The Relationship between Dispositional Mindfulness, Distress and Functioning in Adolescents with Chronic Pain and 'Healthy' Adolescents with Low-level Pain

Objective: Dispositional mindfulness is the general tendency to pay attention to present-moment awareness without judgment. The main aim of this cross-sectional study was to determine: a) whether dispositional mindfulness is associated with psychological distress in adolescents with chronic pain and 'healthy' low-level pain; and b) whether it accounts for unique variance in distress after controlling for key variables already established in the pain literature. *Method*: 54 adolescents seeking help for chronic pain and 94 adolescents with low-level pain from the general population completed the same battery of measures, including the Child and Adolescent Mindfulness Measure of dispositional mindfulness (CAMM). *Results*: As predicted, dispositional mindfulness was associated with mood and anxiety in both groups, and also accounted for unique variance in mood and anxiety in standard regression models after controlling for group, age, pain-intensity, pain-catastrophising and pain-acceptance. Dispositional mindfulness did not differ significantly across the two groups, and did not predict physical functioning. However it did account for unique variance insocial functioning. *Conclusions*: Dispositional mindfulness may be an important construct to consider in the context of adolescents experiencing mood and anxiety problems in both low-level and chronic pain samples. Further research should aim to replicate these findings in larger clinical samples and explore the predictive power of dispositional mindfulness using longitudinal designs.

Introduction

Mindfulness is often defined as "paying attention on purpose, in the present moment, non-judgementally" (Kabat-Zinn, 2003, p.145). Dispositional mindfulness can be thought about as a general 'trait-like' tendency to abide in mindful states over time (Brown & Ryan, 2003). McCracken and colleagues have clearly outlined why mindfulness may be an important construct to consider in the field of adult chronic pain (McCracken, Gauntlett-Gilbert & Vowles, 2007). They argue that observing (as opposed to reacting automatically to) physical sensations, emotions and thoughts, i.e. being more mindful, can lead to a more 'balanced, non-reactive and realistic' relationship to pain experiences. Central to this is the idea that mindful awareness involves noticing and stepping back from, rather than being immersed in and controlled by, thoughts, emotions and sensations (Shapiro, Carlson, Astin, & Freedman, 2006).

The contribution of mindfulness to chronic pain was first supported by evidence that mindfulness training, leading to enhanced levels of mindfulness, was associated with the reduction of distress in the context of chronic pain (Kabat-Zinn, Lipworth & Burney, 1985). More recently, in the adult chronic pain literature, a series of cross-sectional studies have indicated that natural variation in dispositional mindfulness can explain unique variance in distress after controlling for other key variables (Elvery, Jensen, Ehde & Day, 2017; McCracken et al., 2007; McCracken & Keogh, 2009; Mun, Okun, & Karoly, 2014). Two of the established key variables are pain catastrophising (an exaggerated mental set of rumination, magnification and helplessness in the context of actual or anticipated pain) and pain-acceptance (experiencing pain without taking actions to control it and persisting with activity in the presence of pain). It may be that researchers now need to investigate the potential

additive influence of the 'non-pain-specific' construct dispositional mindfulness. If it is important, then chronic pain treatment programs might consider incorporating general mindfulness training (that can be of benefit many areas of one's life) in addition to targeting pain-specific cognitions.

. Relationships exist between pain-catastrophising, pain-acceptance and dispositional mindfulness, however they may not be redundant (Elvery et al., 2017). With emerging evidence that the separate construct of dispositional mindfulness may play an important role in determining the nature of distress experienced by adults living with chronic pain, it is important to assess whether this also applies to adolescents.

The adolescent literature has already demonstrated that pain-catastrophising and pain-acceptance predict levels of distress in the context of chronic pain (Kalapurakkel, Carpino, Lebel, & Simons, 2014; Tran et al., 2015), but as yet no studies have explored the potential role played by dispositional mindfulness in this context. However, there is evidence that dispositional mindfulness is positively associated with good mental health in the general adolescent population (Greco, Baer & Smith, 2011; Pallozzi, Wertheim, Paxton, & Ong, 2016), whilst mindfulness training appears to help to reduce distress in the context of adolescent chronic pain (Gauntlett-Gilbert, Connell, Clinch & McCracken, 2013). Dispositional mindfulness has also been found to account for unique variance in pain interference in healthy adolescents experiencing low-level pain typical of the general population (Petter, Chambers, McGrath & Dick, 2013).

