The Relationship between Beliefs about Pain and Functional Ability with Arthritic conditions.

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Abstract

Objective
Beliefs about pain are an emerging area of research in the biopsychosocial model of pain. Beliefs about the experience of pain have been shown to influence motivation, compliance, understanding of pain mechanisms and outcomes. The aim of this study was to determine the relationship between beliefs about pain and functional ability for those with arthritic conditions.

Design and Setting
Voluntary, anonymous participation was sought from participants of Arthritis New Zealand’s (ANZ) programmes of exercise classes and education. Demographic data, covariables and validated, reliable instruments were used; the Arthritis Impact Measurement Scale 2\textsuperscript{nd} version – Short Form (AIMS2-SF) was used to measure functional ability; the two scales of organic and psychological beliefs in the Pain Beliefs Questionnaires (PBQ) were used to measure pain beliefs.

Intervention
144 Members of ANZ were surveyed anonymously with the AIMS2-SF and PBQ. There was a 61\% response rate.

Outcome measure
This study used $\alpha$ of 0.05, and the 1- $\beta$ of 0.8 to detect significant effect size estimated to be $r = 0.25$. This significance level was for the linear regression analysis of the relationship between the scores of the AIMS2-SF and the organic and psychological beliefs of the PBQ as well as the ANOVA analysis of categorical variables.
Results

The linear regression analysis revealed a significant relationship between the organic beliefs scale of the PBQ and the functional ability of the AIMS2-SF with an r-value of 0.32 and p value of 0.00008. There was no relationship between the psychological beliefs scale of the PBQ and the AIMS2-SF. Better functional ability was influenced significantly by the following: those with less feeling of anger and resentment about pain; those who exercised five times a week; those who always enjoyed their exercise; those who were always confident with their exercise and those who reported their prescription medication to be helpful.

Conclusion

Organic pain beliefs, the belief that the pain experience indicates harm or a threat to well-being is associated with poorer functional ability. Psychological pain beliefs, the beliefs about the internal influences and feelings affecting the experience of pain are not associated with functional ability. It is recommended that clinicians ask their patients about pain beliefs and address organic pain beliefs early in their consultations. Patients with arthritic conditions who respond in the affirmative should be encouraged to modify their organic beliefs and a model is developed as a tool to assist clinicians. Future research to improve interventional programme outcomes could clarify the causal links between organic pain beliefs and functional ability as well as validate covariate data significant findings.
For my Honey, Dirk,
and our A’s
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1. Introduction

Beliefs about pain are an emerging area of research in the biopsychosocial model of pain. Research shows that negative pain beliefs have a detrimental impact on patients’ overall health, self-efficacy and function [1-5]. With the intervention of a self-management programme of exercise and relaxation for arthritis sufferers, positive changes from negative pain beliefs correlate with improvement in self-efficacy [6]. Furthermore, for rheumatoid arthritis, both the extent of the disease as well as the belief that the pain could be capably managed has been found to impact on functional ability [7]. The experience of pain is a significant problem in sufferers with rheumatoid arthritis; it has been recently shown to be an important predictor for psychosocial health [8].

1.1 The definition of beliefs

Beliefs have been defined as personally or culturally shared cognitive configurations [9]. These differ from attitudes that are defined as feelings about events. Beliefs are our thoughts or mental appraisals and understanding of these events. These form the pre-existing concepts about the nature of reality for the individual. These thoughts may be generalised or specific to certain contexts and mould the individual’s perception of the environment, and shape the meaning of their experiences [4].
1.2. Beliefs about pain

Beliefs about pain refer to the thoughts and understanding about the pain experience. These beliefs are about perceived control in managing the pain experience, the evaluation of the extent to which the pain experience is harmful, the perceived disability associated with the pain experience and the expectations of recovery [10-12]. Expectations refer specifically to beliefs about the future, in other words, the relationships between events and the future consequences of these events. The most relevant of these expectations around pain beliefs are the self efficacy expectations, the inherent belief about the capacity to execute an action or behaviour required to produce a certain outcome [13, 14].

These thoughts can positively influence beliefs about the pain experience if, as perceived, there is control in managing the pain experience, confidence that the extent of harm and associated disability are not threatening, and that recovery is possible. These thoughts can negatively influence beliefs about the pain experience if, as perceived, control is threatened and recovery not possible [15]. The consequence can be emotional distress and catastrophising, excessively negative and pessimistic beliefs and thoughts about the pain experience. Catastrophising has been shown to be a significant predictor of poor outcomes in pain management intervention and although catastrophising and emotional distress have common characteristics, it is difficult to separate them in the direction of effect [3, 16]. The thoughts about pain affect physical functioning and contribute to disability; what is interesting is that the physical functioning has a poor association with self-reported pain. Instead, physical functioning is associated with and
predicted by the individual beliefs of the perceived ability to accomplish a functional task, and not by the measurement of self-reported pain [7, 17, 18].

These negative pain beliefs of perceived ability have also been shown to contribute to the transition from acute low back pain to persistent low back pain [10, 19, 20] and specific pain beliefs contributing to poor compliance, motivation and misunderstanding about pain have been identified [4]. Addressing pain related beliefs in the management of persistent pain may affect treatment outcomes by enabling patients to readily acknowledge their beliefs about their pain and treatment [21].

Pain related beliefs observed by researchers can be grouped into seven broad categories: 1) beliefs about general locus of control; 2) beliefs about pain control; 3) beliefs about attribution style; 4) beliefs about cognitive errors; 5) self efficacy beliefs; 6) beliefs about outcome expectancies and; 7) beliefs about individual pain appraisals [22].

It has been suggested that beliefs about persistent pain can be simplified from the broad categories into two dimensions. These include organic pain beliefs (referring to the physiological pain experience indicating physical harm or threat to well-being), and psychological pain beliefs (referring to the internal influences and feelings affecting the experience of pain that can potentially threaten well-being) [7, 23, 24]. Both these can potentially influence the beliefs about pain control either positively (having personal control over the pain experience), or negatively (feeling helpless to manage the potential threat to their well-being).
2. Literature

The evidence, both in research and in clinical practice, shows that treating any condition with persistent pain is complex. The complexities of persistent pain have been investigated from several perspectives. These include the following: the gate control theory of pain [25]; the neuromatrix theory [26]; the biopsychosocial model [27]; the cognitive-behavioural model of pain-related fear [28]; the family systems model [29]; from central pain mechanisms [4] and from pain beliefs [30-35].

This study explores the relationship between pain and functional ability from the pain beliefs and the biopsychosocial perspectives. Both these perspectives have been extensively applied in persistent low back pain as well as arthritic conditions.

2.1. The measures of beliefs and pain

There are several questionnaires to measure the beliefs about pain. The Pain Beliefs Questionnaire (PBQ) is a validated and reliable questionnaire that taps into the two dimensions of pain beliefs (organic and the psychological beliefs), and was developed to describe these beliefs about pain [23, 24]. This questionnaire was chosen for this study as it allowed for differentiation between these two separate dimensions of pain beliefs, was easy to administer and was not time consuming or lengthy for patients to complete.

There are other questionnaires that measure beliefs about pain. Table 1 summarises these questionnaires and why they were not used for this study.
Table 1: Questionnaires to measure Pain Beliefs.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Strengths</th>
<th>Reason for exclusion from this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illness Perceptions Questionnaire (revised) [36]</td>
<td>Comprehensive, psychometrically acceptable measure towards illness adaption; has been used in a wide range of illnesses [36]</td>
<td>Use of the word “illness”—a concept this study is trying to avoid as persistent pain is not necessarily an indication of illness; a lengthy questionnaire</td>
</tr>
<tr>
<td>Back Beliefs Questionnaire [37]</td>
<td>Validated with good internal consistency [37]</td>
<td>Deals only with back pain.</td>
</tr>
<tr>
<td>Fear Avoidance Beliefs Questionnaire (FABQ) [38]</td>
<td>Validated and reliable [38]</td>
<td>Deals only with fear avoidance beliefs</td>
</tr>
<tr>
<td>Survey of Pain Attitudes (SOPA) [39]</td>
<td>Validated and reliable [39, 40]</td>
<td>Deals with the challenge and mastery dimension of cognitive appraisal; these were considered not to be the domain of this study.</td>
</tr>
<tr>
<td>Pain Beliefs and Perceptions Inventory (PBAPI) [41]</td>
<td>Validated and reliable [41]</td>
<td>Addresses three areas of beliefs; these were considered not to be the domain of this study.</td>
</tr>
<tr>
<td>The Pain Cognitions Questionnaire [42]</td>
<td>Specifically for the assessment of five factors of spontaneous cognitions associated with persistent pain [42].</td>
<td>Deals with spontaneous cognitive appraisal; this was considered not to be the domain of this study; a lengthy questionnaire</td>
</tr>
<tr>
<td>The Cognitive Risk Profile [43]</td>
<td>Identifies possible risk factors for intervention failure [44]</td>
<td>Deals with intervention; not considered to be the domain of this study; has not been used widely in clinical practice; a lengthy questionnaire</td>
</tr>
</tbody>
</table>
2.2. Functional ability measures and persistent pain

Research has shown that self-report questionnaires are valid measures for the assessment of functional ability [45]. There are a wide variety of functional ability measures that can be determined using questionnaires. The AIMS2-SF questionnaire was chosen for this project as: (i) it is appropriate for the population sample of arthritic conditions and (ii) it is an instrument that measures upper limb, lower limb, and whole body functional movements (most other instruments do not); (iii) it is a suitable and reliable instrument for measuring disability in personal care for those suffering arthritic conditions [43]; (iv) the shortened version of the revised AIMS2 has been validated, and is reliable with similar psychometric properties; it is easy to administer and is useful for assessing functional ability status with other persistent conditions besides arthritis [44].

This instrument was developed in concordance with the World Health Organisations’ (WHO) International classification of and definition functioning, disability and health [46, 47], and has been widely used for measuring functional status in arthritic diseases [48-51]. The scale includes a broad domain of functional ability with the combination of the five second-order scores. The second-order scores consist of: (i) physical aspects (mobility level, walking, bending, arm/hand/finger function, self-care, household tasks); (ii) affect (level of tension and mood); (iii) self-reported pain; (iv) social interaction (social activity, support from family) and (v) work.

Other possible questionnaires considered for this study along with reasons for exclusion are listed with reasons for their exclusion in Table 2.
Table 2: Questionnaires to measure Functional Ability.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Strengths</th>
<th>Reason for exclusion from this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oswestry Disability Index [52, 53]</td>
<td>Widely used, validated and reliable [54, 55]</td>
<td>Addresses back and leg pain primarily; does not include upper limb functioning</td>
</tr>
<tr>
<td>Roland Morris Disability Scale [55]</td>
<td>Widely used, validated and reliable [55]</td>
<td>Addresses back pain primarily; does not include upper limb functioning</td>
</tr>
<tr>
<td>Acute Low Back Pain Screening Questionnaire [56, 57]</td>
<td>Primarily addresses psychosocial factors [56-58]</td>
<td>Addresses back pain only; no data available on reliability [57, 58]</td>
</tr>
<tr>
<td>Vermont Disability Prediction Questionnaire [57]</td>
<td>Used to predict chronic disability after occupational low back injury</td>
<td>Addresses back pain only</td>
</tr>
<tr>
<td>Screening Questionnaire for predicting outcome in</td>
<td>Screening method to determine a poor prognosis following work related</td>
<td>Addresses back pain only</td>
</tr>
<tr>
<td>acute and subacute back pain [57]</td>
<td>injury</td>
<td></td>
</tr>
<tr>
<td>Orebro Musculoskeletal Pain Questionnaire [58, 59]</td>
<td>Identifies patients at risk of developing chronic low back pain</td>
<td>Addresses back pain only</td>
</tr>
<tr>
<td>Chronic Pain Coping Inventory [60]</td>
<td>Specifically developed for children and adolescents, demonstrating both</td>
<td>Deals primarily with coping methods rather than the specific functional ability</td>
</tr>
<tr>
<td>International Physical Activity Questionnaire [61]</td>
<td>Validated and reliable.</td>
<td>Does not include upper limb functioning</td>
</tr>
<tr>
<td>Instrument</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Pain Disability Index [62]</td>
<td>Good psychometric properties, good for the younger individual [63]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poorer evaluation for older individuals</td>
<td></td>
</tr>
<tr>
<td>West Haven-Yale Multidimensional Pain Inventory [WHYMPI] [64]</td>
<td>Validated and reliable psychometric properties</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimal reporting for older individuals</td>
<td></td>
</tr>
<tr>
<td>Sickness Impact Profile [65-67]</td>
<td>Extensively studied [67]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wording uses questions about “sickness” – a concept this study is trying to avoid as persistent pain is not necessarily an indication of sickness; it is time consuming, requiring 30 minutes to complete; physical and psychosocial scales have been found to be moderately correlated in elderly with hip and knee pain [68]</td>
<td></td>
</tr>
<tr>
<td>Physical Activity Scale for the elderly (PASE) [69]</td>
<td>Used for the elderly population</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Younger population groups excluded</td>
<td></td>
</tr>
<tr>
<td>The Quebec Back Pain Disability Scale [70]</td>
<td>High internal consistency, good validity and reliability [71]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Addresses back pain only</td>
<td></td>
</tr>
<tr>
<td>The Functional Disability Inventory [72]</td>
<td>Specifically designed for children; is reliable and valid for chronic pain conditions [73]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excludes adults</td>
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</tr>
</tbody>
</table>
2.3. Exercise

It is widely accepted that regular exercise is important for physical and psychological general health. Exercise improves cardiovascular fitness as well as providing a sense of well-being with a reduction in anxiety and depression [74-79]. Exercise is considered an essential component of pain management [80-87]. General exercise improves functional ability and quality of life in arthritic conditions [88-93].

