white (86.7%), with African American/Black (4.4%), Hispanic/Latino (2.2%), American Indian (2.2%), and Other (4.4%). The majority of the sample reported themselves as disabled (60.0%). The rest of the sample held full-time employment (15.6%), part-time employment (4.4%), volunteered (2.2%), were unemployed (6.7%), or listed other (8.9%) for employment. The chronic pain participants' annual income was categorized as follows: $0–20,000 (35.6%), $20–40,000 (24.4%), $40–60,000 (13.3%), $60–80,000 (11.1%), $80–100,000 (6.7%), or $100,000 or more (8.9%). There were 27 (60%) who reported back pain, 9 (20.0%) whose pain was related to another condition, 5 (11.1%) with pain related to an accident, and 4 (8.9%) who indicated their pain was of unknown origin. The mean duration of their chronic pain was 14.1 years ($SD = 13.3$); mean pain severity on a 0–100 scale was 68.9 ($SD = 24.5$).

4.1.2 | Procedure

These patients completed a battery of assessments at the pain clinic, including the demographic questionnaire, BADP, FPQ-III, PASS, and BDI-II, and reliability check items. The pain sample data collection used a paper and pencil format for the battery of assessments and were compensated (i.e., $20 USD) for their time. Consistent with Study 1 and Study 2, written

informed consent was obtained; the Institutional Review Board at West Virginia University approved this research.

4.2 | Results

To confirm the previously mentioned item selection and to provide additional evidence of convergent validity in a chronic pain sample, the total score and each of the final four-item scores were correlated with the FPQ-III total score and subscales (Fear of Severe Pain, Fear of Minor Pain, and Fear of Medical/Dental Pain) as well as the PASS and the BDI-II. All correlations were conducted in SPSS 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY). Correlation results are displayed in Table 5 and indicated evidence for convergent validity. The overall BADP total score (i.e., sum of the four items) was moderately to highly associated with all measures ($0.62 < r < 0.84$). When considering each of the single item subscales from the BADP, the fear item correlated moderately to highly with the FPQ subscales and total score ($0.61 < r < 0.74$) and with the PASS Fear subscale ($r = 0.81$, $p < .001$), indicating evidence for concurrent validity. The BADP anxiety item was correlated with the PASS Cognitive Anxiety subscale ($r = 0.72$, $p < .001$). The BADP depression item was correlated with the BDI-III ($r = 0.63$, $p < .001$). Nevertheless, these scores did not show great differentiation, and as expected, suggested overlap among the constructs. Evidence for internal consistency in the chronic pain sample responses was $\alpha = 0.92$ for the BADP total score.

5 | DISCUSSION

The studies detailed here were conducted to develop a brief measure to assess the complex interacting states of fear, anxiety, depression, and negative affect associated with pain. The primary aim was to develop a brief, reliable tool for use in assessing pain-related negative affective states. The newly devised BADP has strong psychometric evidence in assessing negative emotions and affectivity associated with pain. A stringent developmental process was used to create this brief four-item scale. The process included development of items and constructs by researchers actively involved in pain research, evaluation by experts in the field of emotions and pain, pilot testing on an undergraduate sample, and then a confirmatory undergraduate student sample, and finally, clinical application to individuals seeking treatment for chronic pain. These studies are unique in that they aimed to develop a short measure assessing a range of negative emotions and affectivity associated with pain that go beyond examining fear or anxiety. Although there are short versions of popular pain-related anxiety and fear measures, they do not assess depression or negative affect generally in relation to pain, and they are not as short as the BADP (i.e., the short form of the PASS still has 20 items [McCracken & Dhingra, 2002] and the short form of the FPQ, the FPQ-9, has nine items [McNeil et al., 2018]).

Negative emotional states are inextricably linked with pain (Lumley et al., 2011; Rhudy & Meager, 2000). Although this study focused on long-established (i.e., depression) and more recently-researched (i.e., fear and anxiety) states associated with pain, other emotions, including anger, guilt, shame and embarrassment, also impinge on the experience and expression of pain. Advances in measurement strategies such as the current work should support and provide evidence for research that identifies mechanisms involved in emotional, motivational, and interpersonal processes associated with pain (Vervoort & Trost, 2017).

