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2 **A study of psychological pain in substance use disorder and its relationship to**
3 **treatment outcome**

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24

26 **ABSTRACT**

27 Substance Use Disorder (SUD) is a major public health concern affecting an estimated 22.5
28 million individuals in the United States. The primary aim of this study was to characterize
29 psychological pain in a cohort of patients participating in outpatient substance abuse
30 treatment. A secondary aim was to determine the relationships between pre-treatment
31 assessments of psychological pain, depression, anxiety and hopelessness with treatment
32 retention time and completion rates. Data was analyzed from 289 patients enrolled in an
33 outpatient community drug treatment clinic that provides mental healthcare to the
34 underserved. A previously determined threshold score on the Mee-Bunney Psychological
35 Pain Assessment Scale (MBP) was utilized to group patients into high and low-moderate
36 scoring subgroups. The higher pain group reported increased levels of anxiety,
37 hopelessness and depression compared to those in the low-moderate pain group.
38 Additionally, patients scoring in the higher psychological pain group exhibited reduced
39 retention times in treatment and more than two-fold increased odds of dropout relative to
40 patients with lower pre-treatment levels of psychological pain. Among all assessments, the
41 correlation between psychological pain and treatment retention time was strongest. To our
42 knowledge, this is the first study to demonstrate that psychological pain is an important
43 construct that correlates with relevant clinical outcomes in substance abuse treatment.
44 Further, pre-treatment screening for psychological pain may be of benefit in identifying
45 higher-risk patients in need of targeted additional clinical resources to improve treatment
46 retention and completion rates.

47 **INTRODUCTION**

48 Substance Use Disorder (SUD) is a major public health concern affecting an
49 estimated 22.5 million individuals in the United States (1). In 2017, 70,237 deaths were
50 attributed to drug overdoses—a significant increase of 9.6% over the past year (2).

51 Nationally, substance-related addiction incurs a financial burden exceeding \$400 billion per
52 year including expenses related to lost work productivity, healthcare and drug-related
53 crime (3). There are 14,500 drug treatment centers in the US but only a relatively small
54 number of individuals (11%) enter treatment despite the fact that many programs are
55 supported by local, State and Federal government funding (4). Drug treatment programs
56 continue to strive for improving program outcomes, however, data shows that they are
57 maximally effective when patients remain in treatment (length of stay-LOS) for an average
58 of 90 days or more (5, 6). Program completion is associated with better health, fewer
59 readmissions, less criminal activity (7) and lower mortality rates (8).

60 Psychological pain is emerging as an important construct based on data from our studies (9,
61 10) and others (11-19). This form of pain is also described as mental pain, emotional pain,
62 social pain and psychache (20-22). There is very little data, however, on characterizing
63 psychological pain in addiction and in addiction treatment populations. Use of addictive
64 substances has been viewed as a strategy to suppress negative emotions so that the control
65 of mental pain (e.g., drug seeking induced by acute stress) is the objective rather than the
66 pleasure-seeking associated with substances of abuse (23). Within this framework, it might
67 be expected that the greater the level of psychological pain, the more serious the addiction.
68 A study in Portugal that assessed psychological pain in an addicted population using a
69 translated (English to Portuguese) abbreviated version (24 items) of the Orbach &
70 Mikulincer Mental Pain Scale (OMMP) found a small to moderate but positive correlation
71 between mental pain and the severity of addiction (24).

72 Poor retention rates (inadequate LOS) and failure to complete ('Dropout') substance
73 treatment programs pose major clinical challenges (25) to successful treatment. Of those
74 SUD individuals entering a program complete treatment depending on the type of abused
75 substance and whether therapy is offered as in- or outpatient (7). Programs often have no

76 predetermined time period for completion as relapse rates are high and it is common for
77 patients to briefly leave then re-enter treatment. In the case of dropouts, however, patients
78 often terminate treatment early without returning. Studies predicting individuals at high
79 risk for non-completion show that demographics, alone, are relatively poor indicators of
80 dropout risk (7). An adequate length of stay (LOS) is considered an important influential
81 factor for completion whereas early dropout from treatment is associated with outcomes
82 comparable to no treatment (26).

