



SAHLGRENSKA ACADEMY

How is Pain Acceptance related to Interoceptive Awareness?

Degree Project in Medicine

Jessica Fagerkvist

Programme in Medicine

Gothenburg, Sweden 2019

Supervisor: Graciela Rovner

ACT-Institutet, Karolinska Institutet, Dept of Physiotherapy



UNIVERSITY OF
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ACT

ACCEPTANCE AND COMMITMENT THERAPY



DEGREE PROJECT / IN MEDICINE

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JESSICA FAGERKVIST

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Supervisor: Graciela Rovner, PhD

ACT-Institutet & Karolinska Institutet, Dept of Physiotherapy

PROGRAMME IN MEDICINE

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DEGREE PROJECT, PROGRAMME IN MEDICINE

Title: How is Pain Acceptance related to Interoceptive Awareness?

Author: Jessica Fagerkvist

Supervisor: Graciela Rovner

Year: 2019

Institution: ACT-Institutet Sweden, Karolinska Institutet

Location: Gothenburg, Sweden

ABSTRACT

Introduction

Chronic pain is one of the most common reasons for patients to seek medical consultation. Due to the lack of effective conservative or symptomatic treatments, behavioral strategies such as **Acceptance and Commitment Therapy (ACT)** are being incorporated in Rehabilitation Medicine. ACT focuses on increasing the capacity to change behavioral responses to pain by improving three therapeutic processes that will impact the *openness, engagement and awareness*. Awareness facilitates the access to, and interpretation of bodily signals by potentiating **interoceptive awareness (IA)**, and it is less examined. IA is measured by the Multidimensional Assessment of Interoceptive Awareness (MAIA) and ends up with eight subscales. **Pain acceptance (PA)** consisting of *activity engagement (AE)* and *pain willingness (PW)* is known to promote functioning and stands for the ability to engage in meaningful activities despite the presence of pain. When combining AE with PW, four profiles of PA behaviors are identified; representing different ways of handling pain and thus indicates differential needs of treatment. The Chronic Pain Acceptance Questionnaire (CPAQ-8) measures PA.

Aim

To examine whether different profiles of PA demonstrate different levels of IA.

Methods

176 patients with chronic pain, referred to a pain specialist rehabilitation clinic, completed two questionnaires measuring IA and PA. Four behavioral profiles of PA were created using the CPAQ-8 questionnaire. A Kruskal-Wallis H test was used to examine differences in IA in each profile.

Results

Significant differences were seen in six out of eight of the MAIA-subscales in the four PA profiles (*noticing, not distracting, not worrying, emotional awareness, self regulation and trusting*).

Conclusion

These findings indicate that there is a relation between levels of IA and different patterns of PA, bringing purpose to the further examination of using and developing customized treatments for chronic pain according to these behavioral aspects.

POPULÄRVETENSKAPLIG SAMMANFATTNING

Finns det något samband mellan olika profiler av smärtacceptans och olika nivåer av interoceptiv (inre) medvetenhet?

En av de vanligaste orsakerna till att patienter söker vård är kronisk smärta. Ofta saknas effektiva behandlingsmetoder för denna patientgrupp och problem som ofta stöts på är långtidsbehandling med smärtstillande läkemedel med beroendeproblematik som följd. Man har därför börjat inkorporera beteendevetenskapliga behandlingsstrategier i den Rehabiliteringsmedicinska vården, i hopp om att angripa smärtan från ett annat håll. En sådan metod är Acceptance and Commitment Therapy (ACT), som fokuserar på att öka patienternas förmåga att förändra de ofördelaktiga beteendemönster (exempelvis undvikande och distraktion) som automatiskt kommer som svar på den smärta de upplever. Dessa ofördelaktiga beteendemönster hindrar patienterna från att utföra de aktiviteter som de värdesätter och orsakar även stort lidande. ACT fokuserar på tre behandlingsprocesser som alla har betydelse för hur man hanterar ett liv där smärta är närvarande; patientens *öppenhet* för upplevelandet av smärta, förmågan att *engagera sig* i meningsfulla aktiviteter trots att smärtan är närvarande samt *medvetenheten* om inre kroppsliga signaler.

Ökad medvetenhet gynnar tillgången till, och tolkningen av, kroppsliga signaler genom att öka den s.k. interoceptiva (inre) medvetenheten, vilket är ett mindre utforskat område.

Smärtacceptans (förmågan att utföra aktiviteter samt öppenheten för att smärta är närvarande), förbättrar både funktionsförmågan i stort och möjligheten för individen att fortsätta utföra värdefulla aktiviteter trots smärta. Genom att kombinera olika nivåer av smärtacceptans kan fyra beteendeprofiler fås fram, som alla representerar olika sätt att hantera smärta, vilket i sin tur kan vara ett verktyg för att ta fram skraddarsydda behandlingar beroende på vilken av de fyra beteendeprofiler som patienten befinner sig i. Att utforska de egenskaper (i denna studie:

nivåer av interoceptiv (inre) medvetenhet) som varje profil innehåller kan därför vara behjälpligt för att identifiera de enskilda patienternas behov av olika behandlingsmetoder.

Studien är gjord på 176 patienter med kronisk smärta som remitterats till en smärtspecialistklinik och som svarat på två enkäter som mätte nivåer av smärtacceptans respektive interoceptiv (inre) medvetenhet. Utifrån svaren delades de sedan in i respektive smärtacceptansprofil som sedan användes för att se om skillnader i interoceptiv (inre) medvetenhet fanns mellan dem.

I stort kunde vi se att individer med höga nivåer av smärtacceptans också hade högre nivåer av total interoceptiv (inre) medvetenhet. Det sågs även tendenser till att profiler med lägre smärtacceptans hade högre nivåer av mindre fördelaktiga varianter av interoceptiv (inre) medvetenhet, så som hög orosnivå, medan profiler med högre smärtacceptans låg högre i mer fördelaktiga varianter av interoceptiv (inre) medvetenhet, så som tillit till den egna kroppen.

Våra resultat talar för att det finns ett samband mellan olika nivåer av smärtacceptans och olika nivåer och mönster av interoceptiv (inre) medvetenhet. Detta ger stort värde till den fortsatta forskningen av deras relation till varandra, som krävs för att dra slutsatser, i syfte att öka förståelsen och möjligheten till skräddarsydd behandling för patienter med kronisk smärta i framtiden.

ACRONYMS

ACT	Acceptance and Commitment Therapy
PA	Pain Acceptance
	AE Activity Engagement
	PW Pain Willingness
CPAQ-8	Chronic Pain Acceptance Questionnaire – 8-items
IA	Interoceptive Awareness
MAIA	Multidimensional Assessment of Interoceptive Awareness

1. INTRODUCTION

1.1 Chronic pain

Chronic pain is one of the most common reasons to seek medical consultation (1, 2) and its prevalence in Sweden was estimated to reach 55% in 2012 (3). Chronic pain is defined as pain that has lasted for more than 3-6 months, hence missing its function of warning when there's a risk for acute injury or re-injury (4), and past the normal time duration of tissue healing (5). When pain becomes persistent, many other areas are affected, not only physical function but mental and social as well (6). It has a great impact on the quality of life and is associated with anxiety, depression and catastrophizing beliefs about pain (7). Important dimensions of how one does react to, and analyze pain stimulus are; *the sensory aspect* – localization of the pain and registration of how much it hurts, *the emotional aspect* – the registration of how unpleasant the experience is and *the cognitive aspect* – using former experiences to interpret the pain, what feelings it does recall or give rise to, how to react and reply to it (1, 8). According to this, how people handle pain is very individual, also linked with different behavioral patterns, and not easily measured with objective scales. It is utmost subjective and each and everyone has unique references due to own experiences of pain (1). Pain is also closely intertwined with emotions (9) since it generates withdrawal behavior and fear, which is normal in acute pain, to help us take action when there is a risk of re-injury, but in the long run, may just add more dysfunction and negative consequences to the condition (10).

Given that chronic pain lacks conservative or pharmacological treatment with long lasting effectiveness (2), primary care relies on access to integrative, multidisciplinary and holistic approach (5). In these settings, it is imperative to perform a systematic and structured multimodal assessment of the different dimensions of pain which are mentioned above.

According to The Swedish Council on Health Technology Assessment (SBU) the multiprofessional treatment of this patient group should include a behavioral medicine approach, since it is known to be of importance for rehabilitation, partly by improving levels of activity (11). One of the increasingly used therapies focusing on behavioral approaches is Acceptance and Commitment therapy (ACT).

1.2 Acceptance and Commitment Therapy (ACT)

ACT is a therapy that targets how we relate and react to our problems or difficult situations. An important clinical aspect is that the patients are prompted to take on a new perspective on their way of thinking and relating to it. The aim of ACT is for the clients to find, or regain quality of life despite the presence of pain or other discomfort (thoughts, emotions, sensations) while engaging in, for them, meaningful and vital activities (6, 10). ACT presupposes that suffering is a normal psychological processes, generated from human cognition and language; language in a way of symbolic actions such as gestures, pictures, writing, sounds etc. The aim is to be aware over these processes instead of letting them rule over our lives. (12)

ACT focuses on increasing Behavioral Flexibility, which is the capacity to adaptively choose behaviors based on our personal goals and what is important in life in order to avoid systematic withdrawal tendencies (6). These avoidance behaviors are normal and common, and done systematically (as in the presence of a chronic conditions), however in the long run limits life and vitality (10). To promote psychological flexibility, and thereby promoting the ability to choose a beneficial approach and attitude towards pain, it focuses on emotional, interpersonal and experience-based aspects with the purpose of encouraging the client to approach what is important in life even if it is painful (12). Thus, it also prompts focusing on

the opportunities of the present moment instead of dwelling on the impact of the lost past due to pain or catastrophizing about the days ahead (13).

ACT can be seen as three main processes that, when improved, also improves one's behavioral flexibility (**figure 1**). These there are: 1) **awareness** and self-awareness, the capacity to observe and be present in what is happening in the moment and be knowledgeable of the own behavior strategies related to how we react to the present situation or, in the case of pain, to our pain experiences, 2) **engagement**; to be able to clarify what is important in life in order to increase motivation and prompt engagement and commitment to change those strategies that are not functional and 3) **openness**; probably the most difficult part is to be open to the discomfort that all changes bring with them, and allow the hurtful feelings to be present without fighting against them, moving towards what is important in life (6, 8, 10, 14).