The main aim of this cross-sectional study was therefore to determine: a) whether dispositional mindfulness is associated with psychological distress in adolescents with chronic pain and 'healthy' adolescents with low-level pain; and b)

whether it accounts for unique variance in distress after controlling for key variables already established in the pain literature. In order to test this, both a chronic pain and a 'healthy' low-level pain sample were recruited into the study and all adolescents were asked to complete the same battery of measures..

Based on the research described above, our first hypothesis was that dispositional mindfulness would be significantly associated with anxiety and mood in both adolescents with chronic pain and 'healthy' adolescents with low-level pain. Our second hypothesis was that dispositional mindfulness would account for unique variance in mood and anxiety after controlling for group, demographics, pain-intensity, pain-catastrophising and pain-acceptance.

As an exploratory aim, we also examined: the relationship between dispositional mindfulness and aspects of physical and social functioning; and whether there are differences between adolescents with chronic pain and 'healthy' adolescents with low-level pain in terms of their levels of dispositional mindfulness. Inconsistent findings from the adult pain literature (McCracken et al., 2007; Schütze, Rees, Preece, & Schütze, 2010) and a dearth of research in the adolescent literature meant that only exploratory hypotheses could be generated with regard to these questions. We tentatively predicted that dispositional mindfulness would be positively associated with social and physical functioning in the chronic pain group (based on initial adult research reported by McCracken et al., 2007). We also tentatively predicted that levls of dispositional mindfulness would not differ significantly across the two groups (based on initial adult research reported by Schütze et al., 2010). .

Method

Participants and Procedure

Chronic pain group. Potential patients aged 13-17 years presenting for assessment at three UK tertiary child and adolescent pain clinics between October 2016 and March 2017 were handed information and consent sheets by their assessing Psychologist. Inclusion criteria included meeting local service criteria (persistent, distressing, non-malignant chronic pain that had not responded to standard pediatric care) and sufficient English-language skills to complete the survey packs. Exclusion criteria included severe mental disorder, severe substance abuse or known diagnosis of a terminal illness[1]. Interested adolescents and their parents for those < 16 years old were given the choice to complete the consent process and study pack at the clinic (overseen by a clinician) or at home (overseen by the lead author via telephone). In total, 61 chronic pain patients participated (approximately 40% of those invited), but seven were excluded due to incomplete data yielding a final sample of 54 patients. In total, 94% of participants in the chronic pain group were White-British, 72% were female and the mean age was 14.6 years (range 13-17, SD = 1.3). Reasons for declining participation were not recorded. All participants recruited into the chronic pain group were offered a £5 gift voucher as a token of appreciation.

Low-level pain group. All pupils from two classes in a state-funded UK secondary school (N = 51) and a convenience sample of adolescents attending a University open day to find out more about undergraduate degree programs (N = 53) were recruited. The lead author oversaw consent and participation procedures in person. Parents/carers of all school pupils were sent information sheets and opt-out slips in advance of the study. Parental consent was not needed for participants recruited from the University open day because they were ≥16 years old. Eight

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[1] Severe mental disorder and severe substance abuse were not formally defined, but recruiting clinicians were asked to exclude on this basis if they felt that a young person's mental disorder or substance abuse was so extreme that it would interfere with their ability to take part in the study.

participants were excluded retrospectively (after completing the study pack) due to reporting no pain over the last week, one was excluded retrospectively due to reporting treatment for chronic pain and one was excluded retrospectively because of incomplete data, yielding a final sample of 94 participants (50 from the secondary school and 44 from the University open day). In total, 80% of participants in the general population group were White-British, 69% were female and the mean age was 15.2 years (range 13-17, SD = 1.8).

Materials

In addition to routine questions regarding demographics, all participants also completed the measures described below.

