

# Examining Trajectories of Change in ACT Interventions for Chronic Pain

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MARIE-EVE MARTEL, PSY.D., PH.D.(C)

M. GABRIELLE PAGÉ, PH.D.

FRÉDÉRICK DIONNE, PH.D.

# Disclosure

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No conflict of interest



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# Chronic Pain in the World

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- The leading cause of disability and disease burden in the world
- Estimates suggest that globally, **1 in 5 adults** suffer from chronic pain
- Increased risk of developing
  - mood disorders
  - anxiety disorders
  - substance use problems
  - risk of suicide twice as high

## REFERENCES

Vos et al., 2016; Goldberg & McGee, 2011; IASP, n.d.; Demyttenaere et al., 2007; Tang & Crane, 2006; Dear et al., 2013

# ACT, an established treatment for pain

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Acceptance and Commitment Therapy (ACT) is considered a well-established treatment for chronic pain – Division 12 (APA)

## STRENGTH OF RESEARCH SUPPORT

Empirical Review Status			
2015 Criteria (Tolin et al. Recommendation)	Treatment pending re-evaluation		
1998 Criteria (Chambless et al. EST)	Strong ✓	Modest	Controversial

# Accessibility Remains a Major Challenge

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Long wait lists

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Distance from major cities

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Difficulties linked to mobility or transportation

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Costs associated with treatment (\$)

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Lack of qualified professionals

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Stigma

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Barriers to face-to-face treatment due to Covid-19



# What is a Self-Help?

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- “Self-administered ” and based on “ evidence-based treatment ”
- “Guide and encourage the patient to make changes... rather than just provide information” (Anderson et al., 2005; p. 387)

Level of guidance of therapy	Present study
1. Self-Administered	
2. Predominantly Self-Help	✓
3. Minimal Contact	
4. Predominantly Therapist-Administered	

# Various Self-Help Formats

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## ➤ Bibliotherapy

- Veillette et al. (2019); Johnston et al. (2010); Thorsell et al. (2011)

## ➤ Applications on mobile phones

- Kristjánsdóttir et al. (2013); Lappalainen et al. (2013)

## ➤ Web-based

- Fledderus et al. (2015); Ljotsson et al. (2014); Sullivan et al. (2018); Lin et al. (2017); Scott et al. (2018); Sinister et al. (2018); Buhrman et al. (2013); Trompetter et al. (2014)

# Current Gaps in the Literature

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- Although self-help interventions seem promising, **little is known about patterns of change over time**
- Most studies measure effectiveness by comparing average scores on outcome variables before and after an intervention, thus not providing a clear picture on **individual variability throughout the intervention**
- A few studies have examined trajectories of change and **so far, reliable predictors to treatment outcomes have not been found**

## REFERENCES

Vowles et al., 2019; McCracken & Turk, 2002; Trompetter et al., 2016; Batterham et al., 2017; Hedman et al., 2012



# Study aims

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- 1) Identify and describe various trajectories of change in **disability** and **anxiety** during self administered interventions for chronic pain
- 2) Identify characteristics and baseline predictors of trajectory membership
- 3) Identify trajectory groups associated with greater/poorer outcomes

# Method

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# Trial Design

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- Randomized-controlled trial (RCT) comparing two experimental ACT groups to an active control group (education)
- 3-armed – parallel groups
- The intervention was over a period of 9 weeks
- Longitudinal with repeated measures
  - pre, post, 3 and 6 months
  - 11 weekly measures (7 diary items completed at pre/post-test and during each of 9 weeks of the intervention)

# Approval and Ethics

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Ethics certificate CDERS-17-11-06.05 (Feb 5, 2018)



Registration on  
Clinicaltrials.gov -  
NCT03711851 (20 Oct. 2018)



Consort-ehealth statement  
was followed to ensure  
optimal reporting of the  
protocol (Eysenbach et al.,  
2011)

# Eligibility Criteria

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- ✓ **18 years or older** and **residing in Canada**
- ✓ Non-cancer related **pain every day for at least 6 months**
- ✓ Having an **average pain level of at least 4/10** within the past week
- ✓ **Reading** and **writing** abilities equivalent or superior to **grade 8**
- ✓ **Internet access** at home as well as a **valid e-mail address**
- ✓ **Never** having taken part in an **ACT therapy** and/or **practiced mindfulness meditation** and/or **having read the book** used in the study
- ✓ **Not being in an unstable psychological situation** (e.g. severe suicidal thoughts)
- ✓ **Stable medication** for at least one month

# Level of guidance/blindness

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Weekly e-mails Monday AM for a total of 9 weeks



Access to research assistants for questions



2 phone calls (Week 0 and 4), minimal contact

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Blind	Present study
Participant	Not possible
Co-intervention (assistant researcher)	Difficult
Data analysis	✓