1.3 Pain Acceptance

Pain acceptance represents the ability to be open to painful sensations and to engage in meaningful activities although pain is present (15). ACT accentuates the importance of pain acceptance in order to improve function (13). Higher levels of pain acceptance have shown correlation with less avoidance tendencies, less depression, less anxiety and a lower amount of health care visits. It is also associated with increased social functioning and work ability (15, 16). Pain acceptance consists of two behaviors; one physical and social (observable) that involves engaging in valued activities despite the presence of pain (**Activity Engagement, AE**), the other more mental, the openness to handle difficult situations such as those that bring pain when it is in the service of what is important and meaningful for the individual, without trying to avoid it or control it (**Pain Willingness, PW**) (**figure 1**) (15, 17).

The levels of these two behaviors, AE and PW, are measured by The Chronic Pain Acceptance Questionnaire 8-items (CPAQ-8), which is included in the Swedish National Registry for Pain Rehabilitation. Treatment interventions that focus on improving pain acceptance levels have turned out to promote greater function and health, increase the quality of life and decrease the suffering and disability both mentally and physically (15).

Grouping patients according to their Pain Acceptance Levels (GPAQ-8)

What needs to be kept in mind while treating this patient group is the complexity of chronic pain and its wide spread dimensions. A considerable problem when it comes to treatment of patients with chronic pain is that they are generally seen as an identical group of patients, while actually only sharing the same diagnosis. They are given the same interventions and rehabilitation programs, being seen as a homogenous group without taking into consideration, nor having applicable methods to affirm, the specific needs and receptiveness to rehabilitation of these patients as individuals (18, 19). Since different behavioral patterns are known to influence the experience of pain, subgrouping according to the behavioral aspects of pain acceptance may be helpful in identifying the specific needs of each and every pattern of individual behavior characteristics, this in order to customize the therapy plan (15).

When combining AE with PW, four profiles of pain acceptance behaviors have been identified (15). These four profiles based on levels of AE and PW have been associated with distinct ways of functioning, both psychologically and physically (15). These together generate distinct pain acceptance behavioral profiles, where every pain acceptance profile represents a different way to handle pain and thus indicates differential needs of treatment and interventions. Nevertheless, worth reflecting upon is that a great variation can also be found

within a group of patients, meaning even patients within the same group may not respond equally to a specific treatment (17).

In summary, as Rovner et al. (15) examined and in consent with earlier studies, each profile represents different behavioral patterns due to different levels of AE and PW. Some of these features are briefly resumed below.

Characteristics of the pain acceptance profiles (figure 2) (8, 15, 17).

Low PW and Low AE: Patients that score low in both Activity Engagement and Pain Willingness, also score high levels of depression, anxiety and pain intensity. Low levels of activity and high pain interference in life.

High PW and Low AE: Patients that score low in Activity Engagement but high in Pain Willingness; also score the same level of function as the low profile even though they have higher levels of pain willingness.

Low PW and High AE: Patients that score high in Activity Engagement but low in Pain Willingness. Score lower levels of depression but high levels of anxiety and pain-related fear. Moderate intensity of pain and high pain interference in life.

High PW and High AE: Patients that score high in both Activity Engagement and Pain Willingness; also score low levels of depression, anxiety and fear of movement. Have a greater perspective on problems, does not allow pain to restrict on life, and report having a higher activity level.

1.4 Interoceptive Awareness

Interoceptive awareness (IA) has been defined as “the sensing of the physiological condition of the body” (20, 21). It plays a role in the insight of the relation between body and mind, the process in which signals from within the body gets received, accessed to the mind, appraised and regulated (22) – more easily explained as the tendency to notice and be aware of sensations. It is the representation of afferent body sensations, including e.g. heartbeat, emotions and pain (20), and the way one cognitively reacts and chooses to respond to them based on history, environment and emotional experiences etc (23, 24). It is also suggested that bodily sensations give rise to emotions, which are the primary motivators of behavior (20, 21). Studies have shown that the relation between interoceptive awareness and physical body sensations plays a fundamental role for the regulation of affections, decision-making processes and the awareness of one self (24, 25). With that being said, it is also known that mental health and well-being are closely related to IA (23), and the capacity to interpret and regulate internal sensations.

Interoceptive awareness is a topic in many of the health care professions. For example, the occupational therapists and the physiotherapists help patients to be more aware of the body and the impact of sensations and thoughts have on the individual when for example being active. Psychotherapists are another specialty that works with increasing the interoceptive awareness.

1.5 Behavioral Flexibility, Pain Acceptance and Interoceptive Awareness

In summary, interoceptive awareness in its dysfunctional forms, with hyper vigilance, worrying, dramatizing and catastrophizing over sensations within the body, is related to chronic pain and anxiety (21, 22). Contrarily, beneficial forms of IA, such as acceptance and

the ability to direct attention in an advantageous manner and control the attention to body sensations, may be used to influence dysfunctional reactions, and instead enhance sound ways to act in response to chronic pain, hence being a promising treatment aspect to include in rehabilitation (9, 22).

Higher behavioral flexibility is associated with better mental, physical and social function since it allows the individual to consciously choose the most functional response towards the realization of goals and values, despite barriers and discomfort (26). Behavioral flexibility is tightly related to pain acceptance, in the way that it stands for a willingness to accept and live through bodily sensations as they arise and, even with pain being present, engage in behaviors that promotes fulfilling meaningful activities and goals (27). On account of these seen correlations, it is even possible that different patterns of pain acceptance also represents different patterns of IA, which is the primary focus in this study.

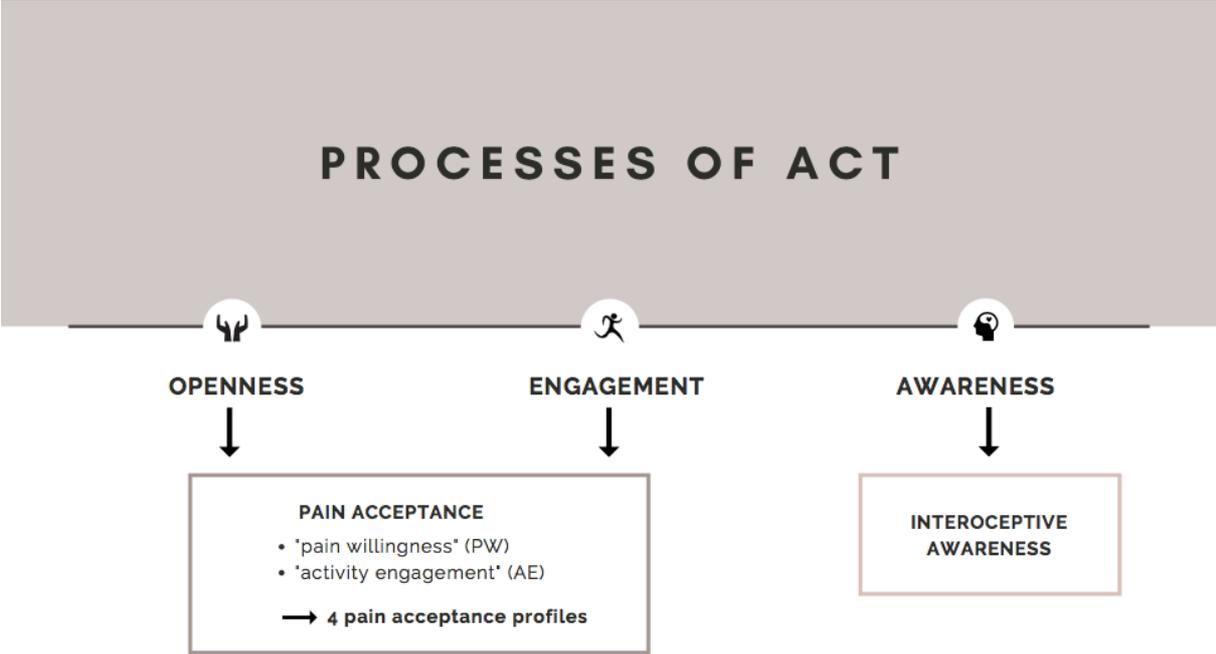


Figure 1. The three main processes of ACT; openness, engagement and awareness.
 ACT = Acceptance and Commitment Therapy; PW = Pain Willingness; AE = Activity Engagement.

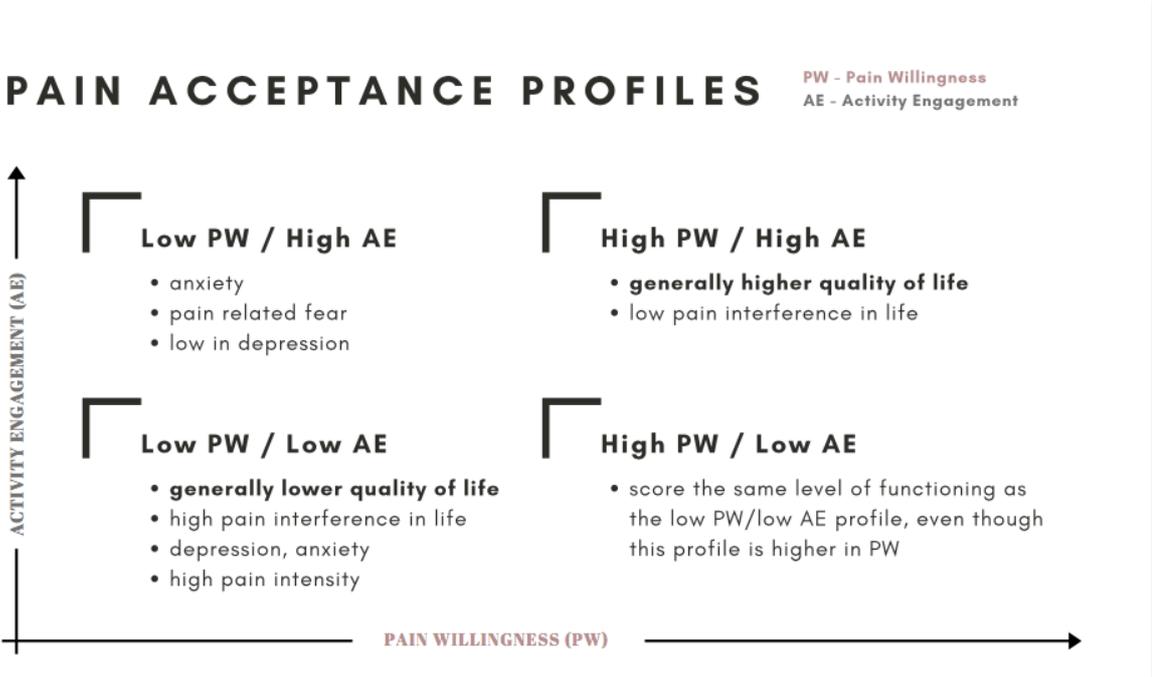


Figure 2. The four pain acceptance profiles including various characteristics (15).
 PW = Pain Willingness; AE = Activity Engagement.