Dispositional mindfulness. The Child and Adolescent Mindfulness Measure (CAMM: Greco et al., 2011) is a ten-item measure of dispositional mindfulness developed from the 39-item four-factor adult Kentucky Inventory of Mindfulness Skills (Baer, Smith & Allen, 2004). Large samples of adolescents took part in the development studies providing feedback on the comprehensibility of the items (Greco et al., 2011). Factor analysis determined the single-factor structure of the CAMM, capturing both 'present moment awareness' and 'non-judgement'. However, the CAMM does not include items measuring 'describing' or 'observing' because they were found to be developmentally inappropriate for the adolescent population. Convergent validity has been demonstrated by expected correlations with quality of life, academic competence, social skills, somatic complaints, internalising and externalising. Incremental validity has been observed beyond measures of thought suppression and psychological inflexibility. The respondent is asked to endorse each of the 10 reverse-scored items (e.g. "at school I walk from class-to-class without

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noticing what I'm doing", "I get upset with myself for having feelings that don't make sense") on a five-point Likert scale (0 = never true, 4 = always true). The CAMM has demonstrated good internal consistency (Cronbach's alpha of .81) and construct validity in previous studies (Greco et al., 2011). The current study found alpha values of .81 and .85 in the chronic pain and general population groups.

Pain factors. Participants were asked to rate their average pain intensity experienced over the last week on a 0-10 Visual Analog Scale (VAS) with zero representing no pain and ten representing the worst pain possible (Varni, Thompson, & Hanson, 1987). Participants were asked to identify where in their body the pain was located (open text response allowing for multiple locations to be listed if appropriate), at what age they first noticed the pain, whether they were currently taking medication for their pain (yes/no response), and whether they had previously received any treatment for their pain (yes/no response). Data was not collected regarding pain frequency or duration of pain episodes.

Distress and functioning. The Bath Adolescent Pain Questionnaire (BAPQ: Eccleston et al., 2005) sub-scales for depression, anxiety, social functioning and physical functioning were used. The depression subscale comprises six statements such as "I feel sad". The anxiety subscale comprises seven statements such as "I worry about the future". The social functioning subscale comprises nine statements such as "I go out to meet my friends". The physical functioning subscale includes nine statements such as "I need help dressing or bathing". Respondents are asked to endorse all statements on a five-point Likert scale (0 = never, 4 = always). Each of these subscales has demonstrated good internal consistency (Cronbach's alpha values ranging from .80 - .83) and construct validity (Eccleston et al., 2005) in previous studies. The Cronbach's alpha values were all above .70 in the current study, except

for the physical functioning subscale when used with the general population group (.66).

Pain-catastrophising. The Pain Catastrophizing Scale for Children (PCS-C: Crombez et al., 2003) has 13 items (e.g. "when I have pain I feel I can't stand it any more") which the respondent endorses on a five-point Likert scale (0 = not at all, 4 = extremely). Recent evidence favours a single factor analysis (Pielech et al., 2014), with previous studies demonstrating good internal consistency (Cronbach's alpha = .87) and construct validity (Crombez et al., 2003). The current study found alpha values of .94 and .92 for the chronic pain and general population groups.

Pain-acceptance. The adolescent version of the Chronic Pain Acceptance Questionnaire (CPAQ-A: McCracken, Gauntlett-Gilbert & Eccleston, 2010) has 20 items (e.g. "it's ok to experience pain") which the respondent endorses on a five-point Likert scale (0 = never true, 4 = always true). Evidence supports using the two sub-scales of 'pain willingness' and 'activity engagement'. Each subscale has demonstrated good internal consistency (Cronbach's alpha = .75 and .86) and construct validity in previous studies (McCracken et al., 2010). The current study found alpha values ranging from .78 to.85.

Design

In this cross-sectional design, all participants completed the same set of measures at one time-point only. Chronic pain group participants recruited from one of the clinics completed the CPAQ-A and the BAPQ as part of their routine assessment. Participants from another of the clinics completed the BAPQ as part of their routine assessment. Other participants completed all measures as part of the study pack.

Ethical Approval

Ethical approval was granted by a regional UK NHS Research and Ethics Committee, the UK Health Research Authority and the University of Bath Psychology department ethics committee.

Data Analysis

All data were screened for outliers, as well as assumptions of normality, linearity, collinearity, homogeneity and independent errors using graphical and statistical means. In terms of missing data, an a-priori decision was taken to replace a participant's missing scale items with their mean scale or sub-scale score when a participant neglected to respond to up to two items of a scale (N = 14). Where a participant neglected to respond to more than two items of a scale, the scale was removed from analyses (N = 8). To test our first formal hypothesis, a series of Pearson's coefficient bivariate correlations were planned to assess the relationship between dispositional mindfulness and distress (plus other key variables). To test our second formal hypothesis, a series of linear multiple regression analyses were planned to assess whether dispositional mindfulness accounted for unique variance in distress after controlling for other key variables. Related to the two exploratory hypotheses, a series of independent *t*-tests were planned to assess group differences for dispositional mindfulness, and additional correlation and regression analyses were planned to investigate the relationship between dispositional mindfulness and functioning scores. .

