The Role of Positive Goal Engagement in Increased Psychological Well-being amongst Individuals with Chronic Non-Cancer Pain

Joanne Iddon

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Supervised by: Dr Joanne Dickson and Dr Jen Unwin

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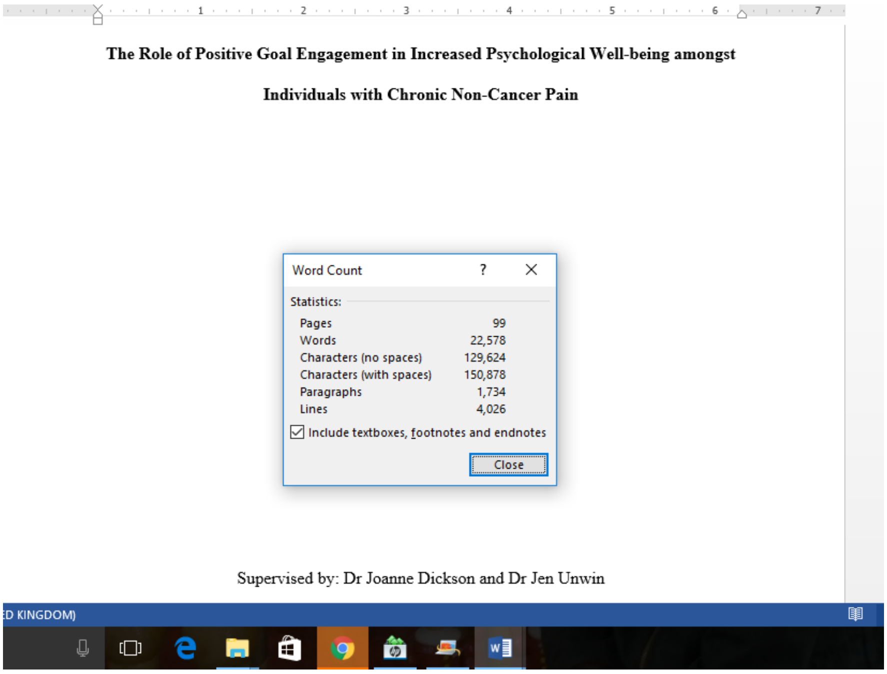

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Introductory Chapter: Thesis Overview

Chronic pain is a prevalent, multi-faceted, long-term health condition associated with significant physical and functional impairment and reduced psychological well-being. To date, the majority of the research has investigated the role of maladaptive psychological processes which maintain and perpetuate psychological distress. Few studies have examined the contribution of adaptive or positive psychological processes which lead to the enhancement of psychological well-being within this clinical population. This thesis aimed to better understand the psychological processes which enable individuals to maintain a sense of well-being, despite the enduring and debilitating nature of chronic pain. Furthermore, the research aimed to summarise and evaluate the effects of clinical interventions developed in line with positive psychology. To address this, the thesis comprises a literature review (Chapter 1) and an empirical manuscript (Chapter 2). The appendices section contains additional information relevant to the two chapters.

The literature review aimed to summarise and evaluate the application of positive psychological interventions (PPIs) delivered to individuals with chronic non-cancer pain. The systematic review first introduces the biopsychosocial model of chronic pain, and discusses the application and findings of more traditional and widely-used interventions (such as those developed in line with Cognitive-Behavioural Therapy and ‘third wave’ therapies) which primarily aim to reduce associated psychological distress, impairment and symptomatology. The review then introduces findings in relation to the role of positive psychological constructs and outlines the relevance of measuring variables relating to psychological well-being and quality of life. Next, this chapter reviews the available empirical research in relation to PPIs and well-being amongst individuals with non-cancer chronic pain. The review attempts to identify the current state of the evidence base within this emerging field, and suggests pertinent areas for future research. The effects of therapeutic techniques based upon positive psychological constructs are highlighted, and the psychological processes underpinning improvements following PPIs are then explored further in the empirical paper.

Chapter 2 contains the empirical paper. The paper builds upon the findings of the systematic review to evaluate the role of positive psychological variables in relation to enhanced psychological well-being in individuals with chronic non-cancer pain. A distinction between cancer and non-cancer pain is commonly made within the literature due to key psychosocial differences between the conditions. A model is proposed based upon the chronic pain and positive psychological literature and tested by means of Structural Equation Modelling (SEM). Specifically, the study investigates relationships between pain characteristics, goal-focused hope, Solution-focused cognitive processing and psychological well-being. It is hypothesised that these positive psychological variables mediate the relationships between pain intensity and psychological well-being, and between pain interference (the impact that the pain has upon daily function) and psychological well-being respectively. Five hundred and eighty-six adults with chronic non-cancer pain completed an online study and the hypothesised SEM model was found to be well-fitting to the data following modification. The study extends our understanding of the psychological processes underpinning enhanced psychological well-being *despite* the presence of enduring and often debilitating physical pain, and highlights the relevance of measuring clinical outcomes relating to psychological well-being within this population. The empirical paper is intended for publication in the Journal of Pain, and is therefore written in the style required by the journal for submission.

Chapter 1

Positive Psychological Interventions and Chronic Non-Cancer Pain: A Systematic Review of the Literature

Abstract

Chronic pain is a multi-faceted, pervasive condition associated with significant psychosocial impairment. Positive psychological interventions (PPIs) are increasingly delivered in clinical settings, with recent research offering evidence supporting the application of PPIs in predominantly mental-health contexts. To date, no review has considered the impact of PPIs applied in physical-health settings. The aim of this systematic review is to investigate the effects of PPIs for individuals with chronic non-cancer pain. Particularly, the review focuses upon study outcomes considered to be conceptually-aligned with the aims of such interventions**.** A systematic search of five electronic databases was conducted utilising terms relating to chronic pain, positive psychological constructs and intervention outcomes. A total of 3289 articles were considered as part of the identification process. Eight studies were included in the final review upon removal of duplicates and application of the review exclusion criteria. The effects of PPIs and the methodological quality of studies varied greatly, though improvements in psychological well-being, hope, pain self-efficacy, happiness and life-satisfaction were evident. The results demonstrate PPIs may have beneficial effects for individuals living with chronic non-cancer pain, though conclusions are limited due to the heterogeneity across study designs, definitions and outcomes assessed.

Keywords: Positive psychological intervention, chronic pain, well-being, systematic review

Introduction

The British Pain Society (2013) defines chronic pain as pain which persists beyond the expected time for tissue healing to have taken place, typically reported to be pain which is present for three months or more since the initial onset. Chronic pain is an exceptionally broad category which encompasses a vast array of disorders and there is great variation with respect to distinct underlying mechanisms, causes and pain sites across pain conditions. Pain symptoms may also occur in the absence of medical cause or explanation (Jackson, George & Hinchey, 2009) and chronic pain is increasingly classified as “a disease in its own right” rather than just a symptom of a disorder (Niv & Devor, 2004, p. 180).

Despite the diversity amongst the causes of onset, there is substantial overlap between the treatment and management options of chronic pain disorders and overarching psychological commonalities relating to the pain experience are evident across differing conditions (Turk, Wilson & Cahana, 2011). The personal impact of chronic pain is well-documented within the literature, with findings suggesting that individuals often experience significant impairments in relation to physical, social and psychological functioning (Smith et al., 2001) and reduced quality of life (Breivik, Collett, Ventafridda, Cohen & Gallacher, 2006).

Whilst not all individuals with chronic pain experience co-morbid mental health difficulties which meet diagnostic thresholds, it is widely accepted that those living with the chronic disease are at an elevated risk of experiencing increased psychological distress compared to non-clinical, healthy samples (McBeth, Macfarlane & Silman, 2002). Pain-related distress is associated with a poor prognosis across various pain conditions (Boersma & Linton, 2006; van der Windt, Kuijpers, Jellema, van der Heijden & Bouter, 2007) and increased healthcare utilisation (Von Korff, Lin, Fenton & Saunders, 2007). In the UK, it has been estimated that chronic pain accounts for 4.6 million primary care appointments each year, at a cost of £69 million to the National Health Service (Belsey, 2002).

The effects of current medical, pharmacological and surgical treatments which aim to ameliorate pain intensity and subsequent functional impairment are modest at best (Turk, Wilson & Cahana, 2011), prompting a growing realisation for the importance and consideration of psychosocial factors in relation to pain-related distress (Gatchel, Peng, Peters, Fuchs & Turk, 2007). The debilitating nature of chronic pain and its impact on both the individual and the global economy highlights the need for effective clinical interventions which aim to promote adaptive functioning and increase individuals' sense of well-being.

Psychological Models and Interventions

Chronic pain is currently understood using biopsychosocial models which have been developed to extend beyond a purely biomedical understanding of chronic pain (Flor & Turk, 2011). These models recognise the significance of psychological and social factors in relation to the effects and maintenance of chronic pain, and have led to the development of a number of psychological interventions in this area over the past 50 years (Jensen & Turk, 2014). For example, models underpinned by behavioural principles (operant conditioning and reinforcement of pain behaviours; Fordyce, 1976) and cognitive processes (such as the presence of dysfunctional beliefs and expectations in relation to the pain; Gamsa, 1994) led to the development of Cognitive-Behavioural Therapy (CBT) treatment packages in the 1970s (Skinner, Wilson & Turk, 2012). Traditional interventions have typically focused on identifying and reducing psychological deficits that pose risk factors for poor prognosis or pain-related outcomes. Though the components of specific CBT programmes for chronic pain vary from service to service (Morley, 2011), this intervention remains the most frequently delivered and commonly researched treatment option available for those with chronic pain.

The outcomes of multidisciplinary CBT interventions are well-documented within the literature, with a meta-analysis of 35 studies indicating small to moderate effects on pain, disability, mood and catastrophising (Williams, Eccleston & Morley, 2012).

More recently, psychological approaches and interventions based upon *third wave* CBT approaches such as Acceptance and Commitment Therapy (ACT; Dahl, Wilson & Nilsson, 2004) and Mindfulness-Based Cognitive Therapy (MBCT; Segal, Williams & Teasdale, 2002) are more frequently being applied in clinical practice with chronic pain populations. Mindfulness-Based Stress Reduction programmes (MBSR; Rosenzweig et al., 2010) are also increasingly delivered to and evaluated within clinical samples, with results of ACT and MBSR interventions being found to be comparable to those of traditional CBT interventions (Veehof, Oskam, Schreurs & Bohlmeijer, 2011).

Whilst many aspects and techniques in these interventions remain true to those used in traditional CBT, such approaches introduce and incorporate the utilisation of individuals' own resources and values to move away from an emphasis on reducing pain and promoting adaptive pain management per se, but instead towards enhancing a *vital life*, or a life well-lived, despite the presence of pain (Dahl & Lundgren, 2006).

Positive psychological interventions

The idea of a paradigm shift away from a sole focus on pathology and reducing suffering and psychological distress is described in detail in Seligman and Csikszentmihalyi's (2000) seminal paper. The authors argued that for too long psychological research had exclusively concentrated upon the treatment of mental health disorders, whilst simultaneously neglecting to consider the effects or benefits of interventions which aim to promote optimal psychological functioning of the individual. The publication of this pivotal article has led to a rapid expansion in the positive psychology literature in a variety of clinical samples in both mental and physical health settings.

A growing body of work is investigating the effects and protective role of positive psychological constructs or attributes that promote health and quality of life amongst those experiencing pain (Pressman & Cohen, 2005). The presence of psychological traits such as pain self-efficacy, pain acceptance, hope, optimism and resilience have been associated with lower negative pain-perception, increased coping and adjustment and less pain-related disability and pain intensity (Newton-John, Mason & Hunter, 2014; Pulvers & Hood 2013; Skidmore et al., 2015; Wright et al., 2011). Promotion of these factors may therefore constitute an important focus for clinical interventions.

Positive psychological interventions (PPIs) are increasingly applied in both online self-help and therapist-delivered formats with individuals and groups, with studies outlining effects of interventions which include expressing gratitude (Emmons & McCullough, 2003), positive writing (Wing, Schutte & Byrne, 2006) and practicing kindness (Otake, Shimai, Tanaka-Matsumi, Otsui & Fredrickson, 2006). The effectiveness of such interventions has been evaluated in two meta-analyses to date (Bolier et al., 2013; Sin & Lyubomirsky, 2009) with results demonstrating enhancements in subjective and psychological well-being and a reduction in depressive symptoms. The vast majority of PPI studies to date have involved non-clinical samples and participants experiencing mood disorders such as anxiety or depression.

Establishing a single definition of what constitutes a PPI is somewhat problematic and challenging due to a lack of a common theoretical thread or framework. Data for specific techniques demonstrating positive change are available, however there is no one common theoretical framework on which to unite or attribute such outcomes. There is thus ongoing debate within the literature regarding the characterization of such interventions (Bolier et al., 2014; Schueller, Kashdan & Parks, 2014). It is recommended that rather than follow one specific definition, researchers are guided by criterion which encompass the overall aims of such approaches (Parks & Biswas-Diener, 2013). In a similar vein, it is important that dependent variables are appropriate and valid for the aims of the interventions. This presents a similar dilemma due to the evident variation in outcomes measured following PPIs within the literature. Although previous reviews include measures which fit within the PPI frameworks conceptually, the measurement of depression alongside well-being has been viewed as both a “bizarre attachment” (Schueller et al., 2014, p. 95) and a “highly relevant” construct (Bolier et al., 2014, p. 102). Furthermore, there is mounting evidence which suggests that although correlated, mental well-being and mental-illness are in fact independent continua (Keyes, 2005). Similarly, positive and negative emotions may co-occur during stressful events, indicating that the absence of one does not necessarily infer the presence the other (Folkman, 2008). Rather than solely focus upon the move away from suffering and the maladaptive thought processes underpinning it, there is a need to appropriately quantify the shift people may make from initially being within an average range of psychological health to a position of flourishing (Hone, Jarden, Schofield & Duncan, 2014). This is operationalised in the literature as striving towards an optimal or increased sense of emotional well-being, psychological well-being, and social well-being (Keyes, 2011).

Similarly, qualitative interviewing and subsequent themes derived from thematic investigations of PPI interventions should also be aligned to facilitate reporting of such outcomes. These recent recommendations relating to both the definition and measurement of PPIs were utilised for the current research.

Review Objectives

Whilst the effectiveness of traditional and more recent third wave CBT clinical interventions is well-documented within the chronic pain literature, little is known about the application and effects of PPIs in this clinical field. Similarly, there is an increasing understanding of how PPI interventions may be applied within healthy populations and those experiencing mental health issues, though to date no review has examined outcomes with respect to individuals with chronic pain. The aim of the present research is to conduct a systematic review of the relevant literature to investigate the effects of PPIs amongst those living with chronic non-cancer pain. Details of the review aims were registered with the International Prospective Register for Systematic Reviews (PROSPERO). The written structure and content of the review is based upon the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (Moher, Liberati, Tetzlaff & Altman, 2009).