83 A Norwegian study addressing 'mental distress' and variables related to dropout
84 included 454 patients from five inpatient SUD centers used a brief version (10-item) of the
85 Hopkins Symptom Checklist (HSCL). The HSCL assesses obsessive-compulsivity,
86 somatization, anxiety and depression. Interestingly a high score on the HSCL, which the
87 investigators interpreted as 'mental distress', was associated with treatment dropout. The
88 HSCL, however, does not specifically define or assess psychological pain. Psychiatric
89 diagnoses including mood disorder, anxiety, PTSD and personality disorder did not
90 significantly differentiate dropouts from completers (27).

91 This study was undertaken to characterize psychological pain using the Mee-Bunney
92 psychological pain scale (MBP) (9, 10) in a substance dependent population. We
93 hypothesized that the construct of psychological pain could be reliably assessed in this
94 population and would correlate with measures of depression and anxiety as previously
95 observed in major depressive episodes and patients with suicidality (9, 10). In addition, to
96 build on these findings, we tested the utility of a previously established threshold for high
97 psychological pain as an indicator of risk for negative treatment outcomes. Our earlier data
98 also showed that patients scoring high for psychological pain upon intake also had higher
99 acuity on other clinical assessments. The MBP is a brief 10-item self-report instrument
100 designed for use in a variety of clinical settings. Items are rated on a 5-point Likert Scale and

101 include categories such as current and past (within 3 months) psychological pain levels,
102 intensity, and tolerance (e.g., how much psychological pain can you tolerate before it
103 becomes unbearable?). We previously documented higher levels of psychological pain in
104 patients with major depressive episodes (MDEs) compared to healthy controls (10) where a
105 secondary finding included a significant correlation between psychological pain and
106 suicidality scores obtained from the Suicide Behavior Questionnaire (28). In a follow-up
107 study we examined psychological pain as a pre-treatment risk indicator for suicidality and
108 serious suicide attempts in U.S. Veterans admitted to a suicide prevention program. Our
109 findings showed that of all the assessments including depression, hopelessness and
110 impulsivity, psychological pain accounted for the most shared variance with suicidality as
111 measured by the Columbia Suicidality Severity Rating Scale (C-SSRS). Using the previously
112 tested MBP threshold score of $MBP \geq 32$ [defined as 0.5 SD above the mean of the MDE
113 patients (10)], we identified a subgroup of patients (24/57) scoring high for psychological
114 pain. At a 15-month follow-up, 9 of the 24 patients had a serious suicidal event (as defined
115 by criteria on the C-SSRS). Of those scoring above 32 on the Mee-Bunney scale, 7/9 would
116 have died if not found and one patient completed suicide. Taken together, these results
117 showed that high psychological pain increased the risk for suicidal ideation and serious
118 suicidal events. In addition, they provided preliminary evidence that stratifying patients by
119 psychological pain scores could aid in identifying those experiencing an elevated risk for
120 negative clinical outcomes.

121 In this study, we hypothesized that psychological pain would correlate with ratings
122 of depression, anxiety and hopelessness consistent with our previous findings in other
123 psychiatric populations. In addition, we tested whether high levels of psychological pain
124 would correlate with an elevated risk for poorer treatment outcomes (i.e., treatment
125 retention times (LOS) and completion rates) compared with lower MBP scoring patients.

126 **METHODS**

127 Study design: A retrospective analysis of medical records was conducted for patients
128 enrolled between 2011-2013 in the Substance Abuse Counseling Systems of The Gary
129 Center (La Habra, California (SACS); a community-based outpatient SUD treatment program
130 providing addiction treatment to the underserved. Data collected included demographics,
131 standardized clinical assessments and outcome variables including completion/dropout
132 status and length of stay (LOS). Patients were referred to the SACS program by medical
133 providers, regional non-profit centers, Orange County (OC) courts, legal agencies and the OC
134 Healthcare Agency. In addition, the SACS program was advertised on the internet
135 (http://orange.networkofcare.org/mh/services/agency.aspx?pid=TheGaryCenterSACS_348
136 [2_0](#)). Direct outreach within the Orange County Healthcare Agency was also used to contact
137 clinicians. The SACS clinical program was supported by a grant from the OC Healthcare
138 Agency to provide substance abuse outpatient treatment to all patients, regardless of
139 funding or insurance status. The Institutional Review Board (IRB) of the County of Orange
140 Healthcare Agency approved the study and waived informed consent due to the minimal
141 risk associated with a retrospective chart review. We carefully protected the identity of the
142 patients by assigning each patient a numerical code to ensure privacy. Research personnel
143 conducting chart reviews were blind to the study protocol.