# Material

## 1. WEB-BASED INTERVENTION

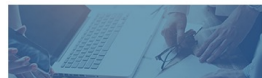
Programme d'intervention ACT

- Accueil
- Module 1  
L'ACT et le courage de changer les choses que je peux
- Module 2  
Redéfinissez vos valeurs profondes
- Module 3  
Apprendre à méditer
- Module 4  
Engagez-vous dans l'action
- Module 5  
Ouvrez les bras aux sensations non désirées
- Module 6  
Défusionnez de vos pensées
- Module 7  
Trouvez le juste équilibre dans vos activités
- Module 8  
Ce n'est qu'un début



Traiter la douleur [chez soi](#)


Ce programme d'intervention d'une durée de huit modules propose une démarche structurée et menée via Internet. Il vise à améliorer votre qualité et vous aider à mieux vivre au quotidien avec votre problème de douleur chronique. À chaque module, vous serez invité à développer des habiletés basées sur la [thérapie d'acceptation et d'engagement \(ACT\)](#), une approche nouvelle de la psychologie qui nous enseigne à vivre différemment avec les douleurs physiques et émotionnelles.



Méditation formelle ou informelle

Module 04 / 08  
Module 3  
Apprendre à méditer

- Introduction
- Le cas de Christophe
- Se familiariser avec la méditation
- Respirer en pleine conscience
- Méditer en 5 min. par jour
- Ce que dit la recherche
- Méditation formelle ou informelle
- Exercices suggérés
- Faites le point et continuez



On distingue deux types de pratiques méditatives, la **méditation formelle** et la **méditation informelle**. La **méditation formelle** consiste à pratiquer la méditation pour un temps donné, soit assis, couché ou en mouvement, comme nous l'avons fait avec le « Cinq minutes de centration sur la respiration ».

La méditation **informelle** consiste à réaliser en pleine conscience des activités du quotidien comme marcher, manger, boire, regarder un beau paysage, écouter une conversation ou une chanson, etc. Elle conduit à remarquer et observer les choses avec des yeux nouveaux, à vivre ici et





# Weekly content of interventions

WEEK	WEB-BASED	BIBLIOTHERAPY	EDUCATION
1	<b>Module 1:</b> Psychoeducation about pain and information about ACT approach	<b>Chapters 1 to 4:</b> Psychoeducation about pain and information about ACT approach	Chronic pain: recognizing and treating it; How to speak to your doctor.
2	<b>Module 2:</b> Redefining your deepest values	<b>Chapter 11:</b> Values	Don't stay alone in the face of pain! Information for families and friends
3	<b>Module 3:</b> Learn to meditate	<b>Chapter 5:</b> Present-moment awareness	Controlling your breath to relieve your pain: a solution for all
4	<b>Module 4:</b> Committed action	<b>Chapters 6 and 7:</b> Committed action	Physical activity to reduce pain... essential to treatment! Sexuality and intimacy.
5	<b>One week-break</b>		
6	<b>Module 5:</b> Willingness to feel pain	<b>Chapters 8 and 13:</b> Willingness to feel pain	When emotions get involved...
7	<b>Module 6:</b> Defuse from your negative thoughts	<b>Chapters 9-10:</b> Defuse from your negative thoughts	To finish with stress!
8	<b>Module 7:</b> Finding the right balance in your activities	<b>Chapter 12:</b> Finding the right balance in your activities	Managing your energy to better control your pain. Nutrition and chronic pain.
9	<b>Module 8:</b> Conclusion: it's just the beginning	<b>Chapters 14, 15 and Conclusion:</b> it's just the beginning	Adopt good sleep habits. Everything you need to know about pain medication.

# Measures

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## Primary outcome

### Impact of pain on daily functioning

- **Brief Pain Inventory (BPI)**
  - 10 items

## Secondary outcomes

### Depression/Anxiety

- **Hospital Anxiety and Depression Scale (HADS)**
  - 14 items

### Quality of life

- **World Health Organization Quality of Life (WHOQOL-BREF)**
  - 26 items

## Process variables

- **Chronic Pain Acceptance Questionnaire (CPAQ)**
  - 8 items
- **Multidimensional Psychological Flexibility Inventory (MPFI)**
  - 24 items
- **French-Canadian Chronic Pain Self-Efficacy Scale (FC-CPSES)**
  - 6 items

#### REFERENCES

Cleeland & Ryan, 1994; Cleeland, 2009; Tyler et al., 2002; Poundja et al., 2007; Bourgault et al., 2015; Zigmond & Snaith, 1983; Savard et al., 1998; Hermann, 1997; Roberge et al., 2013; Group, 1998; Baumann et al., 2010; Rolffs, Rogge & Wilson, 2016; Fish et al., 2010; Scott et al., 2013; Lacasse et al., 2015; Lorig et al.