Method

Eligibility Criteria

In line with existing chronic pain intervention literature, a distinction between cancer and non-cancer pain was made due to several key medical and psychosocial differences between the diseases (Fordyce, 2001). For example, the course of chronic non-cancer pain may be more influenced by psychological and social factors than pain resulting from site-specific cancer-related pain.

Early scoping searches of the PPI evidence base in relation to chronic pain samples identified few relevant papers. However, of those few initially identified, a diversity in relation to the research methodologies employed was apparent. For explorative purposes we included both qualitative and quantitative studies. Unpublished studies were not included in the review due to the risk that these studies may have a high risk of bias, and the idea that the lack of publication could potentially be due to flaws in their designs and/or methodologies. The study inclusion criteria were therefore as follows:

- Participants aged over 18 years old.
- Participants with non-malignant pain for at least three months in duration since onset.
- Studies investigating the effects of a PPI (including therapies explicitly developed according to positive psychology principles, exercises or specific techniques in self-help, individual and/or group formats) which aimed to develop, manipulate and/or induce positive variables (including emotions, behaviours or cognitions).
- Outcomes conceptually aligned with theoretical frameworks underpinning PPIs.
- Publication in a peer-reviewed journal; and
- Published in English

In accordance with the previous systematic review of general PPI outcomes (Bolier et al., 2013), studies which reported on the effectiveness of mindfulness and third-wave CBT interventions were excluded. Although it is arguable that such interventions aim to induce positive affect, in the context of the defined inclusion criteria these interventions are underpinned by therapeutic principles which fundamentally differ to those which form the core elements of positive psychological approaches. For example, mindfulness approaches encourage the development of a non-judgemental, purposeful awareness to the present moment which in turn reduces rumination of positive or future events (Kabat-Zinn, 2013). In contrast, interventions developed in accordance with positive psychology principles may encourage positive rumination and judgement of past events to induce positive affect (Larsen & Prizmic, 2004).

Search Strategy

A systematic literature search was carried out to capture the full scope of published literature. Chronic pain, well-being and positive psychological interventions are in themselves broad topics and it was felt that this method would be the most appropriate to conduct a focused search of the evidence whilst ensuring that the search was as thorough and encompassing as possible.

The first step of the review consisted of searching the following databases for existing academic journal articles and reviews: DISCOVER, PubMed, Web of Science, Scopus and PsychInfo. The search terms were identified taking into account those used in existing reviews of the positive psychology evidence base (Bolier et al., 2013; Sin & Lyubomirsky, 2009) and the author's clinical knowledge of commonly-used terminology within this area. The terms were then entered in four steps to accumulate relevant papers. Firstly, 'chronic pain OR long term pain' was entered, followed by 'AND positive psychol* OR optimism OR hope OR happ* OR gratitude’. Next, ‘AND intervention OR treatment OR therap* OR management’ were inputted. Finally, the terms ‘AND wellbeing OR well-being OR “quality of life” OR QoL OR life satisfaction OR affect OR SWB’ (referring to subjective well-being) were entered. Databases were searched for studies from inauguration to October 2015. Database email alerts were also set up where possible so as not to exclude newly-published articles.

Key published experts in the positive psychology field were then contacted for published papers not previously identified and for studies due to be published over the next six months. The references of the two existing reviews of positive psychological interventions (Bolier et al., 2013; Sin & Lyubomirsky, 2009) were cross-checked, and the reference lists of the papers to be included in the review were also examined. Duplicate studies obtained throughout the search process were removed by means of auto and hand-searching methods as recommended (Qi et al., 2013).

Two reviewers independently selected eligible studies in two phases. The first phase involved selecting potentially-relevant papers by the title and abstract of the publication, and for the second phase selection was based upon the full-text article. A screening tool was developed detailing the review inclusion and exclusion criteria to aid this process (see Appendix A).There was complete agreement regarding the final articles selected for the review (κ =1).

Quality Assessment

The final papers included studies which utilised differing designs and it was necessary to select an appropriate tool accordingly. Furthermore, it was important that the assessment tool allowed for examination of both the risk of bias (in relation to the study design and chosen methodology) and the overall quality of articles, taking into account the level of detail reported in each paper.

The Quality Assessment Tool for Studies of Diverse Designs (QATSDD; Sirriyeh, Lawton, Gardner & Armitage, 2012) was used to assess the diverse range of studies. Originally developed for use with health service researchers by examining common quality indicators featured on existing checklists such as those developed by the Consolidated Standards of Reporting Trials (CONSORT; www.consort-statement.org), the Critical Appraisal Skills Programme (CASP; www.casp-uk.net) and the Strengthening the Reporting of Observational studies in Epidemiology (STROBE; www.strobe-statement.org) guidelines, the QATSDD has shown good reliability and validity when assessing the risk of bias and quality of diverse study designs (Sirriyeh, Lawton, Gardner & Armitage, 2012).

The tool consists of 16 items, with some items specifically relating to quantitative studies and others to qualitative methodologies. Items relating to both the risk of bias (e.g., Evidence of sample size considered in terms of analysis) and quality of reporting (e.g., Description of procedure for data collection) are listed, and reviewers assign each criteria a score of 0-3 taking into account the accompanying scoring guidance notes. In line with the developers’ recommendations, these scores were then converted into percentages in order that comparisons across studies may be undertaken.

Although there are implications and subsequent limitations to consider when employing a more general tool for quality assessment, the QATSDD allowed for cross-comparisons between differing methodologies (Sirriyeh, Lawton, Gardner & Armitage, 2012). Whilst this has its advantages, QATSDD total scores should be interpreted with some discretion as particular areas of significant methodological weaknesses may be concealed by perhaps less influential strengths in other areas, and vice versa.

Data Extraction

A data extraction form was developed and piloted to guide the subsequent data extraction process. Details of the intervention and participant characteristics were extracted, followed by information relating to the study design, the analyses and measures employed and details of any comparators. In line with the recommendations outlined by Schueller et al. (2014), outcome data and study findings were extracted if they were conceptually aligned with the aims and theoretical principles of positive psychology.

Results

The electronic search yielded a total of 3282 records, and 1634 duplicates were removed. A further six papers were identified through searching the reference lists of the final included articles one further paper was provided by a published author in the field. The two previous literature reviews of positive psychology interventions did not yield any relevant results.

Of the total 1655 records assessed during the initial screening phase, 27 were eligible for full-text assessment. The identification process and reasons for exclusion are reported in Figure 1. The most common reason for exclusion during this stage of the review process related to the interventions in these nine studies not being underpinned by positive psychological frameworks upon closer inspection, and instead these interventions were developed in accordance with other theoretical models (e.g., CBT or ACT). A further six papers were excluded due to ambiguity regarding the samples utilised, in that outcome data gathered from participants with chronic pain diagnoses were grouped and analysed collectively with data from participants with other long-term health conditions (including cancer and Parkinson's Disease). An additional three were excluded on the basis that they utilised cross-sectional designs. Of the remaining 22 papers, a further two were excluded due to the outcome measures employed in these studies solely assessing changes or reductions in psychological distress and condition symptomatology. A total of eight studies (reported in seven articles) met the inclusion criteria and were included in the final review. Of these, two employed qualitative methodologies and the remaining six were quantitative studies. Given the diversity amongst the study designs of the included papers, it was considered that a narrative synthesis of results would most-appropriately encapsulate the overall findings and outcomes of each study.

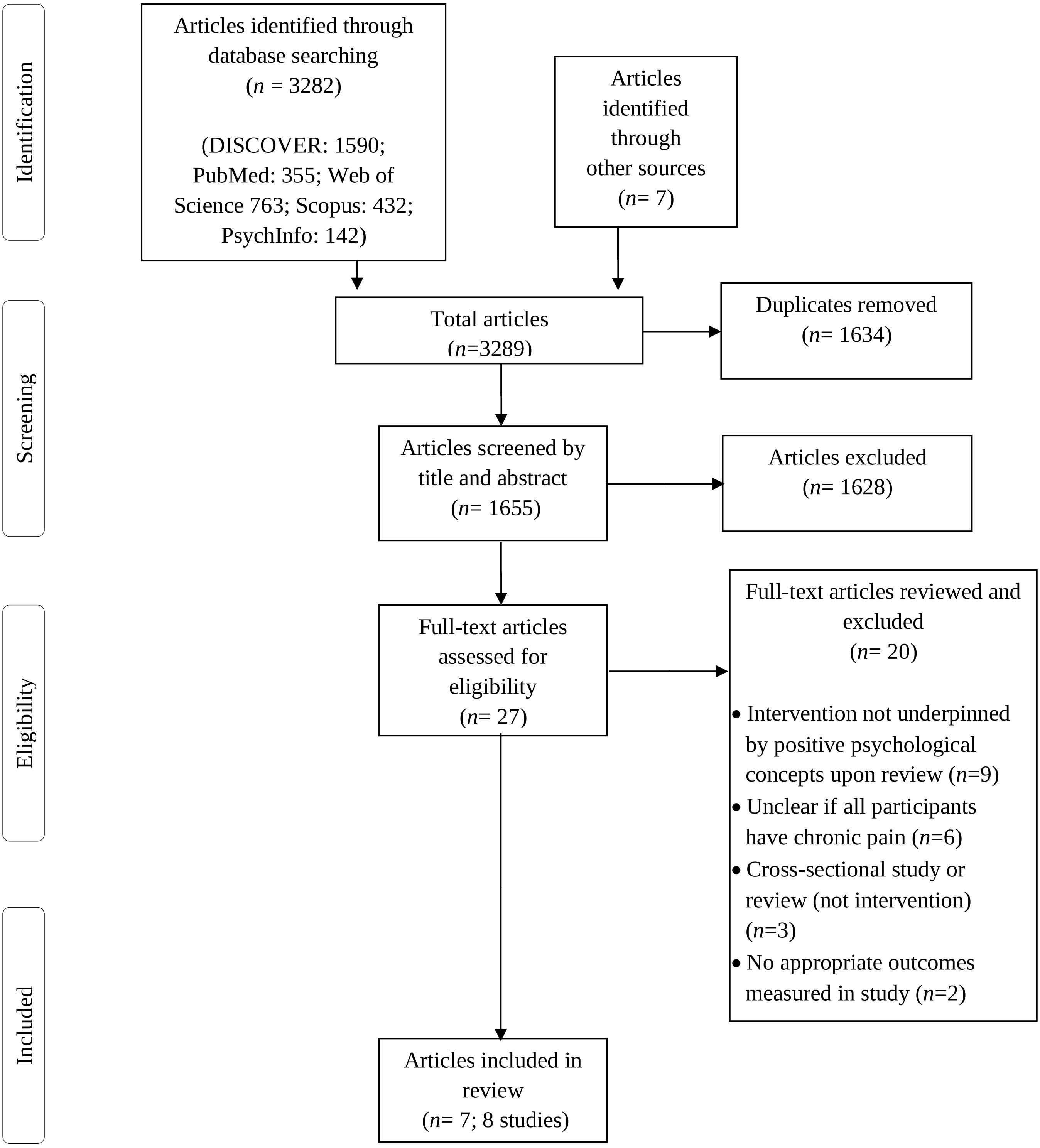

Figure 1. Identification of Included Studies

Characteristics of Included Studies

Demographic information and details of the included studies can be found in Table 1. (See Appendix B for information relating to the positive psychological interventions and techniques employed for each study). The eight studies included a total of 307 participants, of which 211 (68.7%) were female. The mean age of participants within individual studies (where reported) ranged from 49.5 to 78.3 years, though it is notable that Tse et al. (2010) specifically recruited older adults residing in nursing homes. In most cases, the types of pain conditions experienced by participants varied significantly within individual studies. Two studies specified particular pain sites or type and one study examined chronic pain experiences as a result of a co-morbid disability. Of the quantitative studies, two included a control group as a comparator alongside the PPI group, and three studies reported data relating to longer-term follow-up timepoints (ranging from 10-weeks to 12-months). Interestingly, all but one of the papers included in this review were published in 2014 or 2015, indicating the somewhat nascent, but emerging nature of this area.

Table 1. Participant and Intervention Characteristics of Included Studies

Author	**Study design**	***N***	**Country**	**Intervention**	**Delivery**	**Session number and duration**	**Chronic pain condition(s)**	**Mean pain duration**	**Male/ Female**	**Mean age (Range; Standard Deviation)**
Dargan (2014)	Qualitative thematic analysis	5	England	Solution-Focused Pain Management Programme	Group	8 weekly 3-hour sessions	Various chronic pain conditions (not reported)	Mean not reported (Range: 3-12 years)	2/3	Mean not reported (25-75 years)
Flink et al. (2015)	Single-case design	5	Sweden	Self-compassion; Three Good Things; Savouring; Best Possible Self imagery	Individual	7 weekly 1-hour sessions	Back pain	Mean not reported (Range: 15-20 years)	2/3	63.2 (40-73 years)
Howell et al. (2014) Study A	Quantitative pre-test post-test	10	Canada	Hope-Focused Group Counselling	Group	6 weekly 2-hour sessions	Various chronic pain conditions	9.4 years (Range 1-45 years)	2/8	49.7 (27-67 years; *SD* 12.26)
Howell et al. (2014) Study B	Quantitative pre-test post-test	24	Canada	Hope-Focused Group Counselling	Group	6 weekly 2-hour sessions	Various chronic pain conditions	11.52 (Range: 0.42-25 years)	3/21	49.5 (20-70 years; *SD* 12.06)
Larsen et al. (2015)	Qualitative thematic analysis	12	Canada	Hope and strengths activity; Hoped-for future	Group	6 weekly 2-hour sessions	Various chronic pain conditions	12.9 (Range: 5-57 years)	4/8	Mean not reported ('late 20s to early 70s')
Müller et al. (2015)	Quantitative randomised pre-test post-test, follow-up	96	USA	Tailored PPI comprised of 4 (out of a total choice of 10) exercises	Online	15 minutes 'at least one day a week' for 8-weeks	Chronic pain due to SCI, MS, NMD, PPS	Not reported	29/67	59.4 (24-81 years; *SD* 11.78)

Table 1. (Continued). Participant and Intervention Characteristics of Included Studies

Author	**Study design**	***N***	**Country**	**Intervention**	**Delivery**	**Session number and duration**	**Chronic pain condition(s)**	**Mean pain duration**	**Male/ Female**	**Mean age (Range; Standard Deviation)**
Simm et al. (2014)	Quantitative Pre-test post-test, follow-up	85	England	Solution-Focused Pain Management Programme	Group	8 weekly 3-hour sessions	Various forms of chronic pain	Not reported	22/63	54.0 (28-83 years)
Tse et al. (2010)	Quantitative pre-test post-test	70	Hong Kong	Humour Therapy Programme	Group	8 weekly 1-hour sessions	Musculoskeletal pain	Not reported	32/38	78.3 (65-95 years)

Table 2. Outcomes of Included Studies

Author	Measures[1] (Quantitative only)	Control (*n*)	Attrition rate (%)	Analyses	Outcomes and Effect Sizes (where applicable and reported)
Dargan (2014)	-	-	•After commencing interview: 0	Thematic analysis (Braun & Clarke, 2006)	5 main themes relating to: •Accessing the programme • Solution-focused group • The solution-focused clinician • Solutions and changes • Challenges and improvements
Flink et al. (2015)	PDI, SWLS, HADS, SCS-SF, SBI, LOT-R, PCS PTQ, AAQ-II, PANAS, ÖMPSQ, W-BQ12	-	•Post-test: 0 •3-month f/u: 0	Reliable Change Index (RCI) calculated to evaluate pre-test post-test change	•*Participant 1*: Improvements on all outcome measures, though no reliable pre-post change in positive psychology constructs (life satisfaction, self-compassion, savouring beliefs and optimism) when taking into account RCI. No reliable improvements on relevant process variables. Improvements on process variable of self-compassion, but not optimism nor savouring, and improvement was not reliable according to the RCI. The weekly-measure of PA remained stable. No improvement maintained at 3-month follow-up. •*Participant 2:* No pre-post improvement on outcome measure of life-satisfaction. Improvements on all process variables (self-compassion, optimism and savouring) found, though only reliable change found for improvements in savouring beliefs. Weekly measures indicated an increase in positive affect, which was maintained at follow-up. •*Participant 3:* Improvements on outcome measure of life-satisfaction, indicating reliable change according to the RCI. The RCI also indicated reliable improvement on the process variable of self-compassion. Positive affect remained stable on the weekly measures, though was high already at baseline. •*Participant 4:* Improvements on all outcome variables, with life-satisfaction increase found to be reliable according to the RCI. Improvements on all process variables except for optimism, which remained stable, though only savouring (and not self-compassion) was found to demonstrate reliable change according to the RCI. PA varied during the intervention though finished at a similar level as at baseline.

