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8   The Relation of Self-Compassion to Functioning among Adults with Chronic Pain

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10   Karlyn A. Edwards[*1], Melissa Pielech[1], Jayne Hickman[2], Julie Ashworth[2], Gail Sowden[2],

11   & Kevin E. Vowles[1,2]

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14   [1] Psychology Department, University of New Mexico, Albuquerque, New Mexico, USA

15   [2] Interdisciplinary Musculoskeletal Pain Assessment and Treatment Service (IMPACT),

16   Midlands Partnership NHS Foundation Trust, National Health Service, Stoke-on-Trent, UK

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21   [*]Corresponding Author: Karlyn A. Edwards, M.S., Department of Psychology, University of

22   New Mexico, MSC03-2220 Logan Hall, Albuquerque, NM, 87131-0001, kaedwards@unm.edu

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24   **Abstract**

25   Previous research has shown that self-compassion is associated with improved functioning and

26   health outcomes among multiple chronic illnesses. However, the role of self-compassion in

27   chronic pain-related functioning is understudied. The present study sought to understand the

28   association between self-compassion and important measures of functioning within a sample of

29   patients with chronic pain. Treatment-seeking individuals (N= 343 with chronic pain) that were

30   mostly White (97.9%) and female (71%) completed a battery of assessments that included the

31   Self-Compassion Scale (SCS), as well as measures of pain-related fear, depression, disability,

32   pain acceptance, success in valued activity, and use of pain coping strategies. Cross-sectional

33   multiple regression analyses that controlled for age, sex, pain intensity, and pain duration,

34   revealed that self-compassion accounted for a significant and unique amount of variance in all

35   measures of functioning (r^2 range: .07 – .32, all $p < .001$). Beta weights indicated that higher

36   self-compassion was associated with lower pain-related fear, depression, and disability, as well

37   as greater pain acceptance, success in valued activities, and utilization of pain coping strategies.

38   These findings suggest that self-compassion may be a relevant adaptive process in those with

39   chronic pain. Targeted interventions to improve self-compassion in those with chronic pain may

40   be useful.

41   **Significance:** Self-compassion appears a relevant aspect of physical and psychosocial

42   functioning in those with chronic pain. It is possible that self-compassion interventions may aid

43   in facilitating adaptive behavioral change in these individuals.

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45   **Keywords:** Chronic pain, self-compassion, pain-related distress, acceptance.

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47   **Introduction**

48   Chronic pain is a substantial public health problem, with prevalence rates in the United

49   States among adults estimated to be 19% - 44% (Johannes, Le, Zhou, Johnston, & Dworkin,

50   2010; Kennedy, Roll, Schraudner, Murphy, & Mcpherson, 2014; Nahin, 2015; Von Korff et al.,

51   2016). The negative physical and psychological impacts of chronic pain are well-documented

52   (Boggero & Carlson, 2015; Ferreira-Valente, Pais-Ribeiro, & Jensen, 2014; Mun et al., 2017;

53   Park & Engstrom, 2015; Viggers & Caltabiano, 2012). Yet, there continues to be a dearth of

54   treatment options, given that prescription opioids are no longer indicated in the management of

55   chronic pain (Dowell, Haegerich, & Chou, 2016; Krebs et al., 2018), and that the growth of

56   interdisciplinary treatment facilities equipped to handle both the complex physical and

57   psychological needs of these patients has slowed significantly (Gatchel, McGeary, McGeary, &

58   Lippe, 2014). Identification of specific, modifiable treatment targets for this population is one

59   potentially feasible way to improve quality of life for individuals with chronic pain within

60   community treatment settings.

61   Currently, there are a number of reasonably effective treatments for chronic pain (Kerns,

62   Sellinger, & Goodin, 2011). For example, Acceptance and Commitment Therapy (ACT) has

63   shown strong empirical evidence in improving outcomes among numerous pain conditions

64   (APA, 2015). Specifically, ACT and other related mindfulness-based treatments have shown

65   small to medium effect sizes in measures of anxiety, depression, pain interference, and

66   functioning among those with chronic pain (Hilton et al., 2017; Hughes, Clark, Colclough, Dale,

67   & McMillan, 2017; Veehof, Trompetter, Bohlmeijer, & Schreurs, 2016). A proposed and

68   understudied treatment mechanism within ACT and other mindfulness-based interventions is

69   self-compassion. Broadly, self-compassion is defined as the ability to respond to personal

70   shortcomings, difficult circumstances, and painful experiences with kindness. It was first posited

71   by Kristen Neff (2003), who described it to consist of three components: self-kindness, common

72   humanity, and mindfulness. Generally, self-kindness is understood as being kind and

73   understanding towards oneself, rather than self-critical, particularly during instances of pain and

74   failure. Common humanity pertains to perceiving one's experience as part of the larger human

75   experience rather than as separate or isolating. Lastly, mindfulness relates to the ability to hold

76   painful thoughts and experiences in awareness rather than over-identifying with them (Neff,

77   2003). To date, findings indicate that self-compassion is largely associated with better

78   psychological well-being and resilience, and lower negative affect among multiple community

79   adult samples (Muris & Petrocchi, 2017; Zessin, Dickhäuser, & Garbade, 2015). Among the few

80   health conditions studied (e.g. celiac disease, cancer, and arthritis), self-compassion was

81   positively associated with higher quality of life and health promoting behaviors, indicating that it

82   may be an important component in supporting and maintaining physical and emotional health,

83   particularly when faced with managing a chronic medical condition (Dowd & Jung, 2017;