# Measures

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**Weekly diary items** before the intervention, during 9 weeks of the intervention and post-intervention (total measurements = 11)



7-item questionnaire assessing **4 outcome variables** and **3 axes of the psychological flexibility** model (open, aware, engaged)

# Data analysis

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- Growth mixture model (GMM) was used to conduct pain trajectory analyses
- Two separate analyses were carried out, one for pain interference and one for anxiety
- For each, 8 pain trajectory models were tested using the latent class mixed model (lcme) package (2022) in R version 4.1.2
- Model selection was based on the Bayesian information criterion (BIC; lower values associated with better fit), interpretability of the model and a minimum of 5% of patients in each of the trajectories



# Data analysis

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- Once the model was selected, the following variables were entered in the model as predictors of class membership: group, sex, age, education, pain intensity, pain interference, anxiety, depression, quality of life, self-efficacy, psychological flexibility, pain acceptance
- Nominal regressions were carried out to test for predictors of interference and anxiety trajectories
- Chi-square were used to examine how patients were classified across interference and anxiety models

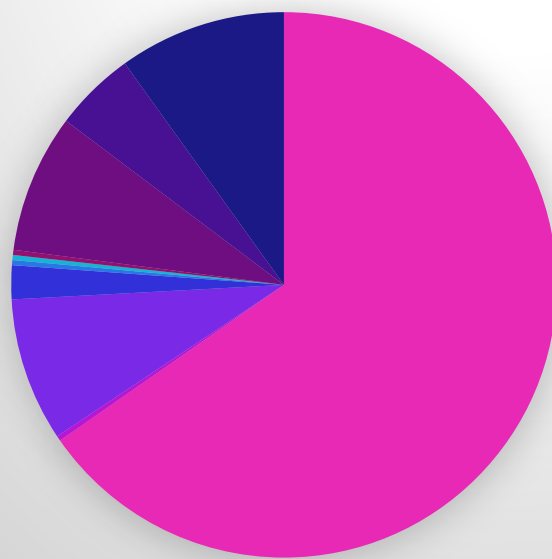
# Results

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# Participant Recruitment

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## Recruitment for sample

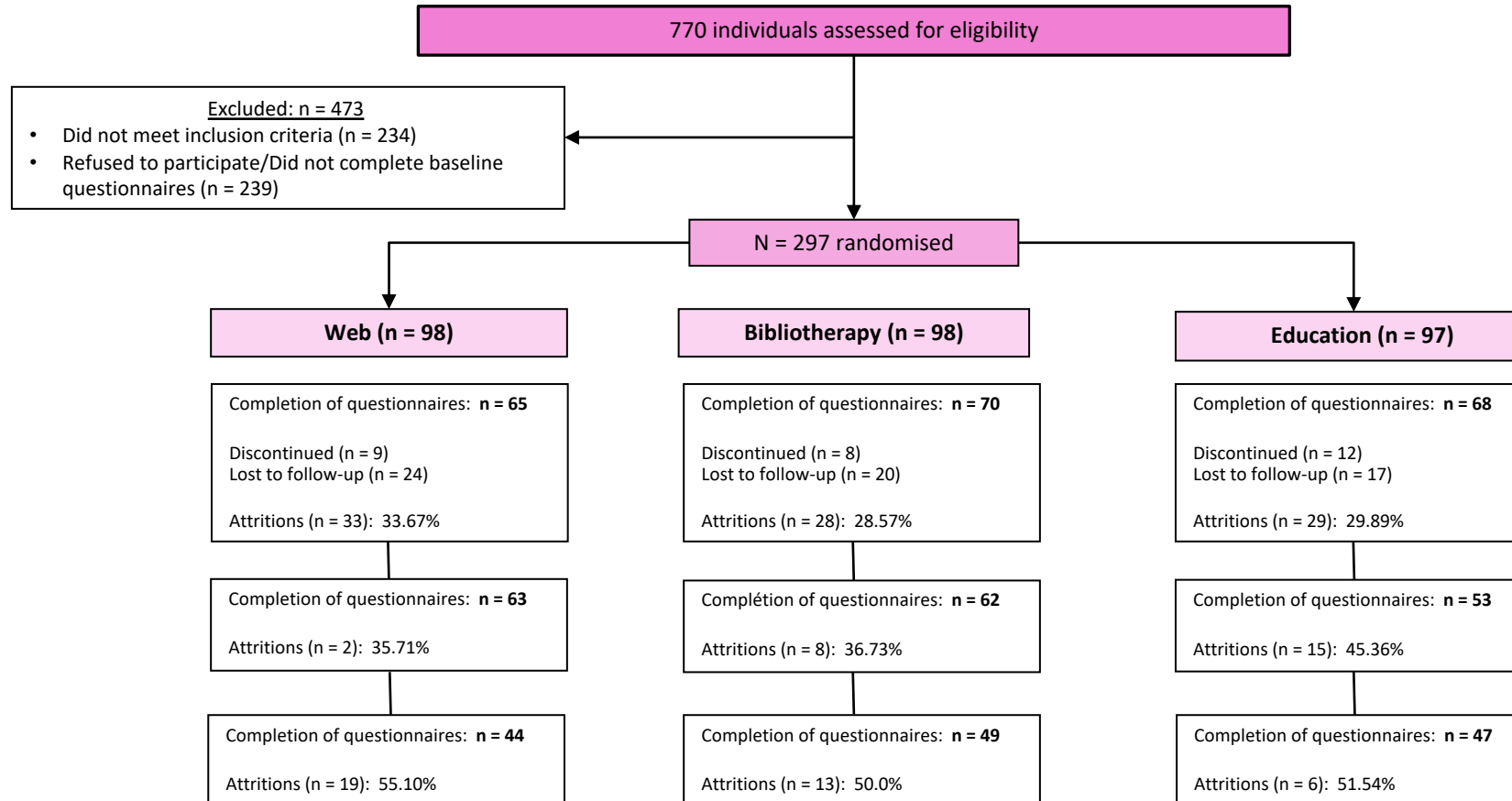


- AQDC (65.2%)
- QPRN (0.3%)