[1] In line with the inclusion and exclusion criteria, this review summarises study outcomes considered to be in line with the theoretical underpinnings of positive psychology (i.e., the presence of adaptive psychological constructs or concepts such as mental well-being). In addition to these measures, several studies utilised additional tools which typically measure constructs not conceptually aligned to PPIs. These tools, although not critically discussed further in this review, were included in Table 2 for information.

Table 2. (Continued). Outcomes of Included Studies

Author	**Measures (Quantitative only)**	**Control (*N*)**	**Attrition rate (%)**	**Analyses**	**Outcomes and Effect Sizes (where applicable and reported)**
					•*Participant 5:* All outcome and process variables remained similar at pre-test and post-test, except for self-compassion which increased with a reliable change according to the RCI. No improvements on weekly measures were found.
Howell et al. (2014) Study A	PPI, SHI, CPAQ-R, PCS	-	•Post-test: 16.7	Multivariate Analysis of variance, T-tests and regression analyses	•Improvements in state hope scores pre and post-intervention were found, though these differences were not statistically significant. •Statistically-significant pre-post-intervention increase in overall well-being scores (total score on the PPI; Cohen's *d*= 1.15). •Regarding individual subscales of the PPI, statistically significant pre-post improvements relating to the Pleasure (Cohen's *d*=1.41) and Engagement (Cohen's *d*=1.02) subscales were found, though no significant difference found for the Meaning subscale. •Pre-intervention well-being scores were found to predict post-intervention well-being scores. •Pre-intervention hope scores and hope change scores (from time 1 to time 2) were predictive of improved well-being.
Howell et al. (2014) Study B	PPI, SHS, CPAQ-R, PCS, CSHS	-	•Post-test: 0	Analysis of variance, T-tests and regression analyses.	•Statistically significant main effect for time across all study variables. •Improvements in state hope scores pre and post-intervention were found, which showed a trend towards significant change with a medium effect size (Cohen's *d*= .55), though these differences were not significantly different. Further analysis identified statistically significant pre-post change in emerged on the Pathways subscale (Cohen's *d*=.63), but not the Agency subscale. •Statistically-significant pre-post-intervention increase in overall well-being scores (total score on the PPI, Cohen's *d*=1.29). Further analysis identified that these differences were statistically significant for all three subscales which comprised well-being scores (Pleasure, Engagement and Meaning). Cohen's *d* effect sizes were .88, .86 and .66 respectively.

Table 2. (Continued). Outcomes of Included Studies

Author	Measures (Quantitative only)	Control (*N*)	Attrition rate (%)	Analyses	Outcomes and Effect Sizes (where applicable and reported)
					•Statistically significant pre and post-intervention increase in total scores of the Comprehensive State Hope Scale were found (Cohen's *d*=1.15). Examination of the four subscales identified statistically significant pre-post change in relation to the Mastery (*d*=.98), Attachment (*d*=.98) and Survival (*d*=.89), but not Spirituality, subscales. •Pre-intervention well-being scores significantly predicted post-intervention well-being scores. •Pre-intervention hope scores and hope change scores (as assessed by the SHS) were predictive of improved well-being. •Regression analyses were repeated for the CSHS scores. Pre-intervention well-being scores significantly predicted post-intervention well-being scores. Hope change scores, but not pre-intervention hope scores, were found to be predictive of improved well-being.
Larsen et al. (2015)	-	-	•After commencing interview: 7.7	Thematic analysis (Braun & Clarke, 2006)	4 themes with subthemes relating to promotion of hope: •Awareness ○ Awareness of strengths: Seeing what's there ○ New perspectives •Comparison ○ Inspiration ○ Capable/content ○ Darker side of comparison •Communion ○ Creating community ○ Receiving support ○ Hope for others •Universality/Connection ○ Shared hope or strength: Banding together ○ Shared difficulty: Not the only one

Table 2. (Continued). Outcomes of Included Studies

Author	Measures (Quantitative only)	Control (*N*)	Attrition rate (%)	Analyses	Outcomes and Effect Sizes (where applicable and reported)
Müller et al. (2015)	PWI-A, PANAS, HADS-D, NRS, BPI, SOPA, CPAQ-8, PCS	Placebo (45)	•Post-test: 20 •2.5 month f/u: 10	Analysis of variance	•Statistically significant increases pre and post-intervention for treatment group for life-satisfaction (*d*=.27) and PA (*d*=.36). Statistically significant pre-post increase in life-satisfaction (*d*=.36), but not PA, for control group. •Increase in life-satisfaction, but not positive affect, maintained at 2.5 month follow-up for treatment group. Non-significant interaction of time and group at 2.5 month follow-up. •Dose effects reported though small sample sizes limited power to detect statistically significant differences between *dose received* subgroups. Data suggests greater increases in PA found when exercises were practiced more frequently (>1 day a week *plus* on bad days). Greater effects for life-satisfaction found when exercises were practiced more frequently (>1 day a week *but not* on bad days). Greater pre-post improvements in positive affect and life-satisfaction observed when exercises were performed for longer than the required 15-minutes.
Simm et al. (2014)	PSEQ, WEMWBS, BPI-SF, STST*	-	PSEQ/WEMWBS •Post-test: 0/0 •10-week f/u: 41.2/45.3 •6-month f/u: 55.3/56.3 •12-month f/u: 72.9/78.1	T-tests	•Statistically and clinically significant improvements in pre-post pain self-efficacy and mental well-being. Effect sizes not reported. •Statistically significant improvements in self-efficacy maintained at 10-week follow-up. •Statistically significant improvements in mental well-being maintained at 10-week, 6-month and 12-month follow-ups.
Tse et al. (2010)	CVRS, SuHS, UCLA, LSI-A	No intervention (34)	•Post-test: 0	Chi-square, Mann-Whitney U tests, Wilcoxon Signed Ranks test, Friedman test	•Statistically significant pre-post (week 1 to week 8) improvements in happiness and life-satisfaction for those in experimental group. No significant pre-post improvements found for the control group. Effect sizes not reported. •Statistically significant differences between humour therapy group and control group were found for life satisfaction and happiness at week 8.

Note: AAQ-II= Acceptance and Action Questionnaire-II; BPI= Brief Pain Inventory (pain interference); BPI-SF= Brief Pain Inventory- Short Form; CPAQ-8= 8-item Chronic Pain Acceptance Questionnaire; CPAQ-R= Revised Chronic Pain Acceptance Questionnaire; CSHS= Comprehensive State Hope Scale; HADS= Hospital Anxiety and Depression Scale; HADS-D= Hospital Anxiety and Depression Scale- Depression Subscale; LOT-R= Revised Life Orientation Test; LSI-A= Life Satisfaction Index-A; MS= Multiple Sclerosis; NMD= Neuromuscular Disease; NRS= Numeric Rating Scale (pain severity); ÖMPSQ= Örebro Musculoskeletal Pain Screening Questionnaire; PA= Positive Affect; PANAS= Positive and Negative Affect Scale; PCS= Pain Catastrophizing Scale; PDI= Pain Disability Index; PPI= Positive Psychotherapy Inventory; PPS= Post-Polio Syndrome; PSEQ= Pain Self-Efficacy Questionnaire; PTQ= Perseverative Thinking Questionnaire; PWI-A= Personal Well-Being Index- Adult version; SBI= Savouring Beliefs Inventory; SCI= Spinal Cord Injury; SCS-SF= Self-Compassion Scale- Short Form; SHS= State Hope Scale; SOPA= Survey of Pain Attitudes (pain control); STST= Sit-To-Stand-Test; SuHS= Subjective Happiness Scale; SWLS= Satisfaction with Life Scale; UCLA= Revised UCLA Loneliness Scale; W-BQ12= 12-item Well-Being Questionnaire; WEMWBS= Warwick-Edinburgh Mental Well-Being Scale

Overall Outcomes

Pre-test post-test studies

Five of the eight studies utilised a pre-test post-test design to assess the effects of PPIs for individuals with chronic pain. Of these, three studies, described in two publications (Howell et al., 2014; Simm et al., 2014), evaluated the impact of PPIs upon psychological well-being, with all reporting significant increases immediately following intervention. The well-being measures used in the studies varied, with Simm et al. (2014) using the Warwick Edinburgh Mental Well-being Scale (Tennant et al., 2007), and Howell et al. (2014) utilising the Positive Psychotherapy Inventory (Rashid, 2009). When the three individual subscales of the Positive Psychotherapy Inventory were investigated Howell et al.'s (2014) two studies, significant increases in relation to the pleasure experienced by the participants, and sense of engagement in life were observed. Significant increases in participants' levels of meaning (i.e., purpose in life) were also noted in the second of the studies reported in the paper (Study B; Howell et al., 2014), though no such increases were found in the first (Study A; Howell et al., 2014). Of these studies which measured well-being as an outcome variable, only Simm et al. (2014) investigated the longer-term effects of the PPI intervention employed, with significant improvements maintained at ten-week, six-month and 12-month follow-ups. The same study additionally investigated the effects of the PPI upon pain self-efficacy, and found significant improvements immediately post-intervention and at the ten-week follow-up. No such maintenance of improvements were observed in the six and 12-months following completion of the programme. The methodological quality of the pre-test post-test studies varied greatly, with Simm et al. (2014) and Howell et al. (2014) comprising the lowest and highest scoring papers on the QATSSD respectively.

In addition to well-being, two studies explored the effects of a PPI in relation to hope (Howell et al., 2014). The outcomes of Study A demonstrated a trend for hope scores (as measured by Snyder et al.,'s [1994] State Hope Scale) to increase following the PPI, though these differences were non-significant. Similar results were observed in the second of the two studies, with pre-post improvements in overall hope scores found to be non-significant. Interestingly, closer examination of results in Study B indicated that increases in hope reflected significant change on the Pathway, (but not Agency) subscale, which when combined rendered the overall pre-post change in state-hope non-significant. Study B additionally incorporated the Comprehensive State Hope Scale (Scioli, Ricci, Nyugen & Scioli, 2011) to further examine any pre-post changes in hope in greater detail by means of the measure's four subscales. As in Study A, improvements in participants' levels of hope following the PPI were found to be significantly greater following completion of the programme. A breakdown of these results suggested that this overall improvement in hope reflected statistically significant pre-post differences on the Mastery, Attachment and Survival (but not Spirituality) subscales. These two studies were assessed as being higher in quality than most of the other quantitative studies included in the review. Particular strengths were noted in relation to the reliability and validity of the outcomes measures used and the appropriate fit between the research questions and the methods of analyses. However, finding of the hope-based psychological interventions are limited due to the small samples sizes utilised.

Two studies assessed the effects of PPI interventions on life-satisfaction (Tse et al., 2010; Müller et al., 2015). Müller et al. (2015) utilised the total score of the eight-item Personal Well-Being Index (International Well-being Group, 2013) and Tse et al. (2010) administered the Life Satisfaction Index (Hoyt & Creech, 1983) to give an overall indication of participants' pre and post life satisfaction ratings.

The two studies varied considerably in terms of their methodological quality, though a mutual strength was that both included a control group with which to compare the effects of the PPIs. However, as was the case for all but two of the studies included in this review, there was no evidence of service-user involvement in the study design processes. Furthermore, the quality of the reporting in the articles was assessed to be weak in certain areas, and both papers would have benefited from a more comprehensive discussion of the research settings and the strengths and limitations of the studies. Both studies found life-satisfaction significantly improved immediately following intervention, with Müller et al. (2015) reporting pre to post-treatment effect sizes as comparable to those in evaluations of CBT interventions for individuals with physical disabilities. The participants in the control group employed in Tse et al.'s (2010) study received no active intervention, and as expected no improvements in life-satisfaction for this cohort were thus found. The control group utilised in Müller et al.'s (2015) study were instructed to take part in a neutral weekly-writing activity to control for the effects of time and participation in an intervention. Although this intervention was not a PPI, significant post-treatment increases in life-satisfaction were also found amongst control group participants. However, whilst significant improvements in life-satisfaction were maintained 2.5 months following completion of the PPI for the treatment group, no significant maintenance of effect was observed for the control group in this study.

Müller et al. (2015) additionally investigated the effects of the PPI on positive affect (PA) by means of the Positive and Negative Affect Scale (Watson, Clark & Tellegen, 1988), and found a statistically significant increase immediately post-intervention for the treatment group (but not control), though this improvement was not maintained at the 2.5 month follow-up.

