

# The Development of Mindful-Based Dance Movement Therapy Intervention for Chronic Pain: A Pilot Study with Chronic Headache Patients

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest

### *Author contribution statement*

IMD was responsible for the conception and design of the study, data collection, interventions implementation, data analysis and interpretation, and writing the manuscript. VK were responsible for the conception and design of the study, contributed to the data analysis, interpretation and manuscript development. IM contributed to the interpretation of the data and manuscript development. All authors have approved the final version of the manuscript.

### *Keywords*

dance movement therapy, mindfulness, Chronic Pain, Anxiety, Depression

### *Abstract*

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Chronic pain is of significant global concern. There is growing evidence that body-mind therapies and psychological approaches can contribute towards changing chronic pain perceptions. This is the first model described in the literature that combines a mindfulness-based approach with dance movement therapy, and explores potential psychological and pain-related changes for this client population. In this paper results from the pilot study are presented involving patients with chronic headache recruited in an outpatient rehabilitation setting.

**Methods:** In this pilot study 29 patients (n=29) with chronic headache were randomized to either an MBDMT group or a waiting list control group (TAU). The MBDMT group was offered ten sessions in a clinical outpatient rehabilitation setting for five weeks. Data were collected pre- and post-intervention and 16 weeks after the intervention finished. The Hospital Anxiety and Depression scale (HADS), Patient Health questionnaire (PHQ-9), Five Facets of Mindfulness questionnaire (FFMQ) and Numeric Pain rating scale (NRS) were used as outcome measures.

**Results:** The working model of MBDMT identifies nine therapeutic mechanisms (safe therapeutic environment, mindfulness skills, body awareness, relaxation / releasing, distancing and staying with discomfort, meaning making, self-regulation, acceptance and integration, creative process). Per-protocol analysis reveals statistically significant reduction of pain intensity and depression scores in favor of the MBDMT group and these improvements were maintained in follow-up assessment.

**Conclusions:** Results suggest that MBDMT is a feasible and promising therapy approach for chronic pain patients. The pilot study offered sufficient information and preliminary results in the desirable direction to enable the researchers to move to an RCT stage in order to establish the efficacy of the intervention.

**Trial registration:** the study was registered in the [www.researchregistry.com](http://www.researchregistry.com) registry (5483).

### *Contribution to the field*

This paper reports results of the development of Mindful-Based Dance movement therapy (MBDMT) approach for chronic pain patient population. Mindfulness is recognized as important component in dance movement therapy (DMT), but there has not been model which explores and integrates therapeutic mechanisms of both approaches - DMT and mindfulness-based interventions. The paper presents model of the MBDMT and results from pilot study where MBDMT intervention was offered to chronic headache patients recruited in an outpatient rehabilitation setting. In study design grounded theory was used to develop MBDMT model and quantitative strategy of pilot randomized controlled study was used to examine the effectiveness of the model. The preliminary results suggest that MBDMT is effective in reducing pain intensity and depression symptoms in comparison with TAU group. Also, important information was gained regarding recruitment and follow-up processes, intervention acceptability and participant satisfaction, outcome measure acceptability and performance. The pilot study offered sufficient information and preliminary results to enable the researchers to move to an RCT stage.

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In review

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8 **Keywords:** Dance movement therapy, mindfulness, chronic pain, anxiety, depression.

9 **Abstract**

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11 and psychological approaches can contribute towards changing chronic pain perceptions. This is the  
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13 movement therapy, and explores potential psychological and pain-related changes for this client  
14 population. In this paper results from the pilot study are presented involving patients with chronic  
15 headache recruited in an outpatient rehabilitation setting.

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19 intervention and 16 weeks after the intervention finished. The Hospital Anxiety and Depression scale  
20 (HADS), Patient Health questionnaire (PHQ-9), Five Facets of Mindfulness questionnaire (FFMQ)  
21 and Numeric Pain rating scale (NRS) were used as outcome measures.

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23 environment, mindfulness skills, body awareness, relaxation / releasing, **distancing** and staying with  
24 discomfort, meaning making, self-regulation, acceptance and integration, creative process). Per-  
25 protocol analysis reveals statistically significant reduction of pain intensity and depression scores in  
26 favor of the MBDMT group and these improvements were maintained in follow-up assessment.

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32

33 **1 Introduction**

34 Chronic pain affects 20% of the worldwide population (Fayaz et al., 2016; Goldberg & McGee,  
35 2011). 150 million Europeans suffer from moderate to severe chronic pain (Thematic Network on the  
36 Societal Impact of Pain, 2018)<sup>1</sup>. This debilitating condition affects persons' physical, emotional and  
37 social functioning, being a major source of suffering at the same time as it is a significant economic  
38 burden and challenge for health care systems (IASP, 2019)<sup>2</sup>. Since 2019 a significant change has  
39 been made in the classification of chronic pain as the World Health Organization has adopted the  
40 new edition of ICD-11. ICD-11 will be the first classification to include chronic pain as a health  
41 condition in its own right. This new classification differentiates chronic primary pain from chronic  
42 secondary pain, with the former referring to pain in one or more anatomical regions that persists or  
43 recurs for longer than three months. Furthermore, it recognizes that chronic primary pain is closely  
44 linked with significant emotional distress (anxiety, anger/frustration or depressed mood) and it  
45 interferes with the activities of daily life and participation in social roles in ways in which cannot be  
46 accounted for by another chronic pain condition (ICD-11, 2018)<sup>3</sup>. The new classification system is  
47 expected to promote research on the etiology and pathophysiology of these conditions and to improve  
48 access to multimodal care for all patients with chronic pain (Treede et al., 2019). Several emotional  
49 distress factors are regarded as mediators in the 'chronification' of pain, that is persistent pain with  
50 characteristic pain behavior and resistance to therapeutic intervention (Borsook et al., 2018). These  
51 factors include pain catastrophizing, anxiety, and fear of pain and helplessness (Keefe et al., 2004).  
52 Depression is also seen as a serious risk factor in the development of debilitating pain (Hülsebusch et  
53 al., 2016). The psychological characteristics of chronic pain patients can involve abuse and neglect  
54 experiences in childhood (Davis et al., 2005), counter-dependency traits and alexithymia (Ak et al.,  
55 2004), with depression working as a mediator between chronic pain and alexithymia (Saariaho et al.,  
56 2013). These psycho-emotional characteristics of chronic pain patients make this patient population  
57 quite a heterogenous group. The large-scale cross-sectional study of chronic pain patients identified  
58 four subgroups. They differ in aspects of pain intensity, duration and spreading, psychological strain  
59 and social distress including lack of social support. Research confirms that all three components –  
60 bio-psycho-social – are important in chronic pain, but different constellations of these components  
61 form subgroups with different needs in pain treatment and indicate the need to design "tailor-made"  
62 interventions (Bäckryd et al., 2018).