144 Subjects: Medical records (N= 529) from January 2011 to December 2013 for male and
145 female patients ≥ 18 years of age and meeting the DSM-IV criteria for Substance Dependence
146 or Substance Abuse were screened for inclusion in the study. Patients with incomplete
147 medical records or who did not meet admission requirements were excluded from the
148 study so that a total of 289 patient clinical charts were entered into the analyses. Successful
149 program completion was defined as fulfilling all required elements of the clinical program.
150 Data collected in the retrospective chart review included demographics, program length of

151 stay (LOS), completion status and data from clinical rating scales. Detailed socioeconomic
152 variables such as employment, education and marital status were not available. All patients
153 entering the program underwent drug screening at admission and during the course of
154 treatment for alcohol, tetrahydrocannabinol (THC), methamphetamine, cocaine, opiates and
155 benzodiazepines.

156 Exclusion criteria: Subjects under age 18 and those who had not agreed to each required
157 random drug screening as well as clinical testing were excluded from the retrospective
158 analyses as were those chart records with missing assessment and/or data relevant to
159 completion status.

160 Assessment: Data collected from the intake assessment upon admission included ratings
161 from the Mee-Bunney Psychological Pain Assessment Scale (MBP) (9, 10) the Beck
162 Depression Inventory (BDI)(29), the Beck Hopelessness Scale (30) and the Beck Anxiety
163 Inventory (BAI) (31). Random drug testing conformed to the standards of the Department
164 of Transportation (DOT)-regulated biological fluid testing and included both observed urine
165 and saliva collection.

166 Program Completion was task dependent and determined by successfully completing the
167 core programmatic components as designed by the SACS treatment team. Primary required
168 elements included: attendance in the program >90 days, participation in 24 group sessions
169 (16 process groups and 8 relapse prevention groups); four individual psychotherapy
170 sessions, evidence of weekly attendance at community-based 12-step programs; two
171 psycho-educational classes; and six random, observed drug tests. In order to maximize the
172 opportunity to complete the treatment program and to accommodate relatively brief
173 diversions from treatment (i.e., court hearings and child visitation), there was no
174 predetermined maximum time for completion.

175 Program Dropout (non-Completion status) was defined as not completing the tasks
176 necessary for program completion as described previously and/or non-attendance for
177 greater than 30 days.

178 Statistical Methods

179 Statistical analyses were performed with IBM SPSS software. Multiple regression analyses
180 with predictors entered into the model in blocks were performed to determine correlation
181 coefficients (Pearson) between clinical tests. Group differences were examined using
182 ANOVA, two-tailed t-test (continuous variables) and Chi Square analysis (categorical
183 variables). Significance levels were set at $p=0.05$. To allow for further examination of
184 outcome variables such as Length of Stay (LOS) and rates of completion or dropout we
185 generated Kaplan-Meier Survival (Retention) curves and performed Log-rank comparison
186 tests with the null hypothesis assuming that the curves would not differ between
187 comparison groups.

188 RESULTS

189 Demographics: Data from 289 patients (188 males and 71 females) were included in the
190 analyses (Table 1). Patients self-identifying as Hispanic comprised a slight majority of the
191 population (55%). Methamphetamine was the most frequently reported drug of abuse
192 (73.7%) followed by alcohol (64.7%) and cannabis (56.4%). The majority of patients were
193 polysubstance abusers ($n=228$; 78.9%), while 21.1% ($n=61$) reported using a single drug of
194 choice. The combined number of drugs used by patients ranged from two ($n=116$; 40.1%) to
195 five ($n=10$; 3.5%) with the majority using two substances, methamphetamine and alcohol.

196 Clinical ratings: As described in Table 2 scoring of clinical assessments for all patients
197 indicated low levels of depression (BDI), anxiety (BAI) and hopelessness (BHS).
198 Psychological pain scores were in the low-moderate range based on previous studies in
199 normal and depressed populations (Mee, et al., 2011). Determination of Cronbach's alpha

200 indicated good internal reliability for all assessment instruments: MBP= .902, BDI=.941,

201 BHS=.876, BAI=.958.

203 Table 1. Demographics

Gender/ Age (yrs) ± SD	N	Percent (%)
Hispanic	159	55
Black	12	4.2
Asian	7	2.4
Pacific Islander	2	0.7
Other	9	3.1
Drug of choice with (+)or without (-) polysubstance		
Alcohol	205	70.9
(+)	187	91.2
(-)	18	.09
Tetrahydrocannabinol (THC)	178	61.6
(+)	163	91.6
(-)	15	8.4
Methamphetamine	238	82.4
(+)	213	89.4
(-)	25	11
Cocaine	68	23.5
(+)	66	97.1
(-)	2	2.9
Opiates	51	17.6
(+)	0	17.6
(-)	51	0
Benzodiazepines	8	2.8
(+)	7	87.5
- drug	1	12.5
Number of drugs abused		
One	61	21.1
Two	116	40.1
Three	64	22.1
Four	38	13.1
Five	10	3.5