84   Homan & Sirois, 2017; Pinto-Gouveia, Duarte, Matos, & Fráguas, 2014; Sirois, Kitner, &

85   Hirsch, 2015; Sirois, Molnar, & Hirsch, 2015).

86   Research focusing on self-compassion in the context of chronic pain is limited.

87   Preliminary cross-sectional work has shown self-compassion to have a positive relation to

88   functioning in chronic pain samples. For example, self-compassion has been associated with

89   higher levels of emotional resilience and positive affect, and lower levels of depression, pain

90   catastrophizing, and pain-related disability among those with chronic pain (Costa & Pinto-

91   Gouveia, 2011, 2013; Purdie & Morley, 2016; Wren et al., 2012). In the context of the ACT

92   model, self-compassion was found to mediate the relationship cognitive fusion (i.e. the tendency

93   to be consumed by thoughts) and depressive symptoms (Carvalho, Gillanders, Palmeira, Pinto-

94   Gouveia, & Castilho, 2018), and was found to be directly and indirectly related to depression

95   symptoms through the activity engagement subscale of a pain acceptance questionnaire

96   (Carvalho, Pinto-Gouveia, Gillanders, & Castilho, 2018). Longitudinal data examining the

97   effectiveness of an interdisciplinary ACT treatment program found changes in self-compassion

98   mediated improvements in disability, depression, pain related anxiety, number of medical visits,

99   and the number of classes of prescribed analgesics (Vowles et al., 2014). Other mindfulness and

100   acceptance-based treatment approaches that have targeted self-compassion have also found

101   increases to be associated with improvements in overall quality of life, pain acceptance, and

102   depression severity (Doran, 2014; Peters et al., 2017).

103   Taken together, current research indicates that self-compassion is a preliminary factor in

104   developing and maintaining psychological wellbeing. Among chronic pain samples, cross-

105   sectional findings suggest that self-compassion may also be an effective and modifiable

106   treatment target. However, it is unclear if self-compassion on its own may be associated with

107   general measures of functioning and pain-specific processes and outcomes over and above

108   important pain and demographic variables. Given these gaps, the current study sought to better

109   understand the role of self-compassion in chronic pain. To achieve this, a secondary data analysis

110   of self-compassion in relation to eight general and pain-specific domains was carried out in a

111   sample of adults with chronic pain. Measured domains included physical and psychosocial

112   disability, depression, engagement in values-based activity, pain acceptance, pain-related

113   anxiety, and use of pain coping strategies. These domains were selected given their established

114   relevance to chronic pain (Vowles et al., 2014). It was hypothesized that higher levels of self-

115   compassion would be associated with greater functioning across all eight measures, while

116   controlling for age, gender, pain duration, and usual pain intensity. Specifically, self-compassion

117   would be associated with greater pain acceptance, use of pain coping strategies, and success in

118   values-based activities, and associated with less depression, pain anxiety, and physical and

119   psychosocial disability.

Method

121   **Participants**

122   Data from 343 participants was collected between March 2010 and December 2011 and

123   339 participants were included in the present analyses. One participant was excluded due to

124   missing data (>75% missing responses), and 3 participants were removed due to outlying scores

125   on one of the nine measures used in the study. Participants were treatment-seeking individuals

126   with chronic pain, who were referred by their primary care providers to a community-based

127   interdisciplinary pain clinic in the Midlands of the United Kingdom. As these data were collected

128   within an established clinical service, the inclusion criteria were fairly broad in that only referral

129   from a primary care provider to the service and patient provision of informed consent to take part

130   in the study were necessary. Individuals with pain related to an active cancerous growth were not

131   seen within the service, nor were individuals with active psychosis.

132   The sample was primarily White European (97%) in ethnicity and female in gender

133   (71%). A full description of the sample demographic characteristics can be found in Table 1. The

134   median pain duration of the sample was about 7 years (*Med* = 7.21, *Range* = .17 - 61.33), with

135   50% (*N* = 168) of the sample not working due to pain. The most common pain site reported was

136   low back (53%), followed by full body pain (13%). The most commonly utilized pain treatments

137   reported by patients were pain medications (86%), followed by physiotherapy (65%), and

138   transcutaneous electrical nerve stimulation (TENS; 53%).

139 [Insert Table 1 here]

Procedures

141   Participants were given a set of standardized measures before attending an initial

142 assessment appointment at the clinic. Participants were instructed to fill out all measures before

143 arrival to their initial appointment. A research coordinator was available during appointments to

144 check for missing data, and assist participants in completing the measures, if needed. Participants

145 were not compensated for completing these questionnaires. Informed consent was obtained prior

146 to assessment and the study was approved by the local Research Ethics Board of the National

147 Health Service.

Measures

149   **Self-Compassion Scale.** Self-compassion was measured using the 24-item Self-

150 Compassion Scale (SCS; Neff, 2003), with questions such as, 'I am kind to myself when I am

151 experiencing suffering', 'When I see aspects of myself that I don't like I get down on myself',

152 and 'When things are going badly for me, I see the difficulties as part of life that everyone

153 goes through'. Responses were measured on a 5-point Likert-type scale from 1 (almost never) to

154 5 (almost always). Total score was used for these analyses, with higher scores indicating higher

155 levels of self-compassion. Among those with chronic pain, higher scores on the SCS have been

156 associated with lower negative affect, pain catastrophizing, and pain disability (Costa & Pinto-

157 Gouveia, 2013). In addition, the SCS has been found to be valid and reliable in a number of

158 clinical and non-clinical samples, including college students, community adults, and those with

159 recurrent depression (Neff, Whitaker, & Karl, 2016). In the current sample, the internal

160 consistency for the SCS was .92, indicating strong reliability.