Walking especially has been shown to be an easy, cost effective form of exercise that does not heighten the pain experience for most types of arthritis [94-97]. Risk factors for cardiovascular disease are reduced with regular brisk walking [98]. Walking potentially becomes an effective exercise when the Borg scale for perceived exertion is used [11]; it is equally effective if continuous or accumulated in several shorter spells [99].

High impact and many repetitions of exercise are contra-indicated in the active inflammatory phases of Rheumatoid Arthritis (RA). Here, the joints are vulnerable to damage due to the erosive nature of the disease process [100]. The optimal exercise regime for persistent pain embraces the principle of individualisation with the use of combinations and alternations of exercise regimes [75, 101].

Any training programme is based on the principle of overload. Specificity and reversibility occurs when a prescribed exercise has a specific duration, intensity and frequency aligned with its intended purpose [102]. The concept of specificity implies that specific stimuli result in specific responses. Specific training leads to specific adaptation [103]. Fatigue is specific to the type of exercise performed for a specific rehabilitation
purpose. This includes competitive or social sporting activity, everyday functional activity (domestic chores), or leisure activity (social walking) [104, 105].

Furthermore, exercise can be prescribed for the management of stress. The experience of pain provides a major stress on the body’s psychological, emotional and physical resources [26]. Meta-analyses have shown that exercise is helpful in managing short as well as long term stress [106]. The relationship between exercise, aminergic activity and psychological stress is a complex interaction that is not fully understood [79].
2.4. Exercise and beliefs about pain

The manner in which beliefs interact with exercise instructions is not fully understood. When a patient is instructed to perform an exercise to potentially improve activation and function, some fundamental issues need to be explored. Firstly, the patient may or may not believe that the recommendation about the exercise is accurate and warrants adherence (a treatment outcome expectancy belief). Secondly, even if the patient believes the recommendation to be valid, he/she might not perform the exercise due to inherent self-doubt about his/her ability to perform such an exercise (a self-efficacy belief). Thirdly, the patient might not execute the exercise for either or both of these reasons (a coping response).

Four steps need to occur in order for prescribed exercise to become a reliable coping response in those with persistent pain [107]:

1. The therapeutic benefit of the prescribed exercise needs to be believed.
2. The capability to perform the exercise must exist.
3. The exercise needs to be performed and adhered to as prescribed.
4. The outcome of the exercise needs to yield thought(s) or mental appraisal(s) that develop a sense of mastery for the patient.
2.5. Purpose of this study

The aim of this study was to determine the relationship between functional ability and pain beliefs in patients with arthritic conditions. This is to specifically explore and differentiate between the relationships of each domain of pain beliefs (organic beliefs, psychological beliefs) with functional ability.

The secondary aim was to explore the relationships between other variables and demographic data with regards to functional ability and beliefs about pain. These variables are as follows: gender; duration of pain experience; age; number of months of physiotherapy intervention; type and frequency of regular exercise; enjoyment and confidence with exercise; ability to stop exercise; previous physical and athletic ability; anger about pain; duration of membership with Arthritis New Zealand (ANZ); ethnicity (defined by Statistics New Zealand); education level; diagnosis; number of months off work; smoking habits and medication or drug use.

This study will try to confirm and validate current research evidence; a novel aspect will be the correlation of the AIMSSF and the PBQ.

This study will also attempt to provide a platform for further research with the exploration of relationships in the covariate data. New questions could be raised and new possibilities verified.
3. Method

ANZ is a national voluntary organisation representing those with formal arthritic diagnoses. It functions as a charitable trust with modest government funding. Activities include member education on pain management, exercise classes, and seminars [108]. Ethical approval was obtained from the Upper South Island A Regional Ethics committee (Reference number URA/10/04/026). The process followed in this study was in accordance with the Helsinki Declaration of 1975, as revised in 1983.

A cross section of members of ANZ who attended an exercise class, an individual education session with an ANZ Educator, or a public education seminar was taken over a specific time period, May 2010 to September 2010. The cross section over a defined time period aimed to capture a sample of as many participants as possible in all the programmes across Christchurch city. All members were residents of the Christchurch city region. Members taking part in the above mentioned formal activities (n = 236) were approached personally to participate. They were approached personally by either the researcher or an Arthritis NZ Educator and invited to participate anonymously. At the time of invitation an explanation about the research project and anonymity was given and invitation was voluntary. No member was cajoled or coerced to fill out their answers to the questionnaire of 72 questions. The questionnaire was issued with a stamped and self addressed envelope for returning to the researcher. Two approached refused to participate, 10 were returned incomplete, and 80 were never returned. This determined a 61% response rate. It was clearly explained that the questionnaire was not to be answered twice as participants could potentially have attended different events and be asked to participate more than once. The flow chart 1 shows the details of the data collection.
Flow chart 1: Method of data collection.

ANZ public education and exercise classes: May 2010 – Sept 2010
n = 236

Personal invitation to ANZ member to answer questionnaire and return by self addressed and stamped envelope in mail
n = 236

n = 2 refuse to participate
n = 10 over half incomplete and not entered into database
n = 80 never returned questionnaire
n=144 responses

61% response rate entered

The questionnaires consisted of the PBQ and the AIMS2-SF. In addition further questions were asked about the following: gender; duration of pain experience; age; number of months of physiotherapy intervention; type and frequency of regular exercise; enjoyment and confidence with exercise; ability to stop exercise; previous physical and athletic ability; anger about pain; duration of membership with ANZ; ethnicity (as defined by Statistics New Zealand [109]; education level; arthritic diagnosis; number of months off work; smoking habit and medication use.

The internal consistency of each scale of the PBQ has been shown to be 0.73 for the organic scale and 0.70 for the psychological scale [23]. A Likert scale of 1-5 was used to
measure each question. The organic scale consists of eight questions; these measure the extent of the belief that personal control of the pain is impossible (due to physical harm or injury believed to be associated with the pain experience). The psychological scale consists of four questions; these measure the extent of the belief that personal control of the pain is linked to the emotional feelings about the pain experience. The higher the summed score on the PBQ, the greater the belief that harm and emotional feelings negate personal control of the pain experience.

The factorial validity of the AIMS2-SF has been verified [51]. The higher the total summed AIMS2-SF score, the poorer the functional ability. The highest possible score is 120; this indicates exceptionally poor functional ability. Such a person is highly dependent on assistance for all daily activities, has a high pain experience, and has low mood and poor social support. On the other hand, a low score indicates greater functional ability with both upper and lower limbs, with whole body tasks, and with independence.
4. Hypothesis

The aim of this study was to determine the relationship between functional ability and pain beliefs in patients. The primary hypothesis is that a relationship exists whereby beliefs about persistent pain are associated with functional ability. It is expected that a low score (less negative beliefs about pain) of the PBQ is associated with better functional ability in the AIMS2-SF. Likewise it is expected that a high score (greater negative beliefs about pain) of the PBQ is associated with poorer functional ability in the AIMS2-SF. The null hypothesis is that any observed relationship is simply due to chance.
5. Results: Primary Investigation

5.1 Demographic data

The demographic data for all participants are summarised in Table 3 as predominant percentages of the full data set.

Table 3: Demographic predominant percentage data.

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>NZ European 88%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>Osteoarthritis 36%</td>
</tr>
<tr>
<td></td>
<td>Rheumatoid Arthritis 17%</td>
</tr>
<tr>
<td></td>
<td>Fibromyalgia 15%</td>
</tr>
<tr>
<td></td>
<td>Unknown 13%</td>
</tr>
<tr>
<td></td>
<td>Polymyalgia Rheumatica 8%</td>
</tr>
<tr>
<td>Gender</td>
<td>Female 85%</td>
</tr>
<tr>
<td>Educational level</td>
<td>School only, 55%</td>
</tr>
<tr>
<td>Physiotherapy intervention for pain</td>
<td>54%</td>
</tr>
<tr>
<td>Membership with ANZ within last 3 years</td>
<td>61%</td>
</tr>
<tr>
<td>Smoking</td>
<td>93% non smokers</td>
</tr>
<tr>
<td>Time off work because of pain experience</td>
<td>32%</td>
</tr>
</tbody>
</table>
5.2 Number of months of pain

The mean for participants’ duration of pain experience was 133 months (11 years) of pain with a large standard deviation. Fifty one per cent of participants experienced more than 8 years of pain. The histogram of the participants’ duration of pain experience measured in number of months is shown in Figure 1.

**Figure 1: Histogram of the participants’ duration of pain experience.**
5.3 Age of participants

The average age of participants was 65 years with a standard deviation of almost 12 years; no person was under the age of 22 years. The histogram of participants’ ages is shown in Figure 2.

Figure 2: Histogram of participants’ ages.
5.4 AIMS scores

The participants showed a broad distribution of AIM2-SF scores with 67% of participants scoring moderate functional disability. A higher score is associated with a poorer functional ability; a lower score is associated with greater functional ability. Fourteen percent of participants scored between 70 and 100, indicating greater disability; 9% of participants scored below 40, indicating excellent functional health. No one scored between 90 and 100. The mean score was 57 with a standard deviation of 12 points; this is shown in Figure 3.

Figure 3: Histogram of the sum of AIMS2-SF scores.
5.5. Beliefs measured on psychological scale

The psychological scale of the PBQ is a measure of the extent to which a person believes that psychological feelings affect the experience of the pain and are a potential threat to feelings of well-being. The psychological scale consists of four questions; these measure the extent of the belief that personal control of the pain is linked to the emotional feelings about the pain experience.

The questions are: a) Does being anxious make the pain worse? b) When relaxed, is it easier to cope with the pain? c) Does thinking about the pain make it worse? d) Does feeling depressed make the pain seem worse? A Likert scale of 1-5 was used to measure each question; the scores in the questionnaire were reversed when appropriate for the calculations. The highest score is 20. The higher the summed score on the PBQ, the greater the belief that harm and emotional feelings negate personal control of the pain experience. The lower the summed score on the PBQ, the less the belief that harm and emotional feelings negate personal control of the pain experience.

The psychological scale of the PBQ mean score was 13 with a standard deviation of 4. This shows a tendency in this sample group to believe that psychological feelings do influence pain experiences. Figure 4 is a histogram showing the sum of psychological beliefs measured with the psychological scale of the PBQ.
Figure 4: Histogram of the sum beliefs about pain measured with the psychological scale of the Pain Beliefs Questionnaire.
5.6. Beliefs measured on the organic scale

The organic scale of the Pain Beliefs Questionnaire is a measure of the extent to which a person believes that there is an organic source of the pain. This belief is that the physical experience of the pain indicates harm, and is a potential threat to well-being with personal control being unlikely. These organic beliefs are associated with negative maladaptive beliefs about pain. The higher the summed score on the scale, the greater the person’s beliefs are about the organic source of the pain experience. The organic scale consists of eight questions; these measure the extent of the belief that that personal control of the pain is impossible (due to physical harm or injury believed to be associated with the pain experience). These are: a) Is the persistent pain a result of damage to tissues of the body? b) Does physical exercise make the pain worse? c) Is it impossible to do much for oneself to relieve this persistent pain? d) Is experiencing persistent pain a sign that something is wrong with your body? e) Does being in persistent pain prevent you from enjoying hobbies and social activities? f) Is the amount of pain related to the amount of damage? g) Is it impossible to control your own persistent pain? h) Is persistent pain a sign of illness?

A Likert scale of 1-5 was used to measure each question; the scores in the questionnaire were reversed when appropriate for the calculations. The highest possible score is 40; this indicates a high tendency to allow the organic beliefs to influence pain experience. The lower the summed score the lesser the tendency for organic beliefs to influence the experience of pain. The lower the score on the organic belief scale, the higher are the positive beliefs about the personal control of pain experience. The mean score in this
study is 24 with a standard deviation of 6. This shows a tendency in this sample group for organic beliefs about pain experience. The histogram of the sum of organic beliefs about pain measured with the organic scale of the PBQ is shown in Figure 5.

Figure 5: Histogram of the sum organic beliefs of the PBQ
5.7. The relationship of the PBQ and the AIMS2-SF

The data showed two different relationships of scatter plot with simple linear regression for each subscale (the organic beliefs and the psychological beliefs) of the PBQ with the AIMS2-SF. The relationship between the organic beliefs subscale reached significance (p = 0.0002) with a modest correlation coefficient (r = 0.32). The relationship for the psychological scale showed no significance (p = 0.4), and no correlation (r = 0.06). The scatter plot with the simple linear regression is shown in Figure 6.
Figure 6: Scatter plot with linear regressions of the sum of AIMS2-SF disability with both the psychological subscale of the PBQ and the organic subscale of the PBQ.

Further analysis of the scatter plot was made with a polynomial fit to determine where the relationship between organic pain beliefs and functional ability was strongest. The greater the functional ability, the worse the negative organic beliefs about the pain experience became. This is shown in Figure 7.
Figure 7: Scatter plot using a polynomial fit of the sum of AIMS2-SF disability and negative maladaptive beliefs about pain measured with the organic scale.
5.8. Spearman rank order correlation

A Spearman rank order correlation was completed to further verify the scatterplot correlation between the organic beliefs subscale of the PBQ and the functional ability sum of the AIMS-SF. This correlation also reached significance with the Spearman = 0.32 and \( p = 0.000089 \). This correlation is shown in Table 4.

Table 4: Spearman rank order correlation the organic beliefs subscale of the PBQ and the functional ability sum of the AIMS-SF.