1.6 Aim and Purpose

The aim of this study is specifically to examine whether different profiles of pain acceptance demonstrate different patterns of interoceptive awareness. This, in order to further understand and develop ACT as a part of the rehabilitation of this patient group.

2. MATERIAL, METHODS AND ETHICS

2.1 Study Design

This is a cross-sectional study based on self-reported quantitative data derived from questionnaires regarding pain acceptance levels (CPAQ-8) and levels of interoceptive awareness (MAIA). The data was gathered between November 2017 and August 2018 and analyzed in this study.

2.2 Participants and collection of data

The study include 176 patients referred to a Specialty Pain Clinic in an urban area in Sweden between November 2017 and August 2018, there were no exclusion criteria other than having completed the CPAQ-8 and having answered at least 80% of each subscale. They received the questionnaires included in the study (from the National Registry of Pain Rehabilitation, CPAQ-8, and one extra questionnaire to measure the Interoceptive Awareness, the instrument “Multidimensional Assessment of Interoceptive Awareness”, MAIA) together with oral and written information and an informed consent. The participants were all over 18 years old and suffered from non-oncologic chronic pain, defined by the duration of over 3-6 months.

Sociodemographic information and an overview of the pain characteristics in the total group and in each pain acceptance profile are specified in **table 1** below.

Table 1. Sociodemographic information and pain characteristics.

CATEGORY		MEAN (SD) OR N (%)				
		Tot.	lowPW/lowAE	highPW/lowAE	lowPW/highAE	highPW/highAE
Total individuals		176	52	57	51	16
Gender	Female	125 (71.0)	31 (59.6)	43 (75.4)	40 (78.4)	11 (68.8)
	Male	47 (26.7)	20 (38.5)	13 (22.8)	11 (21.6)	3 (18.8)
	Other	4 (2.3)	1 (1.9)	1 (1.8)	0	2 (12.5)
Age		47 (15)	48 (14)	48 (13)	47 (17)	43 (15)
Type of pain	Generalized	108	32	38	30	8
	Localized	31	10	9	9	3
	Neck	6	2	0	2	2
Pain Locations (n)		15 (10)	14 (9)	16 (10)	15 (10)	14 (11)

PW = Pain Willingness; AE = Activity Engagement.

2.3 Instruments

The Multidimensional Assessment of Interoceptive Awareness (MAIA) (24) is a 32-item self-report scale developed to measure mind-body interactions and body awareness; the questions are presented in **table 6** (see appendices). The questions are designed to distinguish between adaptive and maladaptive awareness regarding physical sensations. By calculating items concerning the same aspects, the questionnaire yields eight subscales: Noticing, Not Distracting, Not Worrying, Attention Regulation, Emotional Awareness, Self Regulation, Body Listening and Trusting. The characteristics of each subscale are presented in **table 3**. The questionnaire was, as the study went on, sent out in two different editions, with items being scored on a Likert scale from 0 (never true) to 5 (always true) respectively from 0 (never true) to 6 (always true). According to this, patients received different editions; hence the data demanded a recalculation, further explained below under “handling missing and un-adequate data”. The MAIA is being validated in Swedish and this study collects data for it.

The Chronic Pain Acceptance Questionnaire – 8-items (CPAQ8) (28) is a questionnaire that gathers the two behaviors of pain acceptance: Activity Engagement (AE) which is the degree of ability to engage in activities despite the presence of pain, and Pain Willingness (PW), the degree of mental openness to painful experiences. It contains four items per behavior, rated from 0 (never true) to 6 (always true). Out of the different levels of AE and PW, four profiles are drawn out, as defined in the pain acceptance description in the background. These profiles are further used, and discussed below, in the comparison between levels of interoceptive awareness and pain acceptance, which is the main focus in this study. The levels of pain acceptance in the four pain acceptance profiles in our study after a Kruskal Wallis H test can be seen in **figure 4** and **table 4**.

An overview of the MAIA questionnaire and the CPAQ-8 questionnaire is presented in **table 2, 3** and **6**.

Table 2. An overview of the measurements being used in the present study.

MEASUREMENT	MEASURE CONCEPT	SUBSCALES
CPAQ-8	Pain acceptance	Activity Engagement (AE) Pain Willingness (PW)
MAIA	Interoceptive Awareness (IA)	Noticing Not-Distracting Not-Worrying Attention Regulation Emotional Awareness Self-Regulation Body Listening Trusting

CPAQ-8 = Chronic Pain Acceptance Questionnaire 8 items; MAIA = Multidimensional Assessment of Interoceptive Awareness; AE = Activity Engagement; PW = Pain Willingness; IA = Interoceptive Awareness.

Table 3. The characteristics of the subscales in the CPAQ-8 (Chronic Pain Acceptance Questionnaire 8 items) (28) and the MAIA (Multidimensional Assessment of Interoceptive Awareness) questionnaire (24).

MEASUREMENT	SUBSCALE	DESCRIPTION
CPAQ 8	Pain Willingness	Openness to experience pain without trying to control or avoid it.
	Activity Engagement	Being active despite the presence of pain.
MAIA	Noticing	Awareness of uncomfortable, comfortable, and neutral body sensations.
	Not Distracting	Tendency to ignore or distract oneself from sensations of pain or discomfort.
	Not Worrying	Emotional distress or worry with sensations of pain or discomfort (reversed).
	Attention Regulation	Ability to sustain and control attention to body sensation.
	Emotional Awareness	Awareness of the connection between body sensations and emotional states.
	Self-Regulation	Ability to regulate psychological distress by attention to body sensations.
	Body Listening	Actively listens to the body for insight.
	Trusting	Experiences one's body as safe and trustworthy.

CPAQ-8 = Chronic Pain Acceptance Questionnaire 8 items; MAIA = Multidimensional Assessment of Interoceptive Awareness.

Handling missing and un-adequate data

MAIA (24)

Some participants left out questions in the questionnaire. Given that MAIA is divided into eight subscales, containing four to seven closely related questions each, a mean value was computed for subscales with a lack of 25% or less of the answers. This by summing the values of present answers in each subscale and further dividing them with the number of valid items that was summed. Individuals that left out more than 25% in any subscale of the questionnaire were excluded.

Since two questionnaires with different Likert scale ranges were given to the participants, some got the ones graded from 0-5 while others answered questionnaires graded from 0-6, the ones with scores from 0-6 was recalculated to be comparable with the 0-5 scale. This by converting as follows: $\frac{5}{6} = 0.83$. This gives us: $1 \rightarrow 0.83*1 = 0.83$; $2 \rightarrow 0.83*2 = 1.66$; $3 \rightarrow 0.83*3 = 2.50$; $4 \rightarrow 0.83*4 = 3.33$; $5 \rightarrow 0.83*5 = 4.17$; $6 \rightarrow 0.83*6 = 4.9$.

2.4 Statistical methods

All statistical analyses were performed with IBM SPSS Statistics (version 25). Many statistical tests, eg. parametric tests such as analysis of variance, depend on data being normally distributed (29). According to Ghasemi and Zahediasl (29) normality should preferably be appraised both visually and by normality tests, where one highly recommended test is the Shapiro-Wilk test. In tune with this, to identify the distribution of the sample, in order to choose the right statistical methods for comparison between groups, tests for normality were performed by visually inspecting histograms, box plots, normality plots and also by using the skewness and kurtosis z-values and Shapiro-Wilk test ($p \leq 0.05$).

Since the aim for the study was to compare levels of pain acceptance (activity engagement and pain willingness), indeed the various “pain acceptance profiles” due to the CPAQ8 questionnaire (28), with levels of interoceptive awareness, measured by the MAIA questionnaire (24), the preferable method was an analysis of variance. Due to the fact that both normally distributed data and non-normally distributed data occurred, a non-parametric ANOVA (Kruskal-Wallis H test) including a pairwise post-hoc test was performed to detect if there were any significant differences between the profiles, and in that cases, even between which profiles it appeared. For a summary of the methods, materials and analyses, see **figure 5**.

Subgrouping according to pain acceptance

Analyses due to pain acceptance profiles, in line with the purpose of the study, the intervals in which the four subgroups are formed according to activity engagement (AE) and pain willingness (PW) was enabled by using the discoveries of Rovner et al. (15). Hence, the four profiles of pain acceptance are formed between the following intervals, based on former

analyses of the CPAQ-8 questionnaire and also illustrated in **figure 3** (15). No new identification of the interval borders of each profile was performed in this study.