161   **Sickness Impact Profile.** Physical and psychosocial functioning was measured using the

162   136-item Sickness Impact Profile (SIP; Bergner et al., 1981). The measure provides composite

163   scores for Physical Disability and Psychosocial Disability, by assessing twelve domains that

164   measure the effect of a health problem on daily functioning. The physical domain is made up of

165   items that pertain to Ambulation, Mobility, and Body Care and Movement scales, while the

166   psychosocial domain is made up of items that pertain to Social Interaction, Alertness, Emotional

167   Behavior, and Communication scales. Scores can range from 0 to 1 with higher scores indicating

168   higher severity in disability, and are associated with shorter standing/walking times, fewer daily

169   tasks accomplished, poorer satisfaction in social relationships, and increased depression severity

170   (Follick, Smith, & Ahern, 1985; Watt-Watson & Graydon, 1989). Both functioning subscales

171   have demonstrated adequate validity, reliability, and clinical utility in a community-dwelling

172   adult and chronic pain sample (Bergner et al., 1981; Follick et al., 1985). In the current sample,

173   the internal consistency for the Physical Disability domain was .82, and .86 for the Psychosocial

174   Disability domain, indicating good reliability.

175   **British Columbia Major Depression Inventory.** Depression severity was measured

176   using the 20-item British Columbia Major Depression Inventory (BCMDI; Iverson & Remick,

177   2004). Items correspond with the Diagnostic Statistical Manual, Fourth Edition criteria for Major

178   Depression (APA, 1994), with the first 16 items pertaining to specific symptoms and the last 4

179   items assessing impact of symptoms on work, family, school, and social activities. For the

180   symptom items, respondents were asked to endorse symptoms that were present within the past

181   two weeks, and then rate the severity of their symptoms on a 5-point Likert-type scale between 1

182   (very mild) and 5 (very severe). A total symptom severity score was used for the present

183   analyses, which was calculated by summing only the symptom items together and excluding the

184   impact items. Higher scores indicate worse symptom severity. The BCMDI demonstrated

185   adequate validity and reliability, and was clinically useful in classifying Major Depression

186   among a community sample, however has not been examined in a chronic pain sample at this

187   time (Iverson & Remick, 2004). In the current sample, the internal consistency for the BCMDI

188   was .90, indicating strong reliability.

189   **Chronic Pain Acceptance Questionnaire.** Pain acceptance was measured using the 20 -

190   item Chronic Pain Acceptance Questionnaire (CPAQ; McCracken & Eccleston, 2006). Items

191   pertain to assessing frequency of behaviors aimed at controlling pain as well as engagement in

192   valued based activities regardless of pain levels (McCracken, Vowles, & Eccleston, 2004).

193   Responses were measured on an 8-point Likert-type scale from 0 (never true) to 7 (always true).

194   A total score was used[1], with higher scores indicating more pain acceptance. The CPAQ has

195   shown adequate validity and reliability in multiple chronic pain samples (McCracken et al.,

196   2004; Reneman et al., 2010), and has been associated with lower mental distress and disability

197   (McCracken & Eccleston, 2006; Viane et al., 2003). In the current sample, the internal

198   consistency for the CPAQ was .86, indicating good reliability.

199   **Chronic Pain Values Inventory.** Values success was measured using the 12-item

200   Chronic Pain Values Inventory (CPVI; McCracken & Yang, 2006). It was used to assess values

201   success, or how well one is living in concordance with six broad valued domains: family,

202   intimate relations, friends, work, health, and growth or learning. Responses are measured on a 6-

203   point Likert-type Scale from 0 (not at all important/successful) to 5 (extremely

204   important/successful). A mean success score was used for the present analyses. Higher success

205   scores indicate more success at living in concordance with one's values, and has demonstrated

206   adequate validity and reliability in a chronic pain sample (McCracken & Yang, 2006). Higher

207   value success scores have been associated with better physical and psychosocial functioning, and

208   lower depressive symptoms and depression-related interference (McCracken & Yang, 2006;

209   Vowles, McCracken, et al., 2014). In the current sample, the internal consistency for the CPVI

210   was .89, indicating good reliability.

211   **Brief Pain Coping Inventory-2.** Pain-related coping was measured using the 19-item

212   Brief Pain Coping Inventory – 2 (BPCI-2; McCracken, Eccleston, & Bell, 2005). Items

213   correspond to two subscales: use of flexible pain coping strategies and use of traditional pain

214   coping strategies. Typically, traditional pain coping strategies pertain to attempts to try and

215   control pain levels through strategies such as exercise, relaxation, distraction, and positive self-

216   statements. Flexible coping strategies relate to psychological flexibility, and include accepting

217   pain and pain-related distress, present-moment focused awareness, and engagement in valued

218   based activities with or without pain (McCracken & Vowles, 2007). For each item, respondents

219   were asked to indicate the number of days in the past seven they had used each coping strategy.

220   Both subscales were used in the present analyses and were derived by summing the subscale

221   items together, with higher scores indicating higher utilization of coping strategies. Additionally,

222   higher scores on both subscales have been associated with greater physical and psychosocial

223   functioning, as well as higher engagement in valued activity and pain acceptance (Vowles,

224   Mccracken, et al., 2014). Previous research has indicated that the flexible coping subscale may

225   be more strongly associated with positive treatment outcomes than the traditional coping

226   subscale (McCracken & Vowles, 2007; Vowles & McCracken, 2010). In the current sample, the

227   internal consistency for the flexible pain coping subscale was .77, and .70 for the traditional pain

228   coping subscale, indicating adequate reliability.