<table>
<thead>
<tr>
<th></th>
<th>Valid</th>
<th>Spearman</th>
<th>t(N-2)</th>
<th>p-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum AIMS2-SF &amp; SumOrgBlf</td>
<td>144</td>
<td>0.320737</td>
<td>4.035214</td>
<td>0.000089</td>
</tr>
</tbody>
</table>
5.9 Conclusion regarding hypothesis

The primary hypothesis is that a relationship exists whereby beliefs about persistent pain are associated with functional ability. It is expected that a low score (less negative beliefs about pain) of the PBQ is associated with better functional ability in the AIMS2-SF. Likewise it is expected that a high score (greater negative beliefs about pain) of the PBQ is associated with poorer functional ability in the AIMS2-SF. The null hypothesis is that any observed relationship is simply due to chance.

The primary hypothesis confirms that organic beliefs about persistent pain are associated with functional ability. A low score (less negative beliefs about pain) of the organic scale of the PBQ was associated with better functional ability in the AIMS2-SF. A high score (greater negative beliefs about pain) of the organic scale of the PBQ was associated with poorer functional ability in the AIMS2-SF.

The psychological scale of the PBQ shows no relationship with functional ability. The two scales (organic and psychological) in the PBQ are not meant to be the converse of one other, and a converse relationship is not necessarily expected. Furthermore, the psychological scale accounts for only 4 questions of the total of 12 questions asked in both scales. Specific influence of beliefs associated with psychological feelings of the pain experience may need further screening using other psychological measurement tools.
6. Results: Secondary Investigations

The secondary aim is to explore the relationships between covariates and demographic data with regards to functional ability and beliefs about pain. These covariates are as follows: gender; duration of pain experience; age; number of months of physiotherapy intervention; type and frequency of regular exercise; enjoyment and confidence with exercise; ability to stop exercise; previous physical and athletic ability; anger (or resentment) about pain and medication or drug use.

6.1 Physiotherapy Intervention

The participants were asked whether or not they had ever received Physiotherapy and if so, the duration. The functional ability sum measured by the AIMS2-SF was categorised between those who had received physiotherapy intervention and those who had not. The categorised histogram of the functional ability measured with the AIMS2-SF and two groups (those who had received physiotherapy intervention and those who had not) is shown in Figure 8.
Figure 8: Categorised histogram of the functional ability measured with the AIMS 2-SF by those who had not received physiotherapy intervention and those who had received physiotherapy intervention.

ANOVA analysis showed no significant difference between participants among those who did or did not receive physiotherapy. The ANOVA analysis results are shown in Table 5.
Table 5: Tests for significance using ANOVA analysis of the differences in the functional ability between those who had received physiotherapy and those who had not received physiotherapy.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>Partial eta-squared</th>
<th>Non-centrality</th>
<th>Observed power (alpha=0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>396229.1</td>
<td>1</td>
<td>396229.1</td>
<td>2511.16</td>
<td>0.000000</td>
<td>0.953306</td>
<td>2511.16</td>
<td>1.000000</td>
</tr>
<tr>
<td>Physio</td>
<td>1.4</td>
<td>1</td>
<td>1.4</td>
<td>0.008</td>
<td>0.926156</td>
<td>0.000071</td>
<td>0.008</td>
<td>0.050973</td>
</tr>
<tr>
<td>Error</td>
<td>19407.8</td>
<td>123</td>
<td>157.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.2 Anger and resentment about the pain

Anger and resentment about pain was measured with a 5-point Likert scale (where 0 = never feel angry or resentful; 1 = rarely; 2 = sometimes; 3 = almost always; and 4 = always). This showed that 33% sometimes felt anger and resentment about their pain, 39% were rarely or never affected with this feeling, and that 27% were always or almost always angry or resentful about their pain experience. This is shown in Figure 9.
Figure 9: Histogram of anger and resentment about pain.

Associations between functional health with anger and resentment about pain were
analysed using a categorised histogram. Anger showed an association with higher Likert
scale scores associated with greater disability (measured with the AIMS2-SF); this is
shown in Figure 10.
Figure 10: Histogram of functional ability sum of AIMS2-SF and anger/resentment about pain

Testing for significance of the differences between the groups was performed using ANOVA one-way analysis. In this ANOVA analysis, the association is significant (despite small size of sub-groups); this is shown in Table 6.
Table 6: Tests for significance between those who were always angry and resentful about their pain and those who never felt angry or resentful about their pain.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>75556.65</td>
<td>1</td>
<td>75556.65</td>
<td>662.4136</td>
<td>0.000000</td>
</tr>
<tr>
<td>Anger_60</td>
<td>3818.96</td>
<td>1</td>
<td>3818.96</td>
<td>33.4812</td>
<td>0.000006</td>
</tr>
<tr>
<td>Error</td>
<td>2737.50</td>
<td>24</td>
<td>114.06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further analysis created a modified anger scale, since the five-point scale for anger and resentment was somewhat difficult to manipulate. The scale was reformed into a three-point scale:

1: Infrequent (Never + Rarely);

2: Sometimes (Sometimes);

3: Often (Almost always + Always).

It was observed with the categorised histogram that those with greater disability scored higher on anger and resentment. This is shown in Figure 11.
Figure 11: Histogram showing the sum of the AIMS2-SF with the associated score of the modified anger and resentment scale.

The same data are plotted separately and with fit to normal distribution; this is shown in Figure 12.
Figure 12: Histogram showing the sum of the AIMS2-SF with the associated score of the modified anger and resentment scale.

The tests to determine the significance of this correlation used ANOVA one-way analysis and found a significant association between poorer functional ability with those who are often angry about their pain experience where \( p = 0.00006 \). This is presented in Figure 13 and Table 7.
Figure 13: Tests for significance in graphic representation using ANOVA of functional ability with anger and resentment about pain with a modified scale between three groups of self-reported anger about pain.

Table 7: Tests for significance in table format using ANOVA of functional ability with anger and resentment about pain with a modified scale between three groups of self-reported anger about pain.
The medians and range between each group and the functional ability were represented as a box plot, outlined in Figure 14.

**Figure 14: Box plot of the medians and range of functional ability and anger/resentment about pain using the modified anger scale.**

The means and standard deviations for these three groups are shown in Table 8 for reference.
Table 8: Means and standard deviations of functional ability and anger/resentment about pain using the modified anger scale.

<table>
<thead>
<tr>
<th></th>
<th>Sum AIMS2-SF- Means</th>
<th>Sum AIMS2-SF- N</th>
<th>Sum AIMS2-SF- Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr 1. Infrequent</td>
<td>51.00000</td>
<td>50</td>
<td>12.39322</td>
</tr>
<tr>
<td>Gr 2. Sometimes</td>
<td>57.92683</td>
<td>41</td>
<td>8.88829</td>
</tr>
<tr>
<td>Gr 3. Often</td>
<td>62.81818</td>
<td>33</td>
<td>13.56801</td>
</tr>
<tr>
<td>All groups</td>
<td>56.43548</td>
<td>124</td>
<td>12.8806</td>
</tr>
</tbody>
</table>

The implications are that those with an *infrequent* experience of anger and resentment about their pain had improvements in their functional ability compared to the *often-angry* category; they had 19% better functional ability on average.\(^1\)

With these correlations, reducing anger and resentment with anger management strategies might improve functional health.

---

\(^1\) Anger3Grp1 Mean = 51.000 AIMS2; Anger3Grp3 Mean = 62.818 AIMS2; difference% = (difference in means)/(reference mean) = (62.818 - 51.000)/ 62.818 = 0.19
6.3 Frequency of exercise

The frequency of participants’ exercises each week is shown in histogram Figure 15. This shows that 41% of participants exercised 3 to 4 days a week; 16% exercised every day.

Figure 15: Histogram of frequency of exercise per week.

The differences in AIMS2-SF scores of functional ability and the frequency of exercise per week are shown in box plot Figure 16.
Figure 16: Box plot differences in AIMS2-SF score of functional ability and frequency of exercise per week.

Sixty-four is the median score for functional ability associated with exercise once a week; 51.5 is the median score for functional ability associated with exercise five times a week. Tests for significance of functional ability using one-way ANOVA between those who exercised once a week and those who exercised 5 times a week were shown to be significant (p = 0.025); this data are shown in Figure 17 and in Table 9.
Figure 17: Test for significance in graphic representation of functional ability between exercises once a week and five times a week.

Table 9: Test for significance in table format of functional ability between exercises once a week and five times a week.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>Partial eta-squared</th>
<th>Non-centrality</th>
<th>Observed power (alpha=0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>78474.11</td>
<td>1</td>
<td>78474.11</td>
<td>639.8761</td>
<td>0.000000</td>
<td>0.963841</td>
<td>639.8761</td>
<td>1.000000</td>
</tr>
<tr>
<td>FrequencyExcercise_54</td>
<td>701.27</td>
<td>1</td>
<td>701.27</td>
<td>5.7181</td>
<td>0.024983</td>
<td>0.192411</td>
<td>5.7181</td>
<td>0.63114</td>
</tr>
<tr>
<td>Error</td>
<td>2943.35</td>
<td>24</td>
<td>122.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Someone who exercises 5 times a week is likely to have 20% better functional health than someone who exercises only once a week. No significance was seen using ANOVA one-way analysis between the functional ability (measured by the AIMS2-SF) for those who exercised 5 times a week, and those who exercised 2 to 3 times a week. This is shown in Tables 10 and 11 as \( p = 0.090 \) and \( p = 0.07 \), respectively.

### Table 10: Tests for significance between those who exercised 3 times a week.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>Partial eta-squared</th>
<th>Non-centrality</th>
<th>Observed power (alpha=0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>117450.2</td>
<td>1</td>
<td>117450.2</td>
<td>809.950</td>
<td>0.000000</td>
<td>0.952938</td>
<td>809.950</td>
<td>1.000000</td>
</tr>
<tr>
<td>FrequencyExercise_54</td>
<td>437.3</td>
<td>1</td>
<td>437.3</td>
<td>3.015</td>
<td>0.090177</td>
<td>0.070099</td>
<td>3.015</td>
<td>0.39556</td>
</tr>
<tr>
<td>Error</td>
<td>5800.4</td>
<td>40</td>
<td>145.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 11: Tests for significance between those who exercised 5 times a week.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>Partial eta-squared</th>
<th>Non-centrality</th>
<th>Observed power (alpha=0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>104786.1</td>
<td>1</td>
<td>104786.1</td>
<td>1010.22</td>
<td>0.000000</td>
<td>0.967441</td>
<td>1010.22</td>
<td>1.000000</td>
</tr>
<tr>
<td>FrequencyExercise_54</td>
<td>355.6</td>
<td>1</td>
<td>355.6</td>
<td>3.428</td>
<td>0.072789</td>
<td>0.091596</td>
<td>3.428</td>
<td>0.43623</td>
</tr>
<tr>
<td>Error</td>
<td>3526.7</td>
<td>34</td>
<td>103.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.4 Types of exercise

Patients participated in a broad variety of exercises; the great majority (98%) walked. The next most frequently used exercise was in the swimming pool; 67% independently used a pool; 61% participated in an ANZ pool exercise class. The histogram of exercise types is shown in Figure 18.

Figure 18: Histogram of types of exercise.
6.5 Enjoyment of exercise

Participants’ enjoyment of exercise was measured using the self-reported rating of a 5-point Likert scale (where 0 = never enjoy my exercise; 1 = rarely enjoy my exercise; 2 = sometimes enjoy my exercise; 3 = almost always enjoy my exercise; 4 = always enjoy my exercise). Mostly participants enjoyed their exercise; the data are shown in the histogram (Figure 19).

Figure 19: Histogram of self-reported rating of enjoying exercise.

The differences in AIMS2-SF score of functional ability with the self-reported rating of enjoyment of exercise are shown in box plot Figure 20.
Figure 20: Box plot differences in AIMS2-SF score of functional ability self-reported rating of enjoyment of exercise.

Fifty-three is the median score for functional ability associated with those who always enjoy their exercise; 67 is the median score for functional ability associated with those who sometimes enjoy their exercise. A significant difference (p = 0.000024) was seen using ANOVA one-way analysis between the functional ability (measured by the AIMS2-SF sum) between those who always enjoy their exercise and those who sometimes enjoy their exercise; this is shown in Table 12 and Figure 20. Those who always enjoy their exercise are less functionally disabled than those who sometimes enjoy their exercise.
Table 12: Test for significance in table format of functional ability between those who always enjoyed their exercise and those who sometimes enjoyed their exercise.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>Partial eta-squared</th>
<th>Non-centrality</th>
<th>Observed power (alpha=0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>181693.2</td>
<td>1</td>
<td>181693.2</td>
<td>1381.83</td>
<td>0.000001</td>
<td>0.959055</td>
<td>1381.83</td>
<td>1.000000</td>
</tr>
<tr>
<td>EnjoyExercise_55</td>
<td>2771.5</td>
<td>1</td>
<td>2771.5</td>
<td>21.081</td>
<td>0.000024</td>
<td>0.263251</td>
<td>21.081</td>
<td>0.994709</td>
</tr>
<tr>
<td>Error</td>
<td>7757.7</td>
<td>59</td>
<td>131.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 20: Test for significance in graphic representation of functional ability between those who always enjoyed their exercise and those who sometimes enjoyed their exercise.
Those who sometimes enjoy their exercise have 21% greater functional ability than those who always enjoy their exercise. But what specifically in the “enjoyment” improves the functional ability with exercise? Is it the movement of the body per se? Is it the environment in which the exercise is occurring? Is it the emotional or psychological experience with exercising which contributes to the enjoyment so that functional ability improves? These questions warrant further investigation.

6.6 Confidence with exercise

The participants’ confidence with exercising was measured using the self-reported rating of a 5-point Likert scale (0 = never confident with exercise; 1 = rarely confident with exercise; 2 = sometimes confident with exercise; 3 = almost always confident with exercise; 4 = always confident with exercise). No one reported never being confident about exercising. The data are shown in the histogram (Figure 21).
Figure 21: Confidence with exercising.