Results

Preliminary Analyses

SPSS version 23 was used for all data analysis. Following initial screening, four extreme outliers caused by data entry mistakes were corrected. Parametric assumptions were not met for all variables, therefore inferential statistics were conducted using the BCa 95% bootstrapping method (set at 1000 samples). The bootstrapping method helps to reduce error when estimating confidence intervals for data that do not meet all parametric assumptions. The process of sampling with replacement estimates properties of a statistic (e.g., confidence intervals) by taking the original data-set and re-sampling from it (in this case 1000 times). This provides an estimate of the modelled shape of distribution. The bias-corrected and accelerated (BCa) bootstrap method adjusts for bias and skewness in the distribution. In this article, we report BCa 95% bootstrapped confidence intervals for mean differences, pearson's r and regression b values.

Group Characteristics

Pain was more commonly reported in all body locations by adolescents in the chronic pain group, except the head and chest. Overall, 74% of adolescents in the chronic pain group reported pain across multiple sites, whereas this was only reported by 12% of the 'healthy' low-level pain group. The average number of years since first noticing the pain was 3.9 (SD = 2.8) in the chronic pain group and 2.2 (SD = 2.6) in the low-level pain group. The proportion of participants reporting that they were currently taking medication for their pain was higher in the chronic pain group (57% v 10%), as was the proportion of participants reporting that they had previously received some form of medical treatment for their pain (85% v 51%).

Table 1 provides means, standard deviations, independent *t*-test statistics and BCa 95% mean difference confidence intervals for each of the key variables. Participants in the chronic pain group reported significantly higher pain intensity, pain-catastrophising, depressive and anxious symptomology. In contrast, participants in the low-level pain group reported significantly higher pain-acceptance, physical functioning and social functioning. None of the BCa bootstrapped 95% confidence intervals for these mean differences crossed zero indicating that these findings are likely to be reliable.

Supporting our second exploratory hypothesis, dispositional mindfulness scores did not differ significantly across the two groups (and were also normally distributed in both groups). An independent samples *t*-test revealed that although closely matched, the mean ages of the two samples differed significantly, $t(146) = 2.41$, p<.05.

[Insert Table 1 about here]

Bivariate Correlations

Table 2 provides an overview of all bivariate correlations for key variables. Medication use, pain duration and gender were largely unrelated to other variables and so are not included (only two of 24 possible correlations reached significance). Confirming our first formal hypothesis, dispositional mindfulness was negatively associated with depression ($r = -.58$ and $-.50$), anxiety ($r = -.67$ and $-.59$) in both groups. Dispositional mindfulness was also negatively associated with pain-catastrophising ($r = -.52$ and $-.41$) and positively associated with pain-willingness ($r = .37$ and $.42$) in both groups. In the low-level pain group only, higher dispositional mindfulness was also positively associated with age ($r = .27$), activity engagement (r

= .22), social functioning (r = .27) and physical functioning (r = .21). None of the BCa bootstrapped 95% confidence intervals for these r values crossed zero. However, the Cronbach's alpha value was low for the physical functioning measure when used with the low-level pain sample. Therefore the latter of these findings may not be valid. Disconfirming our second exploratory hypothesis, dispositional mindfulness was not significantly associated with social functioning or physical functioning in the chronic pain group.In neither group was dispositional mindfulness associated with VAS pain-intensity.

[Insert Table 2 about here]

Regression

All four regression analyses were conducted on the combined data pooled across the two samples. This provides a mixed group of adolescents who all reported recent experiences of pain (albeit some having chronic problems with this). Each regression analysis aimed to assess whether dispositional mindfulness explained unique variance in the dependent variable after controlling for the other key predictors in the combined group of pain-experienced adolescents. This helps to ensure a wide range of values and to avoid floor-ceiling effects in groups of 1) relatively unimpaired 'healthy' adolescents and 2) very impaired (chronic pain) adolescents. The following predictors were entered simultaneously into each model: group, age, VAS pain intensity, pain-catastrophising, pain-willingness, activity engagement and dispositional mindfulness. Table 3 provides a summary of the findings.