- SQF (8.5%)
- Migraine QC (2%)
- ASID (0.3%)
- Pain Clinics (0.3%)
- CHUM (0.3%)
- Social Networks (8.2%)

The majority of participants were recruited through various patient associations (76%)



# Participant Flow



# Descriptive statistics

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Sociodemographic Information	Web-based (n = 98)	Bibliotherapy (n = 98)	Education (n = 97)
<b>Age</b>	<b>M (SD)</b>	<b>M (SD)</b>	<b>M (SD)</b>
	50.97 (11.23)	50.85 (11.67)	51.37 (11.81)
<b>Gender</b>	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>
<b>Women</b>	<b>88 (89.8%)</b>	<b>90 (91.9%)</b>	<b>86 (89.6%)</b>
Men	10 (10.2%)	8 (8.1%)	10 (10.4%)
<b>Ethnicity</b>			
<b>White/Caucasian</b>	<b>91 (93.8%)</b>	<b>94 (96.9%)</b>	<b>92 (95.8%)</b>
Other	6 (6.2%)	3 (3.1%)	4 (4.1%)
<b>Level of education</b>			
High School	14 (14.3%)	21 (21.2%)	23 (24%)
College studies or CEGEP	<b>44 (44.9%)</b>	<b>40 (40.4%)</b>	<b>37 (38.5%)</b>
University (Undergraduate)	24 (24.5%)	29 (29.3%)	27 (28.1%)
University (Graduate)	16 (16.3%)	9 (9.1%)	9 (9.4%)

# Descriptive statistics

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Sociodemographic Information	Web-based (n = 98)	Bibliotherapy (n = 98)	Education (n = 97)
<b>Main diagnosis of chronic pain</b>	<b>%</b>	<b>%</b>	<b>%</b>
Headaches (migraines)	2.0	6.1	11.5
<b>Fibromyalgia</b>	<b>37.8</b>	<b>39.4</b>	<b>44.8</b>
Back pain	11.2	12.1	12.5
Neck pain	7.1	4.0	2.1
Neuropathic Pain	8.2	7.1	3.1
Musculoskeletal Pain	16.3	6.1	12.5
Arthritis	5.1	5.1	1.0
Chronic Post-Surgical Pain	1.0	3.0	3.1
Complex Regional Pain Syndrome	2.0	4.0	-
Other	9.2	13.1	9.4
<b>Opioid use</b>			
Yes	34.7	40.8	47.9
<b>Presence of recently diagnosed mental disorder</b>			
Yes	37.8	30.3	31.6