The differences in AIMS2-SF scores of functional ability with the self-reported rating of confidence with exercising are shown in the box plot (Figure 22)
Figure 22: Box plot differences in AIMS2-SF score of functional ability self-reported rating of confidence with exercising.

Fifty-two is the median score for functional ability associated with those are always confident with their exercising; 64 is the median score for functional ability associated with those who are sometimes confident with their exercising. A significant difference (p = 0.000035) was seen using ANOVA one-way analysis between the functional ability (measured by the AIMS2-SF sum) for those who are always confident with their exercising and those who are sometimes confident with their exercising; this is shown in Table 13 and Figure 23. Those who are always confident with their exercising exhibit better functional ability than those who are only sometimes confident with their exercising.
Table 13: Test for significance in table format of functional ability between those who are always confident with their exercising and those who are sometimes confident with their exercising.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>Partial eta-squared</th>
<th>Non-centrality</th>
<th>Observed power (alpha=0.05)</th>
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<td>0.95488</td>
<td>1164.17</td>
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<tr>
<td>ConfidenceExc_56</td>
<td>3063.5</td>
<td>1</td>
<td>3063.5</td>
<td>20.287</td>
<td>0.000035</td>
<td>0.269463</td>
<td>20.287</td>
<td>0.99313</td>
</tr>
<tr>
<td>Error</td>
<td>8306.4</td>
<td>55</td>
<td>151.0</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 23: Test for significance in graphic representation of functional ability between those who are always confident with their exercising and those who are sometimes confident with their exercising.
Those who are sometimes confident with their exercising have 19% greater functional ability than those who are always confident with their exercising. This raises the question as to whether confidence may be related to personality or beliefs.

The differences in organic beliefs scores with the self-reported rating of confidence with exercising are shown in the box plot (Figure 23). The median score of the sum of organic beliefs for both the group who sometimes felt confident with exercising, and the group that always felt confident with exercising is 25. The median score is 22 for the group who always felt confident with exercising, and 29 for the group who rarely felt confident with exercising.

Figure 24: Box plot of the sum of organic beliefs grouped by the self-report of confidence with exercising.
ANOVA one-way tests for significance of differences in the sum of organic beliefs with the self-reported confidence with exercising for all groups are shown in Table 14 and Figure 25 as \( p = 0.003 \). This analysis means a significant association between high organic pain beliefs and poor confidence with exercising.

Table 14: Test for significance in table format between the sum of organic beliefs about pain and confidence with exercising.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>Partial etasquared</th>
<th>Non-centrality</th>
<th>Observed power (alpha=0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>34177.6</td>
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<td>1090.41</td>
<td>1.00000</td>
</tr>
<tr>
<td>ConfidenceExc_56</td>
<td>439.2</td>
<td>3</td>
<td>146.43</td>
<td>4.672</td>
<td>0.003993</td>
<td>0.10304</td>
<td>14.01</td>
<td>0.88584</td>
</tr>
<tr>
<td>Error</td>
<td>3823.9</td>
<td>122</td>
<td>31.34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 25: Test for significance in graphic representation between the sum of organic beliefs about pain and confident with exercising.
The data show a 12% lower scoring of organic beliefs associated with confidence on exercising. The more confident a person feels about exercising, the less likely they are to have negative organic beliefs about controlling their pain experience.

6.7 Confidence about stopping exercise for recovery or rest

The confidence that participants had in their ability to stop for recovery or rest during exercise was measured using the self-reported rating of a 5-point Likert scale (0 = never know how to stop; 1 = rarely know how to stop; 2 = sometimes know how to stop; 3 = almost always know how to stop; 4 = always know how to stop). The data is shown in the histogram (Figure 26). No one reported never being confident about being able to stop exercising.
Figure 26: Histogram of self-reported ability to be able to stop exercise for recovery or rest.

The differences in AIMS2-SF scores of functional ability with the self-reported rating of ability of stopping exercising for recovery or rest are shown in the box plot (Figure 27).
Figure 27: Box plot showing the differences in functional ability with the self-reported ability to be able to stop exercise for rest or recovery.

There is no significant difference (p = 0.57) seen in the test for significance using ANOVA one-way analysis between functional ability (as measured by the AIMS2-SF sum) for those who are always able to stop their exercising (for recovery or rest), and those who are sometimes able to stop their exercising (for recovery or rest). This is shown in Table 15.
Table 15: Tests for significance using ANOVA one-way analysis between the AIMS2-SF sum of functional ability with the self-reported ability to be able to stop exercise for rest or recovery.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
<th>p</th>
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<tr>
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<td>65664.4</td>
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<td>RestFromExc_57</td>
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<td>1</td>
<td>69.18</td>
<td>0.3203</td>
<td>0.575010</td>
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<td>0.3203</td>
<td>0.085392</td>
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<td>Error</td>
<td>7558.39</td>
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<td>215.95</td>
<td>1.00000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.8 The self-reported rating of previous physical ability e.g. sports/dancing prior to the pain experience.

The self-reported rating of previous physical ability such as sports or dancing prior to the pain experience was measured using the self-reported rating of a 5-point Likert scale (0 = poor; 1 = below average; 2 = average; 3 = above average; 4 = excellent). Forty-eight percent of participants reported an average physical ability; 46% reported above average or excellent physical ability. The data are shown in the histogram (Figure 28).
The differences in AIMS2-SF scores of functional ability with the self-reported rating of physical ability prior to pain experience are shown in the box plot (Figure 29). This graph shows similar functional ability between all the groups; only 2% of participants had poor physical ability. The median score of functional ability for excellent physical ability prior to the pain experience is 55; the median score of functional ability for an average physical ability prior to the pain experience is 56.5.
Figure 29: Box plot of differences in functional ability with self-reported rating of physical ability prior to pain experience.

6.9 The self-reported rating of previous athletic ability prior to the pain experience.

The rating of previous athletic ability prior to the pain experience was measured using the self-reported rating of a 5-point Likert scale (0 = poor; 1 = below average; 2 = average; 3 = above average; 4 = excellent, at national level). Fifty-five per cent of participants reported average athletic ability; 21% of participants reported above average athletic ability; 5% of participants reported excellent athletic ability (at national level); 15% of participants reported below average athletic ability; 4% of participants reported poor athletic ability. The data are shown in the histogram (Figure 30).
Figure 30: Histogram of self-reported athletic ability prior to pain experience.

The differences in AIMS2-SF scores of functional ability with the self-reported rating of athletic ability prior to pain experience are shown in the box plot (Figure 31). This graph shows a similar functional disability between all the groups. Only 4% of participants had poor athletic ability. The median score of functional ability for above average athletic ability prior to the pain experience is recorded as 52; 64 is the median score of functional disability for the average athletic ability prior to the pain experience.
Tests for significance using ANOVA one-way analysis showed no significant differences (p = 0.11) between the groups. The test for significance between the rating of above average athletic ability and that of poor athletic ability is shown in Table 16. Previous athletic ability in this study is not likely to affect functional ability.
Table 16: Test for significance between self-reported above average athletic ability and poor athletic ability prior to pain experience.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
<th>F</th>
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<th>Partial eta-squared</th>
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<td>57935.0</td>
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<td>332.534</td>
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<tr>
<td>AthletAble_59</td>
<td>458.96</td>
<td>1</td>
<td>458.96</td>
<td>2.634</td>
<td>0.115399</td>
<td>0.08327</td>
<td>2.634</td>
<td>0.34826</td>
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<tr>
<td>Error</td>
<td>5052.44</td>
<td>29</td>
<td>174.22</td>
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</tr>
</tbody>
</table>
6.10 *The use of over-the-counter/non-prescriptive medication*

The data show an even spread amongst those who never used over-the-counter medication, those who occasionally used over-the-counter medication, and those who regularly used over-the-counter medication. These are shown in the histogram (Figure 32).

**Figure 32: Histogram of self-reported uses of over-the-counter medication.**
Differences in AIMS2-SF scores of functional ability with the use of over-the-counter medication are shown in the box plot (Figure 33).

**Figure 33: Box plot of differences in functional ability between self-reported uses of over-the-counter medication.**

Tests for significance using ANOVA one-way analysis between these groups showed no significant differences (p = 0.11). The difference between those who occasionally used over-the-counter medication and those who regularly used over-the-counter medication is shown in Table 17.
Table 17: Test for significance using one-way ANOVA analysis between occasional and regular use of over-the-counter medication with functional ability.

<table>
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<th>Degr. of Freedom</th>
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<td>1814.84</td>
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<td>MedsFreqCounter_67</td>
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<td>1</td>
<td>377.5</td>
<td>2.616</td>
<td>0.10979</td>
<td>0.032051</td>
<td>2.616</td>
<td>0.358769</td>
</tr>
<tr>
<td>Error</td>
<td>11400.5</td>
<td>79</td>
<td>144.3</td>
<td>1</td>
<td>0.00000</td>
<td>0.00000</td>
<td>1814.84</td>
<td>1.00000</td>
</tr>
</tbody>
</table>

6.11 The self-reported effectiveness of over-the-counter medication to improve the pain experience.

The data show that 58% found over-the-counter medication was helpful in improving their pain experience. This is shown in the histogram (Figure 34). Eighteen per cent reported taking over-the-counter medication which was not helpful.
Figure 34: Histogram of self-reported effect of over-the-counter medication to improve pain experience.

Differences in AIMS2-SF scores of functional ability with the self-reported effect of over-the-counter medication on the pain experience are shown in the box plot (Figure 35). The functional ability proved similar in both groups who reported that the over-the-counter medication was either “helpful” or “not sure”.
Figure 35: Box plot of differences in functional ability between the self-reported effects of over-the-counter medication on pain experience.

Tests for significance (p = 0.00046) between the self-reported effect of over-the-counter medication and functional ability used ANOVA one-way analysis and are shown in Table 18 and Figure 36.
Figure 36: Test for significance in graphic representation between the self-reported effects of over-the-counter medication on pain experience.

Table 18: Test for significance in table format using one-way ANOVA between functional ability and self-reported effect of over-the-counter medication.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
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<th>Observed power (alpha=0.05)</th>
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<td>1.0000</td>
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<tr>
<td>MedsCounterHelp_68</td>
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<td>2</td>
<td>1191.1</td>
<td>8.351</td>
<td>0.0005</td>
<td>0.15087</td>
<td>16.70</td>
<td>0.95859</td>
</tr>
<tr>
<td>Error</td>
<td>13406.9</td>
<td>94</td>
<td>142.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.12. The use and effect of prescription medication for pain experience

Seventy per cent take regular prescription medication as shown in the histogram (Figure 37).

Figure 37: Histogram of frequency of prescription medication use.
Seventy-one per cent find their prescription medication helpful in improving the experience of pain as shown in the histogram (Figure 38).

**Figure 38: Histogram of self-reported effect of prescription medication on pain experience.**

The differences in functional ability between the three self-reported effects of prescription medication are shown in box plot (Figure 39). The median score for functional ability for those who found their prescription medication helpful was 54; the median score for functional ability for those who did not find their prescription medication helpful was 66.5.
Tests for significance using ANOVA one-way analysis showed significance (p = 0.024) with poorer functional ability between those who reported their prescription medication not helpful, and those who reported their prescription medication to be helpful. The tests for significance are shown below in Table 19 and in Figure 40.
Figure 40: Test for significance in graphic representation of functional ability between self-reported effect of prescription medication being helpful or not helpful.

Table 19: Test for significance in table format of functional ability between self-reported effect of prescription medication being helpful or not helpful.
There was a larger significant difference in functional ability between those who were not sure about their prescription medication being helpful and those who did not find their prescription medication helpful. The ANOVA one-way analysis is shown in Table 20 and in Figure 41.

Table 20: ANOVA test for significance of functional ability between self-reported effect of prescription medication being helpful or not sure about being helpful.

<table>
<thead>
<tr>
<th>Effect</th>
<th>SS</th>
<th>Degr. of Freedom</th>
<th>MS</th>
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</table>

Figure 41: ANOVA test for significance in graphic representation of functional ability between self-reported effect of prescription medication being helpful, or not sure about being helpful.
6.13 Summary of significant findings

The data show significant relationships to functional ability; these include the feelings of anger, the frequency of exercise, the confidence or enjoyment with exercise, and the use of prescription medication. However, the relationship is weak. It is based on only one Likert scale for each item in the questionnaire.
7. Discussion

7.1 Outcomes achieved

The primary hypothesis in this study is confirmed. There is a significant relationship between organic beliefs about pain and functional ability. This was shown for participants in the ANZ exercise classes and education programmes. The sample consisted of patients with arthritic conditions with pain for 8 years or more (51%), and ranged from age 22 to 91 years (mean age of 65 years; SD 11.7 years).

The participants in this study would have had the benefit from the education and support provided by ANZ for managing their pain and improving their exercise and functioning. It is not possible in this study to measure the modifying extent of the participants’ involvement with the ANZ programmes. This correlation is present despite the membership and participation with ANZ.

Those with high organic beliefs, the belief that the pain experience indicates harm or a threat to well-being, exhibit poor functional ability in arthritic conditions. The converse is also true. This strong evidence dissects organic beliefs from psychological beliefs for their respective influence on functional ability. Furthermore, this study’s contribution confirms the current literature that the transition from acute to persistent pain is associated with cognitive-affective factors (such as negative beliefs and low self-efficacy) [110-116]. Organic pain beliefs contribute to the perception that pain is harmful and that control of pain is not possible, weaving a common thread with catastrophising.
Catastrophising has been shown to influence functional ability. It influences the perception of harm and disability associated with the pain experience, and influences the expectations of recovery [117, 118]. Pain catastrophising plays a significant role in the experience of persistent pain and it predicts the persistence of pain [119-122]. This raises the possibility that organic pain beliefs may have similar effects to catastrophising in influencing outcomes in those with persistent pain. The most recent literature about catastrophising shows that the relationship between coping, pain adjustment and catastrophising is still not fully understood [123].