In addition to life-satisfaction, Tse et al. (2010) administered the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999) to evaluate the effects of the PPI in relation to participants' levels of happiness. Significant pre and post-treatment improvements were found amongst those who took part in the intervention. Control participants' self-report happiness levels remained stable throughout the duration of the study. Furthermore, during the final week, the difference between the levels of happiness reported by the two groups was statistically significant, with those who participated in the PPI reporting greater levels of happiness than those who received no therapeutic input.

Single-case design study

One study (Flink et al., 2015) utilised an experimental single-case methodology to evaluate improvements in participants' life satisfaction, self-compassion, capacity to savour positive outcomes, optimism and PA. Participants completed a several measures at different intervals throughout the study. These included the Satisfaction with Life Scale (Diener, Emmons, Larsen & Griffin, 1985), the Self-Compassion Scale- Short Form (Raes, Pommier, Neff & Van Gucht, 2011), the Savouring Beliefs Inventory (Bryant, 2003), the Life Orientation Test (Scheier, Carver & Bridges, 1994) and the Positive and Negative Affect Scale (Watson, Clark & Tellegen, 1988). The researchers used the Reliable Change Index (RCI) to evaluate whether the pre and post-test changes in scores were beyond changes that could be due to measurement error. The RCI is calculated by dividing the difference between the pre and post–test scores by the standard error of the difference between the two scores (Jacobson & Truax, 1991). In this study, Flink et al. (2015) calculated the RCI by using existing pre and post data from studies which used the same measures in chronic pain samples.

The results indicated improvement across many of the variables for four of the five individuals in the study, though only a limited number of these pre-post differences were found to be reliable according to the RCI. Life-satisfaction was found to have reliably increased for two participants post-intervention, and a reliable improvement in PA was observed for one individual, which was maintained at a three-month follow-up. Optimism remained fairly stable for all participants across the study. Whilst there are methodological advantages utilising the RCI as an objective measure of change, the study's authors note that the stringent criteria led to many non-significant findings, despite somewhat large improvements in scores noted. See Table 2 for the quantitative findings of the PPIs.

Qualitative studies

Two studies (Dargan et al., 2014; Larsen et al., 2015) qualitatively assessed the effects of PPIs amongst individuals with chronic pain. Both papers reported themes which reflected improvements relevant to positive psychological constructs (e.g., flourishing). Both studies were assessed as poor in terms of the level of detail described in their recruitment and procedures, and little information was provided regarding the demographics of the individuals who took part in the interviews. However the reporting quality of other aspects of the papers, such as the analytic process and the description of the theoretic framework underpinning PPIs, was rated as of high quality in both papers. Furthermore, the qualitative methods of data collection were appropriate and fitting to answer the stated research questions, as were the analytic methods employed by the researchers following transcription of the interviews. See Table 2 for a full list of the qualitative themes and main findings for each study addressed in this review.

Dargan et al. (2014) described themes relating to participants' experiences of attending a PPI. One theme (i.e., *Accessing the programme*) reflected the initial effects that being invited to take part in the PPI had upon the individual, in terms of inducing a feeling of hope within participants that the intervention may lead to increased sense of control and greater independence. Other themes (*A solution-focused group* and *The solution-focused* *clinician*) reflected upon the PPI process and the beneficial effects experienced as a result. For example, participants described how the continuous focus upon their strengths and ongoing opportunities to share their expertise in living with chronic pain led to an enhanced sense of meaning, purpose and connectedness with others. It was also found that participants found practical benefit from listening to other group member's examples of competence. Furthermore, the theme *Solutions and changes* encapsulated an increased sense within some participants of their ability to facilitate meaningful and positive change, indicating enhancements in pain-related self-efficacy.

Larsen et al. (2015) encapsulated the experiences of participants who attended a PPI by generating primary themes which explored the impact of the intervention and its influence upon their sense of hope. The theme *Awareness* suggested that the PPI enabled participants to better-recognise and reflect upon their own strengths and internal resources, despite the enduring nature of the chronic pain. Similar to Dargan et al.'s (2014) results, it was found that participants valued the opportunity to both share their strengths and discuss those of others in the PPI, and the effects of doing so resulted in an increased sense of hope. Similarly, the supportive atmosphere experienced by group members led them to feel an increased sense of hope, resulting in the theme of *Community*. As in line with Dargan et al.'s (2014) findings, where increased feelings of support were experienced when attending the PPI, participants in Larsen et al.'s (2015) study reported that the sense of community led to participants fostering a greater sense of hope. The positive impact of the clinicians delivering the PPI (through modelling positive conversations and demonstrating a genuine curiosity of participant's strengths) was also found to be important in both qualitative studies, the effects of which led to an enhanced sense of hope and validation in participants. Both studies recognised these factors to be particularly relevant in the context of chronic pain, where individuals may experience a continual fear of judgement given the invisible nature of their condition.

Quality Assessment of Included Studies

The individual item, total and percentage scores for quality assessment can be found in Table 3. There was considerable variability with regard to overall quality, with scores ranging from 23 to 36 out of a possible 42 (54.8% and 85.7% respectively). Higher scores indicate a higher level of methodological and reporting quality. The sample sizes of the quantitative studies were small in nearly all cases. With the exception of two studies where statistical power was not mentioned, the majority of researchers considered this in terms of the analysis undertaken. Five studies employed pre-test post-test designs, and study limitations therefore mainly centred upon the lack of control or comparator groups and absence of longer-term data to assess for maintenance of effects. Of the two studies that included a control group, only one (Müller et al., 2015) randomised participants.

The analytic processes employed within the qualitative studies were considered suitable approaches to address the research questions and the sample sizes employed in these studies were appropriate for undertaking the thematic analyses of the interview transcripts (Braun & Clark, 2006). Overall, researchers largely reported the limitations of the methodologies and study designs, and noted these accordingly. Similarly, detailed and explicit reference to the underlying theoretical frameworks of the study interventions were described in most. It was noted that just two studies (Dargan et al., 2014; Simm et al., 2014) reported evidence relating to the involvement of individuals with chronic pain in the design of the study. Furthermore, a general trend was observed whereby both the quality of the study design and reporting increased amongst the more recently published papers, perhaps reflecting a greater adherence to quality guidelines and standards checklists as recommended when conducting current research.

Table 3. Quality Assessment Ratings using the QATSDD

Item (Score 0-3)	**Dargan et al. (2014)**	**Flink et al. (2015)**	**Howell et al. (2014) (Study A)**	**Howell et al. (2014) (Study B)**	**Larsen et al. (2015)**	**Müller et al. (2015)**	**Simm et al. (2014)**	**Tse et al. (2010)**
1.Explicit theoretical framework	3	3	3	3	3	3	3	1
2.Statement of aims/objectives in main body of report	3	3	3	3	3	3	1	3
3.Clear description of research setting	2	1	3	3	1	2	3	2
4.Evidence of sample size considered in terms of analysis	3	3	2	3	3	3	0	0
5.Representative sample of target group of a reasonable size	1	1	2	2	2	2	2	3
6.Description of procedure for data collection	2	3	3	3	3	3	3	2
7.Rationale for choice of data collection tool(s)	2	3	3	3	3	3	2	3
8.Detailed recruitment data	1	3	1	1	1	3	1	2
9.Statistical assessment of reliability and validity of measurement tool(s) (Quant. only)	-	3	3	3	-	3	0	1
10. Fit between stated research question and method of data collection (Quant. only)	-	3	3	3	-	3	1	3
11. Fit between stated research question and format and content of data collection tool. (Qual. only)	3	-	-	-	3	-	-	-
12.Fit between research question and method of analysis	2	3	3	3	3	3	1	3
13.Good justification for analytic method selected	1	3	3	3	3	3	1	2
14.Assessment of reliability of analytic process (Qual. only)	3	-	-	-	3	-	-	-
15.Evidence of user involvement in design	3	0	0	0	0	0	3	0
16.Strengths and limitations critically discussed	2	2	3	3	2	2	2	2
Total score	31	34	35	36	33	36	23	27
Percentage score	73.8	81.0	83.3	85.7	78.6	85.7	54.8	64.3

Discussion

The aim of this review was to identify, summarise and appraise studies which reported the effects of PPIs for individuals with chronic pain. The systematic search of five databases rendered results which adequately allowed for the investigation of effects. Eight studies of differing methodologies were included in the review.

Across all six of the quantitative studies, positive effects demonstrating immediate improvements in study variables relating to well-being, hope, pain self-efficacy, happiness and life-satisfaction were evident, suggesting that the effects of attending a PPI may be of benefit to those living with chronic pain. However, one study investigated cases singularly and when taking into account reliable improvements across all participants, the positive effects of the PPI were minimal. Many of the themes generated in the two qualitative studies similarly encapsulated the enhancement of positive psychological constructs such as hope and pain self-efficacy. Both of these studies reported upon the experiences of attending a PPI in a group setting, and the sense of well-being which emanated from the group cohesiveness was also noted as a positive effect in both studies. In line with a biopsychosocial model (Gatchel et al., 2007), whereby pain is understood in terms of its multi-faceted impact upon an individual’s experience, it is anticipated that the social components and interactions within the group setting contributed to individuals’ increased sense of well-being.

PPIs were found to offer beneficial consequences for those with chronic pain, though these effects were mainly observed immediately following treatment. There was slight variation with respect to effect sizes across studies, with the majority categorised as medium to large. It is notable, however, that effect sizes were not reported in two of the articles which employed pre-test post-test designs, and inferences regarding the magnitude of statistically-significant differences found in these studies therefore cannot be made. These effect sizes were not calculated as this review uses a narrative synthesis to draw together the study findings. Only three studies investigated the longer-term continuation of effects, with results indicating a mixed-pattern of maintenance. Furthermore, findings are limited due to attrition rates during the follow-up timepoints.

The review outcomes provide evidence to support existing theories regarding the factors associated with adaptive psychological functioning despite the enduring nature of pain. In line with existing mediation research whereby the presence of positive psychological constructs facilitate greater coping and adjustment (Skidmore et al., 2015; Wright et al., 2011), pre- and post-intervention changes in self-efficacy (Simm et al., 2014) and hope (Howell et al., 2014) were associated with significant improvements in psychological well-being. Although increased levels of optimism have also been found to be related to greater adjustment in individuals with chronic pain (Wright et al., 2011), only one study (Flink et al., 2015) included this variable, with no significant changes in optimism observed following intervention. No studies directly measured resilience, and so despite evidence supporting the existence of relationships between resilience, adjustment and coping (Newton-John et al., 2014), it was not possible to evaluate this in the current review.

Limitations

The poor methodological quality of some studies included in this review necessitate that appropriate caution is given with respect to the conclusions drawn. The heterogeneity of the PPI interventions themselves, the positive psychological constructs measured and study designs employed makes it somewhat difficult to draw firm conclusions regarding the consistency of these effects.

The majority of studies did not collect longer-term follow-up data nor included comparator groups to allow for the investigation of interaction effects. Although most studies made reference to the appropriateness of the sample size in terms of the chosen methodology and data analysis, participant numbers were relatively small across the range of the quantitative articles. In many cases the authors recognised the nature of their research as pilot studies or assessments of feasibility to then warrant larger-scale trials. It is additionally notable that although there were marked differences with respect to participants' improvements described in each of the studies, all studies reported some degree of positive effect following treatment. It is currently unclear whether this observation reflects a publication bias within the existing literature, or perhaps the nascent nature of the evidence base at present.

Just two studies investigated the effects of the PPIs amongst individuals with specific pain sites or types (e.g., back pain and musculoskeletal pain.). The remaining studies included samples consisting of participants with a range of pain conditions, of differing durations, analysed collectively. There was also a great degree of variability found with respect to the outcome measures used in each study, though these inconsistencies are perhaps a reflection of the ongoing and wider debate surrounding the aims and key measurement variables of PPIs.

There are several limitations of the review procedure itself which must be considered when drawing conclusions from the overall findings. First, the inclusion criteria were somewhat broad and resulted in studies detailing interventions which were congruous with the underlying principles of positive psychology, though varied greatly in terms of their content. However, given the ongoing debate within this field and the aim of this research to investigate the effects of PPIs applied amongst pain populations (as opposed to establishing the clinical effectiveness of such interventions), the reviewer considered it appropriate to not adopt criteria which were too conservative or narrow to reduce the risk of excluding relevant research. Furthermore, a strength of the review was that two independent reviewers (each with expertise within the PPI area) were involved in the selection of included papers during this process, and complete agreement regarding the final selected papers was observed.

Similarly, for reasons in line with those described by Bolier et al. (2014), studies were excluded from the review if they were deemed to be developed according to a different theoretical background to that underpinning positive psychology. For example, whilst it is conceivable that elements of ACT interventions fulfil the definition of PPIs used in this review, (as noted earlier with respect to Mindfulness interventions), it is considered a third-wave therapy derived from principles of CBT, and was excluded on this basis. Secondly, the effectiveness of third wave interventions for individuals with chronic pain have been previously reported in existing systematic reviews and meta-analyses (Marikar Bawa et al., 2015; Song, Lu, Chen, Geng & Wang, 2014; Veehof et al., 2011). To include these in the current review may have potentially resulted in the partial obscuration of study findings more explicitly aligned to positive psychological theory.

A related limitation regarding the definition of PPIs emerges with respect to the measurement of such interventions. For the purpose of this review, the author chose to solely include papers which included and reported study outcomes or variables which were deemed to be conceptually aligned to positive psychology. Thus, traditional and more widely-used means of measuring reductions in psychological distress or affective symptomatology were not included in the review. Furthermore, in the cases where studies measured a vast combination of measures, only those assessing for the presence of variables relevant to an increase in *flourishing* (as opposed to a reduction in *languishing*) were taken into account in the synthesis of results. The author therefore acknowledges the potential risk of reporting bias which may arise through synthesising outcomes relating to positive psychological constructs only.

The review benefited from the assessment of the methodological and reporting quality of the individual studies. As discussed, the variation within the study designs across the studies made this process somewhat problematic, though it was possible to use a generic tool as part of this process to collectively analyse and compare quality across diverse methodologies. Although this prospect was considered advantageous for the current review, it was not possible to assess for bias based upon specific quality indicators relevant for the differing methodologies. As the evidence-base for PPIs expands and a greater number of studies using matching designs are published, it is recommended that the rigour of such studies is assessed by means of design-specific quality assessment tools.

Implications for Clinical Practice

The mechanisms underpinning specific PPIs delivered to those with chronic pain varied from study to study, though overall aims of interventions were to support individuals to identify meaningful goals, internal strengths and to notice and savour positive moments, *despite* the presence of pain. These findings are important when considered in the context of chronic pain services, where the client is supported by (often multidisciplinary) clinical teams to “shift their focus away from medical treatments and towards pain management/rehabilitation” (British Pain Society, 2013, p. 26).