204

205

207 Table 2: Mean scores and ratings for psychological pain (MBP), depression (BDI), anxiety
208 (BAI) and hopelessness (BHS)

Scale	Score (\pm SD)	Scoring Category
MBP	23.57 (8.87)	Low-moderate
BAI	11.98 (14.46)	Mild
BHS	4.8 (4.48)	Mild
BDI	8.54 (6.60)	Minimal

209

210 Significant correlations between the clinical assessments are described in Table 3. The
211 strongest relationship was found between psychological pain (MBP) and depression (BDI).

212

213 Table 3. Pearson correlation coefficients between rating scales

	MBP	BDI	BHS	BAI
MBP ^a	1.00			
BDI ^b	0.77*	1.00		
BHS ^c	0.63*	0.64*	1.00	
BAI ^d	0.61*	0.62*	0.44*	1.00

* $p < .0001$

214 Completion of treatment and Length of Stay (LOS)

215 Program completion was defined as satisfying all clinical requirements of the SACS
216 program. Dropouts participated in the program but failed to complete.

217 Completion rates: The overall completion rate was 23.5% (N=68). Significantly fewer higher
218 MBP scoring patients completed the program (11.3%), than lower scoring patients (26.3%).

219 Dropouts: N=221 (76.5%) met the criteria for dropout (i.e., self-termination of treatment
220 without completing program requirements). Gender was not a factor for either completion
221 or dropout ($\chi^2 = 3.29$; $p = .07$).

222 Treatment Retention/Length of stay (LOS) refers to the number of days that patients
223 participated in treatment independent of whether they were completers or dropouts. The
224 mean number of days in treatment for all patients (completers and dropouts) was $143.4 \pm$

225 SD 7.55 with a range of 7-397 days. The median number of days spent in treatment was 100
226 days.

227 Gender: Female patients participated in the program significantly longer than males
228 (mean_{females} =163 days \pm 14.1 vs mean_{males} = 132 days \pm 8.6 days; $t=1.98$, $df=287$, $p=.048$).

229 Completion Status: Completers stayed in treatment for an average of 197.4 days compared
230 to 92.3 days for dropouts. This difference was highly significant ($t=11.52$, $df=28$, $p<.0001$).

231 The earliest patient completed treatment in 94 days while the last patient required more
232 than a year (397 days). Mean LOS with 95% Confidence Interval (CI) for all patients,
233 completers, dropouts, high and low-moderate psychological pain intensity patient groups
234 are illustrated in (Fig 1) for comparison.

235 Psychological Pain (MBP) ratings: Completers vs Dropouts: Although overall MBP scores
236 were in the low moderate range for the total patient population (Table 2), psychological
237 pain ratings were significantly higher for dropouts compared to completers (mean
238 MBP_{Dropouts}=24.4; mean MBP_{Completers}= 20.9; $t=-2.82$, $df=287$, $p=.005$). MBP scores were also
239 significantly higher in dropouts with briefer length of stays (LOS < 65 days) than for
240 dropouts with longer LOS (mean MBP_{<65LOS} =25.9; mean MBP_{>65 LOS}=23.1; $t=5.24$, $df=219$,
241 $p=.02$).

242 Correlation between length of stay (LOS) and ratings for psychological pain (MBP)
243 depression (BDI), anxiety (BAI) and hopelessness (BHS)

244 Regression analysis revealed significant negative linear correlations between LOS and
245 scores of all psychometric assessments with the exception of hopelessness (BHI).

246 Psychological pain was most strongly correlated with length of stay (LOS) ($r= -0.20$, Cohen's
247 $d=0.42$, $p=.001$) compared with the other assessments. This was followed by depression

248 (BDI $r=-.165$, Cohen's $d=0.33$, $p=.005$) and anxiety (BDI $r=-.135$, Cohen's $d=0.27$, $p=.022$).