229   **Pain Anxiety Symptom Scale.** Pain anxiety was measured using the 20-item Pain

230   Anxiety Symptom Scale (PASS; McCracken, Zayfert, & Gross, 1992). Items assess four

231   domains that correspond to aspects of pain anxiety, which include cognitions, physiological

232   anxiety symptoms, fear of pain, and attempts at escape/avoidance of pain. Respondents were

233   asked to rate how frequently each item occurred on a 6-point Likert-type scale, with responses

234   ranging from 0 (never) to 5 (always). A total score was used, with higher scores indicating more

235   pain anxiety. The PASS has shown to be adequately valid and reliable in a community sample of

236   adults and chronic pain sample with varying pain diagnoses (McCracken, Zayfert, & Gross,

237   1992; Osman et al., 1994). The PASS has been shown to predict severity of disability, pain

238   interference, and emotional distress among community and chronic pain samples (McCracken et

239   al., 1992; Osman et al., 1994). In the current sample, the internal consistency for the PASS was

240   .92, indicating strong reliability.

241   **Pain and Demographic Information.** Demographic variables included self-reported

242   age, gender, race, marital status, employment status, and years of education. In regard to pain-

243   specific information, pain duration in years, primary and secondary pain sites, and utilization of

244   previous pain treatments were collected. Usual pain intensity over the preceding seven days was

245   measured on a numerical rating scale (Hartrick, Kovan, & Shapiro, 2003) from 0 (no pain) to 10

246   (worst possible pain).

247   **Data Analysis Plan**

248   Descriptive statistics were calculated for all demographic variables, as well as the eight

249   outcome measures. Assumptions testing for the planned regression analyses included estimates

250   of skew, kurtosis, and multicollinearity (Tabachnick & Fidell, 2013). Potential outliers for each

251   outcome measure were identified via stem and leaf plots and visual inspection. As stated

252   previously, three cases were removed from the present analyses due to outlying scores on one of

253   the eight measures. To test the relation of self-compassion to the eight outcome measures, eight

254   separate cross-sectional linear regressions were conducted, controlling for demographic and pain

255   variables. For each linear regression, demographic variables were entered in the first step, which

256   included participant age and gender. Gender was dummy coded (1= women, 2 = men) before

257   being entered into each linear regression. In the second step, pain specific variables were entered,

258   which included the total number of years the participant had experienced pain (pain duration),

259   and their usual pain intensity for the past week. In the third and final step, self-compassion score

260   was entered. The criterion variables for the eight linear regressions were physical and

261   psychosocial disability, depression, pain acceptance, success in valued activities, use of

262   traditional pain coping strategies, use of flexible pain coping strategies, and pain anxiety. Beta

263   weights were examined to determine the directional relation between self-compassion and the

264   outcome measures. The unique variance accounted for by demographic variables, pain variables,

265   and self-compassion were examined to determine the contribution of each set of variables in the

266   outcome measures. All statistical analyses were carried out using SPSS Version 25 (IBM Corp.,

267   2017).

268   **Results**

269   There was no evidence of significant skew, kurtosis, or multicollinearity among any of

270   the study variables (Tabachnick & Fidell, 2013). The means and standard deviations for all

271   measures can be found in Table 2. It should be noted that the current sample exhibits similar

272   physical and psychological disability as compared to other chronic pain samples (Follick et al.,

273   1985; Vowles, Gross, & McCracken, 2007; Watt-Watson & Graydon, 1989). As hypothesized,

274   self-compassion was a significant predictor in all eight linear regressions, indicating that self-

275   compassion accounted for a significant and unique amount of variance in physical and

276   psychosocial disability, depression, pain acceptance, success in valued activities, use of

277   traditional pain coping strategies, use of flexible pain coping strategies, and pain anxiety.

278   Further, beta weights indicated that self-compassion was associated with the outcome measures

279   in the hypothesized directions. Particularly, self-compassion was positively associated with pain

280   acceptance, use of traditional and flexible pain coping strategies, and success in values-based

281   activities, and negatively associated with depression severity, pain anxiety, and physical and

282   psychosocial disability. These results are displayed in Table 3.

283   [Insert Tables 2 & 3 here]

284   To determine which outcome measures might be more strongly influenced by self-

285   compassion, variance accounted for by self-compassion scores within each functioning measure

286   was examined. Self-compassion contributed the largest amount of unique variance in depression

287   severity. The overall model was significant [r^2 = .44, $F(5, 199)$ = 31.23, $p < .001$], with self-

288   compassion accounting for 32% unique variance in depression severity scores. The second

289   largest unique variance of self-compassion was observed in pain acceptance. The overall model

290   was significant [r^2 = .38, $F(5, 156)$ = 18.92, $p < .001$], with self-compassion accounting for 29%

291   unique variance in pain acceptance scores. Third was psychosocial disability, and the overall

292   model was significant [r^2 = .32, $F(5, 202)$ = 18.87, $p < .001$] with self-compassion accounting for

293   27% unique variance in psychosocial disability scores. Next, self-compassion accounted for an

294   equal amount of unique variance (23%) in flexibility in pain coping and pain anxiety scores.

295   Both models were significant [flexibility in pain coping: r^2 = .26, $F(5, 154)$ = 10.74, $p < .001$;

296   pain anxiety: r^2 = .31, $F(5, 194)$ = 17.44, $p < .001$]. Following this, self-compassion accounted

297   for 14% unique variance in values success scores, and the overall model was significant [r^2 =

298   .17, $F(5, 176) = 7.01$, $p < .001$]. Lastly, self-compassion accounted for the least amount of

299   unique variance in traditional pain coping and physical functioning scores (7%). Both models

300   were significant [traditional pain coping: $r^2 = .08$, $F(5, 170) = 3.11$, $p < .001$; physical disability:

301     $r^2 = .14$, $F(5, 204) = 6.71$, $p < .001$].