Furthermore, these initial findings demonstrating the positive effects of PPIs may contribute to increased patient choice of psychological treatments for those accessing pain services in the future. Finally, given that the majority of the studies included in this review evaluated the effects of PPIs delivered in group settings, (where it was found that group-cohesiveness was an important factor which contributed to an increased sense of well-being), clinicians may consider how the format or delivery of such interventions may have positive clinical implications for both individuals with chronic pain and the wider society, in terms of the potential cost-effectiveness of group interventions.

There is an apparent lack of clarity amongst researchers and clinicians alike regarding which positive psychology constructs are considered fundamental and integral to PPIs. Similarly, these inconsistencies not only affect the development and delivery of standardised PPIs within this field, but also create uncertainty regarding how clinicians measure the effectiveness of such interventions. These discrepancies have clear implications for the quality of the research undertaken within this emerging field, and limit the feasibility of performing further systematic reviews within this clinical area.

Implications for Future Research

Given the heterogeneity across studies, there is a need for a greater consensus amongst clinicians and researchers regarding core elements and definition of PPIs and measurement of outcomes, and from this high-quality trials should be undertaken in order that one may begin to investigate the effectiveness of such interventions alongside more-widely used treatments. Future research may investigate the effects of PPIs on specific pain conditions, and investigate which, if any, specific exercises and techniques currently combined and utilised in existing PPIs contribute to greater improvements in psychological well-being than others.

Although the final review only included studies with adult samples, we did not uncover any relevant articles which utilised child or adolescent populations during the literature search. Given that some authors claim that the incidence of chronic pain amongst children and adolescents is comparable to that of adults (Eccleston & Malleson, 2003), future research should address and evaluate the current state of the positive psychological literature with this clinical population in addition to investigating adult samples. Lastly, a striking finding in this review (particularly given the somewhat recent publication dates of many of the studies) was the apparent lack of evidence for the involvement of individuals with pain in studies' design processes. Given the increasing awareness of the value of service-user involvement in research (Carter, Beech, Coxon, Thomas & Jinks, 2013), future researchers should embrace and utilise the expertise of those with lived-experience of chronic pain.

Conclusion

To the best of the author's knowledge, this review is the first attempt to systematically examine the effects of PPIs amongst individuals living with chronic non-cancer pain. This review extends existing literature and summarises all of the literature currently available within this area and identifies the limitations of the evidence-base to date, providing a platform for future research to advance this field.

Findings offer tentative support for the use of PPIs to enhance positive psychological constructs relevant to positive psychology and psychological well-being amongst individuals living with chronic non-cancer pain. Researchers should work towards a more encompassing definition of the core elements of a PPI and identify key, conceptually-aligned outcomes to measure subsequently. This convergence of thoughts and ideas will allow for the generation of higher quality evidence regarding the effects of PPIs, potentially leading to greater patient choice in clinical services.

Previous reviews have demonstrated that PPIs can be effective in enhancing subjective and psychological well-being, though were limited by their focus upon non population-specific or non-clinical samples and arguably incongruous or narrow inclusion of constructs measured. The findings from this review outline the effects of PPIs upon well-being applied within chronic pain populations, in addition to a wider array of outcome variables relevant to the core aims and underpinnings of positive psychological approaches. It provides a useful summary of the state of the available literature at present and notably identifies the relative lack of high quality studies within this specific clinical area, pointing to the importance of future research to advance this field.

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Chapter 2

The Role of Positive Goal Engagement in Increased Psychological Well-being amongst Individuals with Chronic Non-Cancer Pain

To be submitted to the Journal of Pain. Please see Appendix C for the author guidelines.

Abstract

Individuals with chronic pain commonly report significant functional impairment and reduced quality of life. Emerging evidence demonstrates the relevance of capturing clinical outcomes in relation to improved psychological well-being (PWB), though little is known about the psychological processes or mechanisms underpinning enhancements in PWB within this population. The study aimed to investigate whether 1) increased levels of pain intensity and interference predicted lower levels of PWB, 2) increased goal-focused hope and solution-focused thinking predicted higher levels of PWB, and 3) whether the relationships between pain characteristics and PWP were mediated by increased goal-focused hope and solution-focused thinking. A total of 586 individuals with chronic pain participated in the online, cross-sectional study. Structural equational modelling was used to test a hypothesised model whereby self-report measures of solution-focused thinking and goal-focused hope comprised the latent variable *positive goal engagement* (PGE). Self-report measures of pain characteristics and PWB were also completed. Results showed that both pain characteristics and PGE predicted PWB. Moreover, relationships between pain intensity and interference and PWB were partially mediated by PGE. The results provide tentative evidence for the protective role of PGE in enabling individuals with chronic pain to maintain a sense of PWB.

Perspective

The study findings provide further support for a biopsychosocial model of chronic pain by examining the roles of psychological factors, pain severity and functional impairment. The promotion of PWB through the enhancement of positive psychological constructs comprising PGE is discussed, offering a potential platform for future research and clinical interventions.

Keywords: Chronic Pain, Positive Psychology, Positive Goal Engagement, Well-being, Structural Equation Modelling

Introduction

The impact of chronic pain is multifaceted and best understood from a biopsychosocial perspective which takes into account the complex interplay of factors that contribute towards an individual’s experience (Roditi & Robinson, 2011). Relationships between pain intensity, associated impaired function and low levels of psychological well-being (PWB) are well documented within the literature (Yazdi-Ravandi et al., 2013). Studies have investigated the role of maladaptive processes which underpin and perpetuate pain-related psychological distress (Linton & Shaw, 2011), with increased pain catastrophizing (Jensen, Turner & Romano, 2001; Turner, Jensen, Warms & Cardenas, 2002) and rumination (Edwards, Tang, Wright, Salkovskis & Timberlake, 2011) identified as important influences within this process. Whilst the evidence base outlining psychological deficits that pose risk factors for poor prognosis and impaired functioning (Roditi & Robinson, 2011) is well-established, little is known about the protective role of positive psychological traits in individuals with chronic pain.

Only a handful of studies have currently been undertaken within this area, with factors including self-efficacy (Skidmore et al., 2015), acceptance, hope and optimism (Pulvers & Hood, 2013; Wright et al., 2011) having been found to be associated with increased psychological adjustment and lower pain perception. Furthermore, there is a paucity of research which outlines the contribution of positive psychological constructs in relation to enhanced PWB. Given that increased PWB has been associated with longevity amongst healthy samples and survival in diseased populations (Chida & Steptoe, 2008), it is useful to investigate factors associated with improved well-being amongst individuals with chronic pain, particularly given the somewhat limited effectiveness of medical and pharmaceutical interventions within this area (Turk, Wilson & Cahana, 2011).

Positive psychological interventions underpinned by solution-focused approaches that draw upon inherent personal strengths and resilience to facilitate goal-orientated action have led to increased PWB in chronic pain populations (Simm, Iddon & Barker, 2014). It is theorised that promoting individuals' ability to engage in "solution-focused thinking" (Grant et al., 2012, p. 335) and increasing positive attentional bias enables individuals to better notice their internal resources and exceptions to the pain-related problems, in turn leading to an increased sense of well-being (Bray, Groves, Latham, Iddon & Weymouth, 2015).

Goal-focused hope is an independent predictor of well-being (Unwin & Dickson, 2010) and consists of the presence of motivation to pursue personal goals (i.e., *the will*) and the belief in one's ability to plan how the goal may be achieved (i.e., *the way*) (Snyder, Irving & Anderson, 1991). Within the context of physical pain, hope-based interventions have been found to significantly increase levels of well-being (Howell, Jacobson & Larsen, 2014) and higher levels of dispositional goal-focused hope have been linked to higher pain threshold and greater pain-tolerance (Snyder et al., 2005). It is proposed that individuals in chronic pain with high levels of trait hope may be more likely to be adopt alternative goals (and pathways to meeting them) and rouse any additional motivation needed to follow them through (Snyder, 1998).

To date no research has explored the influence of the presence of these positive factors in relation to PWB amongst individuals with chronic pain. The aim of this study is to investigate whether the characteristics of the pain experienced predict PWB, and whether positive psychological constructs underpinned by goal-focused hope and solution-focused thinking mediate these relationships. It is hypothesised that: 1) increased levels of pain intensity and interference will predict lower levels of PWB, 2) increased goal-focused hope and solution-focused thinking will predict higher levels of PWB, and 3) the relationships between pain characteristics and reduced PWB will be mediated by increased solution-focused thinking and goal-focused hope.

Methods

Design

This was a cross-sectional, internet-based study. Individuals with chronic pain who attended a service-user led support group were consulted during the design stage of the research with respect to the measures employed and recruitment methods utilised in the study. Institutional and ethical approval was obtained from the University of Liverpool (Ref: IPHS-1415-068).

The minimum sample size required recommended for SEM analysis is at least ten participants per estimated parameter (Kline, 2015; Schreiber, Nora, Stage, Barlow & King, 2006). The final model presented in the current study had 22 parameters (9 regression weights, 9 error variances and 4 covariances), suggesting that at least 220 participants were required. The sample size in this study was 586, indicating that the SEM analysis was adequately powered.

Participants

Individuals with chronic non-cancer pain living in the community were recruited between February 2015 and January 2016. A distinction between cancer and non-cancer pain is commonly made within the literature and populations are most often researched independently due to significant variations between the treatment options and prognoses of the different diseases (Fordyce, 2001). Inclusion criteria were: 1) having experienced physical pain for three consecutive months or longer, 2) being aged 18 years or over, 3) being a resident of the United Kingdom, and 4) being fluent in English. The online questionnaire was designed so that participants were prompted to respond to any missed items and only complete datasets were included in the final analysis. A total of 757 individuals accessed the online survey and gave their consent to take part in the study. Of these, 171 completed the demographic items though did not complete all of the online measures and were therefore excluded from the final analysis, yielding a total sample size of 586. The overall completion rate of 77% is comparable to those reported in other research utilising online surveys (Barrios, Villarroya, Borrego & Ollé, 2011).

Measures

Solution-Focused Inventory (SFI; Grant et al., 2012).

Solution-focused cognitive processing was assessed using the SFI. The 12-item questionnaire measures the extent to which a person thinks or processes information according to solution-focused principles. An overall score can be calculated which takes into account all 12 items to give an overview of general solution-focused thinking style, or scores can be categorised into three subscales: Problem Disengagement (PD), Goal Orientation (GO) and Resource Activation (RA). The current study utilised the individual subscales to assess the importance of each in relation to participants' levels of PWB. The PD subscale assesses the extent to which individuals can disengage from problem-focused cognitive processing (e.g., rumination or negative attentional-bias where there is a persistent cognitive focus on one's difficulties, impairments or causal aetiology) to instead focus upon possibilities and potential solutions. The GO subscale measures the extent to which an individual can construct personally-valued goals and engage in active self-regulation to approach and achieve them. Finally, the RA subscale assesses a person's capacity to identify and utilise their own personal strengths and resources in developing solutions to problems, reflecting the presence of resilience and optimism. The minimum and maximum scores for each subscale are four and 24, and higher scores represent greater levels of PD, GO and RA. Validation research using a non-clinical sample demonstrates adequate to good Cronbach's α estimates (PD α= .78, GO α=.78 and RA α= .68) and confirmatory factor analysis of the individual items within each subscale demonstrates support for three factor model (Grant et al., 2012). The internal consistency for each of the subscales within this study was good (PD α= .82, GO α=84. and RA α= .76).

The Adult Hope Scale (AHS; Snyder et al., 1991).

The 12-item AHS was used to measure trait goal-focused hope. The scale is based upon Snyder, Irving and Anderson’s (1991) cognitive model of hope and comprises two subscales: *Agency* and *Pathway*. Four items form each subscale, and the remaining four filler items are not utilised when scoring the measure. The Pathway subscale assesses one’s ability to plan how a goal may be accomplished, and the Agency subscale measures an individual’s goal-directed motivation, or determination to achieve the goal. Snyder et al. (1991) describe that although the individual Pathway and Agency constructs are theoretically distinct factors, they are reciprocal and interactive in nature, and therefore for goal-directed behaviour to occur both need to be operative. Factor analysis supports the use of the two-factor model which in turn may be aggregated to form the overarching construct of goal-focused hope (i.e., the overall perception that positive outcomes can be realised; Snyder et al., 1991). Participants indicate their responses on an eight-point likert scale and higher levels of trait goal-focused hope are represented by higher scores on the subscales. The minimum and maximum scores for each subscale are four and 32. The current study examined the two subscales individually to assess the contribution of each in relation to participants’ levels of well-being. Furthermore, as with the SFI, the AHS measures trait disposition which makes it possible to examine the contribution and influence of individual differences in goal-focused hope upon PWB. Validation research has demonstrated good internal consistency for both the Pathway (α=.80) and Agency (α=.76) subscales, which was replicated in the current sample (Pathway α=.84, Agency α= .82).

Warwick-Edinburgh Mental Well-being Scale (WEMWBS; Tennant et al., 2007).

PWB was measured using the WEMWBS. This measure assesses psychological functioning though 14 positively-worded statements addressing hedonic and eudaimonic perspectives of positive mental health on a series of five-point likert scales. The minimum and maximum possible scores are 14 and 70, and higher scores reflect higher levels of PWB. The scale has shown good internal reliability and good test-retest reliability (α=.91 and α=.83) and confirmatory factor analysis supports the single-factor hypothesis (Tennant et al., 2007). Within this study, the internal consistency of the measure was good (α=.93).

Brief Pain Inventory-Short Form (BPI-SF; Cleeland & Ryan, 1994).

The BPI-SF was used to assess the severity of participants' pain and the impact of this pain upon daily functioning. Widely used in both clinical and research settings, the BPI-SF is a 17-item self-report measure comprising a series of zero-ten numeric rating scales. The mean of items three, four, five and six is calculated to generate an overall pain intensity score, taking into account participants' pain at its worst and least over the past 24 hours, pain on average and current pain intensity. It is widely acknowledged that despite being chronic in nature, the severity and intensity of the pain experienced can fluctuate throughout the day (depending upon factors such as levels of activity and use of analgesic medication), and the composite score is used to provide a general overview of an individual's experience. The mean of the seven sub-items of item nine gives an overall score which represents the impact that the pain has upon daily functioning (i.e., pain interference). These sub-items require participants to rate the degree that pain interferes with general activity, mood, walking ability, normal work, relations with other persons, sleep, and enjoyment of life on a ten-point scale. The minimum and maximum scores for both subscales are zero and ten respectively, and higher scores indicate greater pain intensity and pain interference. The two-factor model which utilises these two subscales has been found to demonstrate good construct validity for individuals with chronic non-cancer pain (Lapane, Quilliam, Benson, Chow & Kim, 2014) and both the intensity and interference scales demonstrate good internal consistency (α=.87 and α=.92 respectively), (Cleeland & Ryan, 1994). In the current sample, the internal consistency of each scale was found to be good (Intensity α=.84 and Interference α=.91).