Supporting our second formal hypothesis, dispositional mindfulness accounted for unique variance in mood (b= -0.26) and anxiety (b = -0.35) after all other variables were controlled for. Neither of the BCa bootstrapped 95% confidence

intervals for these *b* values crossed zero. On average, as dispositional mindfulness increased by one unit, depressive symptomology decreased by 0.26 units and anxiety decreased by 0.35 units (when all other variables were held constant). In terms of our first exploratory hypothesis, ispositional mindfulness was not found to account for unique variance in physical functioning, but it did account for unique variance in social functioning (*b*= 0.17).

[Insert Table 3 about here]

Discussion

As predicted by the first of our two formal hypotheses, dispositional mindfulness was significantly associated with mood and anxiety in both adolescents with chronic pain and 'healthy' adolescents with low-level pain. This replicates and extends previous studies (Greco et al., 2011; Petter et al., 2013), by demonstrating that dispositional mindfulness is positively associated with good mental health in the general adolescent population and those experiencing chronic pain. As predicted by our second formal hypothesis, dispositional mindfulness also accounted for unique variance in mood and anxiety after controlling for group, age, pain-intensity, pain-catastrophising and pain-acceptance. Thus, recent results from the adult literature (Elvery et al., 2017; McCracken et al., 2007; McCracken & Keogh, 2009; Mun, Okun, & Karoly, 2014) suggesting that dispositional mindfulness may play a role in the experience of chronic pain appears to extend to the adolescent population.

This may have significant theoretical implications for cognitive-behavioural models of chronic pain that emphasise the role of pain-specific cognitions (e.g., pain-catastrophising), but do not encompass the more 'trait-like' construct of dispositional

mindfulness (e.g., the Fear Avoidance Model: Simons & Kaczynski, 2012). Our results are also relevant to clinical treatment models. Many clinicians and researchers see it as essential to target pain catastrophising in treatment, particularly in widely-used CBT approaches. However, the current study demonstrated that dispositional mindfulness was key in explaining psychological distress, perhaps more so than pain-catastrophising. This is not necessarily an argument against conventional treatment, which has established positive effects (Bruce et al., 2017; Fisher et al., 2014), but our results should embolden researchers and clinicians to explore mindfulness interventions further with youth. For example, Gauntlett-Gilbert et al. (2013) demonstrated the benefits of a multi-disciplinary treatment programme for adolescent chronic pain that included mindfulness training throughout. Mindfulness and acceptance approaches start from the premise that pain, stress and negative thinking are, to a degree, fundamentally uncontrollable. However, by showing that this uncontrollability is not necessarily a barrier to skilful management, they may offer a particularly hopeful and relevant approach for youth with challenging chronic health conditions.

The first of our two exploratory hypotheses was partially supported. We found that dispositional mindfulness predicted social, but not physical, functioning after other variables had been controlled. This is neither consistent nor inconsistent with the adult literature, because some adult chronic pain studies have found dispositional mindfulness to predict functioning whereas others have found this not to be the case (McCracken et al., 2007; Schütze et al., 2010).

Finally, in support of our other exploratory hypothesis, we found no significant difference between adolescents with chronic pain and 'healthy' adolescents with low-level pain in terms of their levels of dispositional mindfulness. Therefore, the current

study suggests that high pain levels are not necessarily a barrier to the existence or development of mindfulness. This corroborates Schütze et al. (2010), who found that levels of adult dispositional mindfulness were not significantly lower in a chronic pain sample when compared to a general population sample. However, the current study's finding that dispositional mindfulness was not associated with pain-intensity in either group is at odds with two adult chronic pain studies (McCracken et al., 2007; McCracken & Keogh, 2009) and a single adolescent low-pain general population study (Petter et al. 2013). Each of these studies reported a negative association between dispositional mindfulness and pain-intensity.

This needs further investigation, because although mindfulness theory would predict a negative association between dispositional mindfulness and psychological distress in the context of pain, it would not necessarily predict lower pain ratings from individuals experiencing higher levels of dispositional mindfulness. This is a complicated issue that clearly requires further attention. Our preliminary view is that adolescents with greater dispositional mindfulness will have less 'judgement' attached to their pain experience, but also perhaps more 'awareness' of their pain experience. Whilst one could argue that mindfulness explicitly increases the ability to encounter pain sensations with less resistance and struggle (perhaps resulting in a lower pain-intensity rating), being more aware of your pain experience could offset this. Whilst a 'naïve' view of pain might presume tight associations between pain intensity and pain distress, mindfulness theory would point out that these may not be inevitably linked.