63  
64 Epidemiology studies show that the prevalence of pain is higher in women: chronic primary  
65 headache, in particular, affects more women than men (Jiménez-Sánchez et al., 2012; Allais et al.,  
66 2020). Middle-age (40-59) has been reported as high-risk: people in this group appear to be less  
67 satisfied with their social life and are more often diagnosed with fibromyalgia. The older adult group  
68 reported higher life quality scores, higher levels of satisfaction with marital and social life, and better  
69 mood, but they face more comorbidities and longer periods of pain (Rustøen et al., 2005). Seniors  
70 also report lower levels of pain severity and pain interference and greater levels of perceived control  
71 over pain in comparison to younger people suffering from headaches (Lachapelle &  
72 Hadjistavropoulos, 2005).  
73

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<sup>1</sup> Thematic Network on the Societal Impact of Pain, 2018:

[https://ec.europa.eu/health/sites/health/files/policies/docs/ev\\_20181112\\_co07\\_en.pdf](https://ec.europa.eu/health/sites/health/files/policies/docs/ev_20181112_co07_en.pdf)

<sup>2</sup> IASP, 2019: [https://www.iasp-](https://www.iasp-pain.org/PublicationsNews/NewsDetail.aspx?ItemNumber=8340&navItemNumber=643)

[pain.org/PublicationsNews/NewsDetail.aspx?ItemNumber=8340&navItemNumber=643](https://www.iasp-pain.org/PublicationsNews/NewsDetail.aspx?ItemNumber=8340&navItemNumber=643)

<sup>3</sup> ICD-11, 2018: <https://icd.who.int/browse11/l-m/en>

74 Treatment strategies which are regarded as clinically effective, and cost-efficient, tend to be  
75 multidisciplinary and are based on the biopsychosocial model of pain (Gatchel et al., 2007),  
76 acknowledging psychological risk factors (Nicholas et al., 2011) and offering holistic approaches to  
77 multimodal pain management (Kress et al., 2015). The biopsychosocial model of pain recognizes that  
78 pain has three facets: cognitive-evaluative, sensory-discriminative, and affective-motivational aspects  
79 (Melzack, 1999). All of [these](#) need to be included in a treatment package. From a wide range of  
80 psychological therapies, Cognitive Behavioral therapy (CBT) and Acceptance and Commitment  
81 Therapy (ACT) present the strongest evidence for decreasing depression, pain-related anxiety and  
82 catastrophizing, and for increasing self-efficacy (Williams et al., 2012; Veehof et al., 2016). Also,  
83 studies on Mindfulness-Based [Stress Reduction programme \(MBSR\)](#) report decreasing pain intensity  
84 and disability (Cramer et al., 2012). [MBSR was a programme created and introduced by John Kabat-](#)  
85 [Zinn, who defines mindfulness as: “the awareness that emerges through paying attention on purpose,](#)  
86 [in the present moment, and nonjudgmentally to the unfolding of experience moment to moment”](#)  
87 [\(Kabat-Zinn, 2003, p.145\). Mindfulness allows patients to relate to their physical and psychological](#)  
88 [symptoms in a different, more skillful way, with a positive effect on developing a realistic sense of](#)  
89 [control and appropriate strategies in becoming adaptive \(Grossman et al., 2010; Kabat-Zinn et al.,](#)  
90 [1986\). Other Mindfulness-Based Interventions \(MBI\) show](#) positive impact on perceived pain  
91 control, pain acceptance and quality of life (Bawa et al., 2015). In MBIs the indirect effect on pain is  
92 due to an increased acceptance; this buffers the intensity of perceived pain as a stressful event  
93 (Shapiro et al., 2006). Analysis of the content of MBIs reveal meditation practice, exercises that  
94 support the change of habits, simple yoga exercises and psychoeducation as some of the main  
95 structural components of the intervention (Majore-Dūšele et al., 2018). Furthermore, monitoring  
96 attention and acceptance are the central mechanisms in mindfulness training programmes;  
97 these interact to improve stress, affect, and health outcomes (Lindsay & Creswell, 2017).

98  
99 However, these interventions are limited in their capacity to approach the person as a whole,  
100 prioritizing often the cognitive domain as the route through which change may occur. They  
101 require considerable cognitive and linguistic skills from the client/patient and acknowledgment of  
102 psychological difficulties and mental health concerns in their physical symptoms. As chronic pain  
103 patients [experience](#) the physical nature of their symptoms, and may perceive their mental health  
104 concerns as stigma, they may refuse cognitive-based interventions (Payne & Brooks, 2018). With  
105 chronic pain being situated in the body, there is a danger that cognitive-based interventions are  
106 missing the opportunity to validate the physical suffering and work with the body in order to find  
107 therapeutic solutions. They also make limited use of the connection between the body and the mind  
108 as a means through which change may occur, ignoring the role movement can play as a holistic,  
109 creative, and thus therapeutic, tool. For a body-based condition such as chronic pain, there may be  
110 value in the development of a body-mind intervention with a holistic/creative character. Dance  
111 Movement Therapy (DMT) is one such intervention.

112  
113 DMT is defined as “the therapeutic use of movement to further the emotional, cognitive, physical,  
114 spiritual and social integration of the individual. Somatic awareness and kinesthetic empathy,  
115 movement as creative self-expression and dance as non-verbal interaction, are the core components  
116 of DMT (European Association of Dance Movement Therapy 2013, p.1)<sup>4</sup>.

117

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<sup>4</sup> European Association of Dance Movement Therapy, 2013:  
<https://www.eadmt.com/?action=article&id=22>

118 There is growing evidence that Dance Movement Therapy (DMT), a creative body-mind form of  
119 psychotherapy, may have a positive psychological impact on the psychological states of patients with  
120 somatic concerns. Dance and movement, being key elements in the therapeutic alliance between  
121 patient and therapist, can provide the means for the self-expression and communication of unspoken  
122 concerns amongst this client population. The latest meta-analyses show that DMT is helpful in  
123 health-related psychological outcomes, improving wellbeing, mood, affect, quality of life, body  
124 image and interpersonal competence, and reducing clinical symptoms such as anxiety and depression  
125 for different patient groups (Koch et al., 2014; Koch et al., 2019; Meekums et al., 2015; Karkou et  
126 al., 2019). DMT has shown promising improvements in functioning for fibromyalgia patients  
127 (Bojner-Horwitz et al., 2003) and patients with medically unexplained symptoms ([Payne & Brooks,  
128 2020](#); Payne & Brooks, 2017; Payne & Brooks, 2016). However, until now, there has been [limited  
129 research on the effectiveness of](#) DMT with patients suffering chronic pain. [One of the few studies  
130 with this client population comes from](#) Shim (2015; [Shim, et al., 2017](#)) [who found](#) that the ten-week  
131 DMT process increased resilience, decreased ‘kinesiophobia’ (i.e. fear of movement) and showed a  
132 beneficial impact on pain intensity.

133  
134 Regardless of the type of psychological therapy, there are arguments that the mechanisms of change  
135 in each therapeutic intervention need to be considered specifically for each client population (Kazdin,  
136 2009; Burns, 2016). In pain treatment *mindfulness*, *acceptance* and *self-efficacy* are recognized  
137 mechanisms in pain regulation (Turner et al., 2016). In DMT work with chronic pain patients,  
138 increasing *self-compassion* has been set as a main principle of the work, which is facilitated through  
139 alternating between states of acceptance and inspiration (Erber, 2015). [The BodyMind Approach®  
140 \(TBMA\) \(an approach that has derived from DMT\) has identified five key factors as responsible for  
141 successful self-management of patients with medically unexplained symptoms.](#) These are: body with  
142 mind connections, importance of the facilitator, positive benefits, preparedness for change, self-  
143 acceptance and compassion (Payne & Brooks, 2020). The DMT model for building resilience in pain  
144 patients by Shim et al, (2017) recognizes the mechanisms of *activating self-efficacy*, *connecting to*  
145 *self*, *connecting to others*, *enhancing emotional intelligence*, and *reframing* as important. In earlier  
146 models of DMT for chronic pain patients (Shim, 2015), four therapeutic factors were identified:  
147 *kinesthetic awareness* (articulation, noticing, widening), *enactment* (mobilization & motivation,  
148 kinesthetic imagining, reinforcement & reframing), *expressivity* (externalizing & symbolization,  
149 emotional restoration and management, creativity & ability to play), and *making connections* (mind-  
150 body integration, meaning-making & identity reconstruction, interpersonal connection).