Discussion

303   The key findings from this study are: (1) self-compassion was positively associated with

304   pain acceptance, use of traditional and flexible pain coping strategies, and success in valued

305   activities, and negatively associated with depression severity, pain anxiety, and physical and

306   psychosocial disability, and (2) self-compassion accounted for more variance in measures of

307   depression, pain acceptance, psychosocial disability, use of flexible pain coping strategies, and

308   success in valued activities, and less variance in measures of physical disability and use

309   traditional pain coping strategies.

310   In the context of chronic pain, self-compassion entails bringing a nonjudgmental kindness

311   to the experience of pain, suffering, and failures, and understanding these difficult experiences to

312   be unavoidable and part of the human condition. It is to recognize that even in the face of failure

313   and discomfort, one is worthy of compassion, respect, and forgiveness, just as all other human

314   beings are (Neff, 2003). While these definitions coincide with the main tenants of mindfulness

315   and acceptance-based treatments, self-compassion cultivates additional and unique skills. For

316   example, all of these treatments teach individuals to bring a non-judgmental awareness to their

317   experience, no matter the physical sensations, emotions, or thoughts that are present (Kabat-

318   Zinn, 2015; Kabat-Zinn, Lipworth, & Burney, 1985). However, the practice of self-compassion

319   also has individuals actively foster kindness and understanding towards themselves, and to see

320   themselves as part of a larger community. By doing this, individuals may not only effectively

321   respond to and live better with distress, but also promote an improved sense of self-efficacy and

322   connectedness with others that is not entirely present in other mindfulness and acceptance-based

323   treatments.

324   More specifically in chronic pain, self-compassion does not aim to reduce primary

325   suffering (i.e. physical pain) but rather attempts to reduce secondary suffering (i.e. ineffective

326   responses to pain; Scott & McCracken, 2015). Therefore, it may reduce critical self judgements

327   and, in turn, foster successive gains in functioning despite pain. This is supported in the current

328   findings, such that self-compassion was related to more success in engaging in valued activities,

329   despite the presence of pain. Self-compassion may also be an important process working against

330   pain avoidance responses, which aim to accomplish short term relief but do not promote long

331   term functioning (Costa & Pinto-Gouveia, 2013). For example, the ability to acknowledge pain

332   and its limitations may be helpful in reducing unrealistic social role standards that often impede

333   pain acceptance, adjustments, and pacing attempts that are often necessary in functioning well

334   with chronic pain (Neff, 2003; Purdie & Morley, 2016). This is also supported in the findings,

335   which found self-compassion to be more strongly related to use of flexible pain coping strategies

336   (e.g. present moment awareness) and pain acceptance rather than use of traditional pain coping

337   strategies (e.g. distraction, medications) and physical disability. Overall, the current findings and

338   previous literature, illustrate that self-compassion may be an effective and adaptive process in

339   reducing pain interference, rather than pain itself. This is particularly highlighted in that self-

340   compassion scores accounted for the highest amount of variance in measures related to

341   emotional and social functioning, pain acceptance, and engagement in values-based activities,

342   rather than measures related to physical disability and use of coping strategies that attempt to

343   reduce pain intensity.

344   Treatments that involve self-compassion components have shown relative efficacy in

345   improving functioning among chronic pain patients. Acceptance and Commitment Therapy

346   (ACT) has shown that self-compassion contributes to two integral ACT treatment processes

347   (Vowles, Sowden, & Ashworth, 2014). Further, changes in self-compassion after receiving ACT

348   was found to be directly associated with improvements in physical and psychosocial disability,

349   medical visits, and analgesic use (Vowles et al., 2014). Other treatment approaches that include

350   self-compassion training as part of the treatment, such as mindfulness and positive psychology

351   interventions, have also contributed to improvements in happiness, quality of life, and depression

352   (Doran, 2014; Peters et al., 2017). The current findings extend this literature by showing that

353   self-compassion alone is associated with better functioning. It may be warranted to further tailor

354   these interventions to target self-compassion more directly, or broaden some of the newly

355   developed brief self-compassion interventions to chronic pain populations (Friis, Johnson,

356   Cutfield, & Consedine, 2016; Kelman, Evare, Barrera, Muñoz, & Gilbert, 2018). Further, while

357   some data suggest that chronic pain etiology does not predict treatment results, future research

358   may want to examine this specifically in the context of self-compassion (McCracken & Turk,

359   2002).

360   *Study Limitations*

361   There are at least two limitations to the current study that should be taken into

362   consideration when interpreting these results. First, the analyses presented are cross-sectional in

363   nature and do not imply causation between self-compassion scores and functioning measures. In

364   addition, the temporal precedence between self-compassion and the eight outcome measures

365   cannot be established. While previous literature has examined longitudinal changes in self-

366   compassion and functioning and found some support for causality, this cannot be determined

367   from the current analyses. Second, the study sample is primarily treatment seeking, cohabitating,

368   white women and may not generalize to other demographic characteristics, such as men,

369   racial/ethnic minorities, and non-treatment seeking populations.