A strength of this work is the multistage developmental process, including expert judges, patient, and nonpatient samples. As with any investigation, there are limitations.

TABLE 5 Correlations of BADP final four items and other scales for analysis of convergent validity in Study 3

	FPQ-III minor	FPQ-III severe	FPQ-III medical	FPQ-III total	PASS fear	PASS cognitive	PASS avoidance	PASS physiological	PASS total	BDI-II total
BADP negative affect	0.45**	0.43**	0.42**	0.46**	0.66**	0.71**	0.55**	0.60**	0.69**	0.69**
BADP anxiety	0.62**	0.63**	0.61**	0.66**	0.78**	0.72**	0.64**	0.61**	0.75**	0.61**
BADP fear	0.73**	0.61**	0.73**	0.74**	0.81**	0.71**	0.66**	0.65**	0.78**	0.60**
BADP depression	0.62**	0.58**	0.61**	0.64**	0.79**	0.79**	0.67**	0.67**	0.80**	0.63**
BADP total	0.67**	0.62**	0.65**	0.69**	0.84**	0.82**	0.70**	0.71**	0.84**	0.71**

Note: Study 3; $n = 45$.

Abbreviations: BADP, Brief Assessment of Distress about Pain scale; BDI-II, Beck Depression Inventory-II; FPQ, Fear of Pain Questionnaire-III; PASS, Pain Anxiety Symptoms Scale.

*Correlation is significant at the $p < .05$ level.

**Correlation is significant at the $p < .001$ level.

The comparatively small sample size and heterogeneity of pain site in the chronic pain patient study may limit its external validity. A larger sample may also be more ideal for performing PCA. Use of different methods of delivery of the battery of assessments (web-based versus paper-and-pencil) may be viewed as a limitation, although that choice was driven by practicality issues. Lastly, the assessment battery was intentionally designed to be brief, keeping in mind patient burden, but that brevity may affect its construct validity. Disentangling anxiety and fear, in particular, is difficult, given some overlap in these states. The current state of the science is incomplete in our understanding of the relation between fear and anxiety (and other affective states such as depression), which affects their measurement. The language (in this case, English) used to describe these states may itself be limiting. The BADP, typical of any assessment, imperfectly measures the constructs under study, but may be particularly inexact in distinguishing between anxiety and fear. Nevertheless, data on the differential impact of anxiety and fear on pain (Rhudy & Meagher, 2000) emphasize the importance of attempting to assess them both, but to do so independently.

The BADP has potential to be utilized in research and clinical settings to identify individuals who may suffer from anxiety, fear, and/or depression with pain, in hopes of improving treatment. There is clear merit in developing short assessments that are easy to administer, score, and interpret, which may help in early identification of individuals at risk for high negative emotionality associated with pain, allowing for more comprehensive assessments and treatments. Many healthcare settings in which pain is treated are fast-paced, with limited time for professionals to administer psychological screeners or assessments. Given the high comorbidity of pain and psychological distress, it is critical that a short and simple measure is available in these settings. The BADP shows potential for applications in identifying general negative emotional states in individuals experiencing chronic pain, as well being applicable for individuals seeking treatment for acute pain in medical, dental, and other healthcare settings.

It should be noted that the constructs the BADP assesses (i.e., fear, anxiety, depression, and negative affect) are multidimensional and highly comorbid. The benefits of the BADP are such that they measure the higher order construct of distress and allow for clinicians to screen for broader distress and also for more specific constructs associated with pain (i.e., anxiety, fear, and depression). Designing an assessment tool that is capable of making successfully distinctions among these constructs, however, is challenging, especially given the significant overlap among them (Felicione et al., 2021). Although the intent of the BADP is to evaluate specific pain-related negative emotional states, there is an argument that it may primarily assess a single pain-related distress factor. Regardless, the availability of such an instrument for screening patients potentially is of great clinical benefit. The BADP has promise as a screening measure; the single item omnibus negative affect item may have potential as a one-item screener. With further development and analysis, the BADP could address the gap in the literature for a brief measure that assesses fear, anxiety, depression, and negative affect in relation to the experience of pain.