This study raises the differences between the two dimensions of pain beliefs, organic and psychological beliefs, and their relationship with functional ability. It has been shown that psychological and occupational factors can also contribute to persistence of the pain experience [124-130]. In this sample, it is shown that psychological beliefs, the beliefs about the internal influences and feelings affecting the experience of pain, do not have any relationship to functional ability. This is in contrast to systematic reviews that have shown psychological and occupational factors to have the highest reliability for prognostic factors contributing to persistence of the pain experience [124-128]. There is a growing body of research supporting the model that the transition from acute to persistent pain is associated with serious life stressors including cognitive-affective factors [114]. When the PBQ was first developed it was noted that patients with persistent pain were more likely to support the organic beliefs items while non-patients were more likely to support the psychological beliefs items [23].
The secondary aim of this study explored the relationships between other variables and demographic data and functional ability. Significant relationships were found of poorer functional ability in participants viz. those who often have feelings of anger and resentment about pain; those who exercised once a week rather than five times a week; those who only sometimes enjoyed their exercise rather than always enjoyed their exercise; those who were sometimes confident with their exercise rather than always confident with their exercise; and those who reported their prescription medication not to be helpful.

The association of anger and resentment about pain and poorer functional ability is consistent with the current literature which indicate that psychological factors contribute to poorer outcomes [131, 132].

This study showed that those who enjoy and feel confident about their exercise have better functional ability. The findings raise the possibility that confidence and enjoyment of exercise might influence adherence or outcomes of exercise intervention since it has been shown that expectations for recovery are strongly related to the actual recovery itself [133], and that outcomes are affected by the emotional component of the pain experience [134]. Physiotherapy research outcomes have, however, traditionally been measured by adherence [135]. Physiotherapists in some clinical practices might have restricted access to psychological services for patients with persistent pain, and cognitive behavioural therapy might be difficult to implement when patients prefer an active intervention for their pain management [136]. The ideal optimal rehabilitation regime for persistent pain is yet to be determined [80]. Further research towards improving exercise
outcomes is needed as confidence about performing exercise influences functional ability significantly.

Participants who found their prescription medication helpful also experienced better functional ability. This study provides insight into the use of prescription medication by this sample group. Interestingly, adherence to taking the prescribed medication is reported by some who perceive it as not being helpful, this group showing poor functional ability. This raises the question about whether or not medication is effective for this group.

Recent research has shown in a population of rheumatoid arthritis (RA) patients the experience of pain is an important predictor of psychosocial health. This is in spite of disease modifying anti- rheumatic drugs having significantly prevented the progression of the disease pathology [8]. A recent meta-analysis of measures of medication adherence in a population of RA patients shows that methods to assist and improve medication adherence need to be improved and better understood. [137]. Furthermore, this study showed that eighteen per cent reported taking over-the-counter medication and that it was not helpful. The question arises as to why a person would take over-the-counter medication when it is not perceived to be helpful.
7.2. Strengths and weaknesses

The strength of this study is the novel association of the AIMS2-SF and the PBQ for arthritic conditions and the evidence that this relationship is consistent with other research. A correlation of these two instruments has not yet been applied to the author’s knowledge. A further strength is the specific focus on ANZ with a moderate sample size within a larger population of patients with arthritic conditions, accompanied by a robust statistical analysis.

Several factors might account for the fact that the psychological beliefs do not show a relationship with functional ability. The psychological beliefs scale has only four questions in contrast to the eight in the organic scale. It is perhaps a limitation of this questionnaire that the psychological beliefs are less featured, or that specifically it is the organic beliefs rather than psychological beliefs that contribute to the persistent pain affecting functional ability. Sixty-one per cent of participants had joined the ANZ organisation over the previous three years. The functional ability and organic beliefs of responders may have been modified through their previous participation in the seminars and exercise groups. This could have influenced the data acquired.

As the study was not longitudinal in design, the direction of effects between the organic pain beliefs and functional ability could not be determined. Also, the sample group is limited to members of ANZ in a small geographical area. These findings need to be confirmed in wider areas. Non-responders were 35% of those approached there is the possibility that their beliefs about pain and functional ability may have differed from those of the responders.
There was a high percentage (85%) of female participants in the sample. It has been shown that men have different beliefs about pain and express them differently from women and their levels of functional ability associated with persistent pain might also differ [138, 139]. The study only captured 4% of Maori participants, due to Christchurch being on the South Island with lower populations of Maori and Pacific Islanders. New Zealand health statistics generally show poorer health and socioeconomic status for Maori and Pacific Island populations.

7.3. Implications for clinical practitioners

Research outcomes for evidence-based medicine are becoming more important for everyday clinical decisions and health funding. This study provides evidence that organic beliefs and functional ability are indeed related. It is recommended that clinicians ask their patients about pain beliefs. It would be sensible to address organic pain beliefs early in their consultations, as patient beliefs about pain are influenced by interactions with health professionals [140-142]. The way to do this may be to make use of target questions to reveal possible underlying organic beliefs possibly contributing to poor functional ability. For example, “Do you believe that it is impossible for you to control your pain?” or “Do you believe that your pain means that there is something permanently wrong with your body?” Patients with arthritic conditions who respond in the affirmative should be encouraged to modify their organic beliefs. Information and education based on a biopsychosocial model have been shown to be effective in modifying beliefs, improving outcomes and in treatment compliance [85].
These data show a significant relationship for better functional ability being associated with less organic pain beliefs; less feelings of anger and resentment about pain; exercise five times a week; enjoyment and confidence with exercise and taking prescription medication as prescribed. A model is suggested for practitioners to use as a tool in the clinical setting. It is not a model of causality, but a representation of the intertwined relationships found in this study. This model may help practitioners to explain organic pain beliefs and the other factors that have been shown to be related to functional ability. This could help improve patients’ understanding and motivation about modifying their pain beliefs, their feelings of anger and resentment about pain, exercise frequency, enjoyment and confidence with exercise, and taking prescription medication.
Figure 42: Model for use in clinical practice to demonstrate the intertwined influences on functional ability for arthritic conditions.
7.5. Implications for future research

These data show that organic beliefs and functional ability are significantly related. However, psychological beliefs and functional ability are not. Future research could determine the direction of this effect and the main predictors for the direction of this effect for ANZ. The possible causal relationship between pain beliefs and functional ability in arthritic conditions needs further exploration. Furthermore, the relationship between organic beliefs and catastrophising needs to be investigated. The influences of organic and psychological pain beliefs on functional ability are likely to be important in other medical conditions and also need to be explored. Cultural and gender factors influencing pain beliefs in different populations (e.g. Maori and Pacific Islanders, refugees, other minority groups in New Zealand) may also be relevant.

This study confirmed a relationship between organic beliefs about pain and functional ability shown by participants in the ANZ exercise classes and education programmes. As already stated the functional ability and beliefs of responders may have been modified through their previous participation in the seminars and exercise groups. How the specific programmes of ANZ influence and modify beliefs about pain or improve functional ability needs further study as well as variability in efficacy in other geographic locations within New Zealand.

The methodology used in this study was not able to detect a relationship between the psychological beliefs about pain and functional ability. Perhaps arthritic conditions have psychological features about their belief systems that differ from other population groups with pain. The influence of psychological feelings on the experience of pain in arthritic
conditions should be further explored. Table 21 summarises the potential questions for future research that would be worthwhile pursuing from this study’s primary hypothesis.

Table 21: Summary of primary significant findings with future research possibilities.

<table>
<thead>
<tr>
<th>Significant finding</th>
<th>Statistical Analysis</th>
<th>Future research</th>
</tr>
</thead>
</table>
| Functional ability and organic beliefs | Poor functional ability is associated with high organic beliefs | \( r = 0.32 \) \( p = 0.0002 \) | a) the direction of effect and causal links behind functional ability and organic beliefs  
b) determine the main predictors for the direction of this effect for Arthritis New Zealand in particular  
c) how the programmes of ANZ influence and modify beliefs about pain and affect functional ability  
d) how effective the ANZ programmes are to influence and modify beliefs about pain and improve functional ability  
e) how ANZ programmes across NZ differ in their ability to modify beliefs about pain and improve functional ability  
f) clarify the relationship between organic beliefs and catastrophising. |
| Cultural factors of functional ability and organic beliefs in New Zealand minority groups | 88% NZ European | a) the functional ability and organic beliefs of other minority groups is not represented in this data set; this needs investigation |
This study also provides a platform for further research with the exploration of relationships in the covariate data. New questions could be raised and new possibilities verified. Table 22 lists the secondary significant findings of the covariate data, and raises questions that would be worthwhile pursuing in future.

Table 22: Summary of secondary significant findings with future research possibilities.

<table>
<thead>
<tr>
<th>Significant finding</th>
<th>P score</th>
<th>Future research</th>
</tr>
</thead>
</table>
| Feelings of anger and resentment about pain               | p = 0.00006 | a) Validate that there is poorer functional ability in those who often have feelings of anger and resentment about pain.  
b) Validate the direction of effect between functional ability and feelings of anger and resentment about pain  
b) Validate a reliable measure to determine feelings of anger and resentment about pain |
| Frequency of exercise: once a week versus five times a week | p = 0.025 | a) Although higher frequency of exercise has already been shown widely in research to be better than a lower frequency, specific programmes that are shown to be better than others to improve functional ability are sparse.  
b) Validate the direction of effect between frequency of exercise and functional ability. |
<table>
<thead>
<tr>
<th>Significant finding</th>
<th>P score</th>
<th>Future research</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enjoyment of exercise:</strong> “sometimes” versus always</td>
<td>Poorer functional ability for those who only sometimes enjoy their exercise</td>
<td>p = 0.000024.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) Validate that there is poorer functional ability for those who only sometimes enjoy their exercise.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Validate the direction of effect between functional ability and enjoyment of exercise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Validate a reliable measure to determine enjoyment of exercise</td>
</tr>
<tr>
<td><strong>Confidence with exercise:</strong> “always” versus “sometimes” confident</td>
<td>Poorer functional ability for those who are sometimes confident</td>
<td>p = 0.000035.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) Validate that there is poorer functional ability for those who are only sometimes confident with their exercise.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Validate the direction of effect between functional ability and confidence with exercise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Validate a reliable measure to determine enjoyment of exercise</td>
</tr>
<tr>
<td>The use of prescription medication: “helpful” versus “not helpful”</td>
<td><strong>Significant finding</strong></td>
<td><strong>P score</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Poorer functional ability between those who reported their prescription medication not helpful</td>
<td>p = 0.024</td>
</tr>
</tbody>
</table>
8. Conclusion

This study confirmed a relationship between organic beliefs about pain and functional ability for participants in the ANZ exercise classes and education programmes. The sample had a mean age of 65 years (SD 11.7 years) and fifty-one per cent of participants had experienced more than 8 years of pain. Organic pain beliefs, the belief that the pain experience indicates harm or threat to well-being, are significantly associated with poorer functional ability. This was confirmed by linear regression with an r-value of 0.32 where \( \alpha \) was 0.05 and 1 - \( \beta \) was 0.8. Psychological pain beliefs, the beliefs about internal influences and feelings affecting the experience of pain, are not associated with functional ability. It is possible in this study that beliefs had already been modified by the ANZ programmes.

When functional ability is impaired, it is recommended that organic beliefs about pain be addressed in the management of arthritic conditions. It is recommended that clinicians ask their patients about pain beliefs and address organic pain beliefs early in their consultations. Patients with arthritic conditions who respond in the affirmative should be encouraged to modify their organic beliefs and a model is developed as a tool to assist clinicians.

Future research in arthritic conditions needs to determine the possible relationship organic beliefs have with catastrophising, as well as establish the causality between pain beliefs and functional ability. Covariate data show some interesting trends with significant relationships that are worthwhile pursuing. Better functional ability was influenced significantly by the following: those with less feeling of anger and resentment
about pain; those who exercised five times a week; those who always enjoyed their exercise; those who were always confident with their exercise and those who reported their prescription medication to be helpful. This study provides evidence for further research to validate which could potentially improve the outcomes of interventional programmes.
9. References


Appendices

Appendix 1: Publication acceptance with international journal: “Rehabilitation Research and Practice”

28/04/2012

The review of the Clinical Study 206263 titled "The Relationship between Beliefs about Pain and Functional Ability in Rheumatological conditions," by Tracey Pons, Edward Shipton and Roger Mulder submitted to Rehabilitation Research and Practice, has been completed, and I am pleased to inform you that your manuscript has now been accepted for publication in the journal.

The publication process of your manuscript will be initiated upon the receipt of the electronic files. Please login to the Manuscript Tracking System at the link below using your username and password, and upload the electronic files of your final accepted version within the next 2-3 days.

The electronic files should include the following:

1- Source file (Word or TeX/LaTeX).
2- Final PDF file of the accepted manuscript.
3- Editable Figure files (each figure in a separate eps/postscript/word file) if any, taking into consideration that tiff, jpg, jpeg, bmp formats are not editable.

Thank you again for submitting your manuscript to Rehabilitation Research and Practice.

Best regards,

K. S. Sunnerhagen
The Relationship between Beliefs about Pain and Functioning with Rheumatologic conditions

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Disclosure Policy
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Abstract
Beliefs about pain are an emerging area of research in pain. Pain beliefs influence motivation, compliance, and understanding about pain mechanisms and outcomes. This study in rheumatologic conditions sought to determine if a relationship between beliefs about pain and functioning could be found.