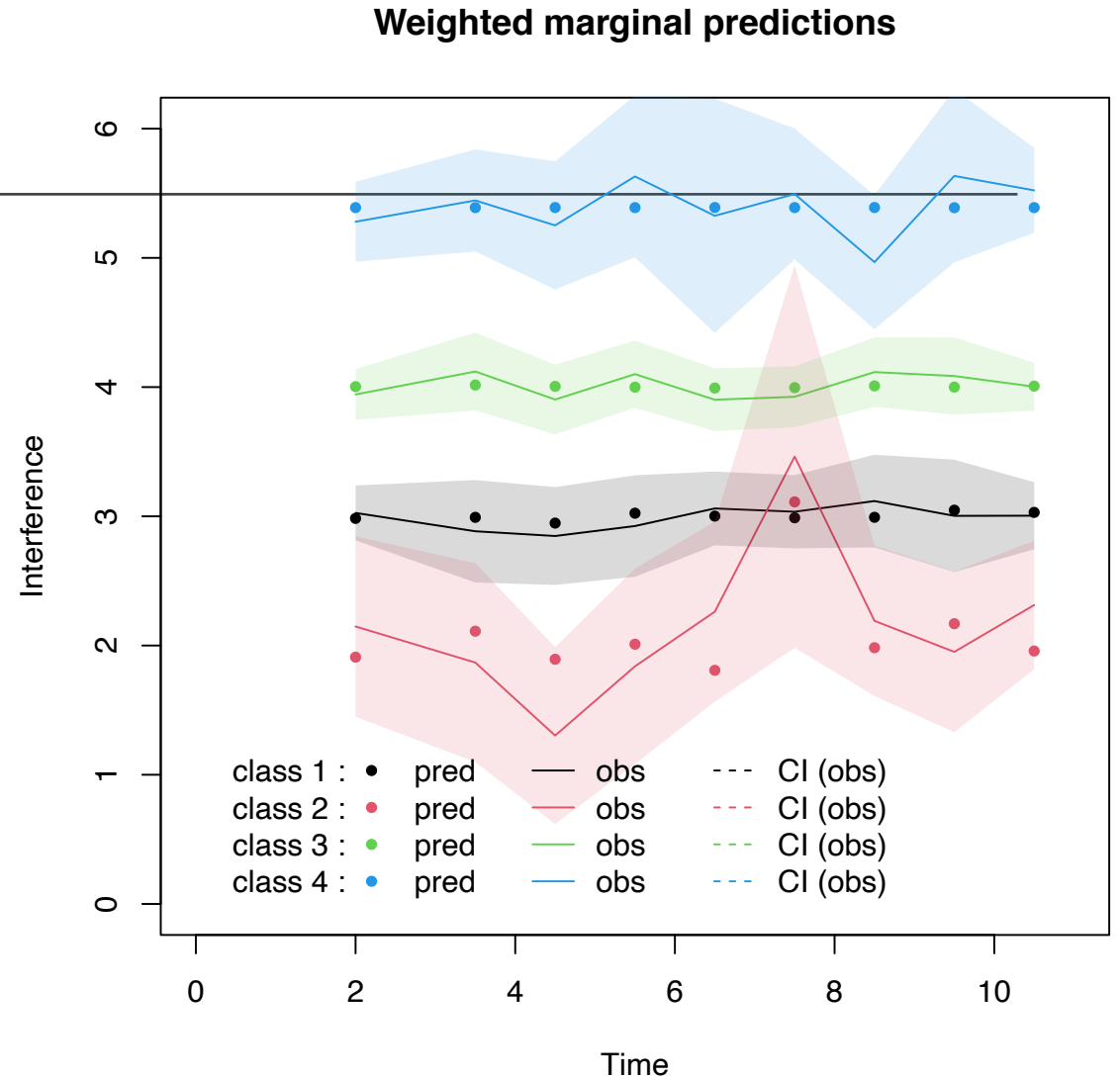
# Descriptive statistics

Variable	Time	Web		Bibliotherapy		Education		Range
		M	É-T	M	É-T	M	É-T	
Pain related disability (BPI)	Pre	<b>52.30</b>	16.35	<b>58.58</b>	18.07	<b>57.77</b>	18.32	0 to 100
	Post	<b>43.98</b>	20.83	<b>42.51</b>	21.60	<b>52.08</b>	23.32	
	3 months	<b>45.39</b>	21.84	<b>42.78</b>	24.66	<b>53.32</b>	23.54	
	6 months	<b>44.02</b>	21.47	<b>43.36</b>	25.67	<b>44.14</b>	23.14	
Anxiety (HADS)	Pre	<b>8.41</b>	3.66	<b>8.86</b>	3.00	<b>8.64</b>	3.09	0 to 21
	Post	<b>7.95</b>	3.91	<b>7.10</b>	3.46	<b>8.02</b>	3.29	
	3 months	<b>7.51</b>	3.71	<b>7.42</b>	3.36	<b>7.92</b>	3.34	
	6 months	<b>7.65</b>	4.02	<b>7.83</b>	3.57	<b>7.98</b>	3.34	
Depression (HADS)	Pre	<b>9.12</b>	4.07	<b>9.44</b>	3.93	<b>9.51</b>	3.55	0 to 21
	Post	<b>7.90</b>	4.05	<b>7.45</b>	3.97	<b>8.70</b>	4.21	
	3 months	<b>7.73</b>	4.07	<b>8.19</b>	3.54	<b>8.79</b>	4.58	
	6 months	<b>7.72</b>	4.71	<b>8.28</b>	4.16	<b>7.87</b>	3.80	
Quality of life (WHOQOL)	Pre	<b>76.49</b>	13.49	<b>75.09</b>	14.18	<b>74.46</b>	13.20	26 to 130
	Post	<b>82.57</b>	16.07	<b>85.55</b>	14.22	<b>78.08</b>	15.62	
	3 months	<b>83.40</b>	15.72	<b>81.54</b>	12.47	<b>77.30</b>	19.12	
	6 months	<b>80.05</b>	18.60	<b>82.46</b>	14.49	<b>80.58</b>	18.62	