370   *Conclusion*

371   The current study findings, in addition to the previous literature, suggest that self-

372   compassion is an effective and adaptive process in improving functioning among adults with

373   chronic pain. Specifically, it may be most effective in helping to reduce the impact of chronic

374   pain in important and valued domains of life, rather than reducing pain intensity itself. In clinical

375   practice, this may be an efficient and effective process to target as the current findings suggest

376   that it may contribute to improvements in multiple domains, and would be relevant to individuals

377   at any stage in their medical and psychological care. Treatments that target self-compassion,

378   such ACT and other mindfulness-based interventions, have shown promising results within

379   multiple chronic pain samples and impact a broad array of general and pain-specific functioning

380   measures (Hilton et al., 2017; Veehof et al., 2016; Vowles, Sowden, et al., 2014; Vowles,

381   Witkiewitz, et al., 2014). In addition, there are a number of promising brief compassion-focused

382   interventions that are in the early stages of development that may be useful to those with chronic

383   pain (Friis et al., 2016; Kelman et al., 2018; Kirby, 2017; Penlington, 2019). While the evidence

384   behind targeting self-compassion in the general population is fairly robust, emphasis on self-

385   compassion in chronic pain treatment needs further examination. Future research should continue

386   to examine the relationship between self-compassion and functioning among more

387   demographically diverse chronic pain samples to better understand how these findings might

388   generalize to the broader population as well as which individuals this treatment target may be

389   most salient for. Future research should also refine and adapt current interventions, such as ACT

390   and Mindfulness, to target self-compassion more directly. Further, it may also be helpful to

391   explore the development and implementation of a brief intervention to increase self-compassion.

392   Findings from the current study suggest that treatment, in any form, may stand to be improved by

393   the addition of self-compassion training to better help individuals cope with the impact of

394   chronic pain.

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413   **Footnotes**

414   [1] The CPAQ subscales (i.e. pain willingness and activity engagement) were examined separately

415   to be sure there were no substantial differences between subscales. A similar pattern was found

416   between each subscale and the total score, therefore only total score is reported.

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436   **References**

437   APA. (1994). *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.). Washington, DC.

438   APA, D. 12. (2015). Diagnosis: Chronic or persistent pain in general (including numerous

439   conditions).

440   Bergner, M., Bobbitt, R. A., Carter, W. B., & Gilson, B. S. (1981). The Sickness Impact Profile:

441   Development and final revision of a health status measure. *Medical Care*, *19*(8), 787–805.

442   Boggero, I. A., & Carlson, C. R. (2015). Somatosensory and affective contributions to emotional,

443   social, and daily functioning in chronic pain patients. *Pain Medicine*, *16*, 341–347.

444   Carvalho, S. A., Gillanders, D., Palmeira, L., Pinto-Gouveia, J., & Castilho, P. (2018).

445   Mindfulness, self-compassion, and depressive symptoms in chronic pain: The role of pain

446   acceptance. *Journal of Clinical Psychology*, 1–13.

447   Carvalho, S. A., Pinto-Gouveia, J., Gillanders, D., & Castilho, P. (2018). Pain and depressive

448   symptoms: Exploring cognitive fusion and self-compassion in a moderated mediation

449   model. *Journal of Psychology: Interdisciplinary and Applied*, *153*(2), 173–186.

450   Costa, J., & Pinto-Gouveia, J. (2011). Acceptance of pain, self-compassion and

451   psychopathology: Using the Chronic Pain Acceptance Questionnaire to identify patients'

452   subgroups. *Clinical Psychology and Psychotherapy*, *18*(4), 292–302.

453   Costa, J., & Pinto-Gouveia, J. (2013). Experiential avoidance and self-compassion in chronic

454   pain. *Journal of Applied Social Psychology*, *43*(8), 1578–1591.

455   Doran, N. J. (2014). Experiencing wellness within illness: Exploring a mindfulness-based

456   approach to chronic back pain. *Qualitative Health Research*, *24*(6), 749–760.

457   Dowd, A. J., & Jung, M. E. (2017). Self-compassion directly and indirectly predicts dietary

458   adherence and quality of life among adults with celiac disease. *Appetite*, *113*, 293–300.

459   Dowell, D., Haegerich, T. M., & Chou, R. (2016). CDC guideline for prescribing opioids for

460   chronic pain-United States, 2016. *JAMA - Journal of the American Medical Association*,

461   *315*(15), 1624–1645.

462   Ferreira-Valente, M. A., Pais-Ribeiro, J., & Jensen, M. P. (2014). Associations between

463   psychosocial factors and pain intensity, physical functioning, and psychological functioning

464   in patients with chronic pain: A cross-cultural comparison. *Clin J Pain*, *30*(8), 713–723.

465   Follick, M. J., Smith, T. W., & Ahern, D. K. (1985). The Sickness Impact Profile: A global

466   measure of disability in chronic low back pain. *Pain*, *21*(1), 67–76.

467   Friis, A. M., Johnson, M. H., Cutfield, R. G., & Consedine, N. S. (2016). Kindness matters: A

468   randomized controlled trial of a mindful self-compassion intervention improves depression,

469   distress, and HbA1c among patients with diabetes. *Diabetes Care*, *39*(11), 1963–1971.

470   Gatchel, R. J., McGeary, D. D., McGeary, C. A., & Lippe, B. (2014). Interdisciplinary chronic

471   pain management: Past, present, and future. *American Psychologist*, *69*(2), 119–130.

472   Hartrick, C. T., Kovan, J. P., & Shapiro, S. (2003). The numeric rating scale for clinical pain

473   measurement: A ratio measure? *Pain Practice*, *3*(4), 310–316.

474   Hilton, L., Hempel, S., Ewing, B. A., Apaydin, E., Xenakis, L., Newberry, S., … Maglione, M.

475   A. (2017). Mindfulness meditation for chronic pain: Systematic review and meta-analysis.

476   *Annals of Behavioral Medicine*, *51*(2), 199–213.