Strengths of this study include the investigation of dispositional mindfulness in a chronic pain sample of adolescents, the use of standardized measures, the use of multiple recruitment sites, and comparison with a large 'healthy' low-level pain sample. However, there are a number of limitations that need highlighting,

particularly the small sample size of the chronic pain group, the differing sample sizes across the two groups, the lack of data on pain frequency and duration of pain episodes, and of course the single time point cross-sectional design. The Cronbach's alpha value for the BAPQ physical functioning subscale was also low. Perhaps additional normative data are needed on this measure to understand its suitability in assessing functioning in healthy youth.

Longitudinal studies (with larger chronic pain samples) will be required to further explore the role played by dispositional mindfulness in the experience of chronic pain, and the possibility that it might be a 'resilience resource' as suggested by Cousins, Kalapurakkel, Cohen & Simons. (2015). Research suggests that dispositional mindfulness tends to predict changes in mood and anxiety (Ciarrochi, Kashdan, Leeson, Heaven & Jordan, 2011), but the direction of causality cannot be confirmed in the current study. Longitudinal studies will also be needed to elucidate the mechanisms or processes underlying the observed relationships between dispositional mindfulness, psychological distress and social functioning. Finally, although it is encouraging that the CAMM demonstrated good internal consistency in both groups, it is a one-dimensional measure, and so this study was not able to differentiate between the elements of 'present-moment awareness' and 'non-judgment' that define the complex and broad construct of mindfulness (Brown & Ryan, 2003). This is important if we want to develop our understanding of how mindfulness could be added to models and treatments of adolescent chronic pain.

Despite these cautions, the current study can conclude that dispositional mindfulness accounted for unique variance in psychological distress (and social functioning) in adolescents with chronic pain and 'healthy' adolescents with low-level pain. This provides some indirect support to the theoretical importance of

dispositional mindfulness in adolescent contextualized cognitive-behavioural models such as ACT (Pielech, Vowles & Wicksell, 2017), and suggests that further research could investigate the utility of mindfulness training , particularly for adolescents experiencing mood and anxiety problems (both in low-pain and chronic pain samples). There is no reason to presume that 'dispositional mindfulness' cannot be changed by intervention. Despite the fact that this concept is framed as a 'trait', all mindfulness training aims to create sustained, daily improvements in levels of present moment awareness and acceptance, rather than experiences that last no longer than a meditation session (Kabat-Zinn, 2003). Evidence from adult meditators shows enduring brain changes associated with sustained practice (Fox et al., 2014), and ACT has emphasised the application of mindfulness across many aspects of daily life, rather than purely in the context of meditation (Hayes, Strosahl & Wilson, 2011). Therefore the potential benefits of incorporating mindfulness practice into adolescent pain treatment programs needs further exploration.

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Table 1

Means, Standard Deviations and Group Difference Statistics for Key Variables

	Chronic pain group (N = 54)	General population group (N = 94)	T-test statistic	Mean difference BCa 95% CI
VAS Pain intensity (0-10)	6.9 (1.9)	3.4 (2.0)	$t(146)=10.80, p<.001$	2.9, 4.2
CPAQ-A total (0-80)	35.2 (10.7)	59.9 (11.0)	$t(143)=13.20, p<.001$	20.8, 28.2
CPAQ-A activity engagement (0-44)	22.2 (7.0)	34.8 (6.2)	$t(143)=11.36, p<.001$	10.2, 14.7
CPAQ-A pain willingness (0-36)	13.0 (6.0)	25.0 (6.8)	$t(143)=10.68, p<.001$	9.7, 14.2
PCS-C (0-52)	31.4 (11.5)	16.6 (9.1)	$t(144)=8.59, p<.001$	10.8, 17.8
BAPQ Physical functioning[a] (0-36)	20.8 (7.5)	30.9 (3.5)	$t(62)=9.04, p<.001$	7.9, 12.4
BAPQ Social functioning (0-36)	18.3 (6.5)	24.6 (5.2)	$t(146)=6.36, p<.001$	4.1, 8.1
BAPQ Depression (0-24)	14.1 (4.5)	10.1 (4.2)	$t(145)=5.43, p<.001$	2.5, 5.4
BAPQ Anxiety (0-28)	14.6 (4.3)	12.9 (4.8)	$t(144)=2.38, p<.05$	0.1, 3.3
CAMM (0-40)	20.0 (7.5)	22.0 (8.0)	$t(146)=1.72, p=.09$	0.7, 4.7