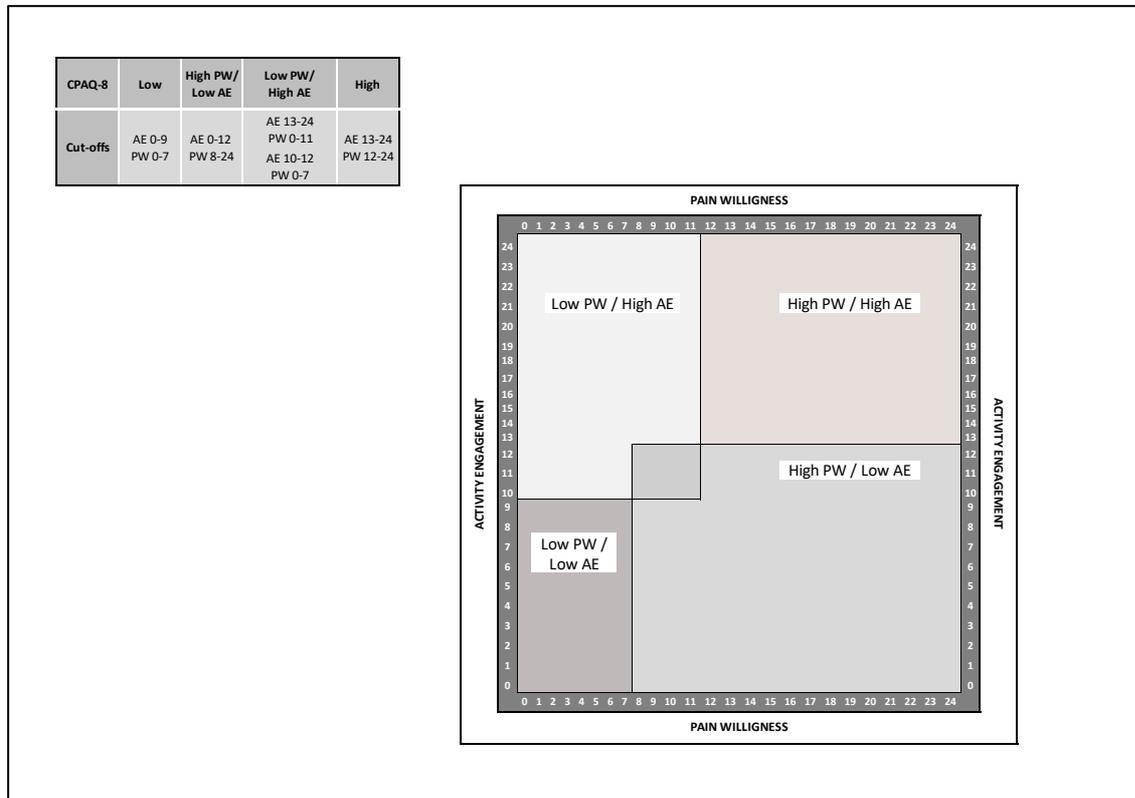


Figure 3. Intervals that make up the four pain acceptance profiles (15), with permission from Graciela Rovner. CPAQ 8 = Chronic Pain Acceptance Questionnaire 8 items; PW = Pain Willingness; AE = Activity Engagement.

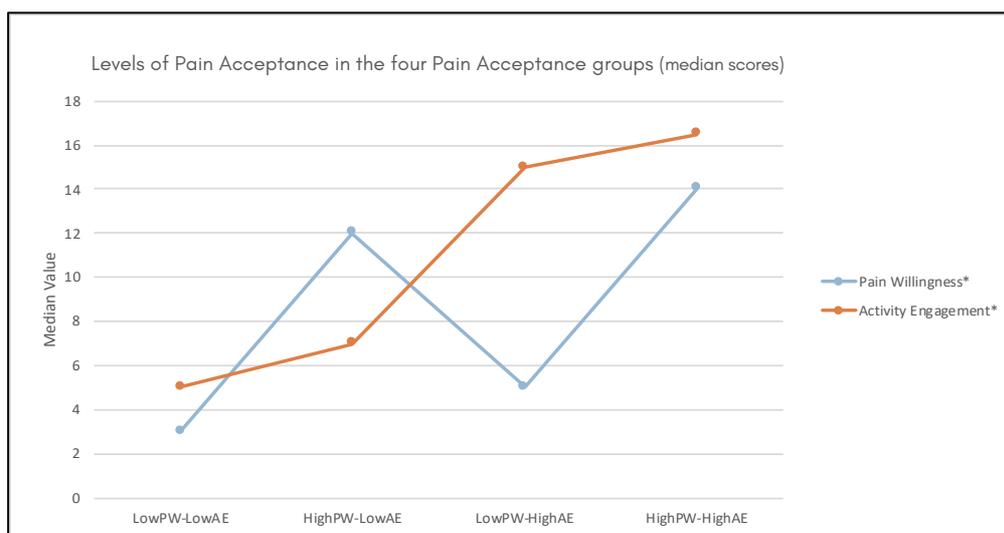


Figure 4. Levels of pain acceptance in the four pain acceptance profiles in our study. PW = Pain Willingness; AE = Activity Engagement.

Table 4. Results after a Kruskal-Wallis H test, measuring levels of pain acceptance in the four pain acceptance profiles.

PAIN ACCEPTANCE PROFILE		PAIN ACCEPTANCE	
		Pain Willingness*	Activity Engagement*
		p = 0.000	p = 0.000
		$\chi^2 = 141.42$	$\chi^2 = 133.49$
Low PW - Low AE	Median	3.00	5.00
	Mean	3.40	4.79
	Std. Deviation	2.55	2.94
	N	52	52
	95% CI	2.67 - 4.10	3.97 - 5.61
	Df	3	3
High PW - Low AE	Median	12.00	7.00
	Mean	12.70	6.70
	Std. Deviation	3.94	3.52
	N	57	57
	95% CI	11.66 - 13.75	5.77 - 7.64
	Df	3	3
Low PW - High AE	Median	5.00	15.00
	Mean	5.29	15.02
	Std. Deviation	2.80	3.49
	N	51	51
	95% CI	4.51 - 6.08	14.04 - 16.00
	Df	3	3
High PW - High AE	Median	14.00	16.50
	Mean	14.44	16.56
	Std. Deviation	2.39	2.13
	N	16	16
	95% CI	13.16 - 15.71	15.43 - 17.70
	Df	3	3

PW = Pain Willingness; AE = Activity Engagement.

The internal consistency of the scales

In studies based on questionnaires, it is important to calculate the internal consistency to make sure that the instrument items represent an outcome of which the instrument is aiming to measure. A measurement widely used in the context of clinical research is Crohnbach's alpha (30). To calculate the internal consistency of the scales used in this study, a calculation of the Crohnbach's alpha coefficient was therefore made. According to De Vellis (31), the Crohnbach's alpha coefficient of a scale should be above 0.7. Crohnbach's alpha coefficients for the MAIA subscales were between 0.62 and 0.84 and the Crohnbach's alpha coefficients for the CPAQ8 subscales were between: 0.60 and 0.84.

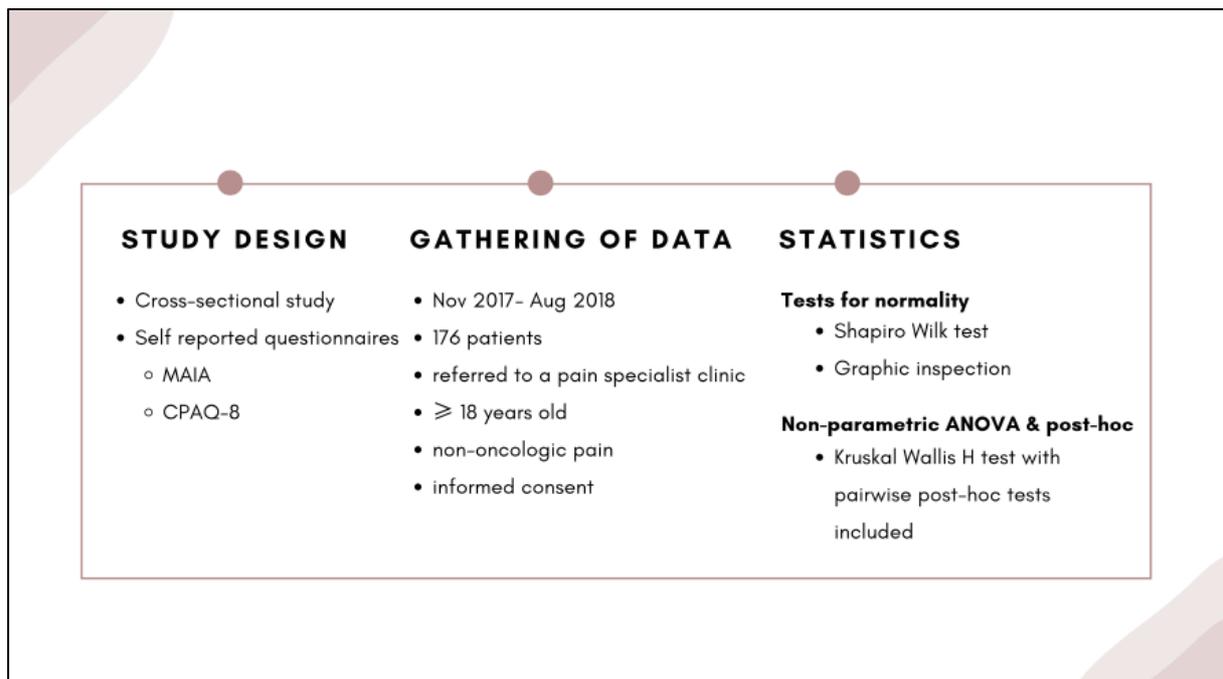


Figure 5. A summary of the methods, materials and analyses used in this study. MAIA = Multidimensional Assessment of Interoceptive Awareness; CPAQ-8 = Chronic Pain Acceptance Questionnaire 8 items

2.5 Ethics

The study was granted ethical clearance by the Regional Ethics Board in Gothenburg (approval #: 815-12). The participation in the study was optional and an information sheet was sent home to all patients together with the informed consent which all participants signed before the study began. Hence, the participation was voluntary and the study does not involve any specific ethical conflicts (24).

3. RESULTS

3.1 Noticing

A significant difference in Noticing levels was seen between the LowPW-HighAE profile and the HighPW-LowAE profile (**figure 9, 10a, 10b** and **table 5**).

3.2 Not Distracting

The Kruskal-Wallis H test including a pairwise post-hoc test did not reveal any statistically significant differences in the Not Distracting levels across the four profiles (**figure 6, 10a, 10b** and **table 5**).