477   Homan, K. J., & Sirois, F. M. (2017). Self-compassion and physical health: Exploring the roles

478   of perceived stress and health-promoting behaviors. *Health Psychology Open*, 1–9.

479   Hughes, L. S., Clark, J., Colclough, J. A., Dale, E., & McMillan, D. (2017). Acceptance and

480   commitment therapy (ACT) for chronic pain. *The Clinical Journal of Pain*, *33*(6), 552–568.

481   IBM Corp. (2017). IBM SPSS Statistics for Windows. Armonk, NY: IBM Corp.

482   Iverson, G. L., & Remick, R. (2004). Diagnostic accuracy of the British Columbia Major

483   Depression Inventory. *Psychological Reports*, *95*, 1241–1247.

484   Johannes, C. B., Le, T. K., Zhou, X., Johnston, J. A., & Dworkin, R. H. (2010). The prevalence

485   of chronic pain in United States adults: Results of an internet-based survey. *Journal of Pain*,

486   *11*(11), 1230–1239.

487   Kabat-Zinn, J. (2015). Mindfulness. *Orthogonal Rotation in Consciousness*, *6*, 1481–1483.

488   Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation

489   for the self-regulation of chronic pain. *Journal of Behavioral Medicine*, *8*(2), 1985.

490   Kelman, A. R., Evare, B. S., Barrera, A. Z., Muñoz, R. F., & Gilbert, P. (2018). A proof-of-

491   concept pilot randomized comparative trial of brief internet-based compassionate mind

492   training and cognitive-behavioral therapy for perinatal and intending to become pregnant

493   women. *Clinical Psychology and Psychotherapy*, *25*(4), 608–619.

494   Kennedy, J., Roll, J. M., Schraudner, T., Murphy, S., & Mcpherson, S. (2014). Prevalence of

495   persistent pain in the U.S. adult population: New data from the 2010 National Health

496   Interview Survey. *The Journal of Pain*, *15*(10), 979–984.

497   Kerns, R. D., Sellinger, J., & Goodin, B. R. (2011). Psychological treatment of chronic pain.

498   *Annu Rev Clin Psychol*, *7*, 411–434.

499   Kirby, J. N. (2017). Compassion interventions: The programmes, the evidence, and implications

500   for research and practice. *Psychology and Psychotherapy: Theory, Research and Practice*,

501   *90*(3), 432–455.

502   Krebs, E. E., Gravely, A., Nugent, S., Jensen, A. C., DeRonne, B., Goldsmith, E. S., …

503   Noorbaloochi, S. (2018). Effect of opioid vs nonopioid medications on pain-related function

504   in patients with chronic back pain or hip or knee osteoarthritis pain the SPACE randomized

505   clinical trial. *JAMA*, *319*(9), 872–882.

506   McCracken, L. M., & Eccleston, C. (2006). A comparison of the relative utility of coping and

507   acceptance-based measures in a sample of chronic pain sufferers. *European Journal of*

508   *Pain*, *10*(1), 23–29.

509   McCracken, L. M., Eccleston, C., & Bell, L. (2005). Clinical assessment of behavioral coping

510   responses: Preliminary results from a brief inventory. *European Journal of Pain*, *9*(1), 69–

511   78.

512   McCracken, L. M., & Turk, D. C. (2002). Behavioral and cognitive–behavioral treatment for

513   chronic pain. *Spine*, *27*(22), 2564–2573.

514   McCracken, L. M., & Vowles, K. E. (2007). Psychological Flexibility and Traditional Pain

515   Management Strategies in Relation to Patient Functioning With Chronic Pain: An

516   Examination of a Revised Instrument. *Journal of Pain*, *8*(9), 700–707.

517   McCracken, L. M., Vowles, K. E., & Eccleston, C. (2004). Acceptance of chronic pain:

518   Component analysis and a revised assessment method. *Pain*, *107*(1–2), 159–166.

519   McCracken, L. M., & Yang, S. Y. (2006). The role of values in a contextual cognitive-behavioral

520   approach to chronic pain. *Pain*, *123*(1–2), 137–145.

521   McCracken, L. M., Zayfert, C., & Gross, R. T. (1992). The Pain Anxiety Symptoms Scale:

522   Development and validation of a scale to measure fear of pain. *Pain*, *50*, 67–73.

523   Mun, C. J., Thummala, K., Davis, M. C., Karoly, P., Tennen, H., & Zautra, A. J. (2017).

524   Predictors and social consequences of daily pain expectancy among adults with chronic

525   pain. *Pain*, *158*, 1224–1233.

526   Muris, P., & Petrocchi, N. (2017). Protection or vulnerability? A meta-analysis of the relations

527   between the positive and negative components of self-compassion and psychopathology.

528   *Clinical Psychology and Psychotherapy*, *24*, 373–383.

529   Nahin, R. L. (2015). Estimates of pain prevalence and severity in adults: United States, 2012.

530   *The Journal of Pain*, *16*(8), 769–780.

531   Neff, K. (2003). Self-compassion: An alternative conceptualization of a healthy attitude toward

532   oneself. *Self and Identity*, *2*, 85–101.

533   Neff, K. D. (2003). The development and validation of a scale to measure self-compassion. *Self*

534   *and Identity*, *2*, 223–250.

535   Neff, K. D., Whitaker, T. A., & Karl, A. (2016). Examining the factor structure of the Self-

536   Compassion Scale in four distinct populations: Is the use of a total scale score justified?

537   *Journal of Personality Assessment, 99*(6), 596-607.

538   Osman, A., Barrios, F. X., Osman, J. R., Schneekloth, R., & Troutman, J. A. (1994). The Pain

539   Anxiety Symptoms Scale: Psychometric properties in a community sample. *Journal of*

540   *Behavioral Medicine*, *17*(5), 511–522.