Voluntary, anonymous participation was sought from participants of Arthritis New Zealand’s (ANZ) programmes of exercise classes and education. Demographic data, and validated instruments were used, namely; the Arthritis Impact Measurement Scale 2nd version – Short Form (AIMS2-SF) to measure functioning, and; two scales of organic and psychological beliefs in Pain Beliefs Questionnaires (PBQ) to measure pain beliefs.

236 Members of ANZ were surveyed anonymously with AIMS2-SF and PBQ, with a 61% response rate; 144 participants’ responses were entered into the database. This study used α of 0.05, and a 1- β of 0.8 to detect for significant effect size estimated to be r = 0.25. This significance level was for linear regression analysis of relationship between scores of AIMS2-SF and organic and psychological beliefs of PBQ. Analysis revealed a significant relationship between organic beliefs scale of PBQ and functioning of AIMS2-SF, with an r-value of 0.32 and p value of 0.00008. No relationship was found between psychological beliefs scale of PBQ and AIMS2-SF.

Organic pain beliefs, indicating harm or threat to well being, are associated with poorer functioning. Psychological pain beliefs are not. In this study beliefs might have been modified by ANZ programmes. Clinicians should ask their patients about and address organic pain beliefs early in consultation. Future research to improve interventional programme outcomes should clarify the causal links between organic pain beliefs and functioning.
Beliefs about pain are an emerging area of research in the bio-psychosocial model of pain. Research shows that negative pain beliefs have a detrimental impact on patients’ overall health, self-efficacy and function [1]. With the intervention of a self-management programme of exercise and relaxation for arthritis sufferers, positive changes from negative pain beliefs correlate with improvement in self-efficacy [2]. The experience of pain is a significant problem in sufferers with rheumatoid arthritis; it has been recently shown to be an important predictor for psychosocial health in general [3]. Furthermore, for rheumatoid arthritis, both the extent of the disease as well as the belief that pain could be capably managed has been found to impact on functioning [4,5].

Beliefs have been defined as personally or culturally shared cognitive configurations [6]. These differ from attitudes that are defined as feelings about events. Beliefs are thoughts or mental appraisals and understanding of these events. These form the pre-existing concepts about the nature of reality for the individual. These thoughts may be generalised or specific to certain contexts, mould the individual’s perception of the environment, and shape the meaning of their experiences [7].

These thoughts can positively influence beliefs about the pain experience if, as perceived, there is control in managing the pain experience, confidence that the extent of harm and associated disability are not threatening, and expectations of recovery [8]. These thoughts can negatively influence beliefs about the pain experience if, as perceived, control is threatened and recovery is not possible [9]. The consequence can be emotional distress and catastrophising, as well as excessively negative and pessimistic beliefs and thoughts about the pain experience. Specific pain beliefs that contribute to poor compliance, motivation and misunderstanding about pain have been identified [10]. These include catastrophising, limited perception of control over the pain experience, and emotional distress. Catastrophising has been shown to be associated with persistent pain; it is a predictor of poor outcomes in pain management interventions [5,11]. Although catastrophising and emotional distress have common characteristics, it is difficult to separate them in the direction of effect. Thoughts about pain affect physical functioning
and contribute to disability; physical functioning is predicted by the beliefs of physical capabilities and not by the experience of self reported pain [12,13,14].

There is evidence that addressing negative pain beliefs in the management of persistent pain can affect treatment outcomes [4,5,15]. Negative pain beliefs can contribute to the transition from acute pain to persistent pain [6,10].

It has been suggested that beliefs about persistent pain have two dimensions. These include organic pain beliefs (referring to the physiological pain experience indicating physical harm or threat to well being), and psychological pain beliefs (referring to the internal influences and feelings affecting the experience of pain that can potentially threaten well being); these dimensions are considered to accurately reflect the general population’s perception of the pain experience [16]. Both these can potentially influence the beliefs about pain control either positively (having personal control over the pain experience), or negatively (feeling helpless to manage the potential threat to their well being).

The aim of this study was to determine the relationship between functioning and pain beliefs in patients with musculoskeletal pain or rheumatologic conditions. The primary hypothesis is that a relationship exists, whereby beliefs about persistent pain are associated with functioning. It is expected that a low score (less negative beliefs about pain) of the Pain Beliefs Questionnaire (PBQ) to be associated with better functioning in the Arthritis Impact Measurement Scale, second version, short form (AIMS2-SF). Likewise it is expected that a high score (greater negative beliefs about pain) of the PBQ to be associated with poorer functioning in the AIMS2-SF. The null hypothesis is that any observed relationship is simply due to chance.

**Materials and Methods**

Members of Arthritis New Zealand (ANZ) who attended an exercise class, an individual education session with an ANZ Educator, or an education seminar were asked to voluntarily complete an anonymous questionnaire containing 72 questions. All 236 members taking part in the above activities were personally approached to participate in the study. Data was collected over six months, from 01 May 2010 to 31 October 2010. Care was taken to ensure that no participant answered a questionnaire twice. Most
returned the answered questionnaire by mail in a preaddressed stamped envelope. Two participants declined to take part in the study, and were not issued with a questionnaire. Eighty-two participants responded as willing to participate, were issued questionnaires, but did not return them. Ten questionnaires were returned with less than half completed; these participants had missed out the middle pages as they filled them in. These were not entered into the database. Only if more than 50% of the questionnaire had been completed was it entered into the database. A total sample of 144 participants completed the questionnaires (a response rate of 61%). A flow chart (Figure 1) shows the details of the data collection.

Figure 1 - Flow chart: Method of data collection

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ANZ public education and exercise classes: 01 May 2010 – 01 Sept 2010</td>
</tr>
<tr>
<td>2</td>
<td>n = 236</td>
</tr>
<tr>
<td>3</td>
<td>Personal invitation to ANZ member to answer questionnaire and return by self addressed and stamped envelope in mail</td>
</tr>
<tr>
<td>4</td>
<td>n = 236</td>
</tr>
<tr>
<td>5</td>
<td>n = 2 refuse to participate</td>
</tr>
<tr>
<td>6</td>
<td>n = 80 did not return questionnaire</td>
</tr>
<tr>
<td>7</td>
<td>n = 10 over half incomplete and not entered into database</td>
</tr>
<tr>
<td>8</td>
<td>n = 144 full responses</td>
</tr>
<tr>
<td>9</td>
<td>61% response rate entered into Statistica 9</td>
</tr>
</tbody>
</table>

ANZ is a national voluntary organisation representing those with formal rheumatologic diagnoses. It functions as a charitable trust with modest government funding. Activities include member education on arthritis and pain management, exercise classes, and seminars [17]. Ethical approval was obtained from the Upper South Island A Regional
Ethics committee (reference number URA/10/04/026). The process followed in this study was in accordance with the Helsinki Declaration of 1975, as revised in 1983.

The questionnaires consisted of the PBQ and the AIMS2-SF. In addition further questions were asked about the following: gender; duration of pain experience; age; number of months of physiotherapy intervention; type and frequency of regular exercise; enjoyment and confidence with exercise; ability to stop exercise; previous physical and athletic ability; anger about pain; duration of membership with ANZ; ethnicity (as defined by Statistics New Zealand) [18], education level; rheumatologic diagnosis; number of months off work; smoking habit, and; medication use.

**Instruments to measure beliefs about pain**

Several questionnaires are used to measure the beliefs about pain. The Pain Beliefs Questionnaire (PBQ) is a validated and reliable questionnaire that taps into the two dimensions of pain beliefs (organic and the psychological beliefs), and was developed to describe these beliefs about pain [16,19,20]. It was chosen for this study as it allowed for differentiation between these two separate dimensions of pain beliefs, was easy to administer and was not time consuming or lengthy for patients. The questions of the PBQ are listed in Table 1.

The internal consistency of each scale of the PBQ has been shown to be 0.73 for the organic scale and 0.70 for the psychological scale [16]. A Likert scale of 1-5 was used to measure each question. The organic scale consists of eight questions; these measure the extent of the belief that that personal control of the pain is impossible (due to physical harm or injury believed to be associated with the pain experience). The psychological scale consists of four questions; these measure the extent of the belief that personal control of the pain is linked to the emotional feelings about the pain experience. The higher the summed score on the PBQ, the greater is the belief that harm and emotional feelings negate personal control of the pain experience.
Table 1: PBQ organic and psychological pain beliefs of the PBQ

<table>
<thead>
<tr>
<th>Organic pain beliefs</th>
<th>Psychological pain beliefs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent pain is the result of damage to tissues of the body</td>
<td>Being anxious makes persistent pain worse</td>
</tr>
<tr>
<td>Physical exercise makes the persistent pain worse</td>
<td>Thinking about persistent pain makes it worse</td>
</tr>
<tr>
<td>It is impossible to do much for oneself to relieve persistent pain</td>
<td>When relaxed persistent pain is easier to cope with</td>
</tr>
<tr>
<td>Persistent pain is a sign of illness</td>
<td>Feeling depressed makes persistent pain seem worse</td>
</tr>
<tr>
<td>Experiencing persistent pain is a sign that something is wrong with the body</td>
<td></td>
</tr>
<tr>
<td>It is impossible to control your own persistent pain</td>
<td></td>
</tr>
<tr>
<td>Being in persistent pain prevents you from enjoying hobbies and social activities</td>
<td></td>
</tr>
<tr>
<td>The amount of persistent pain is related to the amount of damage</td>
<td></td>
</tr>
</tbody>
</table>

There are other seven questionnaires that measure beliefs about pain; these were excluded, as they were either too lengthy, not specific to rheumatologic conditions or outside the domain of this study. They were as follows: the Illness Perceptions Questionnaire (revised) [21]; the Back Beliefs Questionnaire [22]; the Fear Avoidance Beliefs Questionnaire (FABQ) [23]; the Survey of Pain Attitudes (SOPA) [24]; the Pain Beliefs and Perceptions Inventory (PBAPI) [25]; the Pain Cognitions Questionnaire [26], and; the Cognitive Risk Profile [27].

**Instruments to measure functioning**

Research has shown that self-report questionnaires are valid measures for the assessment of functioning [28]. There are a wide variety of functioning measures that can be determined using questionnaires. The AIMS2-SF questionnaire was chosen for this
project as: (i) it is appropriate for the population sample of rheumatologic conditions, and; (ii) it is an instrument that measures upper limb, lower limb, and whole body functional movements (unlike most other instruments that do not); (iii) it is a suitable and reliable instrument for measuring disability in personal care for those suffering rheumatologic conditions [29]; and (iv) the shortened version of the revised AIMS2 has been validated, and is reliable with similar psychometric properties; it is easy to administer, and is useful for assessing functioning status with other persistent conditions besides arthritis [30]. The AIMS2-SF is appropriate to use in this study, as it is symptom specific as well as able to reliably enquire about the broader areas of functioning.

The AIMS2-SF was developed in concordance with the World Health Organisation’s (WHO) International Classification of Functioning, Disability, and Health (ICF) [31], and has been widely used for measuring functioning in rheumatologic diseases [29,32,33,34]. The scale includes a broad domain of functional ability with the combination of the five second-order scores. The second-order scores consist of: (i) physical aspects (mobility level, walking, bending, arm/hand/finger function, self-care, household tasks); (ii) affect (level of tension and mood); (iii) self-reported pain; (iv) social interaction (social activity, support from family), and; (v) work.

The Health Assessment Questionnaire is another instrument applied to measuring functioning in rheumatologic conditions [35,36,37]. It was not chosen for this study as the AIMS2-SF covers broader areas of functioning, including work and affect. Fourteen other possible questionnaires considered for this study were excluded; the reasons for this varied. For example, they were not inclusive of both upper and lower limb functioning, addressed back pain only, addressed pain experiences as “sickness”, or restricted the age group involved. These other questionnaires were as follows: the Oswestry Disability Index [38,39]; the Roland Morris Disability Scale [40]; the Acute Low Back Pain Screening Questionnaire [41,42]; the Vermont Disability Prediction Questionnaire [42]; the Screening Questionnaire for predicting outcome in acute and subacute back pain [42]; the Orebro Musculoskeletal Pain Questionnaire [43,44]; the Chronic Pain Coping Inventory [45]; the International Physical Activity Questionnaire [46]; the Pain Disability Index [47]; the West Haven-Yale Multidimensional Pain Inventory [WHYMPI] [48]; the Sickness Impact Profile [49,50,51]; the Physical Activity Scale for the elderly (PASE)
The factorial validity of the AIMS2-SF has been verified [29]. The higher the total summed AIMS2-SF score, the poorer the functioning. The highest possible score is 120; this indicates exceptionally poor functioning. Such a person is highly dependent on assistance for all daily activities, has a high pain experience, and has low mood and poor social support. On the other hand, a low score indicates greater functioning with both upper and lower limbs, with whole body tasks, and with independence.

Analysis

The analysis for this study was to use simple linear regression between the sum of the AIMS2-SF and the sum of each of the two scales of the PBQ. This study used an $\alpha$ of 0.05, and a $1-\beta$ of 0.8 to detect for significant effect size, estimated to be $r = 0.25$.