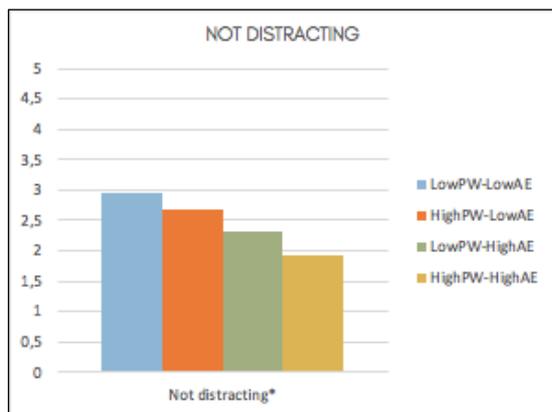


Figure 6. The trend of Not Distracting levels across the four pain acceptance profiles, not statistically significant. PW = Pain Willingness; AE = Activity Engagement.

3.3 Not Worrying

Significant differences in Not Worrying levels were seen between the LowPW-HighAE profile and the LowPW-LowAE profile as well as between the HighPW-HighAE profile and the LowPW-LowAE profile (**figure 9, 10a, 10b** and **table 5**).

3.4 Attention Regulation

The Kruskal-Wallis Test did not reveal any statistically significant differences in Attention Regulation levels across the four different behavioral flexibility profiles (**figure 7, 10a, 10b** and **table 5**).

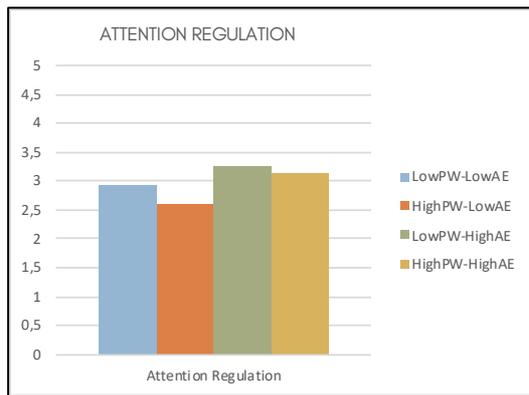


Figure 7. The trend of Attention Regulation levels across the four pain acceptance profiles, not statistically significant. PW = Pain Willingness; AE = Activity Engagement.

3.5 Emotional Awareness

A significant difference in Emotional Awareness levels was seen between the LowPW-HighAE profile and the LowPW-LowAE profile (**figure 9, 10a, 10b and table 5**)

3.6 Self Regulation

A significant difference in Self Regulation levels was seen between the LowPW-HighAE profile and the LowPW-LowAE profile (**figure 9, 10a, 10b and table 5**).

3.7 Body Listening

The Kruskal-Wallis Test revealed no statistically significant difference across the four different behavioral flexibility profiles (**figure 8, 10a, 10b and table 5**).

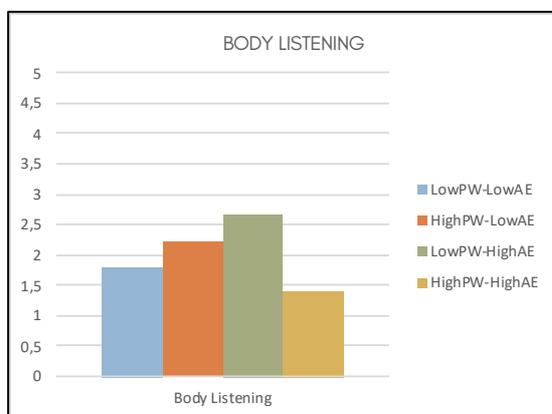


Figure 8. The trend of Body Listening levels across the four pain acceptance profiles, not statistically significant. PW = Pain Willingness; AE = Activity Engagement.

3.8 Trusting

Significant differences in Trusting levels were seen between the LowPW-HighAE profile and the LowPW-LowAE profile as well as between the LowPW-HighAE profile and the HighPW-LowAE profile (figure 9, 10a, 10b and table 5).

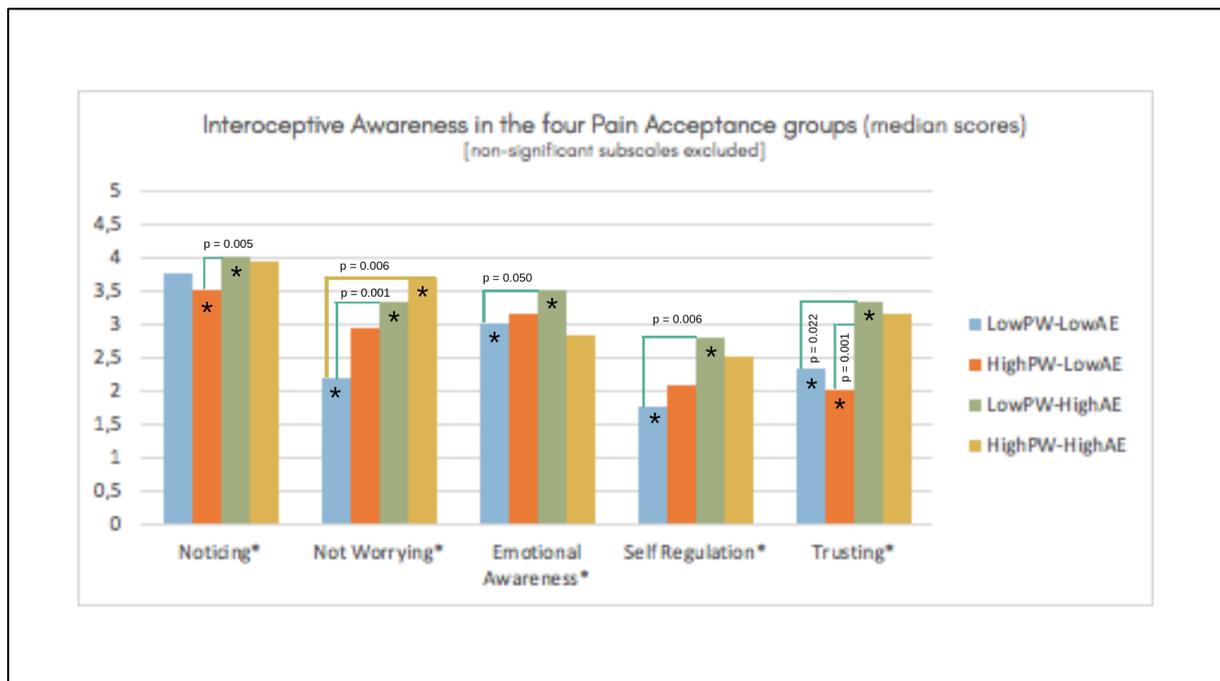


Figure 9. A summary of the five subscales that showed statistically significant differences in interoceptive awareness between the four pain acceptance profiles after a post-hoc test as described above. The significant in-between groups differences are marked with an asterisk and also linked together with a line. Notable is that the majority of the statistically significant differences in between the groups were found between the LowPW-LowAE profile (blue) and the LowPW-HighAE profile (green).

PW = Pain Willingness; AE = Activity Engagement.

Table 5. Results after a Kruskal-Wallis H test, measuring interoceptive awareness in the four pain acceptance profiles.

PAIN ACCEPTANCE PROFILE		MAIA SUBSCALES							
		Noticing*	Not Distracting*	Not Worrying*	Attention Regulation	Emotional Awareness*	Self Regulation*	Body Listening	Trusting*
		p = 0.024	p = 0.009	p = 0.034	p = 0.130	p = 0.017	p = 0.003	p = 0.165	p = 0.003
		$\chi^2 = 9.44$	$\chi^2 = 11.48$	$\chi^2 = 8.69$	$\chi^2 =$	$\chi^2 = 10.16$	$\chi^2 = 14.00$	$\chi^2 =$	$\chi^2 = 14.28$
Low PW - Low AE	Median	3.75	2.94	2.19	2.92	3.00	1.75	1.81	2.33
	Mean	3.60	2.75	2.22	2.63	2.91	1.75	2.08	2.36
	Std. Deviation	1.10	1.14	1.41	1.23	1.17	1.25	1.55	1.44
	N	48	43	44	42	47	47	46	47
	95% CI	3.28 - 3.91	2.40 - 3.10	1.79 - 2.65	2.25 - 3.02	2.57 - 3.25	1.38 - 2.11	1.62 - 2.54	1.94 - 2.78
	Df	3	3	3	3	3	3	3	3
High PW - Low AE	Median	3.50	2.67	2.95	2.60	3.15	2.08	2.22	2.00
	Mean	3.40	2.63	2.78	2.58	3.03	2.04	2.11	2.10
	Std. Deviation	0.87	0.83	1.18	1.11	1.13	1.24	1.19	1.53
	N	56	51	48	50	50	51	52	51
	95% CI	3.17 - 3.63	2.40 - 2.86	2.44 - 3.12	2.26 - 2.90	2.71 - 3.35	1.69 - 2.38	1.78 - 2.44	1.67 - 2.53
	Df	3	3	3	3	3	3	3	3
Low PW - High AE	Median	4.00	2.33	3.33	2.27	3.50	2.81	2.67	3.33
	Mean	3.98	2.38	3.27	3.24	3.53	2.59	2.56	3.24
	Std. Deviation	0.80	0.83	1.00	0.89	0.91	1.24	1.30	1.32
	N	49	47	46	48	47	44	45	46
	95% CI	3.75 - 4.21	2.13 - 2.62	2.97 - 3.56	2.98 - 3.50	3.26 - 3.80	2.21 - 2.97	2.16 - 2.95	2.85 - 3.63
	Df	3	3	3	3	3	3	3	3
High PW - High AE	Median	3.96	1.92	3.69	3.14	2.82	2.50	1.39	3.17
	Mean	3.71	2.17	3.52	3.19	2.50	2.59	1.91	3.18
	Std. Deviation	0.80	1.17	1.08	0.80	1.67	1.21	1.42	1.48
	N	15	16	16	15	16	16	13	14
	95% CI	3.27 - 4.15	1.55 - 2.80	2.94 - 4.10	2.75 - 3.63	1.60 - 3.39	1.94 - 3.23	1.05 - 2.77	2.33 - 4.03
	Df	3	3	3	3	3	3	3	3

PW = Pain Willingness; AE = Activity Engagement.