541   Park, J., & Engstrom, G. (2015). Health-related quality of life and pain intensity among

542   ethnically diverse community-dwelling older adults. *Pain Management Nursing*, *16*(5),

543   733–742.

544   Penlington, C. (2019). Exploring a compassion-focused intervention for persistent pain in a

545   group setting. *British Journal of Pain*, *13*(1), 59–66.

546   Peters, M. L., Smeets, E., Feijge, M., Van Breukelen, G., Andersson, G., Buhrman, M., &

547   Linton, S. J. (2017). Happy despite pain: A randomized controlled trial of an 8-week

548   internet-delivered positive psychology intervention for enhancing well-being in patients

549   with chronic pain. *Clinical Journal of Pain*, *33*(11), 962–975.

550   Pinto-Gouveia, J., Duarte, C., Matos, M., & Fráguas, S. (2014). The protective role of self-

551   compassion in relation to psychopathology symptoms and quality of life in chronic and in

552   cancer patients. *Clinical Psychology and Psychotherapy*, *21*(4), 311–323.

553   Purdie, F., & Morley, S. (2016). Compassion and chronic pain. *Pain*, *157*(12), 2625–2627.

554   Reneman, M. F., Dijkstra, A., Geertzen, J. H. B., & Dijkstra, P. U. (2010). Psychometric

555   properties of Chronic Pain Acceptance Questionnaires: A systematic review. *European*

556   *Journal of Pain*, *14*(5), 457–465.

557   Scott, W., & McCracken, L. M. (2015). Psychological flexibility, acceptance and commitment

558   therapy, and chronic pain. *Current Opinion in Psychology*, *2*, 91–96.

559   Sirois, F. M., Kitner, R., & Hirsch, J. K. (2015). Self-compassion, affect, and health-promoting

560   behaviors. *Health Psychology*, *44*(6), 661–669.

561   Sirois, F. M., Molnar, D. S., & Hirsch, J. K. (2015). Self-compassion, stress, and coping in the

562   context of chronic illness. *Self and Identity*, *14*(3), 334–347.

563   Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics* (6th ed.). Boston:

564   Pearson.

565   Veehof, M. M., Trompetter, H. R., Bohlmeijer, E. T., & Schreurs, K. M. G. (2016). Acceptance-

566   and mindfulness-based interventions for the treatment of chronic pain: a meta-analytic

567   review. *Cognitive Behaviour Therapy*, *45*(1), 5–31.

568   Viane, I., Crombez, G., Eccleston, C., Poppe, C., Devulder, J., Van Houdenhove, B., & De

569   Corte, W. (2003). Acceptance of pain is an independent predictor of mental well-being in

570   patients with chronic pain: Empirical evidence and reappraisal. *Pain*, *106*(1–2), 65–72.

571   Viggers, L. C., & Caltabiano, M. L. (2012). Factors affecting the psychological functioning of

572   Australian adults with chronic pain. *Nursing and Health Sciences*, *14*, 508–513.

573   Von Korff, M., Scher, A. I., Helmick, C., Carter-Pokras, O., Dodick, D. W., Goulet, J., …

574   Mackey, S. (2016). United States national pain strategy for population research: Concepts,

575   definitions, and pilot data. *The Journal of Pain*, *17*(10), 1068–1080.

576   Vowles, K. E., Gross, R. T., & McCracken, L. M. (2007). Evaluating outcomes in the

577   interdisciplinary treatment of chronic pain: A guide for practicing clinicians. In M.

578   Schatman & A. Campbell (Eds.), *Chronic Pain Management: Guidelines for*

579   *Multidisciplinary Program Development* (pp. 203–220). New York, NY: Informa.

580   Vowles, K. E., & McCracken, L. M. (2010). Comparing the role of psychological flexibility and

581   traditional pain management coping strategies in chronic pain treatment outcomes.

582   *Behaviour Research and Therapy*, *48*(2), 141–146.

583   Vowles, K. E., Mccracken, L. M., Sowden, G., & Ashworth, J. (2014). Psychological flexibility

584   in coping with chronic pain further examination of the Brief Pain Coping Inventory-2. *Clin*

585   *J Pain*, *30*(4), 324–330.

586   Vowles, K. E., Sowden, G., & Ashworth, J. (2014). A comprehensive examination of the model

587   underlying acceptance and commitment therapy for chronic pain. *Behavior Therapy*, *45*,

588   390–401.

589   Vowles, K. E., Witkiewitz, K., Sowden, G., & Ashworth, J. (2014). Acceptance and commitment

590   therapy for chronic pain: Evidence of mediation and clinically significant change following

591   an abbreviated interdisciplinary program of rehabilitation. *Journal of Pain*, *15*(1), 101–113.

592   Watt-Watson, J. H., & Graydon, J. E. (1989). Sickness Impact Profile: A measure of dysfunction

593   with chronic pain patients. *Journal of Pain and Symptom Management*, *4*(3), 152–156.

594   Wren, A. A., Somers, T. J., Wright, M. A., Goetz, M. C., Leary, M. R., Fras, A. M., … Keefe, F.

595   J. (2012). Self-compassion in patients with persistent musculoskeletal pain: Relationship of

596   self-compassion to adjustment to persistent pain. *Journal of Pain and Symptom*

597   *Management*, *43*(4), 759–770.

598   Zessin, U., Dickhäuser, O., & Garbade, S. (2015). The relationship between self-compassion and

599   well-being: A meta-analysis. *Applied Psychology: Health and Well-Being*, *7*(3), 340–364.

600