6 | CONCLUSIONS

The development of a brief measure to examine negative affectivity in relation to pain experience was needed, as evident by the gap in the literature. Thus, the BADP was created to measure affectively negative psychological states known to be related to chronic and acute pain (i.e., fear, anxiety and depression). This brief measure can aid in the rapid and accurate assessment of comorbid psychological states related to the experience of pain. The respondent and clinician burden with the BADP is low, which is a strength of the measure, especially when used in clinical settings. Furthermore, the BADP includes a one-item, omnibus question, which could easily be implemented throughout care for regular assessment of individuals suffering from chronic pain. Overall, the ease of administration, scoring, and interpretation of the BADP demonstrates the utility of the measure for healthcare providers and researchers working with chronic and acute pain patients. The BADP may be relevant to many types of patients and healthcare settings.

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DATA AVAILABILITY STATEMENT

This manuscript is based in part upon a thesis by the first author, supervised by the last author. It is available at https://libwvu.on.worldcat.org/oclc/909371279.

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REFERENCES

Anastopoulos, A. D., & Shelton, T. L. (2001). Assessment procedures. In D. C. Turk & R. J. Gatchel (Eds.), *Assessing attention-deficit/hyperactivity disorder* (pp. 73–119). Kluwer Academic/Plenum Publishers.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Beck depression inventory-second edition manual*. Psychological Corporation. https://doi.org/10.1037/t00742-000.

Beesdo, K., Jacobi, F., Hoyer, J., Low, N. C. P., Höfler, M., & Wittchen, H. U. (2010). Pain associated with specific anxiety and depressive disorders in a nationally representative population sample. *Social Psychiatry and Psychiatric Epidemiology*, *52*(1), 89–104. https://doi.org/10.1007/s00127-009-0045-1

Costello, A. B., & Osborne, J. W. (2005). Best factors in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, *10*(7), 1–9.

DeVellis, R. F. (2017). *Scale development: Theory and applications*. (4th ed.). Sage Publications.

Fabrigar, L. R., & Wegener, D. T. (2012). Understanding statistics. *Exploratory factor analysis*. Oxford University Press.

Felicione, N. J., Blank, M. D., Wright, C. D., & McNeil, D. W. (2021). Pain, fear, anxiety, and stress: Relation to beta-endorphins. In P. Kerr, & C. Sirbu (Eds.), *Opioids from inside out: Scientific foundations and clinical innovations of endogenous opioid research*. Springer.

Field, A. (2009). *Discovering statistics using SPSS*. SAGE Publications Ltd.

Gross, R. T., & Collins, F. L. (1981). On the relationship between anxiety and pain: A methodological confounding. *Clinical Psychology Review*, *1*, 375–386. https://doi.org/10.1016/0272-7358(81)90012-X

Hinkin, T. R. (1995). A review of scale development practices in the study of organizations. *Journal of Management*, *21* (5), 967–988. http://dx.doi.org/10.1177/014920639502100509.

Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. *Organizational Research Methods*, *1* (1), 104–121. http://dx.doi.org/10.1177/109442819800100106.

Hu, L. T., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to under parameterized model misspecification. *Psychological Methods*, *3*(4), 424–453. https://doi.org/10.1037/1082-989X.3.4.424

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hudson, J. L., & Moss-Morris, R. (2019). Treating illness distress in chronic illness. *European Psychologist*, *24*, 26–37. https://doi.org/10.1027/1016-9040/a000352

James, A. D., & Meloy, M. G. (2017). Attention by design: Using attention checks to detect inattentive respondents and improve data quality. *Journal of Operations Management*, *53*, 63–70.

Janssen, S. A. (2002). Negative affect and sensitization to pain. *Scandinavian Journal of Psychology*, *43*(2), 131–137. https://doi.org/10.1111/1467-9450.00278

Kincaid, J. P., Fishburne, R. P., Rogers, R. L., & Chissom, B. S. (Eds.) (1975). Derivation of new readability formulas (Automated Readability Index and Flesch Reading Ease Formula) for navy enlisted personnel, *Research Branch Report* (pp. 8–75), Naval Technical Training.

Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel Psychology*, *28*, 563–575. https://doi.org/10.1111/j.1744-6570.1975.tb01393.x

Lazarus, R. S., & Lazarus, B. N. (1996). *Passion and reason: Making sense of our emotions*. Oxford.

LeDoux, J. E., & Brown, R. (2017). A higher-order theory of emotional consciousness. *Proceedings of the National Academy of Sciences*, *114*, E2016–E2025. https://doi.org/10.1073/pnas.1619316114

Lerman, S. F., Shahar, G., & Rudich, Z. (2010). Distinguishing affective and somatic dimensions of pain and depression: A confirmatory factor analytic study. *Journal of Clinical Psychology*, *66*(4), 456–465. https://doi.org/10.1002/jclp.20674

Liebeskind, J. C., & Paul, L. A. (1977). Psychological and physiological mechanisms of pain. *Annual Review of Psychology*, *28*(1), 41–60. https://doi.org/10.1146/annurev.ps.28.020177.000353

Lingard, H. C., & Rowlinson, S. (2006). *Sample size in factor analysis: Why size matters* (pp. 1–6). University of Hong Kong.

Lumley, M. A., Cohen, J. L., Borszcz, G. S., Cano, A., Radcliffe, A. M., Porter, L. S., Schubiner, H., & Keefe, F. J. (2011). Pain and emotion: A biopsychosocial review of recent research. *Journal of Clinical Psychology*, *67*(9), 942–968. https://doi.org/10.1002/jclp.20816

Marks, I. M., & Mathews, A. M. (1979). Brief standard self-rating for phobic patients. *Behaviour Research and Therapy*, *17*, 263–267. https://doi.org/10.1016/0005-7967(79)90041-X

McCracken, L. M., & Dhingra, L. (2002). A short version of the pain anxiety symptoms scale (PASS-20): Preliminary development and validity". *Pain Research and Management*, *7*(1), 45–50. https://doi.org/10.1155/2002/517163

McCracken, L. M., Zayfert, C., & Gross, R. T. (1992). The pain anxiety symptoms scale: Development and validation of a scale to measure fear of pain. *Pain*, *50*(1), 67–73. https://doi.org/10.1016/0304-3959(92)90113-P

McNaughton, N. (2011). Trait anxiety, trait fear and emotionality: The perspective from non-human studies. *Personality and Individual Differences*, *50*, 898–906. https://doi.org/10.1016/j.paid.2010.07.011

McNeil, D. W., Kennedy, S. G., Randall, C. L., Addicks, S. H., Wright, C. D., Hursey, K. G., & Vaglienti, R. (2018). The Fear of Pain Questionnaire – 9: Brief assessment of fear of pain. *European Journal of Pain*, *22*(1), 39–48. https://doi.org/10.1002/ejp.1074.

McNeil, D. W., & Rainwater, A. J. (1998). Development of the fear of pain questionnaire-III. *Journal of Behavioral Medicine*, *21*(4), 389. https://doi.org/10.1023/A:1018782831217.

McNeil, D. W., & van Wijk, A. (2005). *Understanding and assessing fear of dental pain, Lunch and learn session presented at the meeting of the American/International*. Association for Dental Research.

McNeil, D. W., Vargovich, A. M., Sorrell, J. T., & Vowles, K. E. (2014). Environmental, emotional, and cognitive determinants of dental pain. In D. I. Mostofsky & F. Fortune (Eds.), *Behavioral dentistry* (pp. 89–107). John Wiley & Sons Inc.

Media, M. B. (2013). The Flesch Reading Ease Readability Formula. *Readability formulas: Free readability tools to check reading levels, reading assessment, and reading grade levels*. Retrieved from: http://www.readabilityformulas.com/flesch-reading-ease-readability-formula.php

Morley, S., Eccleston, C., & Williams, A. (1999). Systematic review and meta-analysis of randomized controlled trials of cognitive behaviour

therapy and behaviour therapy for chronic pain in adults, excluding headache. *Pain*, *80*(1–2), 1–13. https://doi.org/10.1016/S0304-3959(98)00255-3

Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus user's guide*. Muthén & Muthén.