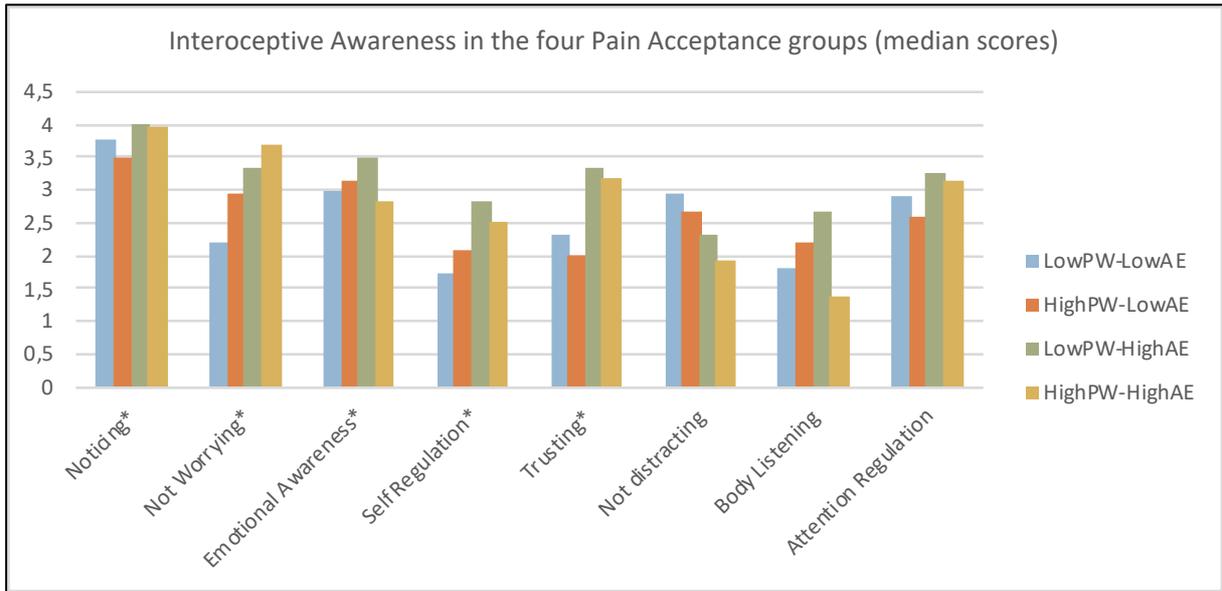


Figure 10a. Interoceptive Awareness in the four Pain Acceptance profiles. Significant subscales after a post-hoc test are marked with an asterisk (*). The Not Distracting subscale did show significant differences after a Kruskal Wallis H test, but the post-hoc test did not reveal any statistically significant in-between profile differences, hence it is not marked with an asterisk in this figure.

PW = Pain Willingness; AE = Activity Engagement.

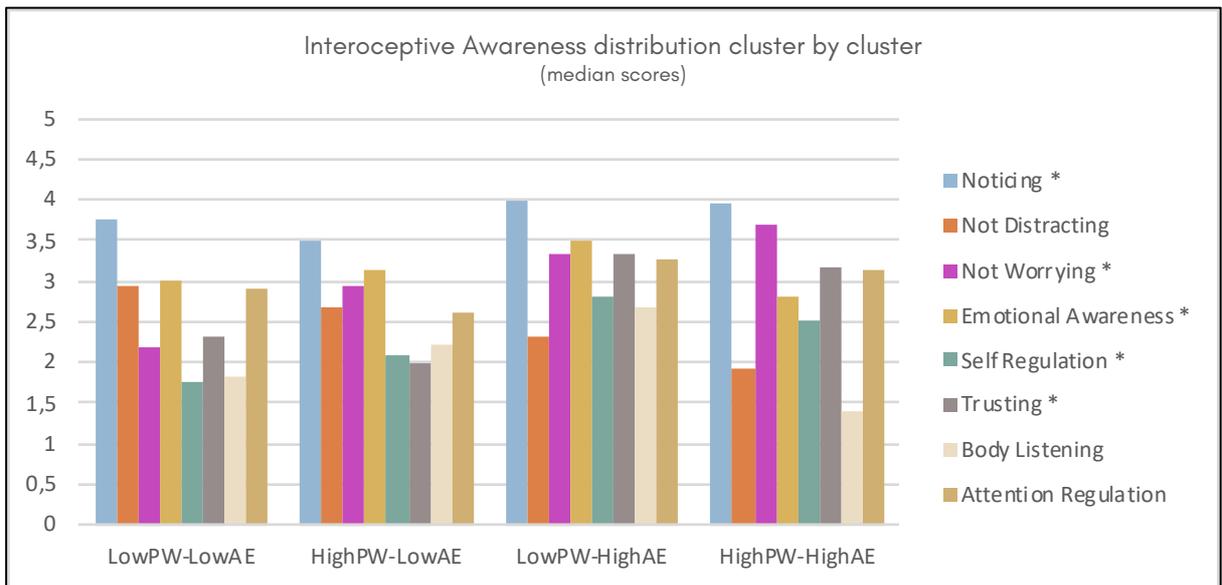


Figure 10b. Interoceptive awareness distribution displayed profile by profile. Significant subscales are marked with an asterisk (*). The Not Distracting subscale did show significant differences after a Kruskal Wallis H test, but the post-hoc test did not reveal any statistically significant in-between profile differences, hence it is not marked with an asterisk in this figure. Generally, the lowest scores of overall interoceptive awareness were seen in the LowPW-LowAE profile and the HighPW-LowAE profile, while the highest scores in overall interoceptive awareness were seen in the LowPW-HighAE profile and the HighPW-HighAE profile.

PW = Pain Willingness; AE = Activity Engagement.

4. DISCUSSION

In this present study, which is the first of its kind, we got results indicating that there is a relation between levels of IA and different profiles of PA, as was our specific research question. The highest levels of overall interoceptive awareness were found in the lowPW/highAE profile while the lowest levels were found in the lowPW/lowAE profile. Six of the eight aspects of IA (five of the eight subscales after a post-hoc test), when measured with MAIA, demonstrated statistically significant differences in patterns over the four profiles. This indicates that not only they differ in how they accept (or not) their pain and behave with pain, but also in the way they perceive their pain.

4.1 General assumptions and previous studies

Previous studies have shown that higher levels of pain acceptance (as in for example the highPW/highAE profile) are associated with greater functioning than lower levels of pain acceptance (as in for example lowPW/lowAE) (15). High function, physical, mental and social, is related to a greater quality of life and well-being. This concludes that there might be a difference in overall health-related well-being between the profiles. Furthermore, it has also been suggested that higher levels of interoceptive awareness, higher sensitivity to interoceptive signals, may contribute and support emotional balance and self regulation, as well as contributing to the usage of ones inner bodily signals as guidance in decision making, which are all factors supporting well-being and quality of life. Meanwhile, higher levels of sensitivity may also detract from well-being when the inner sensations are irregular, which in turn may give rise to anxiety related feelings and fear (23).

Since there are no earlier studies examining the relationship between IA patterns and PA profiles, the fact that higher levels of pain acceptance correlate with higher functioning and

well-being at the same time as higher levels of interoceptive awareness mainly seem to share the same correlation, may furthermore be used to compare our findings with other studies in the area.

One of the studies used in the comparisons examined levels of interoceptive awareness in a group of patients with pain at a primary care setting where they were divided in three groups: 1) recovered, 2) not recovered but without pain and 3) still with chronic pain (9). Since the patients in our study were all referred to specialist care, supposedly due to the fact that they were all in a situation of struggling with current pain that demanded further and more advanced assessment, the last group – *still with chronic pain* – may be assumed to be most alike our participants. Meanwhile, to compare this with our pain acceptance profiles, we may assume that the *recovered* group represents patients with better functioning and health, hence the profile with high levels of pain acceptance (highPW/highAE) whereas the *still with chronic pain* group may represent the profile with less functioning and health (low levels of pain acceptance, lowPW/lowAE). The *not recovered but without pain* group may speak for the pain acceptance profiles in between (lowPW/highAE and highPW/lowAE).

Given that there are not many studies about the relation between pain acceptance and interoceptive awareness, one way to interpret the findings was to relate some of the aspects of interoception to more common concepts used in the medical and research field, as to relate the MAIA subscale “**Not Worrying**” to *anxiety* and *Kinesiophobia* or **Self Regulation** to *depression* and *affective distress*. Some of these concepts were examined in a study on pain acceptance profiles (15), which also were used in our comparisons below.

4.2 Main findings

The greatest differences in IA between the four pain acceptance profiles were seen between the lowPW/lowAE profile and all the IA aspects since it generally presents the lowest levels of IA, except in Noticing, which is the capacity of being aware of uncomfortable, comfortable, or neutral body sensations. One unexpected finding was that it was not the profile with high in both pain willingness and activity engagement that scored highest in IA, instead it was the profile with low PW and high AE that achieved the greatest overall IA. Also, most of the significant differences in levels of interoceptive awareness between the four PA-profiles, in all the subscales, occurred between the lowPW/highAE profile and the lowPW/lowAE profile.

4.3 Description of the PA profiles in terms of IA

LowPW/LowAE

The profile with low pain willingness and low activity engagement shows a greater tendency to notice body sensations. It also presents low levels of self-regulation, is the most worrying profile and, in comparison to the lowPW/highAE and highPW/highAE profiles, is also low in trusting. Interestingly, it presents the greatest tendencies not to distract oneself from pain across the four PA profiles, although this finding was not statistically significant. This is the profile that generally scores the lowest levels of IA, as mentioned above, and these findings seem to be in line with the level of functioning of each pain acceptance profile (8, 15, 17), where the low pain acceptance profile systematically scores poorer physical, mental and social functioning and higher pain interference in life (15), implying that predominantly dysfunctional ways to handle their situation of interoceptive awareness are present in this group and thereby it generally scores low in IA.

HighPW/LowAE

The profile with high pain willingness and low activity engagement scores the lowest levels of noticing bodily signals, presents the lowest in trusting, is also low in self regulation and not worrying (meaning they worry a lot). At the same time, it shows the second highest tendencies not to distract oneself from pain, which is notable, but not significant.