151  
152 Despite the discussion in DMT literature that mindfulness is an important component of DMT (Koch  
153 et al., 2019), there has been no prior study that integrates these two approaches and explores potential  
154 psychological and pain-related changes for this client population. In this paper the development of  
155 the working model of the Mindful-Based DMT (MBDMT) is presented, along with results from the  
156 pilot study that has been completed, before conducting a large RCT that will examine the efficacy of  
157 MBDMT for chronic pain patient population.

158  
159 The objectives of the pilot study were to: (1) [establish recruitment and follow-up processes](#); (2)  
160 [explore initial outcome results of MBDMT intervention](#); (3) [examine](#) intervention acceptability,  
161 participant [adherence and](#) (4) [test adherence to the MBDMT protocol](#). This current paper will present  
162 and discuss how these objectives were met.

## 163 2 Methods

### 164 2.1. Recruitment procedure and participants



165 The present study recruited patients with chronic headache (tension-type headache and/or migraine  
166 with or without aura, diagnosed by neurologist). Patients with chronic headache were prioritized in  
167 this study because of easy access to this population in the first instance. Inclusion and exclusion  
168 criteria were established prior to the commencement of the study. Inclusion criteria for the study  
169 were: (1) primary headache lasting more than three months (headaches needed to be the primary  
170 cause for seeking medical help); (2) being between 20 and 55 years old; (3) increased depression  
171 and/or anxiety measures (PHQ-9 > 5; HADS > 7). Exclusion criteria were: (1) patients who had a  
172 disease based on an infectious process, autoimmune or metabolic pathology, traumatic injury,  
173 neoplastic process (primary tumor or metastasis) or internal organ pathology which can be connected  
174 with pain; (2) movement limitations not related to the diagnosis of chronic pain (eg cerebral palsy,  
175 spinal injuries, etc.); (3) pregnancy.

176 The recruitment strategy involved: (i) the neurologists of the rehabilitation setting who were  
177 informed at their quarterly meeting about the aims and structure of the intervention, and the inclusion  
178 and exclusion criteria of the pilot study; (ii) participation in the research and DMT groups was  
179 advertised through social media in a closed group of the headache patient's association. Interested  
180 participants allowed their neurologist to send contact information to the principal investigator (first  
181 author of this paper). Alternatively, they were given the option to contact the principle investigator  
182 themselves through email or SMS. The principal investigator made an initial phone call to each  
183 interested individual to inform them about the study, to answer any questions, and to gain verbal  
184 consent for participation in the study. Potential participants were informed about randomization, and  
185 were also informed that members of the control group could participate in the DMT group after the  
186 intervention group process was complete. Following this, all participants were sent by email written  
187 information about the study, the consent form and all measures for the baseline assessment. The  
188 recruitment process and all aspects of the study gained ethical approval by the Ethics Committee of  
189 Riga Stradins University (02/28/2019 Nr,6-3/2/43).

190 Over the ten weeks of the recruitment period (Aug-Nov 2019), 39 women (n=39) expressed interest  
191 in participating in the study; 19 were recommended for participation by their neurologists, while the  
192 other 20 were recruited through the headache patient's association. Although no prevalence or  
193 restrictions were identified in inclusion criteria regarding sex, only female participants came forward  
194 to participate in the study. After the baseline assessment, 29 patients (n=29) were eligible for  
195 inclusion. These patients were randomly assigned to the MBDMT intervention or the waiting list  
196 control group using the random number generator that produced two sets of 15 unique numbers from  
197 1-30.

198  
199 All participants in the study received treatment as usual (TAU), continuing in their rehabilitation  
200 outpatient setting. TAU for chronic headache patients was pharmacological treatment ordered by a  
201 neurologist along with physical and/or physiotherapy input (Table 1).

202 **Figure 1** Recruitment flow diagram (insert here)

203 2.2. Outcome measures

204 Assessments were performed at baseline (T1), post treatment (T2; 2 months after baseline) and four  
205 months post-intervention (T3; 4-month follow-up).

206 *Demographic information* was collected through a self-completed questionnaire created by the  
 207 researcher, which gathered information about the gender, age and pain characteristics - pain duration,  
 208 pain etiology, and types of pain control strategies.

209 *A numeric rating scale (NRS)* was used as a scale for pain intensity measurement. This is an 11-point  
 210 scale where the end points are the extremes of no pain (0) and worst possible pain (10). The NRS can  
 211 be graphically or verbally presented, and can be self-assessed. This method of assessing pain is  
 212 widely recommended as a core outcome measure in clinical trials of chronic pain treatment  
 213 (Dworkin, et al., 2005; Farrar, et al., 2001).

214 *The Hospital anxiety and depression scale (HADS; Zigmond & Snaith, 1983)* evaluates the severity  
 215 of anxiety and depression symptoms in non-psychiatric inpatients. It is composed of seven items that  
 216 assess anxiety symptoms and seven for depression symptoms. Each item contains a scale of four  
 217 points (from 0 to 3) with total scores ranging from 0 to 21 for anxiety and depression in three  
 218 categorical levels: normal (0–7); borderline abnormal (8–10); abnormal (11–21). Higher scores mean  
 219 greater severity. Psychometric properties for the Latvian version showed a good internal consistency  
 220 (Cronbach's alpha 0.892) (Šmite & Ancāne, 2010). In the present study, the internal consistency at  
 221 T1 was Cronbach's  $\alpha = .82$  for depression scale and  $\alpha = .80$  for anxiety scale; at T2  $\alpha = .79$  and  $\alpha =$   
 222  $.82$ ; at T3  $\alpha = .74$  and  $\alpha = .73$ .

223 *The 9-items Patient Health Questionnaire (PHQ-9; Kroenke & Spitzer, 2002)* is a self-administered  
 224 dual-purpose instrument that can establish provisional depressive disorder diagnoses as well as grade  
 225 depressive symptom severity. Each of the nine items is scored 0 to 3, providing a severity score  
 226 ranging from 0 to 27. Severity of depression was assessed by the PHQ-9 depression severity score  
 227 and graded as none/minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), and  
 228 severe (20-27). In the present study, the internal consistency of T1 data was Cronbach's  $\alpha = .79$ ; T2  $\alpha$   
 229  $=.74$ ; T3  $\alpha = .70$

231 *The Five facets of mindfulness questionnaire (FFMQ; Baer et al., 2006)* is composed of 39 items.  
 232 Each item is rated on a 5-point Likert scale (1 = "never or very rarely true"; 5 = "very often or always  
 233 true"). Five scales: "Observing" is the ability to notice or attend to internal and external experiences  
 234 such as sensations, thoughts, or emotions. "Describing" means to label internal experiences with  
 235 words. "Acting with awareness" refers to focusing on one's activities in the moment as opposed to  
 236 behaving mechanically. "Non-judging of inner experience" means taking a non-evaluative stance  
 237 toward thoughts and feelings and "non-reactivity to inner experience" refers to allowing thoughts and  
 238 feelings to come and go, without getting caught up in or carried away by them. Higher scores on the  
 239 FFMQ reflect greater mindfulness skills. The Latvian version of this scale has shown good reliability  
 240 and internal consistency (Cronbach's alpha 0.9; Majors, 2013). In the present study, the internal  
 241 consistency of T1 data was Cronbach's  $\alpha = .89$ ; T2  $\alpha = .86$ ; T3  $\alpha = .91$ .