Oei, T. P., Moylan, A., & Evans, L. (1991). Validity and clinical utility of the fear questionnaire for anxiety-disorder patients. *Psychological Assessment*, *3*, 391–397. https://doi.org/10.1037/1040-3590.3.3.391

Rhudy, J. L., & Meagher, M. W. (2000). Fear and anxiety: Divergent effects on human pain thresholds. *Pain*, *84*(1), 65–75. https://doi.org/10.1016/S0304-3959(99)00183-9

Sprinkle, S. D., Lurie, D., Insko, S. L., Atkinson, G., Jones, G. L., Logan, A. R., & Bissada, N. N. (2002). Criterion validity, severity cut scores, and test-retest reliability of the beck depression inventory-II in a university counseling center sample. *Journal of Counseling Psychology*, *49*, 381–385. https://doi.org/10.1037/0022-0167.49.3.381

Storch, E. A., Roberti, J. W., & Roth, D. A. (2004). Factor structure, concurrent validity, and internal consistency of the beck depression inventory—second edition in a sample of college students. *Depression and Anxiety*, *19*(3), 187–189. https://doi.org/10.1002/da.20002

Sylvers, P., Lilienfeld, S. O., & LaPrairie, J. L. (2011). Differences between trait fear and trait anxiety: Implications for psychopathology. *Clinical Psychology Review*, *31*(1), 122–137. https://doi.org/10.1016/j.cpr.2010.08.004

Tovote, P., Fadok, J. P., & Lüthi, A. (2015). Neuronal circuits for fear and anxiety. *Nature Review: Neuroscience*, *16*, 317–331. https://doi.org/10.1038/nrn3945

Vervoort, T., & Trost, Z. (2017). Examining affective-motivational dynamics and behavioral implications within the interpersonal context of pain. *Journal of Pain*, *18*(10), 1174–1183. https://doi.org/10.1016/j.jpain.2017.03.010

Vowles, K. E., McNeil, D. W., Sorrell, J. T., & Lawrence, S. M. (2006). Fear and pain: Investigating the interaction between aversive states. *Journal of Abnormal Psychology*, *115*(4), 821–833. https://doi.org/10.1037/0021-843X.115.4.821

Waddell, G., Newton, M., Henderson, I., Somerville, D., & Main, C. J. (1993). A fear-avoidance beliefs questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain*, *52*(2), 157–168. https://doi.org/10.1016/0304-3959(93)90127-B

Woby, S. R., Roach, N. K., Urmston, M., & Watson, P. J. (2005). Psychometric properties of the TSK-11: A shortened version of the Tampa Scale for Kinesiophobia. *Pain*, *117*, 1–2. https://doi.org/10.1016/j.pain.2005.05.029

Woo, A. K. (2010). Depression and anxiety in pain. *Reviews in Pain*, *4*(1), 8–12. https://doi.org/10.1177/204946371000400103

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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APPENDIX A

Brief Aessessment of Distress about Pain

Directions: The items listed below describe emotions associated with painful experiences. Please look at each item and think about how you may feel if you currently have pain or have experienced pain in the past. If you have never experienced any significant amount of pain, please answer on the basis of how you would expect you would feel if you had such an experience. Circle one number for each item below to rate how you may feel in relation to the experience of pain.

	Not at all	A little	A fair amount	Very much	Extreme
1. Pain causes me to have strong negative feelings.	0	1	2	3	4
2. The fact that I could feel pain the future worries me a lot.	0	1	2	3	4
3. I am scared of feeling pain.	0	1	2	3	4
4. Being in pain makes me feel sad.	0	1	2	3	4

Note: The BADP has a public domain copyright in the United States. Permission is granted for users to reproduce the instrument for clinical and research purposes. Item 1 is an overall, omnibus item. A total score can be derived by summing all four items.