Results

Demographic data

A sample of 122 participants had been calculated for the effect size ‘r’ of 0.25 [55]; 144 responses (61% response rate) were entered into Statistica 9 ® for statistical analysis. The demographic data for all participants is summarised in Table 2 as predominant percentages of the full data set.
Table 2: Demographic predominant percentage data

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>NZ European 88%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>Osteoarthritis 36%</td>
</tr>
<tr>
<td></td>
<td>Rheumatoid Arthritis 17%</td>
</tr>
<tr>
<td></td>
<td>Fibromyalgia 15%</td>
</tr>
<tr>
<td></td>
<td>Unknown 13%</td>
</tr>
<tr>
<td></td>
<td>Polymyalgia Rheumatica 8%</td>
</tr>
<tr>
<td>Gender</td>
<td>Female 85%</td>
</tr>
<tr>
<td>Age</td>
<td>Mean: 65 years</td>
</tr>
<tr>
<td></td>
<td>Std Dev 11 years, 8 months</td>
</tr>
<tr>
<td></td>
<td>Highest recorded data: 91 years</td>
</tr>
<tr>
<td></td>
<td>Lowest recorded data: 22 years</td>
</tr>
<tr>
<td>Educational level</td>
<td>School only, 55%</td>
</tr>
<tr>
<td>Physiotherapy intervention for pain</td>
<td>54%</td>
</tr>
<tr>
<td>Membership with ANZ within last 3 years</td>
<td>61%</td>
</tr>
<tr>
<td>Smoking</td>
<td>93% non smokers</td>
</tr>
<tr>
<td>Time off work because of pain experience</td>
<td>32%</td>
</tr>
<tr>
<td>Number of years with pain</td>
<td>51% greater than 8 years</td>
</tr>
<tr>
<td></td>
<td>Mean: 130 months (11 years)</td>
</tr>
<tr>
<td></td>
<td>Std Dev: 125 months (10.4 years)</td>
</tr>
<tr>
<td></td>
<td>Highest recorded data: 55 years</td>
</tr>
<tr>
<td></td>
<td>Lowest recorded data: 2 months</td>
</tr>
</tbody>
</table>

The mean age of the participants was 65 years (SD 11 years, 8 months). Eighty-five per cent of the participants were females. The mean for participants’ duration of pain experience was 133 months (almost 11 years of pain). The standard deviation remained large. Most participants in this study were new members of Arthritis New Zealand (ANZ) where 61% of participants had joined the organisation in the past three years.
Eighty-eight per cent of all participants were classified as New Zealand European/Pakeha. The predominant group (36%) suffered from osteoarthritis. Other diagnoses included rheumatoid arthritis (18%), fibromyalgia (15%), no diagnosis given (12%), “undefined” arthritis (7%), inflammatory arthritis (2%), and temporal arteritis, systemic lupus and other diagnoses (1%). Fifty-five per cent of participants received no formal qualification other than schooling.

**Questionnaire data for primary hypothesis testing**

**AIM2-SF scores**

The AIMS2-SF has second-order scores consisting of: (i) physical aspects (mobility level, walking, bending, arm/hand/finger function, self-care, household tasks); (ii) affect (level of tension and mood); (iii) self-reported pain; (iv) social interaction (social activity, support from family), and; (v) work. Each of these second order scores was summed and correlated with the organic scale of the PBQ. The highest correlation was found with the work subscale, $r = 0.36$ and $p = 0.03$. The physical activity, affect and pain experience correlated similarly with $r = 0.34$ and $p = 0.00003$. However social activity had a high correlation, $r = 0.69$ but with no significance $p = 0.4$. This data is outlined in Table 3.
Table 3: Second order AIMS2-SF scales and correlation with PBQ organic scale

<table>
<thead>
<tr>
<th>AIMS2-SF Subscale</th>
<th>Mean</th>
<th>Std Dev</th>
<th>Median</th>
<th>Correlation r with PBQ organic scale</th>
<th>p (linear fit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical activity</td>
<td>295.2</td>
<td>42.3</td>
<td>297</td>
<td>r = 0.34</td>
<td>p = 0.00003</td>
</tr>
<tr>
<td>Affect</td>
<td>10.8</td>
<td>4.2</td>
<td>10</td>
<td>r = 0.33</td>
<td>p = 0.00004</td>
</tr>
<tr>
<td>Pain</td>
<td>9.8</td>
<td>2.8</td>
<td>10</td>
<td>r = 0.34</td>
<td>p = 0.00003</td>
</tr>
<tr>
<td>Social</td>
<td>11.5</td>
<td>2.9</td>
<td>12</td>
<td>r = 0.69</td>
<td>p = 0.4</td>
</tr>
<tr>
<td>Work</td>
<td>3.1</td>
<td>1.7</td>
<td>2</td>
<td>r = 0.36</td>
<td>p = 0.03</td>
</tr>
</tbody>
</table>

The participants showed a reasonable distribution of summed AIM2-SF scores. A higher score is associated with a poorer functioning; a lower score is associated with greater functioning. Fourteen per cent of participants scored between 70 and 100, indicating greater disability; 9% of participants scored below 40, indicating excellent functional health. The mean score was 57 with a standard deviation of 12 points.

**The duration of pain experience**

The mean for the participants’ duration of pain experience was 130 months (11 years) of pain. The standard deviation is large with 125 months (10.4 years). The highest number
of pain recorded by a participant was 55 years and the lowest recorded was 2 months; 51% of participants had experienced 8 years or more of pain.

**Beliefs measured on the organic scale**

The mean score in this project was 24 with a standard deviation of 6.

**Beliefs measured on psychological scale**

The psychological scale of the PBQ mean score was 13 with a standard deviation of 4.

The data for the primary hypothesis testing is outlined in Table 4.

Table 4: Data for primary hypothesis testing

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std Dev</th>
<th>Max score</th>
<th>Min Score</th>
<th>Highest possible score</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIMS2-SF</td>
<td>57.3</td>
<td>12.7</td>
<td>101</td>
<td>27</td>
<td>130</td>
</tr>
<tr>
<td>PBQ organic belief scale</td>
<td>23.8</td>
<td>5.8</td>
<td>37</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>PBQ psychological belief scale</td>
<td>12.6</td>
<td>3.9</td>
<td>20</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Duration of pain (years)</td>
<td>11.1</td>
<td>10.9</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Hypothesis testing for the relationship of the PBQ and the AIMS2-SF

Simple linear regression analysis was applied with each of the subscales sum of the PBQ and the AIMS2-SF. The data showed two different relationships of scatter plot with simple linear regression for each subscale of the PBQ with the AIMS2-SF. The relationship between the organic beliefs subscale reached significance (p = 0.0002) with a modest correlation coefficient (r = 0.32). The Spearman Rank Order Correlation is 0.3297 for the relationship between the two variables ‘sum of AIMS’ vs. ‘sum of BELIEFS’ and is significant at p < 0.05. The relationship for the psychological scale showed no significance (p = 0.4), and no correlation (r = 0.06). The scatter plot with the simple linear regression is shown in Figure 2.

The primary hypothesis tests confirmed that organic beliefs about persistent pain are associated with functioning. A low score (less negative beliefs about pain) of the organic scale of the PBQ was associated with better functioning in the AIMS2-SF. A high score (greater negative beliefs about pain) of the organic scale of the PBQ was associated with poorer functioning in the AIMS2-SF. The psychological scale of the PBQ showed no relationship with disabled functioning.
Figure 2: Scatterplot with linear regressions of the sum of AIMS2-SF disability with both the psychological subscale of the PBQ and the organic subscale of the PBQ.

Discussion

Outcomes achieved

The primary hypothesis in this study is confirmed. There is a significant relationship between organic beliefs about pain and functioning. This was shown for participants in the Arthritis New Zealand exercise classes and education programmes. The sample consisted of patients with rheumatologic conditions with pain for 8 years and more (51%), and ranged from 22 to 91 years in age (mean age of 65 years; SD 11.7 years).

The participants in this study would have benefited from the education and support provided by ANZ for managing their pain, and improving their exercise and functioning. It is not possible in this study to measure the modifying extent due to the participants’
involvement with the ANZ programmes. This correlation is nevertheless present despite the membership and participation with ANZ.

Data from this study show that for patients with rheumatologic conditions who have had pain for more than 8 years and have a high score of organic beliefs, are likely to exhibit poor functioning. High organic beliefs are the beliefs that the pain experience indicates harm or a threat to well being. The converse is also true. This strong evidence dissects organic beliefs from psychological beliefs for their respective influence on functioning. Furthermore, this study’s contribution is consistent with the current literature that the transition from acute to persistent pain is associated with cognitive-affective factors (such as negative beliefs and low self efficacy) [56,57,58,59].

Beliefs contribute to the formation of an individual’s perception of reality. Pain beliefs are thoughts about the perceived control of the pain experience. These include the extent to which the pain experience is perceived to be harmful, the perceived disability associated with the pain experience, and the expectations of recovery [60]. Those who have a low score of organic pain beliefs are likely to have better functioning. This confirms the literature that organic beliefs about pain influence catastrophising and functional disability [60].

Organic pain beliefs contribute to the perception that pain is harmful and that control of pain is not possible; this weaves a common thread with catastrophising. Catastrophising is widely known to influence functional disability; it influences the perception of harm and disability associated with the pain experience, and influences expectations of recovery [61]. It would make sense that high organic pain beliefs should have a relationship with poor functioning. Pain catastrophising plays a significant role in the experience of pain, and predicts the persistence of pain [62,63,64,65]. This raises the possibility that organic pain beliefs have similar effects to catastrophising in influencing outcomes in those with persistent pain. The most recent literature about catastrophising shows that the relationship between coping, pain adjustment and catastrophising is still not fully understood [66].
This study raises the differences between the two dimensions of pain beliefs (organic and psychological), and their relationship with functioning. Psychological and occupational factors can also contribute to persistence of the pain experience [10,67,68,69,70,71]. In this sample, it is shown that psychological beliefs, the beliefs about the internal influences and feelings affecting the experience of pain, do not have any relationship with functioning. This is in contrast to systematic reviews that have shown psychological and occupational factors to have the highest reliability for prognostic factors contributing to persistence of the pain experience [10, 67,68,69,70]. There is a growing body of research supporting the model that the transition from acute to persistent pain is associated with serious life stressors including cognitive-affective factors [56]. When the PBQ was first developed it was noted that patients with persistent pain were more likely to support the organic beliefs items, while non-patients were more likely to support the psychological beliefs items [16].

**Strengths and weaknesses**

The strength of this study is the novel association of the two instruments, the AIMS2-SF and the PBQ for rheumatologic conditions, and the evidence that this relationship is consistent with international research. A correlation of these two instruments has not yet been applied. A further strength is the specific focus on ANZ with a moderate sample size within the larger population of rheumatologic conditions.

Several factors might account for the fact that the psychological beliefs do not show a relationship with functioning. The psychological beliefs scale has only 4 questions, in contrast to the 8 in the organic scale. It is perhaps a limitation of this questionnaire that the psychological beliefs are less featured, or that specifically it is the organic beliefs rather than psychological beliefs that contribute to the persistent pain affecting functioning. The ANZ programmes and input could have influenced the data acquired. Sixty-one per cent of participants had joined the ANZ organisation over the previous three years. The functioning and psychological beliefs of responders may have been modified through their previous participation in the seminars and exercise groups; whereas the organic beliefs may not have been modified.
Since this study was not longitudinal in design, the direction of effects between the organic pain beliefs and functioning could not be determined. Furthermore, the sample group is limited to the members of ANZ in a small geographical area; these findings would need to be confirmed in wider areas. Non-responders were 35% of those approached; there remains the possibility that their beliefs about pain and functioning may have differed from those of the responders.

There was a high percentage (85%) of female participants in the sample. Men might have different beliefs about pain and express them differently; their levels of functional ability associated with persistent pain might differ from those of women [72,73]. The study only captured 4% of Maori participants, due to Christchurch being on the South Island with fewer Maori and Pacific Island populations. New Zealand health statistics generally show poorer health and socioeconomic status for the Maori and Pacific Island populations.

**Implications for clinical practitioners**

Research outcomes for evidence-based medicine are becoming more important for everyday clinical decisions and health funding. This study provides evidence that organic beliefs and functioning are indeed related. It is recommended that clinicians ask their patients about pain beliefs. It would be sensible to address organic pain beliefs early in their consultations, as patient beliefs about pain are influenced by interactions with health professionals [74,75,76]. The way to do this may be to make use of target questions to reveal underlying organic beliefs possibly contributing to poor functioning. For example, “Do you believe that it is impossible for you to control your pain,” or “do you believe that your pain means that there is something permanently wrong with your body?”

Patients with rheumatologic conditions who respond in the affirmative should be encouraged to modify their organic beliefs. Information and education based on a biopsychosocial model have been shown to be effective in modifying beliefs, improving outcomes and in treatment compliance [77].
Implications for future research

These data shows that organic beliefs and functioning are significantly related. However, psychological beliefs and functioning are not. Future research should determine the direction of this effect. The causal links between organic pain beliefs and functional ability for rheumatologic conditions could be further explored, and relationships between organic beliefs and catastrophising investigated. The influences of organic and psychological pain beliefs with functioning in other medical conditions can be probed. Possible cultural and gender factors influencing pain beliefs in different populations (e.g. Maori and Pacific Islanders, refugees, other minority groups in New Zealand) could be considered as well.

This study confirmed a relationship between organic beliefs about pain and functioning (as shown by participants in the Arthritis New Zealand exercise classes and education programmes). As previously stated, the functioning and beliefs of responders may have been modified through their previous participation in the seminars and exercise groups. Specifically, how the programmes of ANZ influence and modify beliefs about pain or improve functioning as well as their variability in efficacy across the different geographic locations, requires more investigation.