249 Hopelessness was non-significant (BHS $r=-.107$, Cohen's $d=0.22$, $p=.07$).

250 Relationship between Psychological Pain (MBP) and Clinical Outcomes

251 A subgroup of 53 patients (18.3%) meeting the criterion for scoring high on psychological
252 pain assessment was identified. A threshold for high psychological pain ($MBP \geq 32$) was
253 developed and described in an earlier MBP scale validation study (10). As illustrated in
254 Table 4, patients meeting this definition of high psychological pain scores (at intake) also
255 rated significantly higher for depression (BDI), anxiety (BAI) and hopelessness (BHS)
256 compared to lower MBP scoring patients.

257

258 Table 4: Significant differences in clinical assessment symptom severity between subgroups
259 of patients scoring above and below threshold for high psychological pain (MBP)

Rating Scale	MBP <32 (Low-Moderate) n= 236	MBP \geq 32 (High) n=53	t-test	p-value
BDI	6.44 (Minimal)	17.77 (Mild)	df 278, t=-14.99	p<.001
BAI	8.24 (Minimal)	28.75 (Moderate)	df 278, t= -8.33	p<.001
BHS	3.53 (Minimal)	10.31 (Moderate)	df 253, t=-11.73	p<.001

260

261 Additionally, as shown in Table 5, higher scoring patients on MBP assessment had
262 significantly diminished program retention times in terms of LOS and were more likely to
263 drop out of treatment than the low-moderate group.

264

265 Table 5: Significant differences in clinical outcomes between patients scoring above and
266 below-threshold for high psychological pain (MBP)

Outcome measure	MBP \geq 32 (high) N=53	MBP <32 (lower) N= 236	p-value (χ^2)
Completers	6 (11.3%)	62 (26.3%)	p<.02
Dropouts	47 (88.7%)	174 (73.7%)	p=.02
Length of Stay (Mean)	102 days	152 days	p<.009
Dropout to Completion ratio	7.8	2.79	p<.02

267

268 Completion Rates and LOS

269 Logistic regression analysis showed that patients with high category pre-treatment
270 MBP scores were significantly more likely to become treatment dropouts compared to
271 patients reporting lower intensity psychological pain (Odds ratio 2.79, RR 1.21, p=.025).
272 Additionally, there were significantly more dropouts per completion in the high pain group
273 (47:6,) compared to the lower scoring psychological pain group (174:62) [$\chi^2 = 5.38$,
274 p=0.02].

275 Retention in treatment (LOS) was significantly reduced in high pain category
276 patients relative to low-moderate patients (Table 5). A separate analysis replicated this
277 pattern within the Dropout group where high-pain Dropout patients demonstrated a
278 reduced LOS (mean=73.1d) relative to lower pain Dropouts (mean=97.5d) (p=.02, t=2.31, df
279 =219). While high pain category patients exhibited diminished LOS and lower subsequent
280 completion rates, we observed robust increases in both of these variables for patients who
281 remained in treatment for more than 100 days. Specifically, completion rates for the high
282 pain group increased from 11.3% to 35.3% and the low-moderate pain group increased
283 from 26.3% to 48.3% when LOS was greater than 100 days. Overall, 96.8% of all
284 completions for both groups occurred after 100 days of treatment.

285

286 Fig 1 illustrates mean LOS and 95% confidence interval (CI) for patients grouped by
287 outcome status and psychological pain intensity at program admission. Notably, the mean
288 LOS of high psychological pain (MBP) category patients was significantly decreased
289 compared to the low-moderate pain patients.

290

291 **Fig 1 Legend:** Mean retention times portrayed as LOS (days) with corresponding 95% CI
292 for the total patient population, completers, dropouts, as well as high and low-moderate
293 category psychological pain (MBP).

294

295 Retention Curves and Survival Analyses

296 Kaplan-Meier survival analyses and retention curves were developed for further
297 comparison of the high (n=53) and low-moderate MBP (n=236) psychological pain
298 subgroups for visualizing LOS and dropout patterns. These analyses revealed significant
299 differences between the patient curves (Log Rank p=0.001) in terms of retention rates and
300 patterns (**Fig 2**). Even at similar time points, the considerable over-representation of
301 completions clustering on the Low-moderate pain curve while largely absent on the High
302 pain curve is visually apparent. A separate analysis performed on the dropout group alone
303 comparing the high and low-moderate pain groups reflected a similar difference between
304 the curves (p=.011). 66% (n=35) of high scoring MBP patients had dropped out before the
305 first patient completed the treatment program (day 94) and by day 129, 75% of high-pain
306 patients had dropped out. High-pain category patients reached 50% attrition after just 53
307 days compared to 108 days for the lower pain group.