## 242 *Intervention*

243 The Mindful-Based Dance Movement Therapy (MBDMT) intervention model used in this study was  
 244 grounded on the contribution of five expert informants. It involved nine therapeutic  
 245 mechanisms/components of change, which were structured in a developmental process with each  
 246 component supporting the next one.

247 1. *Safe therapeutic environment.* This is a common factor in any counselling or psychotherapy  
 248 process. Its main characteristics are warm relationships built on empathy, support, validation and the  
 249 acceptance of the patient as he/she is – emotionally, physically, and cognitively. These are also

250 known as the person-centered facilitative conditions (Lambert & Barley, 2001). The therapeutic  
 251 environment is a safe holding space for the other factors in the therapy process.  
 252 2. *Mindfulness skills*. The patient will be supported to focus and regulate their attention to different  
 253 realms of perception: their own sensations, emotions, thoughts and images, and to cultivate kindness,  
 254 compassion and a non-judgemental attitude towards their self. The development of mindfulness skills  
 255 will serve as gateway into the creative process.  
 256 3. *Body awareness*. The patient will pay attention toward their body sensations, not reacting  
 257 negatively or emotionally but with an explorative interest. Attention toward interaction between  
 258 sensation, emotions and thoughts, experience of body-mind connectivity.  
 259 4. *Relaxation / releasing*. Through creative activities, verbalization and sharing, the patient will  
 260 express themselves safely and release physical tension. This will open them up for new experiences  
 261 and perceptions of themselves and others.  
 262 5. *Distancing and staying with discomfort*. Instead of persisting with fear and avoidance reactions,  
 263 the patient will use creative tools (props) and aesthetic distance to focus on pain. This will help them  
 264 to explore their relationship with their symptoms, and to build tolerance and the ability to manage  
 265 their discomfort.  
 266 6. *Meaning making*. The patient will be invited to respond to the question: ‘Why is this happening to  
 267 me?’ In-depth exploration of symptoms in the context of one’s personal life and possible insights into  
 268 the cause-effect relationship of symptom development.  
 269 7. *Self-regulation*. The patient will practice self-management, recognizing and releasing physical  
 270 tension and dealing with any emotionally intense feelings which may arise.  
 271 8. *Acceptance and integration*. As a result of the therapeutic process, the patient may gain a deeper  
 272 understanding of themselves, as well as an acceptance of their physical and emotional state.  
 273 9. The *Creative process* permeates all of the above factors in the model, as they are delivered through  
 274 creative activities. Imagery, symbolism and movement metaphors are core aspects of dance  
 275 movement therapy.

276  
 277 The therapy model described above shows that MBDMT is a purposefully organized therapeutic  
 278 process where, through the use of creative activities, the development of mindfulness skills, and an  
 279 exploration of bidirectional processes, the relationship between body and mind is explored and self-  
 280 management and self-regulation skills are learned (Majore-Dūšele et al., 2019).

281  
 282 **Figure 2** Mindful-Based Dance Movement therapy intervention model (insert here)  
 283

284 The protocol of the MBDMT intervention is organized as a short-term focused therapeutic process  
 285 taking into the account the short-term organization structure of rehabilitation settings in Latvia. **It**  
 286 includes ten sessions, twice a week, for a five-week period. Each session lasts 90 minutes and  
 287 follows a similar structure: (1) check-in and physical warm-up; (2) body-scan (sitting, lying,  
 288 standing, or walking); (3) work with themes – safety, pleasure, personal borders, body-mind  
 289 connection, relationship with pain, resources; (4) closure and homework.

290 Two therapeutic groups took place, with seven/eight participants in each group. Three participants  
 291 were lost early in the process, leaving a group of twelve (n=12) from whom the data was derived.  
 292 The groups were facilitated by a dance movement therapist in training (**3<sup>rd</sup> year professional** Masters  
 293 **student in arts therapies with specialization in dance movement**). **The facilitator had been licensed as**  
 294 **a psychotherapist prior to training as a dance movement therapist, had more than five years practice**  
 295 **working with mental health issues and adult groups, had previous mindfulness practice training (8**  
 296 **weeks programme), received training in delivering the MBDMT intervention (24 hrs) and had**

supervision during the intervention period by a qualified supervisor. MBDMT intervention training included personal experience with the MBDMT model and facilitating skills training.

### 2.3. Analysis

Data were analyzed using the Statistical Package for Social Science – Version 23 (SPSS-23, IBM SPSS Statistics for Macintosh, Version 23.0. Armonk, NY, United States: IBM Corp.). Descriptive statistics were used to present the characteristics of the sample. The Kolmogorov-Smirnov test indicated that the distribution departed from normality and the small sample size limited the power of statistical analysis, so the Mann-Whitney  $U$  test was used to analyze baseline group differences of the interval data (ie socio-demographic and clinical characteristics), while the Pearson Chi-Square test or Fisher's Exact Test was used for categorical variables (localization and duration of pain and pain control strategies). The Mann-Whitney  $U$  test was also used to conduct a between-group comparison of the change in scores from baseline (T1) to the post treatment (T2) and follow up (T3) for all the outcome measures with  $p < 0.05$  being the accepted level of statistical significance. Although medians (interquartile range) were used for the calculation of averages, also means and standard deviations were presented. Taking into account the small sample size of this pilot study, the statistical analysis was performed Per Protocol (PP) instead of performing Intention To Treat (ITT) analysis. PP included patients who completed the intervention according to the protocol only along with data collected from the control group. In all cases, missing data were not included in the calculation.

The Reliable Change Index (RCI; Jacobson & Truax, 1991) was calculated for PHQ-9, HADS and pain measures to assess the impact of the intervention at the individual level. RCI was used as an indicator of clinical significance of change because it allowed a determination of whether an individual change score (between pre-intervention and post-intervention assessment) was significantly greater than a difference that could have occurred due to random measurement error alone (Guhn et al., 2014). Cut-off points dividing clinical and non-clinical patient groups were  $\geq 10$  for PHQ-9 and  $\geq 8$  for HADS as the most frequently recommended ones in the literature (Manea et al., 2012; Hansson et al., 2009; Bjelland et al., 2002). Participants whose PHQ-9 and HADS scores were below the cut-off point at the pre-treatment measurement (T1) were excluded from the RCI calculation. RCI were calculated at 95% confidence. If a participant's RCI was below  $-1.96$  and passed the cut-off point, the participant was classified as *recovered*. If the RCI was below  $-1.96$  but did not passed the cut-off point, the participant was classified as *improved*. If the participant's RCI was between  $-1.96$  and  $1.96$ , the participant was classified as *unchanged*. If the participant's RCI was above  $1.96$ , the participant was classified as *deteriorated*. For pain measures the RCI were calculated based on the minimal clinically important difference being 2-points on a 10-point rating scale as reported in previous studies (Hägg et al., 2003).

Power calculation was performed for the primary outcome measure – depression (PHQ-9), to detect the adequate sample size for future RCT.