* p<.05, ** p<.01; [a] = Levene's test indicated that equal variances could not be assumed, perhaps indicating ceiling effects in the general population group

Table 2

Correlations between Mindfulness and Key Variables for both Groups

	Chronic pain group (N = 54)									General population group (N = 94)								
	2	3	4	5	6	7	8	9	10	2	3	4	5	6	7	8	9	10
1. CAMM	-.22	.24	.52**	.02	.37**	.17	.11	-.58**	-.67**	.41**	.02	-.41**	.22*	.42**	.27**	.21*	-.50**	-.59**
2. Age	-	-.07	-.13	.05	.24	.27	.33*	-.12	.16	-	-.04	.47**	-.14	-.42**	-.11	-.17	.25*	.27**
3. VAS pain intensity		-	-.05	-.16	-.07	.14	-.35**	-.02	-.05		-	-006	-.06	-.08	.11	-.22*	.11	-.01
4. PCS-C			-	-.39**	-.72**	-.24	-.24	.48**	.46**			-	-.48**	-.71**	-.21*	-.37**	.41**	.36**
5. CPAQ-A Activity engagement				-	.37**	.40**	.34*	-.37**	-.02				-	.52**	.12	.38**	-.25*	-.30**
6. CPAQ-A Pain willingness					-	.19	.20	-.37**	-.28					-	.09	.26*	-.31**	-.31**
7. BAPQ Social functioning						-	.36**	-.55**	-.24						-	.15	-.55**	-.45**
8. BAPQ Physical functioning							-	-.41**	-.05							-	-.24*	-.18
9. BAPQ Depression								-	.66**								-	.66**
10. BAPQ Anxiety									-									-

* p<.05, ** p<.01

Table 3

Combined data-set Regression Models for Outcome Variables (N = 148)

	B	β	BCa 95% CI for B
Depression (R² = .48)			
Group	-0.01	-0.01	-1.83, 1.80
Age	-0.21	-0.07	-0.62, 0.24
VAS pain intensity	0.30	0.17	-0.01, 0.64
PCS-C	**0.12****	0.31	0.01, 0.23
CPAQ-A pain-willingness	0.09	0.16	-0.07, 0.26
CPAQ-A activity engagement	-0.11*	-0.22	-0.23, 0.02
CAMM	**-0.26****	-0.43	-0.36, -0.15
Anxiety (R² = .43)			
Group	0.71	0.07	-1.59, 3.13
Age	-0.04	-0.01	-0.48, 0.44
VAS pain intensity	0.19	0.11	-0.12, 0.55
PCS-C	0.07	0.19	-0.02, 0.18
CPAQ-A pain-willingness	0.07	0.14	-0.07, 0.23
CPAQ-A activity engagement	-0.07	-0.12	-0.17, 0.03
CAMM	**-0.35****	-0.59	-0.46, -0.24
Social functioning (R² = .31)			
Group	**4.08***	0.31	1.15, 7.04
Age	0.46	0.12	-0.25, 1.13
VAS pain intensity	0.29	0.12	-0.23, 0.75
PCS-C	-0.07	-0.13	-0.21, 0.08
CPQ-A pain-willingness	-0.10	-0.14	-0.34, 0.12
CPQ-A activity engagement	**0.21***	0.29	0.03, 0.36
CAMM	**0.17***	0.20	0.03, 0.30
Physical functioning (R² = .58)			
Group	**3.43***	0.23	0.82, 6.15
Age	0.45	0.10	0.01, 0.93
VAS pain intensity	**-0.70****	-0.25	-1.07, -0.34
PCS-C	-0.12*	-0.20	-0.23, 0.01
CPQ-A pain-willingness	-0.08	-0.10	-0.30, 0.12
CPQ-A activity engagement	**0.21****	0.26	0.06, 0.37
CAMM	0.09	0.09	-0.03, 0.21

* p<.05, ** p<.01