308

309 **Fig 2 Legend:** Program retention curves for High and Low-moderate pain categories. Log
310 Rank analysis showed that the curves significantly differed between the high pain and low-
311 moderate pain patient groups ($\chi^2=11.1$, p=.001). (+) indicates individual patient-program
312 completion. There is a notable clustering of completions on the low-moderate pain curve
313 while relatively absent on the high pain curve even at similar time points. At the mean LOS
314 of 143d for the general group, nearly twice the percentage of low-moderate psychological

315 pain patients remained in treatment compared with the high category pain patients (41.0%
316 vs 22.5%).

317

318 **DISCUSSION**

319 This study is, to our knowledge, the first to specifically focus on characterizing
320 psychological pain in a population seeking treatment for substance use disorders. Primarily,
321 the data from this effort confirm that psychological pain is a quantifiable construct in
322 patients suffering from substance abuse/dependence and that the MBP demonstrated
323 adequate reliability for measuring psychological pain in this clinical population.
324 Additionally, we found evidence that elevated pretreatment psychological pain is associated
325 with negative treatment outcomes such as diminished treatment retention time (LOS) and
326 reduced likelihood for program completion. We chose program completion as a proximal
327 indicator of overall treatment outcome although we did not have follow-up for abstinence.

328 Dropout was the most frequent treatment outcome for the SACS patients. This
329 observation agrees with data from the Treatment Episode Data Set (TEDS) published by
330 SAMHSA (32). Our patient population exhibited dropout rates somewhat higher than many
331 programs reported to the TEDS nationwide. It is possible that this was in part due to a high
332 proportion (73.7%) of our patients reporting methamphetamine dependence. Data from a
333 similar region in Los Angeles, California found that methamphetamine abusers were likely
334 to continue drug use during initial entry into the program, a factor which was thought to
335 contribute to the relatively high attrition rate (51%) during the first few weeks of treatment
336 (33). Another potential factor is that many of the patients were disadvantaged. We did find
337 that completion rates in the SACS population nearly doubled when patients remained in
338 treatment at least 100 days, reaching levels in agreement with data from the TEDS
339 Government analysis.

340 Pre-treatment levels of anxiety, depression and hopelessness symptoms for the
341 entire treatment population were indicative of minimal comorbid psychopathology. A
342 simple binary risk stratification method based on psychological pain (MBP scores),
343 previously developed and applied to depressed and suicidal psychiatric populations (9, 10)
344 re-grouped patient data into high and low-moderate categories of pain. The 'high' pain
345 category group, relative to the lower pain group, exhibited significantly greater dropout
346 rates, had more severe psychopathology (depression and anxiety) scores as well as a
347 pronounced reduction in LOS. Survival curve analyses confirmed differences in completion
348 patterns and LOS which suggest that our high and low-moderate pain risk categorization
349 scoring method separated patients into two sub-populations differing in treatment
350 outcomes. Incorporating systematic psychological pain screening within current standard
351 intake assessment paradigms, may aid in identifying patients at program entry posing
352 elevated risk for early dropout and offer the potential for outcome modifying interventions
353 such as increasing retention time. For example, each of the relatively few high-pain
354 category patients who successfully completed the treatment protocol (only 2.1% of the total
355 patient sample) were associated with LOS >129 days; nearly twice the mean LOS for the
356 total high pain population. In contrast, 89% of high pain patients who dropped out of
357 treatment, did so before the first 102 days of treatment.

358 This is a small, retrospective observational study. In light of the preliminary nature
359 of these findings, caution is warranted in generalizing them pending replication in larger
360 populations. Future replicative studies would benefit from a prospective design, however,
361 retrospective designs can be appropriately used in the context of multiple outcome
362 measures (34). Demographic information was limited to and dependent upon the clinical
363 program intake process. An additional limitation was that these findings derive from a
364 relatively small sample size. Statistical significance, however, was reached for nearly all

365 tests performed, reflecting the robust effect size we have observed in our previous studies
366 on the effects of elevated psychological pain on clinical outcomes.