LowPW/HighAE

The profile with low pain willingness and high activity engagement shows the greatest tendency to notice body sensations and also to trust them, as well as it presents the highest levels of emotional awareness across the four PA profiles. In Rovner et al (15), the lowPW/highAE profile is characteristically high in anxiety and pain related fear but low in depression, suggesting that this profile possesses a great capacity of sensing the body's signals overall, and thereby being high in IA levels. Furthermore, this profile's high levels of activity in combination with high levels of anxiety and pain related fear also brings thoughts to that the great commitment of being active might be driven by the needs to distract from pain. In another study it is described that high levels of IA may be correlated with anxiety when the signals from within the body are unbalanced (23), and therefore might end up with experiencing these sensations as overwhelming.

HighPW/HighAE

The profile with high pain willingness and high activity engagement presents a great capacity in noticing bodily sensations, worries the least of the profiles and also presents high levels of trusting. At the same time, the lowest scores of emotional awareness across the four PA profiles are found in this group.

4.4 How IA (MAIA) subscale patterns differ in the four PA profiles

Noticing

Noticing assesses the awareness of uncomfortable, comfortable, or neutral body sensations (24) and we can see that all the pain acceptance profiles were relatively high in scores, hypothetically meaning that they have a lot of focus on their current pain, coherent with being a patient in need to be referred to a pain specialty clinic. Although all four PA profiles scored similar values, there is still a pattern in which the profiles with higher Activity Engagement (the lowPW/highAE and highPW/highAE) presents higher levels of Noticing than the profiles with lower Activity Engagement. These results are consistent with the study done at a primary care setting where the patients were grouped by *recovered*, *not recovered but without pain* and *still with chronic pain*, with high levels of Noticing in the *recovered* group and the lowest levels presented in the *still with chronic pain* group (9).

However, the statistically significant differences in our sample were seen between the lowPW/highAE profile and the highPW/lowAE profile. These results indicate and strengthen the above-mentioned idea that profiles higher in AE presents higher levels in Noticing than the ones with lower AE. At the same time, it is difficult to compare these results with the primary care setting (9) that only contains three groups, where we assume that both of these two profiles belong in the same group in the middle (*the not recovered but without pain*).

In summary, given the notable results where the tendencies in difference between the two high AE profiles and the low AE profiles are clearly displayed, at the same time as our significant differences inbetween the profiles suggests the same trend, this speaks for that there probably might be such a tendency in Noticing.

Not Distracting

The Not Distracting subscale assesses the tendency *not* to apply distracting coping strategies in order to manage discomforting feelings or situations. In other words, it is the ability to not ignore or distract oneself when for example painful sensations are being present (24). High scores represent more awareness (less distracting), and less avoidance. Unfortunately, after a posthoc test, no statistically significant differences between the profiles were seen. The tendencies indicate that the lowPW/lowAE profile is the one profile with the highest score in Not Distracting, meaning they distract less than the others, followed by the second highest scoring profile; highPW/lowAE and furthermore in descending order the lowPW/high AE and the highPW/highAE profile. Interestingly, these tendencies are in complete opposition with the other two studies (9, 15), where there is a trend ranging from low scores in the groups corresponding with the lowPW/lowAE profile (speaking for a high tendency to distract, thereby lower levels of awareness) and the highest scores in the group corresponding with the highPW/highAE profile in our study, suggesting that these tendencies are probably not reliable.

Not Worrying

The Not Worrying subscale assesses the ability to not worry about painful or unpleasant sensations as they appear, thereby not being upset or presume that something is wrong in situations of discomfort (high scores represents worrying less) (24). In our sample, the profile presenting the highest scoring tendencies in not worrying was the highPW/highAE, followed by the lowPW/highAE and highPW/lowAE in a descending manner. However, the statistically significant differences were seen between the lowPW/highAE profile and the lowPW/lowAE profile, as well as between the highPW/highAE profile and the lowPW/lowAE profile. This states that the lowest scores in Not Worrying were significantly

seen in the lowPW/lowAE group. These tendencies are completely in line with the corresponding groups in the other studies (9, 15), suggesting that higher levels of not worrying correlates with higher levels of pain acceptance, and indeed higher levels of activity engagement.

Attention Regulation

The Attention Regulation subscale evaluates the capability to actively regulate and sustain the directing of attention towards various parts of the body and bodily events without being distracted (24). In our sample, this subscale did not score statistically significant differences in between the four PA profiles. However, the results showed following tendencies; the profile scoring the highest value was the lowPW/highAE, tightly followed by the second highest value in the highPW/highAE profile. After a slight gap, the lowPW/lowAE profile follows and the lowest scores were seen in the highPW/lowAE profile. In Mehling 2013 (9), all the groups scored very similar levels, although the highest scores were seen in the *recovered* group, which as mentioned is presumed to be comparable with highPW/highAE and lowPW/highAE.

Emotional Awareness

The Emotional Awareness subscale measures the awareness of the linkage between bodily sensations and emotional processes and states that the individual experiences, for example the ability to notice how the body changes in situations of feeling happy, comfortable, angry etc, as well as the awareness of how feelings in the body may appear due to certain life circumstances (24). Our results showed tendencies that the lowPW/highAE profile maintained the highest scores in our sample, and there were also statistically significant differences between the higher scoring lowPW/highAE profile and the lower scoring lowPW/lowAE profile, supporting Rovner et al. (15) that this profile is very aware of feelings and emotions.

In the primary care setting (9), there were slightly small differences between the groups, nevertheless presenting the same trend as in our sample, that the highest scores are maintained in the lowPW/highAE and the highPW/lowAE profiles. Furthermore, the second lowest and lowest scores in our setting were found in the lowPW/lowAE respectively in the highPW/highAE profiles, this too in agreement with the primary care study.

Self Regulation

The Self Regulation subscale obtains information about the ability to direct attention to bodily sensations in a beneficial way when feeling distressed, such as finding a calm place inside when feeling overwhelmed (24). The results in our study show tendencies that the highPW/highAE and the lowPW/highAE profiles scored highest. The following profiles scored lower, in a descending order; highPW/lowAE and lowPW/lowAE. The statistically significant differences in this subscale were seen between the lowPW/highAE profile and the lowPW/lowAE profile, which is the same sort of pattern that can be found in both Mehling et al. (9) and Rovner et al. (15). In the primary care study, the *recovered* group (comparable with our highPW/highAE profile) also presented the highest scores among the other profiles, but still with a higher value in Self Regulation than the corresponding highPW/highAE profile in our study. The tendency that the highest achieved value in the Self Regulation subscale in our sample still is a bit lower than in the equivalent group in the primary care study (9) might be considered being due to the fact that our population may be in a worse condition given that they were referred from the primary care to a pain specialist center, hence probably having more trouble to pursue coping strategies with pain.

Body Listening

The Body Listening subscale assesses the way in which one listens to information from within the body. This in order to verify what inner sensations one's emotions does recall, to consider the body's state when determining what to do and to give space and time for exploring how one feels (24). In our sample, this subscale did not score statistically significant differences in between the four PA profiles. However, the results showed following tendencies; the profile scoring highest in Body Listening was again the lowPW/highAE, which over again supports the findings of Rovner et al. (15) that this group is highly sensitive to, and aware of, bodily signals. Likewise results may also be found in the primary care setting study (9) where the *not recovered, without pain* group scored the highest, which is one of the groups that might be alike the lowPW/highAE profile. The following profiles in our study, in a descending value order, were the highPW/lowAE and the lowPW/lowAE. The highPW/highAE profile recorded the lowest scores in Body Listening in our study, which is interesting since this is the profile that presents the lowest levels of distress and disrupted functioning, depression, fear of movement and pain interference in Rovner et al. (15). One would expect such a profile to be high in taking in sensations, to be able to act in a way that favors the body according to its signals, in order pursue good health and to not distract from pain.

Trusting

The Trusting subscale assesses the grade to which one experiences the body as a home that is safe and trustworthy (24). In our study, there was a remarkable difference in levels between the profiles with high activity engagement respectively low activity engagement where the first presented higher scores in Trusting, meaning the profiles lowPW/highAE and highPW/highAE. Furthermore, the lowest scoring profiles in our study were the ones with lowPW/lowAE respectively highPW/lowAE. Our results showed that the lowPW/highAE

profile scored statistically significant higher levels in Trusting than both the lowPW/lowAE profile and the highPW/lowAE profile. These tendencies seems to be in accordance with both the study in the primary care (9) and the study on functioning in pain acceptance behaviors (15) telling us that trusting the body may be related to a higher quality of life, a state of well-being where one can manage to engage in activities, knowing that one can rely on the body. It is also suggested, in another study, that generally experiencing the body as trustworthy also means being relatively free from continuously attending to, and experience, anxiety related feelings such as fears and worries (24).

4.5 Limitations

The measurements used in this study were both behavioral research questionnaires, limited to self-reports. Therefore, response bias and method variance could have influenced the results. Response bias might occur due to for example misunderstandings of what an accurate assessment is, or due to the fact that the participants might want to exaggerate their responses so that one may look good (or worse) in the study, although they are responding anonymously. The questionnaires were furthermore presented in Swedish, presumably bringing difficulties to non-Swedish speaking participants to answer properly. Considering the validity and reliability of the measurements, both of the questionnaires subscales satisfyingly meet with the desired standards of self-reported questionnaires. Furthermore, a future power analysis to determine the required statistical power when examining the IA levels in the four PA profiles should be done. In that analysis, this study can be used.

5. CONCLUSIONS AND IMPLICATIONS

In this present study, which is the first of its kind, we got results indicating that there is a relation between levels of IA and different profiles of PA, as was our specific research question. In six out of eight MAIA-subcales (five out of eight after a post-hoc test), significant differences between the PA profiles were found, that in a large extent also correspond with similar findings in previous studies, although none of them measured and compared the exact same things as we did.