## 3 Results

### 3.1. Recruitment and follow-up feasibility

During the 2.5-month enrollment period, 39 women expressed an interest in participating in the study and 29 met the eligibility criteria. Both recruitment strategies (i) by the neurologists and (ii) by headache patients' association were similarly effective, attracting 50% and 50% of study participants. As the study flow diagram shows (see Figure 1), post-treatment measures used immediately after the



342 intervention were completed by all the members of the control group and all those from the  
 343 intervention group who attended for the whole duration of the programme. Three participants who  
 344 did not complete therapy discontinued early in the study. Follow-up measures were completed by  
 345 100% of the intervention group completers and 71% (10/14) of the control group.

### 347 Sample characteristics

348  
 349 All the participants in the study were female and between 26 and 55 years of age ( $M = 36.7$ ,  
 350  $SD=7.4$ ). 56.7% of the patients had suffered from pain (headache, migraine) for more than ten years.  
 351 60% of the patients suffered from other types of pain in addition to headache and migraine. The  
 352 participants in the intervention and control group were compared by demographic characteristics in  
 353 order to establish whether there were differences between them at baseline. The participants in the  
 354 intervention group were older ( $M = 40.9$ ,  $SD= 6.9$ ) than participants in the control group ( $M = 32.6$ ,  
 355  $SD= 5.0$ ). There were no differences between the two groups in the duration of pain experience and  
 356 variabilities of pain type or pain control strategies (Table 1).

357  
 358 **Table 1:** Baseline participant demographic and clinical characteristics in intervention and control  
 359 groups (insert here).

### 360 3.2. Treatment outcome results: changes in intervention group versus control group

361 **Table 2** Means, standard deviation, medians of clinical outcome measures; between group  
 362 comparison of the pre/post and pre/follow up change scores (per-protocol analysis) (insert here).

363  
 364 The means, standard deviation and medians of the outcome measures, as well as between group  
 365 comparison of the baseline/post (T1/T2) and baseline/follow up (T1/T3) change scores are presented  
 366 in Table 2 at three measurement points. Results indicate that, at baseline (T1), there were no  
 367 statistically significant differences between groups in the measurements of pain, PHQ-9, HADS or  
 368 FFMQ. For each of the scales with clinical cut-offs the selected population baseline mean was above  
 369 the clinical cut-offs, PHQ-9 ( $M= 8.1$ ,  $SD=4.3$ ), HADS-A ( $M=9.8$ ,  $SD= 4.1$ ), HADS-D ( $M= 5.34$ ,  $3.8$ )  
 370 respectively, indicating mild to moderate symptoms of anxiety and depression for both groups.

371  
 372 A Mann-Whitney  $U$  test was conducted to look for statistically significant differences in the  
 373 reduction of pain, depression and anxiety scores across treatment conditions. The test identifies a  
 374 significant difference in the change score (T1/T2) of perceived pain between the MBDMT group  
 375 ( $Mdn = -1$ ) and control group ( $Mdn = .00$ ),  $U= 128.5$ ,  $p = .02$ . The change remained statistically  
 376 significant in T1/T3 between the intervention group ( $Mdn = -1.5$ ) and the control group ( $Mdn = .00$ ),  
 377  $U= 81.5$ ,  $p = .04$ .

378  
 379 The reduction of PHQ-9 scores indicates that there were changes in symptoms for the intervention  
 380 group ( $Mdn = -2$ ) which was different from the control group in a statistically significant way ( $Mdn$   
 381  $= -1$ ),  $U = 40.5$ ,  $p = .02$ . in T1/T2 comparison. The difference was not statistically significant when  
 382 T1/T3 was calculated,  $U = 35.5$ ,  $p = .18$ .

383  
 384 On HADS measures the change score for anxiety and depression was greater than for the control  
 385 group in both post intervention time points with reduced scores post intervention for the MBDMT  
 386 intervention group, but this change did not reach statistical significance (HADS-A, T1/T2:  $Mdn = -2$   
 387 vs  $Mdn = .00$ ,  $U = 121.00$ ,  $p = .06$ ; T1/T3:  $Mdn = -4$  vs  $Mdn = -1$ ,  $U = 78.5$ ,  $p = .08$ ; HADS-D,

388 T1/T2: Mdn = -1.5 vs Mdn = .00,  $U = 118.5$ ,  $p = .07$ ; T1/T3: Mdn = -1 vs Mdn = .00,  $U = 76.5$ ,  $p =$   
 389 .11).

390  
 391 No significant differences between groups was found for Five Facets of Mindfulness scores as  
 392 indicated in Table 2.

393  
 394 Table 3 Reliable change of intervention group using 95% CI for outcome measures pre-intervention  
 395 to follow-up (insert here)

396  
 397 With reference to Table 3, 50% (6/12) of the intervention group participants experienced a reliable  
 398 change in pain reduction of at least 2-points. For the other 50% their pain level stayed unchanged.  
 399 For 92% (11/12) of participants, their anxiety level reached the clinical cut-off point at baseline for  
 400 HADS-A, but follow up measures demonstrated reliable improvement for 73% (8/11) of the  
 401 participants. 28% (3/11) of the participants' anxiety levels changed from clinical to non-clinical  
 402 population valuables. Only four participants' depression levels reached clinical cut-off points at  
 403 baseline by both measures PHQ-9 and HADS-D, but at follow up three of these patients (75%)  
 404 demonstrated a reliable improvement with regard to depression, changing from the clinical to the  
 405 non-clinical population. One patient, from the intervention group included in RCI calculations,  
 406 demonstrated a significant increase in anxiety.

407  
 408 As this pilot study demonstrated statistically significant decrease in depression, the PHQ-9 measure  
 409 of depression was used as a primary outcome of the intervention. Based upon the follow up data,  
 410 using the means and standard deviation, sample size calculation for a larger RCT was performed.  
 411 Calculation for continuous outcome superiority trial with 80% power at an alpha level of .05  
 412 suggestes that a total sample of 86 participants was needed to detect clinically important difference  
 413 between means. To allow for attrition between end of trial and follow-up, the aim was to recruit 120  
 414 patients for an RCT.

### 415 3.3. Intervention acceptability, participant adherence and satisfaction

416 Of the 15 patients who began to participate in the MBDMT group, twelve completed the therapy  
 417 course and attended at least eight sessions. The three participants who did not complete the treatment  
 418 discontinued early in the study: one moved to a new residence, and two concluded after the first  
 419 session that the intervention was not appropriate for them. Four patients completed all ten sessions,  
 420 three patients nine sessions and five completed eight sessions.

### 421 3.4. Adherence relative to MBDMT protocol

422 Adherence to the treatment protocol from the dance movement therapist in training was evaluated  
 423 through a selection of video recordings from the sessions, looking at different stages of the work  
 424 (warm-up, working and closing stage). This was also discussed during regular supervision sessions.  
 425 Substantial diversion from the protocol was not observed. The nine working mechanisms that  
 426 informed the structure of the intervention were found to be logical and supportive of the development  
 427 of the group therapy process. There was, however, some difficulty in the timing of the sessions: the  
 428 therapist in training found that more time was needed at the beginning and end of the sessions to  
 429 allow for the participants' verbal discussion.

430 On the whole, the treatment protocol was easy to follow and responsive to group dynamics offering  
 431 alternative choices of techniques.