367 **CONCLUSION**

368 In this study, we present evidence suggesting that psychological pain has a negative
369 influential effect on program completion and LOS in outpatient substance treatment. The
370 highest scoring patients on pre-treatment psychological pain assessment were ultimately
371 1.21 times more likely to drop out and to participate in treatment significantly fewer days
372 compared with lower pain scoring peers. Whether this reduction in completion rates is a
373 direct or indirect consequence of decreased LOS remains unanswered and further work in
374 larger populations is needed to better understand these relationships. The survival curve
375 analysis demonstrated a preferential clustering of completions on the lower pain group
376 curve and relative lack of completions on the higher pain curve at identical time
377 points. This suggests that a factor apart from reduced LOS may also be negatively
378 influencing completion likelihood. Regardless, the study of psychological pain represents a
379 novel area to further our understanding of the unpredictable outcomes in substance use
380 disorders treatment. The subset of patients experiencing very high levels of psychological
381 pain at treatment initiation may be inherently poorer candidates for outpatient substance
382 treatment and early identification could allow for prompt referral to accessing higher levels
383 of care. Efforts to further our understanding on the negative influence of high pre-
384 treatment levels of psychological pain on completion rates and LOS offer additional
385 opportunities for improving substance treatment outcomes.

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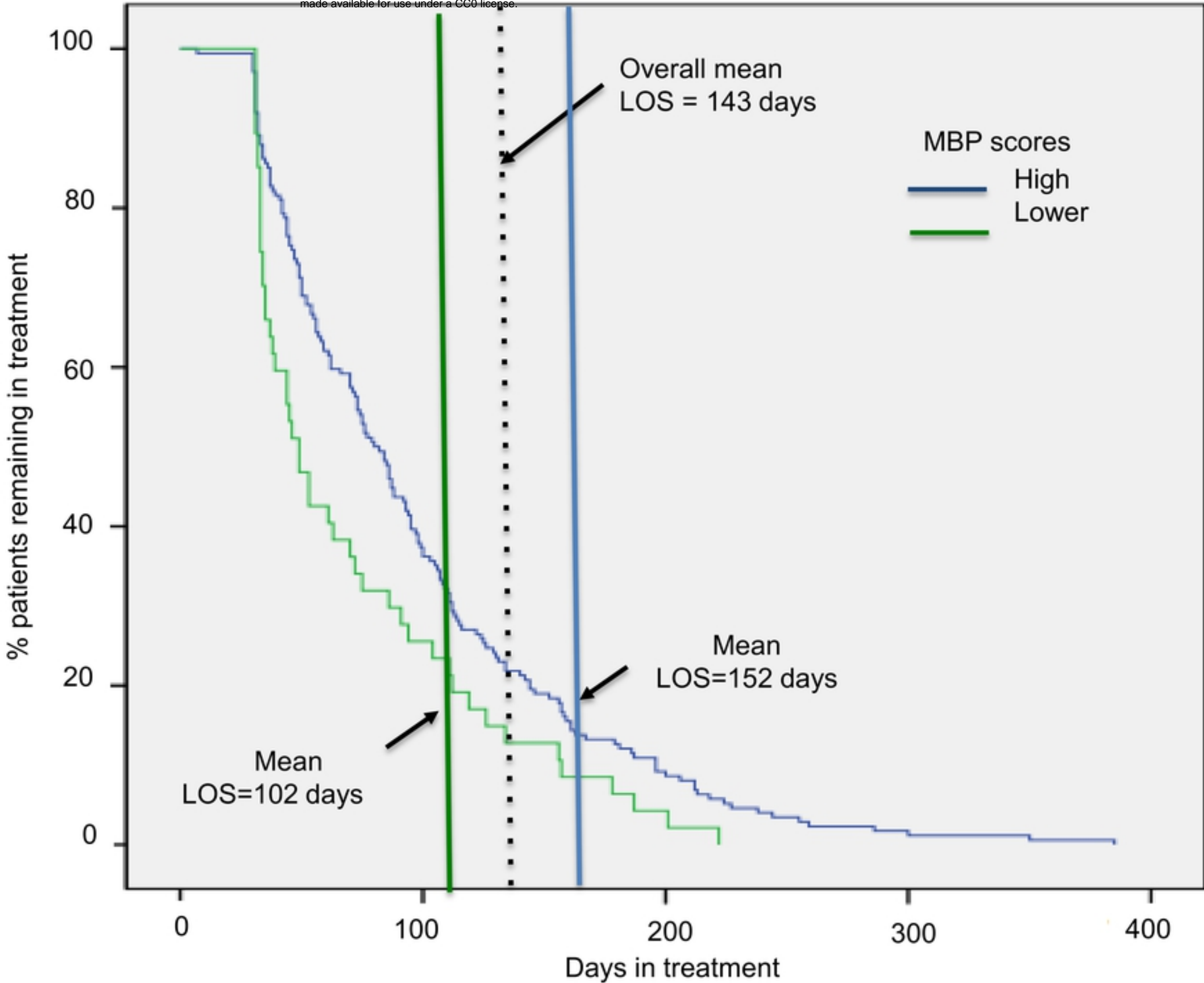