\*BPI: Pre: N= 277; Post: N = 182 ; 3 months: N = 162; 6 months: N = 131, HADS-Anx: Pre: N= 291; Post: N = 194 ; 3 months: N = 171; 6 months: N = 135  
HADS-Dep: Pre: N= 291; Post: N = 195 ; 3 months: N = 171; 6 months: N = 135, WHOQOL: Pre: N = 233; Post: N = 152; 3 months: N = 140; 6 months: N = 116

# Pain interference

- **Trajectory #1 (n = 60)** showed moderate levels of pain interference
- **Trajectory #2 (n = 12)** showed lower levels of interference
- **Trajectory #3 (n = 116)** showed high interference
- **Trajectory #4 (n = 29)** showed very high interference and was stable with time
- Trajectories #1 to 3 showed improvement with time ( $p = .00$ ) although these changes may not be clinically significant



# Predictors – Pain interference

Effect	Model Fitting Criteria	Chi-square	df	Sig.
Sex	310.60	6.97	3	.07
Age	304.63	1.00	3	.80
Education	311.91	8.28	6	.22
<b>Group</b>	<b>319.85</b>	<b>16.23</b>	<b>6</b>	<b>.013*</b>
Pain intensity	309.21	5.58	3	.13
<b>Pain interference (BPI)</b>	<b>326.34</b>	<b>22.71</b>	<b>3</b>	<b>&lt; .001*</b>
<b>HADS-Anxiety</b>	<b>313.82</b>	<b>10.20</b>	<b>3</b>	<b>.02*</b>
HADS-Depression	305.44	1.81	3	.61
<b>Quality of life (WHOQOL)</b>	<b>312.28</b>	<b>8.66</b>	<b>3</b>	<b>.03*</b>
<b>Self-efficacy (CPSES)</b>	<b>311.53</b>	<b>7.90</b>	<b>3</b>	<b>.04*</b>
<b>Psychological flexibility (MPFI)</b>	<b>312.42</b>	<b>8.79</b>	<b>3</b>	<b>.03*</b>
Pain acceptance (CPAQ)	310.95	7.32	3	.06

Model fit: 303.63,  $\chi^2 = 139.12(42)$ ,  $p < .001$

# Predictors – Pain interference

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More specifically, results showed that **compared to Trajectory #4**