## 432 4 Discussion

433 This pilot study suggested that MBDMT was a useful intervention for reducing the pain, depression  
434 and anxiety symptoms of chronic pain patients participating in the study. Results indicate that  
435 offering a DMT group intervention in addition to the usual medical treatment of chronic pain  
436 improved the psychological aspects and reduced pain more than just medical treatment and  
437 physiotherapy. Viewing the results of the present study within the context of other DMT and  
438 mindfulness-based intervention studies, the study offers an interesting addition to the literature,  
439 especially with regards to pain reduction. Results from systematic reviews show that MBIs are  
440 inconsistent in terms of their effect on pain reduction. Results vary from medium to weak  
441 effectiveness, but do reveal a positive impact on perceived pain control with a moderate effect size ( $g$   
442 = 0.58) (Cramer et al., 2012; Bawa et al., 2015). Note: the goal of MBIs is not to reduce the intensity  
443 of the pain but to improve the patient's functioning and reduce their general distress; being mindful  
444 has a therapeutic value in its own right (Reiner et al., 2013).

445 Results from this MBDMT study, however, do suggest a statistically significant reduction in pain  
446 intensity, in contrast with the mindfulness measure where no significant change was observed. While  
447 pain reduction is not the primary goal of the MBDMT intervention, the pain experience of the patient  
448 is validated and the relationship with pain is addressed in the work phase of the therapeutic process.  
449 For 50% of MBDMT participants pain reduction was at least two points on the NRS scale; this is  
450 considered to be a reliable and clinically important change (Farrar et al., 2001). These results are  
451 consistent with the earlier research in DMT for chronic pain patients, in which the theme of working  
452 with the meaning of pain was part of the therapeutic process, and the reduction in pain intensity was  
453 observed (Shim et al., 2017).

454 The MBDMT intervention preliminary results also suggest that reduction in depression and anxiety  
455 symptoms is possible at least for the small sample of participants with chronic pain involved in this  
456 study. Individual analysis of reliable change for the intervention group indicated reliable  
457 improvement in anxiety symptoms for 73% of patients. For those four patients with moderate and  
458 severe depression, improvement was clinically significant, allowing them to move to a non-clinical  
459 population. These results are consistent with previous research with a similar patient group with  
460 medically unexplained symptoms, including medically unexplained pain, where 65% of participants  
461 involved in a (TBMA) group demonstrated reliable improvement on depression or anxiety measures  
462 (Payne & Brooks, 2017; Payne et al., 2017). These results can also support results from a large-scale  
463 clinical trial on DMT and depression (Hyvönen et al., 2020) and meta-analyses on DMT for  
464 depression (Meekums et al., 2015; Karkou et al., 2019) Also, potentially they add to results from  
465 generic meta-analyses on DMT (Koch et al, 2019). The latter study argues that DMT can improve  
466 psychological conditions by decreasing depression and anxiety levels for patients with somatic  
467 concerns. Results from the current study suggest that this was also true for the participants of the  
468 MBDMT group.

469  
470 Findings from this current study may be biased, due to the small sample size and the possibility of a  
471 type II error (low power to detect true effects). However, it is important to mention that the follow-up  
472 measurement (T3) took place two weeks after the beginning of the Covid-19 pandemic in Latvia  
473 (March 2020), and that an overall atmosphere of fear and uncertainty may have influenced the  
474 participants' psycho-emotional state. This, in turn, may have been reflected in the results of the  
475 follow-up anxiety, depression and also pain measures. Also, it is important to acknowledge that 60%  
476 of the study participants had comorbid pain states, which may also have influenced the study results.  
477 The comorbidity of other pain and mental states (depression and anxiety) are characteristic of women

478 with migraine diagnosis and has been reported in previous chronic pain studies (Allais et al., 2020;  
479 Xu et al., 2020), suggesting that mechanism of central sensitization may be a substrate or  
480 consequence of comorbidity (Ashina et al., 2018).

481 Patients found the experience of being in the MBDMT group to be useful. This was reflected in the  
482 acceptability of the intervention by the participants, which was evaluated as good; 80% of the  
483 participants assigned to the treatment group stayed in the process and attended at least eight out of  
484 ten therapy sessions. The literature suggests that other body-based interventions also show high  
485 completion rates. TBMA, for example, reported a completion rate of 95 percent (Payne & Brooks,  
486 2017), and the resilience-building DMT approach for chronic pain patients was evaluated as helpful  
487 and supporting of a body-mind orientated approach by 68% of participants (Shim et al., 2017).

488 Still, in the current study, since two patients did not find the intervention appropriate for them and  
489 dropped out of the intervention group after the first therapy session, an assessment of the  
490 intervention's suitability is needed. Although statistical tests showed no significant difference in  
491 baseline measures between those dropping out and those completing the intervention, HADS anxiety  
492 scores indicate that there were some differences worthy of further analysis. The mean score of  
493 anxiety (9.95) for the group completing the intervention can be seen as borderline with the mean  
494 score of the dropout group (14.00) being a clear outlier. It is possible that the patients with the high  
495 anxiety scores perceived the creative group intervention of MBDMT as too unusual, and involvement  
496 in the therapeutic group as emotionally overwhelming. In a clinical context, an individual dance  
497 movement therapy approach could have been more suitable for these patients.

498 The evaluation of *acceptability of outcome measures* indicated that in comparison with HADS, PHQ-  
499 9 could show a higher sensitivity in assessing symptoms of depression for this patient group. The  
500 construction of the HADS relies on anhedonia, not on somatic symptoms, and it is sensitive to mild  
501 distress as it excludes symptoms of severe mental illness. PHQ-9 is constructed as a diagnostic tool  
502 for clinical depression and strongly correlates with mental and physical health difficulties (e.g. self-  
503 reported disability days and clinical visits) (Anderson et al., 2011) making it an appropriate tool for  
504 use within this study. Furthermore, PHQ-9 was evaluated by patients with unexplained medical  
505 conditions as a more appropriate measurement tool than CORE or HADS in a TBMA pilot study  
506 (Payne, personal communication, December 2020). Finally, chronic pain patients are often more  
507 interested in the physical representation of their difficulties than the emotional aspects. It therefore,  
508 appeared that PHQ-9 was a more suitable measure of depression for this study, as it captured changes  
509 in the somatic aspects of psycho-emotional distress.

510  
511  
512 Similarly, the General Anxiety Disorder (GAD-7) scale was considered a good tool to assess the  
513 anxiety level for the chronic pain patient group. GAD-7 has good psychometric properties and is  
514 sensitive as a clinical outcome measure (National IAPT Programme Team, 2011). Both GAD-7 and  
515 PHQ-9 were also used as measurement tools for depression and anxiety in previous research with a  
516 similar population in The BodyMind Approach (Payne & Brooks, 2017; Payne & Brooks, 2016). It  
517 was therefore decided to use this tool along with PHQ-9 instead of HADS for the larger scale clinical  
518 trial following the pilot.

519  
520 Somatic sensitivity may also be relevant to the mindfulness measure. In the present study the FFMQ  
521 was used to assess changes in mindfulness aspects. The FFMQ evaluates the components of  
522 dispositional mindfulness, i.e. the tendency to express mindful attitudes and behaviors in everyday  
523 life (observing experience, using language to describe experience, acting with awareness, being non-



524 reactive, and being non-judgmental). However, the FFMQ does not distinguish between attention  
525 directed to exteroception, interoception or thoughts (Hanley et al., 2017). Since body awareness is  
526 one of the basic components of the MBDMT intervention, a measurement that detects aspects of  
527 interoceptive body awareness may be more appropriate in future studies. The Multidimensional  
528 Assessment of Interoceptive Awareness (MAIA, Mehling et al., 2012) is one such example: it allows  
529 an assessment of awareness of the body's physiological condition alongside the evaluative  
530 interpretations arising in tandem with that awareness (Mehling, 2016). Mehling (2012) also states  
531 that the MAIA can be helpful in researching mind-body interventions, where the multidimensional  
532 assessment of body awareness can be used to understand which aspects of body awareness contribute  
533 to improvements in clinical outcomes. MAIA has been used as a body awareness assessment tool in  
534 previous research on use of DMT for chronic pain patients (Shim, 2015).