Procedure

A total of 12 member charities of Pain UK advertised the study via a link on their social media pages and discussion forums. The link took participants to the study web page which contained detailed information about the study and a consent form. It was necessary for participants to complete the consent form before they could access the online questionnaire. Participants were informed that they could withdraw from the research at any time by closing the internet browser and were made aware that incomplete responses would be deleted and excluded from the study analysis. See appendices D, E and F for the recruitment advertisement, participant information sheet and study consent form.

Participants were then asked to complete initial demographic questions and provide information regarding the nature of the pain they experienced (e.g., specific condition, duration since onset, whether or not they had received a formal diagnosis and current use of analgesic medication). Each measure was then presented on a separate page in the following order: SFI, AHS, WEMWBS and BPI-SF (see Appendix G for the study questionnaires). A deliberate decision was made to position the BPI-SF items at the end of the online survey to avoid the possibility that participants’ mood may potentially be negatively primed through completing items relating to pain symptoms and associated functional impairment. Efforts were made to ensure that participation time was kept to a minimum given that those experiencing chronic pain may often find it difficult to sit for prolonged periods of time. Participation in the study took approximately 15 minutes. Upon completion of the questionnaires, participants were presented with debriefing information and a list of useful contacts. Individuals were also invited to take part in a prize draw for the chance to win one of three £50 Amazon vouchers as an acknowledgement of thanks for taking part in the research. Following completion of the study, the pain charities who were part of the recruitment process were provided with a summary of the results to share with their membership (see Appendix H) and the findings were also fed back to the chronic pain support group.

Data Analytic Procedure

SPSS 22 (IBM Corp., 2013) was used to manage the dataset and undertake the initial statistical analyses. Correlations between the key study variables were calculated and the data were examined to ensure that it met the statistical assumptions required for structural equation modelling (SEM). AMOS (Arbuckle, 2011) was used to analyse the proposed SEM *a priori* model, which was developed taking into account existing theory and literature within the fields of positive psychology, PWB and chronic pain. Model fit was assessed via a range of fit statistics, including the chi-square statistic (χ^2), the Root Mean Square-Error of Approximation (RMSEA; Steiger, 1990), the Comparative fit index (CFI; Bentler, 1990) and the Standardised Root Mean Square Residual (SRMR). For a model to be regarded as an acceptable fit, the χ^2 should be non-significant (p >.05) although it is notable that this statistic can often be sensitive towards large sample sizes, leading to an inflated χ^2 which may erroneously imply a poor data-to-model fit (Byrne, 2010; Schumacker & Lomax, 2004). With respect to other fit indices, Hu and Bentler (1999) recommend that values ≤ .06 for the RMSEA and SRMR suggest good fit and values ≤ .08 indicate adequate fit. A CFI value of >.95 suggests a good model to the observed data. In the current study, 95% bias-corrected bootstrap confidence intervals were calculated to examine the indirect effects of the hypothesised mediator variables in the SEM model (Preacher & Hayes, 2008). The total number of bootstrap samples was 5000, as recommended when undertaking scientific research (Hayes, 2013).

Multicollinearity

Multicollinearity between predictor variables can be problematic in SEM and lead to inaccuracies in the estimation of parameters (Kaplan, 1994). Whilst such issues may be alleviated by means of good measure reliability and adequate statistical power through an appropriate sample size (Mason & Perreault, 1991), such as in the current study, multicollinearity can lead to inference errors when two variables do not have sufficient independent variation (Grewal, Cote & Baumgartner, 2004). Whilst hope is more commonly recognised as an implicit feature of the solution-focused approach, as opposed to being a prominent element underpinning therapeutic change (Dolan, 2014), there is evidence to which would suggest that modelling the concepts collectively makes sense from a theoretical perspective (Blundo, Bolton & Hall, 2014). Specifically, solution-focused thinking encapsulates what Snyder (1994) highlighted as important elements underpinning goal focused hope. Namely, being able to identify and build upon positive, goal-directed changes (e.g., goal orientation), and importantly being able to notice and recognise the intrapersonal effort that it takes to achieve such successes (i.e. resource activation).

Given the evident statistical multicollinearity between subscales of both predictor variables and theoretical commonalities, the three SFI and two AHS subscales were modelled as one latent variable in the SEM model, titled *Positive Goal Engagement* (PGE) to reflect both constructs. It is important to note that both the SFI and the AHS are trait measures which assessed goal-focused hope and solution-focused thinking in relation to participants’ stable and enduring dispositions. This is important as if either of the measures were measures were assessing a different or incongruous construct to the other (i.e., if one were a state measure), the validity of the PGE latent variable would have been compromised.

Data screening

The skewness and kurtosis values of all variables fell comfortably within the recommended parameters of +1 and -1 (Schumacker & Lomax, 2004) and examination of the histograms did not suggest significant departures from normality. The distribution of residuals was examined by conducting a series of multiple regression analyses. Each of the proposed endogenous variables (PD, RA, GO, Agency, Pathway and PWB) were entered as the dependent variable, and all the remaining variables were entered as predictor variables. Examination of the histograms and scatterplots suggested normality and homoscedasticity.

A significant difference was apparent between completers and non-completers in relation to age, t (755) = 4.09, p <.001, where there was a tendency for non-completers to be younger than those who completed all of the survey. Furthermore, there was a difference across the two groups in relation to the frequencies of the varying pain conditions, χ^2 (13) = 31.75, p <.01. That is, upon examination of the expected and actual counts of the χ^2 analysis, there were significantly fewer people than expected with fibromyalgia, and significantly more people than expected with endometriosis within the non-completer group.

Further χ^2 tests of independence revealed no significant differences were apparent in relation to gender, the use of analgesic medication and the presence of a formal diagnosis between those who completed the questionnaire in its entirety and those who did not (all *p*s >.001). See Appendix I for further information regarding the demographic details of the 171 individuals who did not complete all of the study measures.

Results

Descriptive Statistics

Mean descriptive statistics for the study variables are displayed in Table 4. The vast majority of participants were female (95.1%, n=557) and the mean age was 41.6 (SD 12.5, range 18-86 years). In total, 94.7% (n=555) had received a formal diagnosis of a chronic pain condition from a health professional, though specific diagnoses varied (see Appendix J for a list of pain conditions). The range in duration since the initial onset of the pain also varied, with the slight majority of participants (25.4%) reporting having experienced pain for longer than 15 years. A total of 88.6% (n= 519) reported taking analgesic medication on a regular basis to manage pain-related symptoms.

There were no significant gender differences across the key study variables (all *ps* >.05). Furthermore, no statistically significant differences were evident between participants with a formal diagnosis of a pain condition and those without a formal diagnosis for all study variables. Individuals taking medication to manage pain symptoms reported significantly higher levels of pain interference, but not intensity, than those not on regular medication, *t* (584) = 3.00, *p* < .01. No other significant differences across the study variables with respect to medication were found. Statistically significant differences in SFI PD, *F* (13, 572) = 2.88, *p* <.001, Agency, *F* (13, 572) = 2.33, *p* <.05, BPI-SF Intensity, *F* (13, 572) = 3.87, *p* <.001 and BPI-SF Interference, *F* (13, 572) = 3.10, *p* <.001 across differing pain conditions were evident. The means and standard deviations for these variables across the different pain conditions are displayed in Table 5 (see appendix K for the means plots).

Table 4. Descriptive Statistics for the Key Study Variables

Variable	**Mean**	**Standard Deviation**	**Minimum-Maximum Score Range**
PWB	40.43	9.35	18-63
BPI-SF Intensity	5.49	1.75	0-10
BPI-SF Interference	6.50	2.29	0-10
SFI PD	15.59	4.46	4-24
SFI RA	15.86	3.68	5-24
SFI GO	15.14	3.77	4-24
AHS Agency	20.60	6.15	4-32
AHS Pathway	21.05	5.38	4-32

Note: PWB= Psychological well-being; BPI-SF= Brief Pain Inventory Short-Form; SFI PD= Solution-Focused Inventory Problem Disengagement subscale; SFI RA= Solution-Focused Inventory Resource Activation subscale; SFI GO= Solution-Focused Inventory Goal Orientation subscale; AHS= Adult Hope Scale.

Additional analyses were undertaken to further examine the finding that more individuals than expected with endometriosis (and fewer than expected with fibromyalgia) were apparent in the non-completer group. Specifically, t-tests were conducted to give an indication of the differences between the means of two populations with respect to the pain variables. Only demographic data were available for participants in the non-completer group, and therefore the following analyses were performed using data from participants with fibromyalgia and endometriosis who completed all of the study items. It was found that participants with fibromyalgia reported significantly higher levels of pain intensity, t (342) = 5.68, $p < .001$ and pain interference, t (344) = 4.16, $p < .001$, than those with endometriosis. The implications of these differences are discussed later in this paper.

Table 5. Means and Standard Deviations for all Significant ANOVAs of Key Study Variables across Pain Conditions

		SFI PD		**AHS Agency**		**BPI-SF Intensity**		**BPI-SF Interference**	
	n	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Ankylosing Spondylitis	8	15.00	5.07	21.75	8.07	6.00	1.23	7.00	1.76
Arthritis	54	17.44	3.67	22.44	5.19	5.41	1.83	6.30	2.37
Back Pain	48	16.54	4.19	20.48	5.60	5.57	1.56	6.46	2.09
Chronic Pain Syndrome	25	15.48	4.61	19.24	5.97	6.37	1.58	7.24	1.84
CRPS	16	15.88	3.88	18.50	5.69	6.63	1.95	8.00	2.06
Endometriosis	198	14.22	4.49	21.20	6.13	5.00	1.82	6.01	2.37
Fibromyalgia	148	16.05	4.59	18.85	6.62	6.01	1.46	7.02	2.05
Hypermobility Syndrome	5	16.40	5.41	26.00	4.06	6.00	2.01	8.69	0.66
Lupus	9	15.78	3.96	21.56	6.69	5.14	1.75	6.25	2.19
Neck Pain	8	17.50	3.70	21.00	4.84	5.78	1.63	6.93	2.35
Pelvic Pain	13	15.08	4.72	20.23	7.17	5.40	1.98	6.28	2.32
Shoulder Pain	6	16.67	4.63	23.50	4.37	4.38	2.15	4.29	3.50
Trigeminal Neuralgia	12	16.67	3.68	22.42	4.19	5.13	1.59	5.91	2.83
Other	36	16.33	3.86	21.53	5.31	5.19	1.69	6.47	2.26
Total	586	15.59	4.46	20.60	6.15	5.49	1.75	6.50	2.29

Note: SFI PD= Solution-Focused Inventory Problem Disengagement subscale; AHS= Adult Hope Scale; BPI-SF= Brief Pain Inventory Short-Form; CRPS= Complex Regional Pain Syndrome.

Correlations

Pearson’s correlations were calculated for all pairs of study variables and are reported in Table 6. As expected, PWB correlated negatively with pain intensity and interference, and positively with the solution-focused thinking and goal-focused hope subscales. There was also a small but significant positive relationship between income and PWB, though contrary to previous findings which suggest that older adults with chronic pain report a greater quality of life and better mood than younger individuals (Rustøen et al., 2005), no significant relationships between PWB and age were evident. As predicted, pain intensity and interference correlated negatively with hope Agency and Pathway, suggesting that an individual experiencing high levels of pain (which impacted significantly upon their everyday functioning) would feel less able and motivated to plan and accomplish valued goals. With the exception of Problem Disengagement and pain intensity, where no significant relationship was evident, the solution-focused thinking subscales correlated negatively with pain intensity and interference. All three subscales comprising solution-focused thinking were significantly correlated with hope Agency and Pathway, with the largest effect sizes observed between the goal-focused hope variables and the solution-focused Goal Orientation subscale.

Table 6. Correlation Matrix of all Study Variables

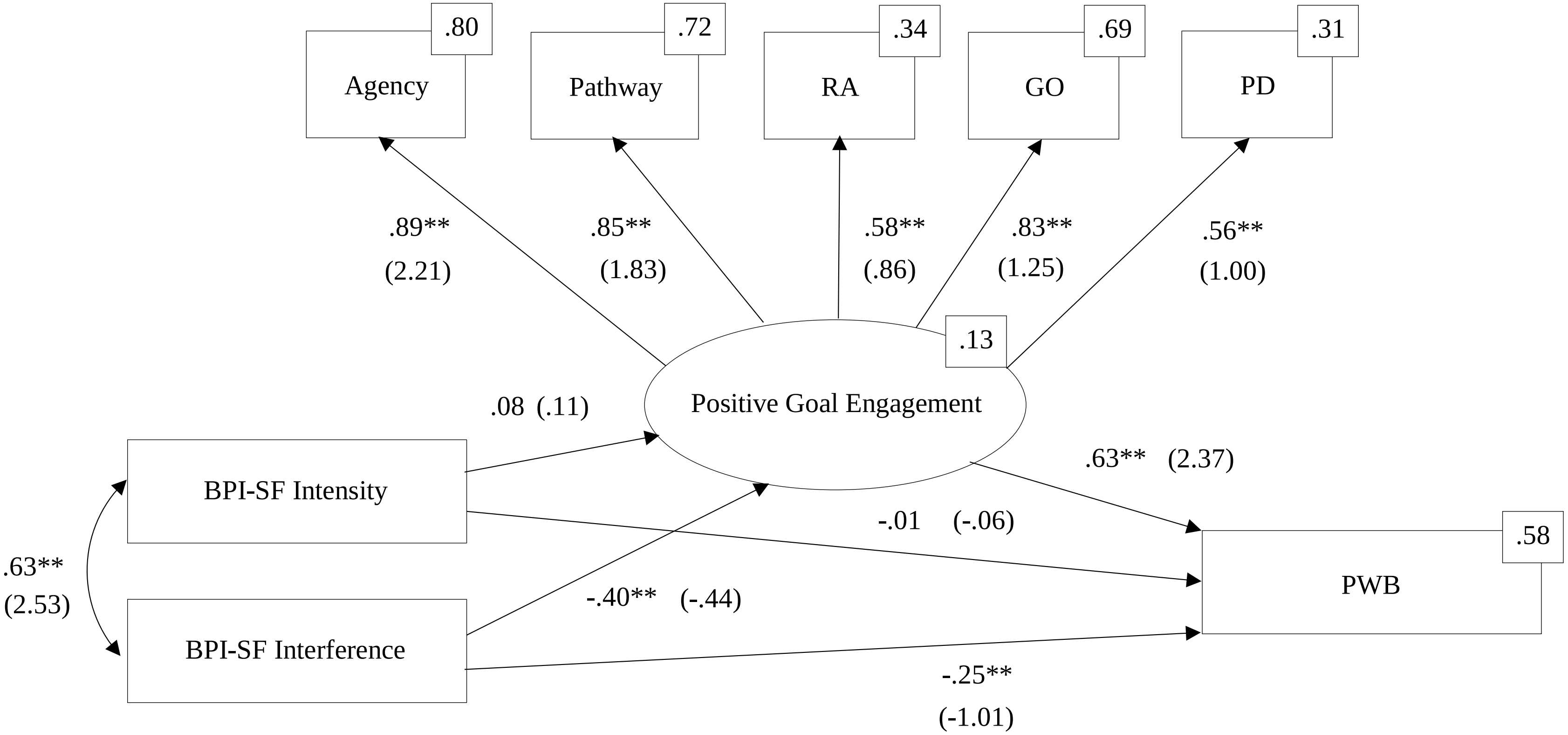
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1. PWB											
2. BPI-SF Intensity	**-.28****										
3. BPI-SF Interference	**-.48****	**.63****									
4. SFI PD	**.54****	.06	**-.16****								
5. SFI RA	**.43****	**-.12****	**-.29****	**.32****							
6. SFI GO	**.56****	**-.09***	**-.23****	**.46****	**.46****						
7. AHS Agency	**.65****	**-.22****	**-.34****	**.47****	**.49****	**.77****					
8. AHS Pathway	**.61****	**-.14****	**-.31****	**.46****	**.56****	**.70****	**.76****				
9. Income	**.22****	**-.19****	**-.22****	.02	.04	**.12****	**.25****	**.17****			
10. Duration	.02	.01	.02	.04	-.07	-.02	-.03	.01	.03		
11. Age	.05	**.15****	**.10***	**.25****	**-.11****	**-.12****	**-.10***	.04	.03	**.16****	

** Significant at .05 level, two-tailed, ** Significant at .01 level.*

Note: PWB= Psychological well-being; BPI-SF= Brief Pain Inventory Short-Form; SFI PD= Solution-Focused Inventory Problem Disengagement subscale; SFI RA= Solution-Focused Inventory Resource Activation subscale; SFI GO= Solution-Focused Inventory Goal Orientation subscale; AHS= Adult Hope Scale.