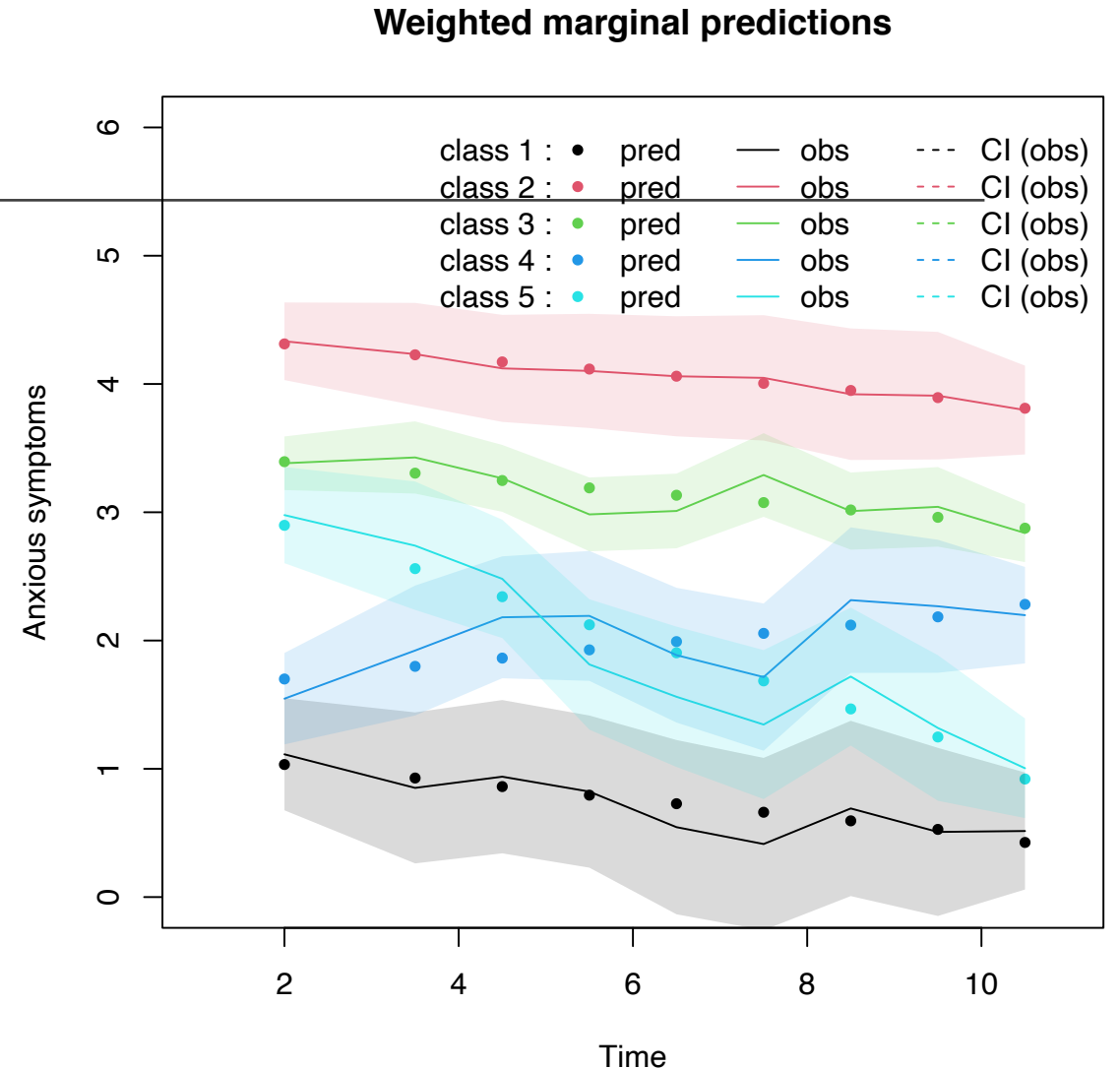
- **Trajectory #1** had differences in pain interference ( $p < .001$ ) and quality of life ( $p = .049$ )
- **Trajectory #2** had differences in pain interference ( $p = .005$ ), quality of life ( $p = .01$ ), and psychological flexibility ( $p = .005$ )
- **Trajectory #3** had differences in pain interference ( $p < .001$ ), anxiety ( $p = .01$ ), pain self-efficacy ( $p = .023$ )

Chi-square results ( $X^2(6, N= 217) = 18.10, p = .006$ ) showed that

- Participants in **trajectory #2** were more likely to be in the **ACT bibliotherapy group**
- Participants in **trajectory #4** were more likely to be in the **web-based ACT group**

# Anxiety

- **Trajectory #1 (n = 21)** had low anxiety
- **Trajectory #2 (n = 39)** had very high anxiety
- **Trajectory #3 (n = 105)** had moderate anxiety
- **Trajectory #4 (n = 29)** low anxiety that increased with time
- **Trajectory #5 (n = 23)** had moderate anxiety that decreased with time