The main findings showed that the generally highest total levels of interoceptive awareness was pursued in the lowPW/highAE profile, which showed the greatest tendencies to notice bodily sensations as well as emotional awareness and experiencing their bodies as trustworthy among all of the PA profiles. At the same time, this profile shows high tendencies of distracting from pain and uncomfortable feelings, suggesting that there is a possibility that they engage in activities to keep busy and distract themselves from pain. In turn the lowest total levels of interoceptive awareness were seen in the lowPW/lowAE. One of the interesting tendencies was that a remarkable difference in the levels of trusting across the PA profiles was revealed, more specifically between the ones with high levels of AE (showing higher levels of trusting), and the low levels of AE (presenting lower levels of trusting). Thus, there seems to be a relation between experiencing the body as trustworthy and having a high ability to engage in activities, it is still not clear which one who gives the other; hence which came first, the chicken or the egg?

These mentioned findings are inspiring. Mostly since they might be a step forward in the further understanding and development of identifying behavioral tendencies, to pursue customized treatment strategies for the very heterogenous group of individuals that suffer

from chronic pain. Since this is a patient group that in many cases experience restrictions in their every day life due to their pain, in combination with poor now existing treatment strategies and a patient group that by way of a guess also lack belief in that their symptoms will ever get better, every step forward in research towards better and sustainable treatment alternatives is a hopeful step for the future.

In order to verify the findings of our small sample study, more and larger studies are required. Furthermore, questions that still remains are more precisely what treatments that would be useful in the customization according to the PA profiles. What profile needs what strategy? Also, since our participants represent a narrow and selected part of the population, with not only chronic pain but also chronic pain that demands further assessment than the primary care can offer, it would have been interesting to investigate how our findings correlate with a more well being population, for example in the primary care.

Identifying the needs of each individual patient is an important key when treating chronic conditions, to minimize the suffering and the delay of finding the most adequate and effective treatments for every one of them.

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7. REFERENCES

1. Crofford LJ. Chronic Pain: Where the Body Meets the Brain. *Transactions of the American Clinical and Climatological Association*. 2015;126:167-83.
2. Gatchel RJ, McGeary DD, McGeary CA, Lippe B. Interdisciplinary chronic pain management: past, present, and future. *The American psychologist*. 2014;69(2):119-30.
3. Harker J, Reid KJ, Bekkering GE, Kellen E, Bala MM, Riemsma R, et al. Epidemiology of chronic pain in denmark and sweden. *Pain research and treatment*. 2012;2012:371248.
4. Treede RD, Rief W, Barke A, Aziz Q, Bennett MI, Benoliel R, et al. A classification of chronic pain for ICD-11. *Pain*. 2015;156(6):1003-7.
5. Mills S, Torrance N, Smith BH. Identification and Management of Chronic Pain in Primary Care: a Review. *Current psychiatry reports*. 2016;18(2):22.
6. Hughes LS, Clark J, Colclough JA, Dale E, McMillan D. Acceptance and Commitment Therapy (ACT) for Chronic Pain: A Systematic Review and Meta-Analyses. *The Clinical journal of pain*. 2017;33(6):552-68.
7. van Hecke O, Torrance N, Smith BH. Chronic pain epidemiology and its clinical relevance. *British journal of anaesthesia*. 2013;111(1):13-8.
8. Costa J, Pinto-Gouveia J. Acceptance of pain, self-compassion and psychopathology: using the chronic pain acceptance questionnaire to identify patients' subgroups. *Clinical psychology & psychotherapy*. 2011;18(4):292-302.
9. Mehling WE, Daubenmier J, Price CJ, Acree M, Bartmess E, Stewart AL. Self-reported interoceptive awareness in primary care patients with past or current low back pain. *Journal of pain research*. 2013;6:403-18.
10. Dindo L, Van Liew JR, Arch JJ. Acceptance and Commitment Therapy: A Transdiagnostic Behavioral Intervention for Mental Health and Medical Conditions. *Neurotherapeutics : the journal of the American Society for Experimental NeuroTherapeutics*. 2017;14(3):546-53.
11. SBU. Rehabilitation of Patients with Chronic Pain Conditions Stockholm: Swedish Council on Health Technology Assessment (SBU); 2010 [SBU report no 198 (in Swedish)].
12. Hayes SC, Strosahl KD, Wilson KG. ACT i teori och tillämpning: Vägen till psykologisk flexibilitet. Stockholm: Natur & Kultur; 2014.

13. Veehof MM, Trompetter HR, Bohlmeijer ET, Schreurs KM. Acceptance- and mindfulness-based interventions for the treatment of chronic pain: a meta-analytic review. *Cognitive behaviour therapy*. 2016;45(1):5-31.
14. Lachapelle DL, Lavoie S, Boudreau A. The meaning and process of pain acceptance. Perceptions of women living with arthritis and fibromyalgia. *Pain research & management*. 2008;13(3):201-10.
15. Rovner G, Vowles KE, Gerdle B, Gillanders D. Latent Class Analysis of the Short and Long Forms of the Chronic Pain Acceptance Questionnaire: Further Examination of Patient Subgroups. *The journal of pain : official journal of the American Pain Society*. 2015;16(11):1095-105.
16. Kranz D, Bollinger A, Nilges P. Chronic pain acceptance and affective well-being: a coping perspective. *European journal of pain (London, England)*. 2010;14(10):1021-5.
17. Vowles KE, (LM, McLeod C, Eccleston C. The Chronic Pain Acceptance Questionnaire: confirmatory factor analysis and identification of patient subgroups. *Pain*. 2008;140(2):284-91.
18. Huijnen IP, Rusu AC, Scholich S, Meloto CB, Diatchenko L. Subgrouping of low back pain patients for targeting treatments: evidence from genetic, psychological, and activity-related behavioral approaches. *The Clinical journal of pain*. 2015;31(2):123-32.
19. Turk DC. The potential of treatment matching for subgroups of patients with chronic pain: lumping versus splitting. *The Clinical journal of pain*. 2005;21(1):44-55; discussion 69-72.
20. Craig AD. Interoception: the sense of the physiological condition of the body. *Current opinion in neurobiology*. 2003;13(4):500-5.
21. Stern ER, Grimaldi SJ, Muratore A, Murrrough J, Leibur E, Fleysler L, et al. Neural correlates of interoception: Effects of interoceptive focus and relationship to dimensional measures of body awareness. *Human brain mapping*. 2017;38(12):6068-82.
22. Hanley AW, Mehling WE, Garland EL. Holding the body in mind: Interoceptive awareness, dispositional mindfulness and psychological well-being. *Journal of psychosomatic research*. 2017;99:13-20.
23. Farb N, Daubenmier J, Price CJ, Gard T, Kerr C, Dunn BD, et al. Interoception, contemplative practice, and health. *Frontiers in psychology*. 2015;6:763.
24. Mehling WE, Price C, Daubenmier JJ, Acree M, Bartmess E, Stewart A. The Multidimensional Assessment of Interoceptive Awareness (MAIA). *PloS one*. 2012;7(11):e48230.
25. Mehling WE, Gopisetty V, Daubenmier J, Price CJ, Hecht FM, Stewart A. Body awareness: construct and self-report measures. *PloS one*. 2009;4(5):e5614.

26. Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and commitment therapy: model, processes and outcomes. *Behaviour research and therapy*. 2006;44(1):1-25.
27. Foote HW, Hamer JD, Roland MM, Landy SR, Smitherman TA. Psychological flexibility in migraine: A study of pain acceptance and values-based action. *Cephalalgia : an international journal of headache*. 2016;36(4):317-24.
28. Rovner GS, Arestedt K, Gerdle B, Börsbo B, McCracken LM. Psychometric properties of the 8-item Chronic Pain Acceptance Questionnaire (CPAQ-8) in a Swedish chronic pain cohort. *Journal of Rehabilitation Medicine*. 2014;46(1).
29. Ghasemi A, Zahediasl S. Normality tests for statistical analysis: a guide for non-statisticians. *International journal of endocrinology and metabolism*. 2012;10(2):486-9.
30. Heo M, Kim N, Faith MS. Statistical power as a function of Cronbach alpha of instrument questionnaire items. *BMC medical research methodology*. 2015;15:86.
31. De Vellis RF. *Scale Development: Theory and Applications*. 2nd ed. Thousand Oaks, CA: Sage Publications; 2003.

8. APPENDICES

Table 6. Questions included in the MAIA questionnaire, specified for every subscale. The answers are graded on a Likert scale from 0 (never true) to 5 (always true).

MAIA	QUESTIONS
	
Noticing	1. When I am tense I notice where the tension is located in my body 2. I notice when I am uncomfortable in my body. 3. I notice where in my body I am uncomfortable. 4. I notice changes in my breathing, such as whether it slows down or speeds up.
Not Distracting	5. I do not notice physical tension or discomfort until they become more severe. <i>(reversed)</i> 6. I distract myself from sensations of discomfort. <i>(reversed)</i> 7. When I feel pain or discomfort, I try to power through it. <i>(reversed)</i>
Not Worrying	8. When I feel physical pain, I become upset. <i>(reversed)</i> 9. I start to worry that something is wrong if I feel any discomfort. <i>(reversed)</i> 10. I can notice an unpleasant body sensation without worrying about it.
Attention Regulation	11. I can pay attention to my breath without being distracted by things happening around me. 12. I can maintain awareness of my inner bodily sensations even when there is a lot going on around me. 13. When I am in conversation with someone, I can pay attention to my posture. 14. I can return awareness to my body if I am distracted. 15. I can refocus my attention from thinking to sensing my body. 16. I can maintain awareness of my whole body even when a part of me is in pain or discomfort. 17. I am able to consciously focus on my body as a whole.
Emotional Awareness	18. I notice how my body changes when I am angry. 19. When something is wrong in my life I can feel it in my body. 20. I notice that my body feels different after a peaceful experience. 21. I notice that my breathing becomes free and easy when I feel comfortable.
Self-Regulation	22. I notice how my body changes when I feel happy/joyful. 23. When I feel overwhelmed I can find a calm place inside. 24. When I bring awareness to my body I feel a sense of calm. 25. I can use my breath to reduce tension.
Body Listening	27. I listen for information from my body about my emotional state. 28. When I am upset, I take time to explore how my body feels. 29. I listen to my body to inform me about what to do.
Trusting	30. I am at home in my body. 31. I feel my body is a safe place. 32. I trust my body sensations.

MAIA = Multidimensional Assessment of Interoceptive Awareness.