The instruments used in this study might not have been able to detect a relationship between the psychological beliefs about pain and functioning. On the other hand, rheumatologic conditions might have psychological features about their belief systems that differ from other population groups with pain? The influence of psychological feelings on the experience of pain in rheumatologic conditions should be explored as well.
Conclusion

This study confirmed a relationship between organic beliefs about pain and functioning for participants in the ANZ exercise classes and education programmes. The sample had a mean age of 65 years (SD 11.7 years); fifty one per cent of participants had experienced more than 8 years of pain, and 61% had joined ANZ in the last three years. Organic pain beliefs (beliefs that the pain experience indicates harm or threat to well being) are significantly associated with poorer functioning. This was confirmed by linear regression with a r-value of 0.32 (where α was 0.05 and 1- β was 0.8). Psychological pain beliefs (beliefs about the internal influences and feelings affecting the experience of pain) are not associated with functioning. In this study that beliefs could have been modified by the ANZ programmes.

When functioning is impaired organic beliefs about pain need to be addressed in the management of rheumatologic conditions. It is recommended that clinicians ask their patients about pain beliefs and address organic pain beliefs early in their consultations. Patients with rheumatologic conditions who respond positively to questioning should be encouraged to modify their organic beliefs.

Future research in rheumatologic conditions will determine the possible relationship between organic beliefs and catastrophising, as well as establish the causality between pain beliefs and functioning.
References


Appendix 2: Questionnaire information sheet

Questionnaire information sheet

Please do not fill out this questionnaire more than once.

Thank you for considering answering this questionnaire. I appreciate your time; it will take you around 10 minutes to complete. You are most welcome to only answer some of the questions or not answer anything at all. You do not need to feel obliged to explain your reasons for not wanting to participate. There is no way of identifying any person who has answered the questionnaire. Your ongoing health care will not be affected in any way by answering this questionnaire or choosing not to participate.

This questionnaire is part of Master’s Thesis research for Tracey Pons. The supervisor for this Thesis is Prof Shipton who heads the Department of Anaesthesia for the University of Otago at the Christchurch school of Medicine. They can be contacted for any queries you might have with the details below.

The aim of this research is to explore the relationship between beliefs about pain and everyday functioning and exercise using this questionnaire. This research will take a year and seeks about 120 participants from Arthritis New Zealand (ANZ) in Christchurch. Results will be reported back to ANZ in 2011. The benefit of this research is the potential to be able to implement more helpful strategies in the future to assist people who have persistent pain.

This research has received ethical approval from the Upper South A Regional Ethics Committee.

Thank you for letting us find out about yourself, what you believe about your pain, how you are able to manage in your everyday life and how you exercise.

If you would like to have any clarity regarding anything you are not sure about, please feel free to ask.

There are no right or wrong answers and your personal answer is important to us.

Version 3.3
27 April 2010
Appendix 3: Ethical approval

5 May 2010

Ms Tracey Pons
13 Kirk Street
Kaiapoi 7630

Dear Tracey Pons,

Ethics ref: URA/10/04/026

Study title: Pain beliefs, functional ability and persistent pain: a Masters proposal

Investigators: Ms T Pons

Localities: Arthritis New Zealand

Approved Documents
Information sheet version 3.3 dated 27 April 2010
Questionnaire version 3.1 dated 28 March 2010

The Committee is satisfied that this study is not being conducted principally for the benefit of the manufacturer or distributor of the medicine or item in respect of which the trial is being carried out.

Accreditation
The Committee involved in the approval of this study is accredited by the Health Research Council and is constituted and operates in accordance with the Operational Standard for Ethics Committees, April 2006.

Reporting
The study is approved until 31 November 2011. A progress report is required in May 2011. A final report is required at the end of the study. Report forms are available at http://www.ethicscommittees.health.govt.nz. If the study will not be completed as advised, please forward a progress report and an application for extension of ethical approval one month before the above date.
Amendments
It is also a condition of approval that the Committee is advised of any adverse events, if the study does not commence, or the study is altered in any way, including all documentation eg advertisements, letters to prospective participants.

Please quote the above ethics committee reference number in all correspondence.

It should be noted that Ethics Committee approval does not imply any resource commitment or administrative facilitation by any healthcare provider within whose facility the research is to be carried out. Where applicable, authority for this must be obtained separately from the appropriate manager within the organisation.

We wish you well with your study.

Yours sincerely

Alieke Dierckx
Administrator
Upper South A Ethics Committee
Alieke_dierckx@moh.govt.nz
Appendix 4: Questionnaire

During the past four weeks, please indicate with a tick [✓] ……..

<table>
<thead>
<tr>
<th>All days</th>
<th>Most days</th>
<th>Some days</th>
<th>Few days</th>
<th>No days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

- How often were you physically able to drive a car or use public transport?
- How often were you in bed or chair for most of the day?
- Did you have any trouble doing vigorous activities such as running, lifting heavy objects, or participating in strenuous sports?
- Did you have trouble either walking several blocks or climbing a few flights of stairs?
- Were you unable to walk unless assisted by another person or a cane, crutches or walker?
- Could you easily write with a pencil or pen?
- Could you easily button a shirt or blouse?
- Could you easily turn a key in a lock?
- Could you easily comb or brush your hair?
- Could you easily reach shelves that were above your head?
- Did you need help to get dressed?
- Did you need help to get out of bed?
- How often did you experience your pain?

Please turn over to continue
<table>
<thead>
<tr>
<th>All days</th>
<th>Most days</th>
<th>Some days</th>
<th>Few days</th>
<th>No days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often were you stiffer for longer than one hour after you woke up?</td>
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<tr>
<td>How often did your pain make it difficult to sleep?</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>How often have you felt tense or high strung?</td>
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<tr>
<td>How often have you been bothered by nervousness or your nerves?</td>
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<tr>
<td>How often have you been low or very low in spirits?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often have you enjoyed the things you do?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often did you feel a burden to others?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often did you get together with friends or relatives?</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>How often were you on the telephone with close friends or relatives?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>How often did you go to a meeting of a church, club, team or other groups?</td>
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</tr>
<tr>
<td>Did you feel that your family or friends were sensitive to your personal needs?</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Leave this question out if you are unemployed, disabled or retired

<table>
<thead>
<tr>
<th>All days</th>
<th>Most days</th>
<th>Some days</th>
<th>Few days</th>
<th>No days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often were you unable to do any paid work, house work or school work?</td>
<td></td>
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</tr>
<tr>
<td>On the days you did work, how often did you have to work a shorter day?</td>
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<td></td>
<td></td>
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</tbody>
</table>

Please turn over to continue the questionnaire
Which column best indicates how much you agree with the statement. Please indicate with a tick [√].....

<table>
<thead>
<tr>
<th>Always</th>
<th>Almost Always</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Persistent pain is the result of damage to tissues of the body</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Physical exercise makes the persistent pain worse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. It is impossible to do much for oneself to relieve persistent pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Being anxious makes persistent pain worse</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5. Experiencing persistent pain is a sign that something is wrong with the body</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6. When relaxed persistent pain is easier to cope with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Being in persistent pain prevents you from enjoying hobbies and social activities</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>8. The amount of persistent pain is related to the amount of damage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Thinking about persistent pain makes it worse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. It is impossible to control your own persistent pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Persistent pain is a sign of illness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Feeling depressed makes persistent pain seem worse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please turn over to continue the questionnaire
Please indicate with a tick [✓] or write your answer....

13. Are you?

[ ] Male or [ ] Female

14. How long have you experienced your persistent pain?

[ ] Months or [ ] Years

15. How old are you in years?

[ ] Years

16. How much physiotherapy treatment have you had for this pain?

[ ] Never [ ] Months [ ] Years

What kind of exercise do you participate in - tick ALL the types of exercise you do.

17. Never exercise

18. Walking: outdoors/ treadmill

19. Jogging: outdoors/ treadmill

20. Riding a bicycle outdoors

21. Riding an indoor exercycle

22. Cross trainer

23. Pool exercise or swimming

24. Gym programme

25. Arthritis NZ exercise class

26. Arthritis NZ pool class

27. Other: please state

28. How often do you exercise in a week?

<table>
<thead>
<tr>
<th>Never</th>
<th>Once</th>
<th>Twice</th>
<th>Three times</th>
<th>Four times</th>
<th>Five times</th>
<th>Six times</th>
<th>Every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please turn over to continue the questionnaire
29. How would you rate your enjoyment with your exercise?

<table>
<thead>
<tr>
<th>Always</th>
<th>Almost always</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I enjoy my exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

30. How would you rate how confident you are about yourself when you exercise?

<table>
<thead>
<tr>
<th>Always</th>
<th>Almost always</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am confident in myself</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

31. How would you rate yourself about when to stop exercise for recovery/rest?

<table>
<thead>
<tr>
<th>Always</th>
<th>Almost always</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know when to stop</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

32. How would you rate your previous physical ability (e.g. sports, dancing) before your experience of this pain?

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Above average</th>
<th>Average</th>
<th>Below average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>My physical ability was</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

33. How would you rate your previous athletic ability?

<table>
<thead>
<tr>
<th>Excellent, national level</th>
<th>Above average</th>
<th>Average</th>
<th>Below average</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>My athletic ability was</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please turn over to continue the questionnaire
34. How would you rate your anger and resentment about your pain?

<table>
<thead>
<tr>
<th>Always</th>
<th>Almost always</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I resent it, I feel angry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

35. How long have you been a member of Arthritis NZ?

| Never | Months | Years |

36. What ethnic group do you belong to?

Mark the box or boxes which apply to you

| 61.1. New Zealand European |
| 61.2. Maori |
| 61.3. Samoan |
| 61.4. Cook Islands Maori |
| 61.5. Tongan |
| 61.6. Niuean |
| 61.7. Chinese |
| 61.8. Indian |
| 61.9. Other, please state: e.g. Dutch, Japanese, Tokelauan |

61.10.

37. What is your highest education qualification?

| 62.1. No qualification |
| 62.2. School leaver certificate |
| 62.3. Apprenticeship |
| 62.4. Tertiary certificate |
| 62.5. Tertiary diploma |
| 62.6. Tertiary degree |
| 62.7. Post graduate degree |
| 62.8. Masters or Doctoral degree |
| 62.9. Other, please state: |

62.10.

38. What has been given as your diagnosis by a Doctor or Specialist?


39. How long have you been off work because of this pain?

| Never | Months | Years |

Please turn over to continue the questionnaire
40. Are you a tobacco smoker?

Yes [ ] or No [ ]

41. How often do you take “over-the-counter medication” for this pain?

<table>
<thead>
<tr>
<th>I take over-the-counter medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
</tr>
<tr>
<td>Occasionally</td>
</tr>
<tr>
<td>Regularly</td>
</tr>
</tbody>
</table>

42. Does “over-the-counter medication” help this pain?

<table>
<thead>
<tr>
<th>Over-the-counter medication helps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not sure</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

43. How often do you take prescribed medication for this pain?

<table>
<thead>
<tr>
<th>I take my prescribed medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
</tr>
<tr>
<td>Occasionally</td>
</tr>
<tr>
<td>Regularly</td>
</tr>
</tbody>
</table>

44. Does your prescribed medication help this pain?

<table>
<thead>
<tr>
<th>Prescribed medication helps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not sure</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

45. How often do you take drugs like cannabis/ hashish/marijuana for this pain?

<table>
<thead>
<tr>
<th>I take drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
</tr>
<tr>
<td>Occasionally</td>
</tr>
<tr>
<td>Regularly</td>
</tr>
</tbody>
</table>

46. Do drugs help improve this pain?

<table>
<thead>
<tr>
<th>Drugs help my pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not sure</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Thank you for answering these questions-I appreciate your time.
Appendix 5: Information to ANZ participants following analysis

Oct 2011

Dear Arthritis New Zealand members

A very big thank you to many of you reading “Juice” for participating in my research project in Christchurch. You may remember that last year, I visited the pool exercise classes at Burwood and Christchurch hospitals and I also attended some of the education seminars organised by Arthritis New Zealand for members and the public. I asked you to answer my questionnaire and most of you took it home and returned it to me by post.

WHAT WAS THIS PROJECT ALL ABOUT?
My project was towards a Masters thesis with the University of Otago Health Science department. It looked at how beliefs about pain and functional ability using well established questionnaires in these two fields.

WHAT THIS PROJECT FOUND:
This finding confirmed my hypothesis and was statistically significant:

A high score of “organic” beliefs about pain that was negative, where a person believed that personal control of pain was difficult, was associated with poorer functional ability. Likewise a low score of beliefs about pain that was negative was associated with better functional ability.

Other findings that were also statistically significant:

A high score of a person’s confidence about their ability to exercise was associated with better functional ability and a low score of confidence about the ability to exercise was associated with poorer functional ability.

A high score of anger and resentment about the pain experience was associated with poorer functional ability and a lower score of anger and resentment about the pain experience was associated with better functional ability.

What does this mean for you?
This project confirmed what a lot of other research has found in that what you a) believe about your pain; b) how confident you are about your exercise programme c) feelings of anger and resentment about your pain has an intertwined relationship with what you are able to accomplish with your everyday functional ability.

This project’s findings cannot tell us which way the arrow goes between beliefs about pain, confidence with exercise, and feelings of anger/resentment about the pain experience and functional ability. What we can see is that they are intertwined together:

Beliefs about pain
Confidence with exercise
Feelings of anger/resentment

FUNCTIONAL ABILITY
The project data about the participants showed us a participation of 83% females with average age 65 years with a good distribution from 22 to 91yrs and standard deviation of 12 yrs. 88% were NZ pakeha, 55% had no formal qualification other than schooling, 46% had never had physiotherapy intervention for their pain, 61% of participants had joined the organisation in the last three years with 17 percent never having been a member.

This then raises a question of if these findings are also applicable for men or other population groups? We can’t jump to conclusions too soon as you can see that this sample does not really represent them.

Thank you again for assisting this project with your answers. If you have any further questions you are welcome to contact me on 03 327 2359. Also your Arthritis New Zealand educator will be able to help you with any questions you have about your pain problem.

Warm wishes for you all

Tracey Pons