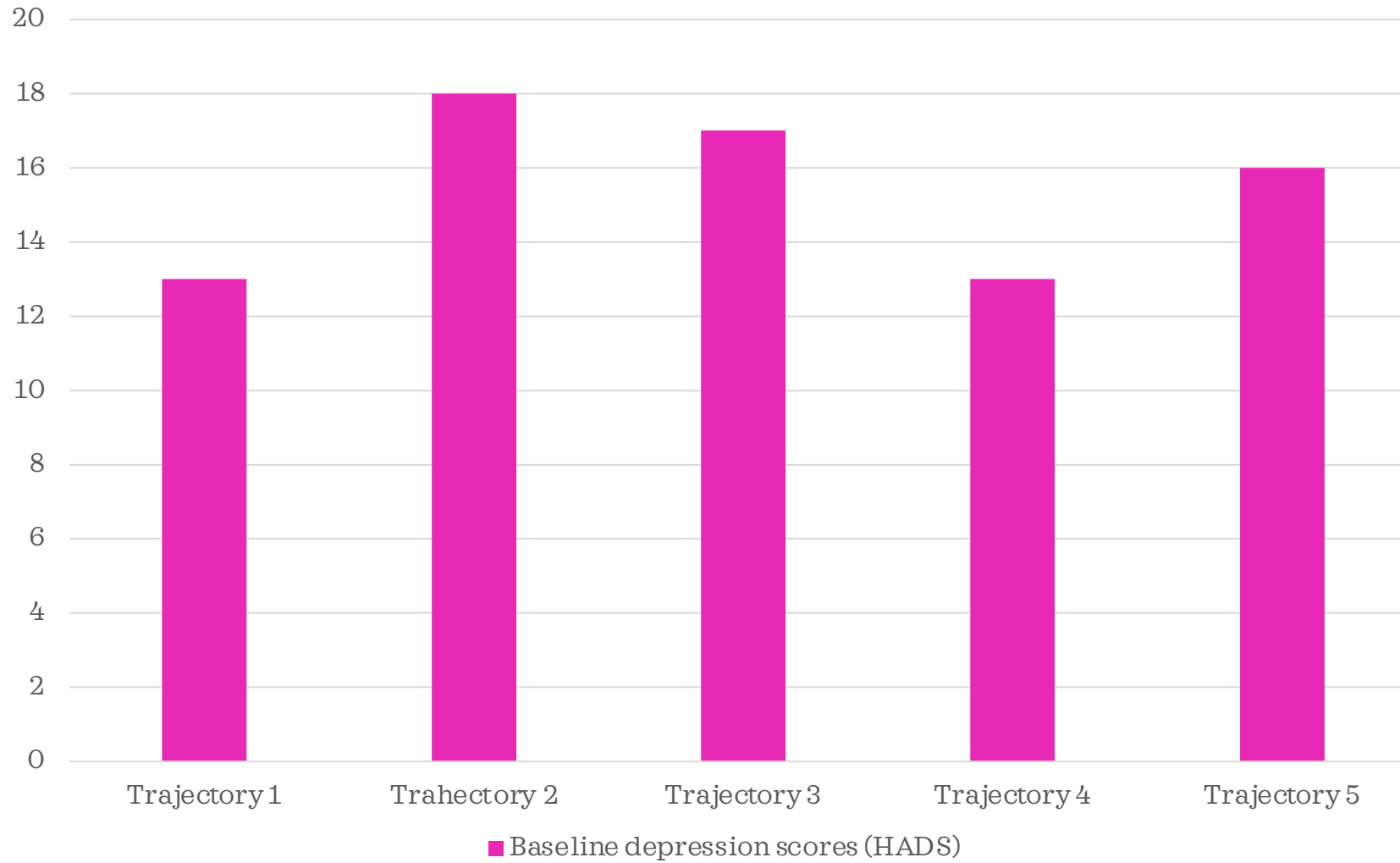
# Predictors - Anxiety

Effect	Model Fitting Criteria	Chi-square	df	Sig.
Sex	398.20	7.54	4	.11
Age	394.65	3.98	4	.41
Education	392.90	2.23	8	.97
<b>Group</b>	<b>414.85</b>	<b>24.18</b>	<b>8</b>	<b>.002*</b>
Pain intensity	397.37	6.71	4	.15
Pain interference (BPI)	393.63	2.97	4	.56
HADS-Anxiety	396.82	6.16	4	.19
<b>HADS-Depression</b>	<b>415.51</b>	<b>24.85</b>	<b>4</b>	<b>&lt; .001*</b>
Quality of life (WHOQOL)	398.93	8.27	4	.08
Self-efficacy (CPSES)	395.08	4.41	4	.35
Psychological flexibility (MPFI)	396.65	5.99	4	.20
Pain acceptance (CPAQ)	399.04	8.38	4	.08

Model fit: 390.66,  $\chi^2 = 150.04(56)$ ,  $p < .001$



## Baseline depression scores (HADS)



# Predictors - Anxiety

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Chi-square results ( $X^2(8, N= 217) = 22.79, p = .004$ ) showed that

- Participants in **trajectory #2** were more likely to be in the web-based ACT group
- Participants in **trajectory #3** were less likely to be in the web-based ACT group

# Discussion

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# In sum...

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- There are different trajectories of change for individuals engaging in ACT self-help interventions for chronic pain
- **Lower** levels of **pain related disability, anxiety** and **depression** at baseline, as well as **higher quality of life, self-efficacy** and **psychological flexibility** at baseline **predicted greater outcomes**
- The **ACT bibliotherapy** group was generally **associated to greater outcomes** than the web-based ACT group (which is consistent with our first study comparing 3 groups)
- **Results can help us use self-help interventions more appropriately** and may indicate, for example, that individuals with greater disability and distress may need more therapeutic guidance before they can benefit from self-help

# Questions?

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**Thank you for your attention**

**Thank you to ACBS**