SEM Analysis

SEM was used to test a proposed theoretical model whereby Positive Goal Engagement (comprising the two AHS subscales and three SFI subscales) mediated the relationships between pain intensity and PWB, and pain interference and PWB, respectively. The Maximum Likelihood method was used to estimate the parameters of the hypothesised model, χ^2 (17) = 141.37, $p < .01$). The χ^2 was significant and suggested that the hypothesised model did not acceptably fit the data, though this figure may have been biased by the large sample size. Further examination of the fit indices revealed that the model was a poor to adequate fit (CFI = .95, RMSEA = .11, SRMR = .05). Figure 2 displays the initial model complete with the standardised and unstandardised regression weights, significance values and R^2 values.



Note: Standardised regression slopes for direct effects are represented by single-headed arrows. Covariance between variables is depicted by curved double-headed arrows. The unstandardised regression weights are reported in the brackets. The total standardised proportion of variance accounted for (R^2) is reported to the top right hand corner for each endogenous variable.

PWB= Psychological well-being; BPI-SF= Brief Pain Inventory Short-Form; SFI PD= Solution-Focused Inventory Problem Disengagement subscale; SFI RA= Solution-Focused Inventory Resource Activation subscale; SFI GO= Solution-Focused Inventory Goal Orientation subscale; AHS= Adult Hope Scale.

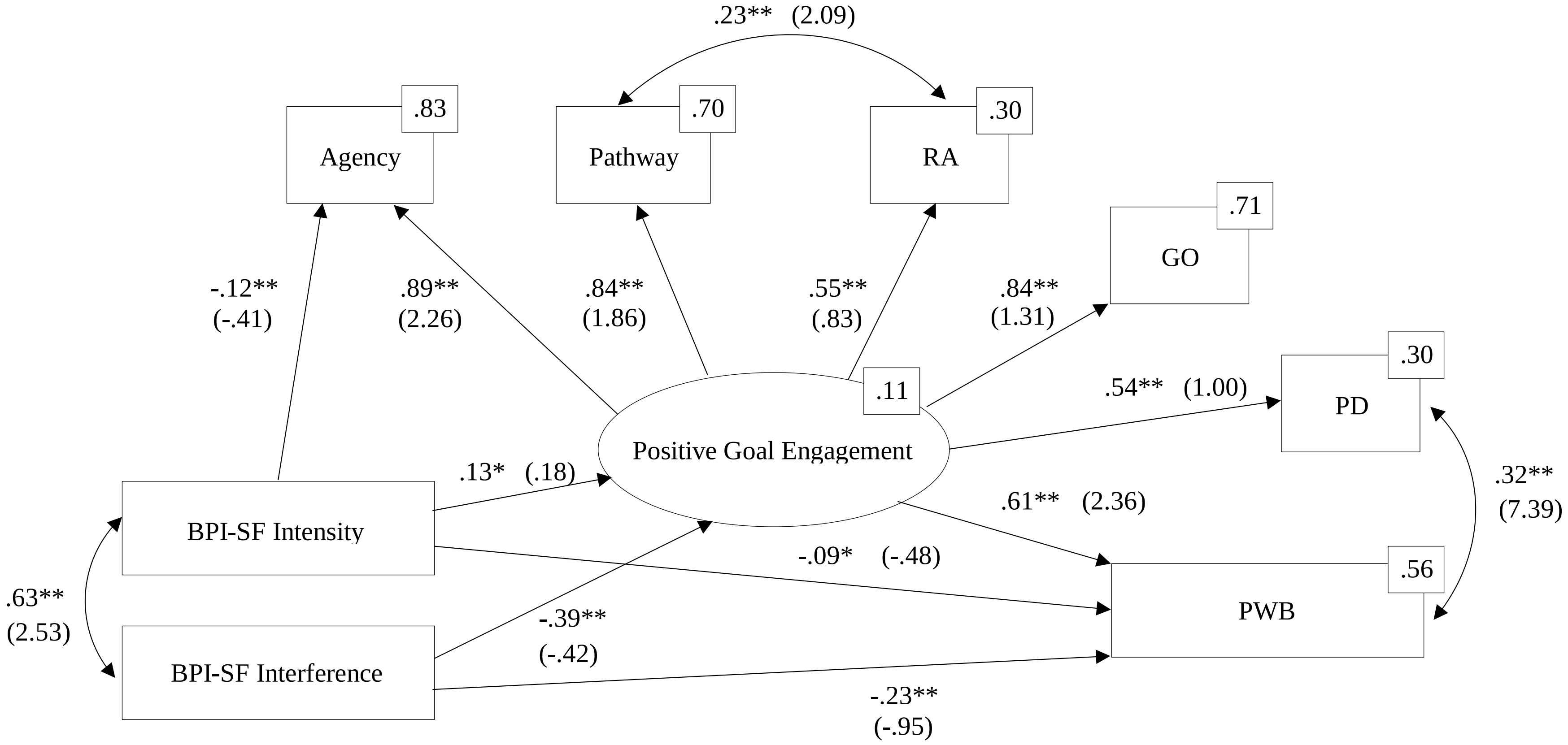
*** Significant at .001 level.*

Figure 2. Graphical Representation of the Initial SEM model

Model modification

The modification indices highlighted that the model could be improved by making a number of adjustments. It was necessary that any modifications made were theory-driven in order to avoid over-fitting the data and thereby limiting the generalisability of the model. The modification indices suggested adding a direct path from BPI-SF intensity to the Agency subscale would improve the model. This modification seemed theoretically coherent given that the severity of pain experienced is likely to have an influence on an individual's motivation to set and achieve goals. The indices also suggested correlating the error terms of the Pathway and RA subscales, which seemed appropriate given the related items on both subscales focus upon the ability to find solutions which lead to goal-accomplishment. Finally, a correlation between the PD and PWB error terms was also suggested. A certain degree of residual covariation between these constructs is expected and it is theoretically reasonable that there would be an association between experiencing a greater sense of well-being and having a greater capacity to disengage from problem-focused cognitive processes.

Following modification, the final model fit indices indicated that the model was a good fit to the data (CFI = .99, RMSEA = .06, SRMR = .03). As with the original model, the $\chi 2$ was significant, χ^2 (14) = 42.74, p <.01, suggesting that the second model was significantly different from the 'perfect' model with respect to fitting the data. Whilst it is important to consider the implications of this finding, it is again anticipated that the statistic may have been sensitive to the sample size. The modifications made did not significantly affect the original hypothesis in relation to the relationships between variables, and the modified model was a significantly better fit to the data than the initial model, ($\Delta\chi^2$ (3) = 98.63, $p < .01$). The modified, final model with standardised and unstandardised direct effects, associated significance values and R^2 values is displayed in Figure 3.



Note: Standardised regression slopes for direct effects are represented by single-headed arrows. Covariance between variables is depicted by curved double-headed arrows. The unstandardised regression weights are reported in the brackets. The total standardised proportion of variance accounted for (R^2) is reported to the top right hand corner for each endogenous variable.

PWB= Psychological well-being; BPI-SF= Brief Pain Inventory Short-Form; PD= Solution-Focused Inventory Problem Disengagement subscale; RA= Solution-Focused Inventory Resource Activation subscale; GO= Solution-Focused Inventory Goal Orientation subscale; Agency= Adult Hope Scale Agency subscale; Pathway= Adult Hope Scale Pathway subscale.

*** Significant at .001 level, * Significant at .05 level.*

Figure 3. Graphical Representation of the Final SEM Model

Indirect effects

All indirect effects in the modified model were significantly different from zero. Positive Goal Engagement partially mediated the relationships between pain intensity and PWB, and pain interference and PWB, respectively. The standardised and unstandardised indirect effects are reported in Table 7.

Table 7. Indirect Effects for the Final Model

Predictor	**Outcome**	**Standardised Indirect Effect**	**Unstandardised**		
			Indirect Effect	**Lower CI**	**Upper CI**
BPI-SF Intensity	PWB	.08*	.42	.03	.80
BPI-SF Interference	PWB	-.24**	-.98	-1.28	-.71

**Significant at .05 level, two-tailed ** Significant at .01 level, two-tailed.*

Note: BPI-SF= Brief Pain Inventory Short-Form; PWB= Psychological well-being.

Discussion

This study investigated the role of chronic pain characteristics and positive psychological constructs in relation to enhanced psychological well-being. Results demonstrated that greater levels of pain intensity and interference in everyday functioning significantly predicted lower levels of psychological well-being. Furthermore, greater levels of trait PGE (comprising factors based upon goal-focused hope and principles underpinning the solution-focused approach) predicted higher levels of psychological well-being. An important finding of this study was that PGE partially mediated the relationships between both pain severity and its impact upon function and psychological well-being. These findings provide tentative support for the protective effect of the presence of PGE in enabling individuals with chronic pain to maintain a sense of psychological well-being, whilst accounting for effects of the intensity and impact of the pain itself.

The finding that higher levels of pain intensity and interference were significant independent predictors of reduced psychological well-being is in line with past research (Huber, Suman, Biasi & Carli, 2008). Interestingly, in the current study pain interference was more strongly associated with reduced psychological well-being than pain intensity, suggesting that it is the extent to which the pain prevents individuals from engaging in everyday activities, as opposed to the level of pain which has the greatest impact upon psychological well-being. Whilst there is a paucity of studies which investigate the differing effects of the pain characteristics upon psychological well-being specifically, the variability between the strength of these relationships upon depression has been replicated in previous research (Cuff, Fann, Bombardier, Graves & Kalpakjian, 2014). It is expected that the disabling nature of pain and subsequent impact upon function contributes towards a reduced sense of psychological well-being through a number of mechanisms. For example, having a sense of autonomy, personal growth, purpose in life, environmental mastery and maintaining positive relations with others are all factors identified as important in relation to psychological well-being (Ryff, 1989), and these factors may be threatened or diminished by the enduring nature of chronic pain. The multifaceted impact of pervasive pain upon these aspects therefore highlights the importance of biopsychosocial interventions which aim to target the potentially debilitating impact of pain from multidisciplinary perspectives (Kaiser et al., 2013).

The finding that PGE significantly predicted higher levels of psychological well-being and mediated the effects of pain severity and interference upon psychological well-being complements and extends existing literature within the field. Emerging evidence outlines the relevance of measuring asset-based (as opposed to deficit-based) constructs which act as protective buffers against psychological distress (Morgan & Ziglio, 2007), and both hope-based and solution-focused interventions have been found to increase well-being within pain populations. It is proposed that individuals with greater levels of PGE are able to maintain a higher sense of psychological well-being through the activation of positive psychological processes despite observed variability in chronic pain characteristics. First, individuals with a higher sense of goal-focused hope may be more likely to self-orientate towards valued goals and identify the means to pursue them, despite the presence of pain, thus promoting effective coping (Snyder, 1998). Second, it is proposed that a dispositional ability to operate in line with principles such as those used in solution-focused approaches promotes improved adjustment and coping (Cockburn, Thomas & Cockburn, 1997). Such individuals may be more likely to recognise and utilise their successes, strengths and internal resources despite the presence of problems or pain-related difficulties, promoting increased adjustment and motivation to pursue valued goals (O’Connell, 2005).

Contrary to expected, when the constructs were analysed collectively as a latent variable, a small yet significant positive relationship was found between pain intensity and

PGE, suggesting that individuals experiencing more intense pain also reported a greater presence of PGE. The opposite was evident in relation to pain interference whereby greater functional impairment was found to predict lower levels of PGE. One possible explanation for this is that the current study employed trait, as opposed to state measures of goal-focused hope and solution-focused thinking. Although there is evidence to suggest that both state and trait hope measures are highly correlated (Snyder et al., 1996), no separate state and trait measures in relation to solution-focused cognitive-processing exist at present to further explore these relationships.

Examination of the relationships between the key study variables revealed the goal-focused hope subscales to be more strongly associated with pain intensity and interference than the subscales comprising solution-focused thinking. Furthermore, the fit of the initial model was significantly improved by including an additional direct relationship between pain intensity and Agency, suggesting that greater levels of pain severity lead to a reduced capacity to motivate oneself to remain focused upon and accomplish goals. This finding suggests that the role of trait hope in increased psychological well-being is of particular significance to individuals reporting high levels of pain intensity.

The principal limitation of the study is the design. Although the SEM model was based upon hypotheses generated from relevant theory and existing literature, the cross-sectional nature of the data means that it is not possible to infer the direction of effects (Maxwell & Cole, 2007). It is plausible that increased psychological well-being predicts greater levels of PGE, and that both higher PGE and psychological well-being influence individuals' perception and reporting of pain intensity and interference. Consequently, it is important that findings are interpreted with this limitation in mind. Further longitudinal and experimental studies are required to establish whether the promotion of goal-focused hope and solution-focused thinking improve the psychological well-being of individuals with chronic pain over time.