535  
536 Mindfulness scores did not show statistically significant changes after the five-week-long MBDMT  
537 intervention. The most commonly used structure in MBI research is eight weeks, with a group  
538 session once a week and an emphasis on regular practice at home (Bawa et al., 2015). The present  
539 length of the MBDMT intervention may not be enough to develop sustainable mindfulness skills.  
540 The 'dosage' of this DMT intervention might have been insufficient to create quantitatively  
541 observable changes in mindfulness outcome measures. Another possible interpretation is that the  
542 working mechanisms of the MBDMT model were more closely connected with active therapeutic  
543 factors in DMT than with mindfulness interventions. To research this hypothesis future studies  
544 should involve qualitative and quantitative analysis of therapeutic mechanisms. Future research may  
545 also attempt to answer questions present in the DMT literature (Koch et al., 2019): what do DMT and  
546 mindfulness-based interventions have in common? Additional mindfulness principles that have been  
547 incorporated in DMT through the practice of authentic movement such as the concept of  
548 bodymindfulness (Payne & Brooks, 2019) or "bodyfulness" (Caldwell, 2014) can be further  
549 considered in future research studies.

550  
551 At the time of writing, this is the first pilot clinical trial to explore a mindfulness-based model in  
552 DMT for the specific patient group. There are several publications available at the time of writing  
553 this paper: a published case analysis, in which the principles of mindfulness are used within the  
554 context of somatic psychotherapy and DMT as a pathway towards embodiment (Tantia, 2013); a  
555 research study, showing mindfulness skill training as one of the guiding principles of therapeutic  
556 intervention for patients with depression (Pylvänäinen et al., 2015); and therapy models that offer the  
557 perspective of mindfulness meditations, mindful movement practices, e.g. tai chi and yoga as an  
558 important aspect of the DMT intervention (Olmedo, 2020; Sanchez, 2012; Barton, 2011). The  
559 BodyMind Approach (TBMA)® created by Helen Payne (2009a,b) is an integrative approach  
560 underpinned by principles of experiential learning cycles, dance movement psychotherapy and  
561 mindfulness research, created and researched for patients with medically unexplained symptoms  
562 (Payne et al., 2020). However, the MBDMT is the first model in DMT to be adapted for chronic pain  
563 patients which employs aspects from other models in a unique way. The model uses mindfulness as  
564 an integral part of the therapeutic process, in which the methodology of mindfulness practice and the  
565 understanding of the working mechanisms are integrated within the creative process of DMT. The  
566 MBDMT model adopts a bi-directional body-mind approach, in which awareness of the body is used  
567 as a physical portal to consciousness (Eddy, 2016), and awareness of the mind is seen as a  
568 metacognitive state - ability to observe, explore and gain the understanding of the processes and  
569 relationships between mind and body, with both aspects (ie body awareness and meta-cognitive  
570 aspects) of mindfulness being equally important (Majore-Dusele & Karkou, 2018). In comparison  
571 with other mindfulness-based interventions, the advantage of the MBDMT is that mindfulness is put

572 into action through creative activity, and creative methods enable the participant to fully experience  
573 and to be able to observe the experience at the same time.

574

575           Limitations and future research directions

576

577 The first limitation of the study is the small sample size (n=29) that reduces the generalizability and  
578 statistical power of calculations, and questions the reliability of the quantitative findings. Qualitative  
579 data were used to complement the findings coming from quantitative data and to strengthen the  
580 conclusions regarding the study's feasibility and the impact of the intervention on specific self-  
581 reported measures completed by the participants. The use of self-reported scales is another limitation  
582 of this study. One of the clinical characteristics of the chronic pain patients includes alexithymia – a  
583 decreased ability to identify and describe emotional states and differentiate them from bodily  
584 sensations. This questions the participants' ability to evaluate their own psycho-emotional states  
585 properly. Although the validity and reliability of the self-report scales used were high, in future  
586 research both subjective and objective measures should be incorporated to increase the validity of the  
587 research findings. Another limitation is the fact that there were only female participants in the study,  
588 questioning the external validity of the study and suggesting a potential selection bias. Also, the  
589 length of the intervention (10 sessions), and the fact, that the therapeutic process was directed by a  
590 dance movement therapist in training, should be considered as possible limitations of the study and as  
591 factors with capacity to influence the results of the study.

592

593 In contrast, the strength of the study is based on the use of randomization and the presence of  
594 homogeneity of the study's sample. Further strengths can be assigned to the careful development of  
595 the intervention integrating the two practices.

596

597           Conclusions

598

599 The MBDMT is a feasible and promising intervention for chronic pain patients. The participants in  
600 the MBDMT group reported a significant decrease in pain intensity in comparison with the TAU  
601 control group in both post-intervention measures. A decrease in depression symptoms was significant  
602 in post-intervention measurement. Anxiety also changed in the expected direction for the MBDMT  
603 group. Although results did not reach statistical significance, there was reliable improvement for 73  
604 per cent of the patients attending the intervention group. Scores on mindfulness measures changed in  
605 the expected direction for the MBDMT group, but did not reach statistical significance when  
606 compared with scores from the control group on the same measures.

607

608 Still, it was concluded that the pilot study offered sufficient information and preliminary results to  
609 enable the researchers to move to an RCT stage. It is expected that a larger sample, the inclusion of  
610 an active control, the replication of the group to more than one site delivered by more than one  
611 therapist, and the inclusion of additional somatic outcome measures, will strengthen this pilot study  
enabling generalizable findings on the effectiveness of this approach to people with chronic pain.

## 612 5 Ethics statement

613 This study gained approval by the Ethics Committee of Riga Stradins University with written  
614 informed consent from all subjects. All subjects gave written informed consent in accordance with  
615 the Declaration of Helsinki.

616 **6 Author contributions**

617 IMD was responsible for the conception and design of the study, data collection, interventions  
 618 implementation, data analysis and interpretation, and writing the manuscript. VK were responsible  
 619 for the conception and design of the study, contributed to the data analysis, interpretation and  
 620 manuscript development. IM contributed to the interpretation of the data and manuscript  
 621 development. All authors have approved the final version of the manuscript.

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630 The authors declare that the research was conducted in the absence of any commercial or financial  
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632 **9 Footnotes**

- 633  
 634  
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- 963 **Table 1** Baseline participant demographic and clinical characteristics in intervention and control groups
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Characteristics	Intervention group (n=15)	Control group (n=14)	<i>p</i>
Age M (SD)	40,9 (6,97)	32,2 (4,98)	.001 <sup>a</sup>
<b>Localization of pain</b>	<b>N (%)</b>	<b>N (%)</b>	
Headache, migraine	15(100)	14(100)	
Lower back pain	8(53.3)	5(35.7)	.340 <sup>b</sup>
Musculoskeletal	7(46.7)	2(14.3)	.109 <sup>c</sup>
Fibromyalgia	2(13.3)	1(6.7)	1.0 <sup>c</sup>
<b>Duration of pain</b>			.431 <sup>c</sup>
until 1 year	1(6.7)	2(14.3)	
1-3 years	2(13.3)	0(0)	
3-5 years	0(0)	1(7.1)	
5-10 years	2(13.3)	4(28.6)	
more than 10	10(66.7)	7(50.00)	

Pain control strategies			
Medication	14(93.3)	13(85.7)	.598 <sup>c</sup>
Physiotherapy/massage	9(60.0)	5(35.7)	.191 <sup>b</sup>
Daily exercise	3(20.0)	2(14.3)	1.0 <sup>c</sup>
Physical procedures	5(33.3)	4(28.6)	1.0 <sup>c</sup>
Relaxation/meditation	2(13.3)	1(7.1)	1.0 <sup>c</sup>
<sup>a</sup> Mann-Whitney U test; <sup>b</sup> Pearson Chi-Square; <sup>c</sup> Fisher Exact test.			