Figure 2

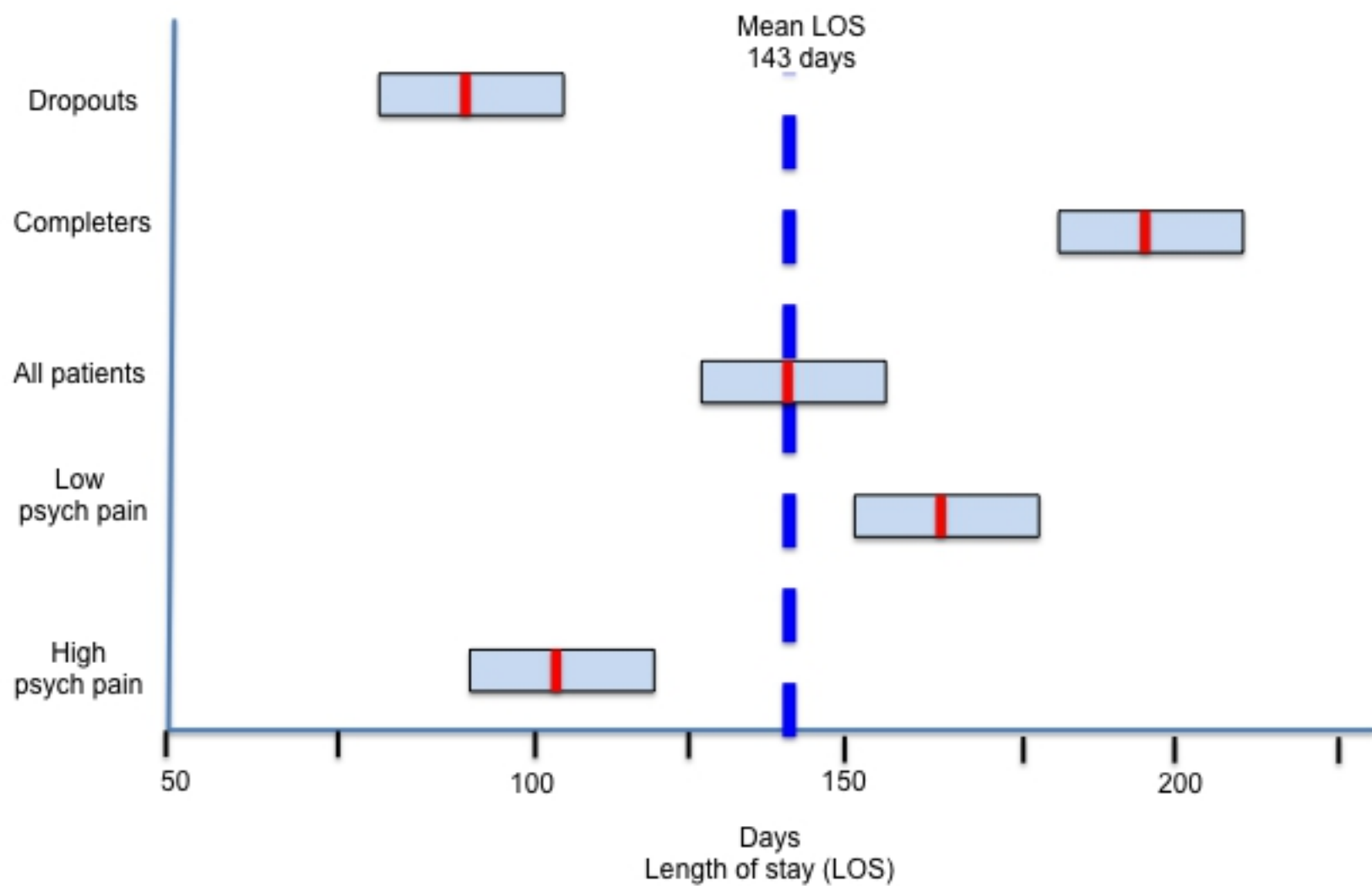


Figure 1