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**Table 2** Means, standard deviation, medians of clinical outcome measures; between group comparison of the pre/post and pre/follow up change scores.

Variables	Time	Intervention group (n=12)		Control group (n=14)		Mann-Whitney U / p - value		
		Mean (SD)	Mdn (IQR)	Mean (SD)	Mdn (IQR)			
Pain (NRS)	T1	6.00 (1.28)	6 (2)	6.33 (1.22)	6 (3)	102.5 / .35		
	T2	4.83 (1.34)	5 (1)	6.22 (1.56)	6 (2)			
	T3	4.67 (1.44)	4 (2)	6.00 (1.23)	6 (2)			
	( $\Delta$ )T1 to T2	- 1.17 (.83)	- 1.00 (1.75)	- .11 (1.17)	.00 (1.5)	39.5 / .02*		
	( $\Delta$ )T1 to T3	- 1.33(.98)	-1.5 (1.75)	-.33 (1.0)	.00 (1.5)			
PHQ-9 (.80)	T1	8.08 (4.64)	6 (5)	8.67 (4.53)	8 (6)	86.00 / .92		
	T2	4.58 (2.61)	4.5 (4)	8.33 (4.21)	9 (6)			
	T3	4.17 (1.75)	4.5 (2)	6.78 (3.03)	8 (6)			
	( $\Delta$ )T1 to T2	-3.5 (6.19)	-2.00 (3.00)	- .33 (2.96)	- 1 (2)	40.5 / .02*		
	( $\Delta$ )T1 to T3	-3.91 (4.12)	-2.5 (3.75)	-1.89 (3.59)	-2 (3.5)			
HADS- Anx (.82)	T1	10.83 (4.39)	11.5 (6)	9.22 (3.89)	9 (5)	56.00 / .15		
	T2	8.08 (3.91)	7.5 (7)	8.56 (3.21)	9 (5)			
	T3	8.17 (2.72)	8.5 (3)	9.22 (3.93)	9 (6)			
	( $\Delta$ )T1 to T2	-2.75 (3.67)	-2 (3.75)	-.67 (2.24)	.00 (3)	121.0 / .06		
	( $\Delta$ )T1 to T3	-2.67 (3.31)	-4 (4.75)	.00 (3.46)	-1 (7)			
HADS- Depr (.80)	T1	6.25 (3.72)	5 (5)	4.57 (3.81)	4.5 (5.8)	64.00/ .30		
	T2	4.75 (3.17)	5 (4)	4.22 (2.77)	4 (5)			
	T3	4.42 (2.61)	4 (3)	3.44 (2.83)	3 (6)			
	( $\Delta$ )T1 to T2	-1.5 (3.70)	-1.5 (3.75)	.44 (1.94)	.00 (6)	118.5 / .07		

	( $\Delta$ )T1 to T3	-1.83 (2.72)	-1 (4)	-.33 (2.00)	.00 (3)			76.5 / .11
FFMQ_full scale	T1	129.25 (20.04)	127 (32.3)	138.67 (15.35)	141 (49)	92.5/.67		
(.89)	T2	136.92 (17.05)	135 (15)	137.11 (9.21)	136 (10.5)			
	T3	134.75 (18.69)	136.5 (22.3)	137.11 (21.99)	141 (31.5)			
	( $\Delta$ )T1 to T2	-7.67 (22.69)	-2.5 (21.25)	1.55 (7.52)	2 (8.5)		108.5 /.21	
	( $\Delta$ )T1 to T3	-5.5 (16.63)	-4 (26)	1.55 (10.97)	2 (16.5)			65.00 / .43

969 IG – intervention group; CG – control group; ( $\Delta$ ) was computed by subtracting pretest from posttest and  
 970 pretest from follow up scores; positive values signify an increase and negative values a decrease in the  
 971 dependent measure. Results from NRS – Numerous pain rating scale; PHQ-9 – Patient health questionnaire;  
 972 HADS – Hospital anxiety and depression scale; FFMQ – Five facets of mindfulness questionnaire – full scales  
 973 results. \* $p < 0.05$

974 **Table 3** Reliable change of intervention group using 95% CI for outcome measures pre-intervention  
 975 to follow-up.

Outcome variables	Recovered	Improved	Deteriorated	Unchanged
Pain (NRS) n=12	0%	50% (6/12)	0%	50% (6/12)
PHQ-9 n= 5	80% (4/5)	0%	0%	20% (1/5)
HADS-D n=4	75% (3/4)	25% (1/4)	0%	0%
HADS-A n=11	28% (3/11)	45% (5/11)	9% (1/11)	18% (2/11)

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Figure 1.TIFF

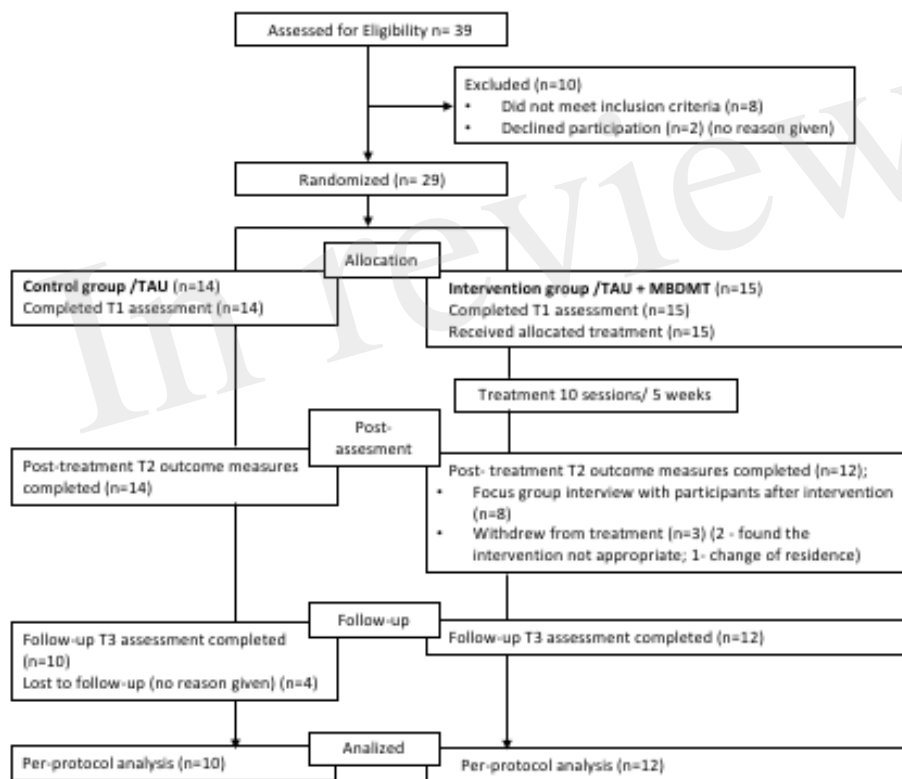


Figure 2.TIFF