A second limitation of the study was that the somewhat broad inclusion criteria which encompassed a range of chronic pain conditions. Although no significant differences were found in relation to the dependent variable psychological well-being across the different groups, it was evident that pain intensity and interference differed across pain conditions. As would be expected, those with localised pain specific to certain sites on the body (e.g., shoulder pain) scored lower on both BPI-SF subscales than those with more generalised pain conditions such as Complex Regional Pain Syndrome (CRPS). Although there is often limited variation with respect to the treatments offered across chronic pain conditions, these findings highlight the importance of researching differing diagnostic groups independently and tailoring clinical interventions accordingly to suit the needs of individuals. Furthermore, the fact that the study participants were predominantly female limits the generalisability of the findings to males with chronic pain.

Finally, the study aimed to increase participation by means of online recruitment through social media websites. Whilst this made it possible to engage individuals from their own homes, it was not possible to confirm that participants met the inclusion criteria for the study. Attempts to address this issue were made by advertising solely through pain charities' social media pages, ensuring that the inclusion criteria and study objectives were clear in the participant information sheet and consent form. Furthermore, whilst the fit indices of the final model were good, it would be interesting to investigate the model fit in relation to male populations and samples comprising specific pain conditions.

There are implications for clinical practice and future research arising in the current study. First, the mediating effect of PGE in current study demonstrates the worthwhile contribution of this positive psychological construct within this clinical area. The current study extends the evidence base to identify the protective role or *buffering* effect of goal-focused hope and solution-focused thinking. Promoting the development of these factors amongst individuals with low levels of PGE through tailored interventions may lead to increased psychological well-being and improved clinical outcomes. Furthermore, given that there appears to be both theoretical commonalities and statistical collinearity across differing positive psychological constructs and variables (such as hope, optimism, resilience, goal-orientation and self-efficacy), future research should aim to conceptualise distinct components underpinning therapeutic change and further investigate the unique contributions of each in relation to the promotion of psychological well-being amongst individuals with chronic pain.

A further implication is the relevance of including measures of psychological well-being in outcome studies within chronic pain populations. Psychological health is described as “not just the absence of stress or mental illness (i.e., languishing), but also the presence of flourishing (i.e., well-being)”, (Pulvers & Hood, 2013, p. 330). Although partially overlapping, there is evidence to suggest that mental well-being and mental illness are in fact distinct theoretical (Huber et al., 2008), statistical (Keyes, 2002) and neurological concepts (Keyes, 2005). By solely measuring reductions in levels of psychological distress or symptomatology, researchers and clinicians may inadvertently omit clinical outcomes relevant to improvements in well-being and quality of life.

Finally, an interesting finding was that although individuals with fibromyalgia reported significantly higher levels of pain intensity and interference than those with endometriosis, these individuals were more likely than those with endometriosis to complete all of the items and continue to the end of the online survey. One might reasonably expect that attrition rates are associated with participants’ pain levels at the time of taking part, however this notion was not supported in the current study, prompting the need for further exploration within this area.

In conclusion, this study is the first to demonstrate that PGE, comprising goal-focused hope and key principles of the solution-focused approach, is associated with enhanced psychological well-being amongst individuals with chronic pain. A SEM model which proposed that PGE mediated the effects of pain intensity and interference in function upon psychological well-being proved to be well-fitting to the data. This research complements and extends existing literature within the positive psychology and chronic pain fields and highlights potentially beneficial components of clinical interventions for individuals living with chronic pain.

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Appendices

Appendix A- Literature review screening tool

Appendix B- Details of included positive psychological interventions

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Appendix A: Guidance and screening tool

Guidance for use with Systematic Review Screening Tool

Step 1: Screen title and abstract **Step 2:** Read and review full paper

Review question: What are the effects of positive psychological interventions for people living with chronic pain?

Inclusion criteria:

- *Population* = adult patients experiencing chronic pain (> 3 months since onset; either as primary or co-morbid diagnosis)

- *Intervention* = Psychological interventions underpinned by positive psychology concepts and principles. i.e., "*An intervention, therapy, or activity primarily aimed at increasing positive feelings, positive behaviours, or positive cognitions*" (Sin and Lyubomirsky, 2009). Exclude interventions which aim to reduce or treat negative or dysfunctional feelings, behaviours or cognitions (e.g., Cognitive-Behavioural Therapy)

- *Outcomes* = those which are "*aligned with the conceptual framework of the positive psychological interventions*" (Scheuller, 2014). i.e., Measurements of positive psychological constructs such as well-being (psychological, mental, subjective), positive affect, satisfaction with life, hope, gratitude and optimism. Exclude studies which only report reductions in psychological constructs related to negative or dysfunctional feelings, behaviours or cognitions (e.g., depression, anxiety etc.)

- *Article types* = Both quantitative and qualitative studies which have been published in English in a peer-reviewed journal. Exclude papers which have not been through this publication process (e.g., Thesis papers and dissertation articles).

Screening Tool for Systematic Review

Author name:

Year of publication:

Article title:

Journal:

Patient population	**Include** ☐ Adults with chronic pain	**Exclude** ☐Adults not experiencing chronic pain ☐Children
Interventions	**Include** ☐ Psychological interventions which aims to increase positive feelings, behaviours or cognitions.	**Exclude** ☐ Psychological interventions which do not aim to increase positive feelings, behaviours or cognitions.
Outcomes	**Include** ☐ Measurement of psychological constructs aligned with conceptual framework of positive psychology.	**Exclude** ☐ Measurement of psychological constructs not aligned with conceptual framework of positive psychology.
Article type	**Include** ☐ Published in peer-reviewed journal and in English	**Exclude** ☐ Not published in peer-reviewed journal

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OVERALL DECISION ☐ **INCLUDED** ☐ **NOT INCLUDED**

Notes:

Appendix B: Table displaying intervention details of included studies

Study	Intervention
Dargan et al. (2014)	Qualitatively examined the same PPI as that described by Simm et al. (2014). 8-week solution-focused pain management-programme delivered by a multidisciplinary team in a chronic pain service (all of whom were trained in the approach and received regular supervision from the Clinical Psychologist). Each week involved a 3-hour long biopsychosocial discussion/education component (which included energy management, mood and stress and relaxation) and 2 1-hour long exercise sessions. The group facilitators delivered the programme and self-management topics according to a solution-focused framework. Explored patients' 'best hopes' for sessions and explored these through 'problem-free talk', with a focus on 'amplifying' individuals' own resources and strengths. See the full paper (Simm et al., 2014) for a detailed description of the intervention.
Flink et al. (2015)	Intervention consisted of 1-hour individual meetings once a week during 7 weeks. The PPI was conducted by two psychologists and participants were given homework assignments related to the topic of the week to practice on a daily basis. Exercises were based on current findings in positive psychology research. Exercises included: becoming self-aware of one's suffering, the self-compassion journal, self-compassion mantra, self-compassion letter, self-compassion journal, three good things daily, savouring techniques, replay happy days, best possible selves (BPS), BPS visualisation, followed by the development of a maintenance plan.
Howell et al. (2014) Study A	Hope-orientated group counselling group titled 'Being Hopeful in the Face of Chronic Pain'. A free service to community members, the intervention was led by 2 female counselling psychologists (with 5 and 17 years of counselling experience). The intervention consisted of six weekly 2-hour long sessions. There was an explicit and intentional focus upon hope throughout the duration of the group intervention. Techniques employed varied, and included narrative therapeutic and psychoeducational approaches. Exercises included: creation of a group poem, completing statements about what they hoped for in the sessions (e.g., I hope…), creation of a 'hope collage', discussing strengths of others and sharing personal strengths, seeking new resources and exploring hope in the context of chronic pain, creating a map of 'hopeful resources' and a future-focused activity titled the 'hope time machine'. See Howell et al. (2014) for a detailed description of the group intervention.
Howell et al. (2014) Study B	The intervention was the same as that described in Howell et al. (2014) Study A. It was conducted on 4 occasions over the course of several months, with group sizes ranging from 5 to 7 clients.
Larsen et al.	Qualitatively examined the same 'Being Hopeful in the Face of Chronic Pain' intervention as described in Howell et al. (2014) Study A. This

(2015)	research qualitatively analysed the responses given by individuals during week 3 of the programme (wherein participants identified and discussed personal strengths and hope).
Muller et al. (2015)	The online PPI exercises tailored for individual participants' according to their responses on the adapted online version of the Person-Activity Fit Diagnostic (PAFD), whereby they each rated ten different activities on a series of 7-point likert-scales. From this, it was possible to establish which exercises would best 'fit' each individual (in terms of enjoyment, sense of value etc. experienced from doing it). The four activities that received the highest ratings were identified as those that best matched the participants' interests. The ten PPI activities were developed by the study authors by reviewing the positive psychology literature, taking into account what exercises had been successfully applied in previous research. The exercises related to: • Kindness (performing good deeds for other people, whether friends or strangers, either directly or anonymously, either spontaneously or planned. • Gratitude (counting blessings, appreciation of life circumstances and gratitude towards persons by writing, contemplating and reflecting or expressing gratitude directly to another person. • Savouring (taking delight, and replaying life's momentary pleasures and wonders. For example, by being open to beauty and excellence, through relishing ordinary experiences and savouring those experiences with others. • Flow (increasing the number of challenging and absorbing i.e., "flow" experiences) • Taking care of the body (engaging in physical activity or exercise, being mindful, smiling and laughing). • Spirituality (becoming more involved in religion or spirituality by, for example, seeking meaning and purpose, finding the sacred in ordinary life and being mindful). • Relationships (strengthening and enjoying relationships by making time for people, expressing admiration, appreciation, and affection, capitalizing on good fortunes, being supportive and loyal, managing conflict and sharing your inner life). • Goals (picking one, two, or three significant goals that are meaningful and devoting time and effort to pursuing them). • Optimism (writing about best possible future selves, goals and subgoals as well as identifying barriers and automatic pessimistic thoughts and coming up with ideas to minimize their effects). • Forgiveness (writing about letting go of anger and resentment toward other persons).
Simm et al. (2014)	Quantitatively examined the same PPI as that described by Dargan et al. (2014). See Dargan et al. (2014) above.
Tse et al. (2010)	8-week humour therapy programme carried out in a nursing home for 1 hour a week. Each participant developed a portfolio titled 'my happy collection' and the research team worked with the participants each week to populate it with funny books, photos, jokes, tapes, videos, clips, stories, reflections and cartoons. The research team delivered the 'humour therapy' during weeks 2 to 8. This involved starting with a joke of the day, reading funny stories and lectures about humour research. Participants were shown ways to give humour higher priority in their lives, and took part in laughing exercises and games.

Appendix C- Author instructions for the Journal of Pain

The full guidelines are comprehensive and are available from: http://www.jpain.org/content/authorinfo

Below are the main formatting points and article requirements:

Article structure

Materials should be presented in this order:

- Cover letter
- Manuscript (as a single file that contains the following): title page (include all authors' names and affiliations and disclosures), abstract, perspective, key words, text, acknowledgments (optional), references, figure legends
- Figures
- Tables
- Checklist (see more information)

Abstract (page 2)

An abstract of 200 words or less should describe concisely the purpose of the study, the main findings, and conclusions, all in one paragraph without subheadings. References may not be included in the abstract.

Perspective

This item, limited to 50 words, should appear at the end of the abstract. The perspective presents a synopsis of the work to facilitate understanding of its significance. Authors of basic science reports should highlight the potential clinical relevance of their results for the benefit of clinical readers. Authors of clinical science reports should highlight the underlying mechanisms for the results, for the benefit of clinical scientists and basic scientists.

Key words

Five key words should be provided following the Perspective.

Text headings should be as follows:

Introduction: State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.
Methods: Provide sufficient detail to allow the work to be reproduced. Methods already published should be indicated by a reference; only relevant modifcations should be described.
Results: Results should be clear and concise.
Discussion: This should explore the significance of the results of the work, not repeat them. Avoid extensive citations and discussion of published literature.

Subheadings in the *Methods, Results,* and *Discussion* sections should be used as necessary to aid organization and presentation, but subheadings and sections should not be numbered. All sections should be written concisely. Limit the *Introduction* to 600 words and the *Discussion* to 1500 words. Note that section labels may not apply to some article types, including Focus Articles and Critical Review Articles.

Formatting requirements

There are no strict formatting requirements but all manuscripts must contain the essential elements needed to convey your manuscript.

Appendix D- Study recruitment advertisement

(Advert for charity websites, forums & the charities' Facebook pages)

Research Volunteers Wanted

We are conducting research into factors which promote well-being in individuals with chronic pain.

We are looking for individuals who have experienced pain for a period of 3 months or longer, who are aged 18 and over and are residents of the United Kingdom.

The study is an online questionnaire, which should take approximately 20 minutes to complete.

Participants will have the option to enter a prize draw to win one of three £50 Amazon vouchers as an acknowledgement of thanks for taking part.

For more information, and to participate in the study, please click on the link below:

[insert link here]

(Advert for charities Twitter feeds – has to be 140 characters or less)

Research volunteers wanted. Please click on the link for more details: [insert link here]

Appendix E- Participant information sheet

Title of Study

Relationships between Chronic Pain and Mental Well-being.

Thank you for taking the time to read this information sheet.

You are being invited to take part in an online questionnaire study. Before you decide whether or not you wish to take part in the study, please read the following information carefully. The following information will explain why the research is being done, what you will be asked to do, and will explain confidentiality. Please take time to read the following information carefully and feel free to ask us if you would like more information or if there is anything that you do not understand. If you would like any further information or have any questions please contact me or my supervisor using the contact details below. Please also feel free to discuss this with your friends, relatives or GP if you wish.

To take part you must be 18 years or older, and a resident of the United Kingdom.

As an expression of thanks for your time spent completing the questionnaire, you will be given the opportunity to enter an optional draw where you can win one of three £50 Amazon vouchers.

What is the purpose of the study?

The purpose of the study is to explore which psychological factors may contribute to well-being in people living with chronic pain. Chronic pain is defined as pain which lasts for a period of three months or longer. There has been lots of research that shows that people with physical health conditions (such as chronic pain) who maintain higher levels of well-being do well. For example they live longer, and need to have less healthcare appointments

Why have I been chosen to take part?

As we are interested in learning more about how to improve well-being in individuals with chronic pain, we are specifically looking for individuals who have experienced pain for a period of three months or longer, including those who have been diagnosed with a chronic pain condition.

Please note, due to the different underlying causes and treatment of cancer-related chronic pain, this study will only be recruiting those whose pain is not caused by cancer or cancer-related treatment (non-malignant chronic pain).

Furthermore, we are only inviting individuals who are over the age of 18 and residents of the United Kingdom to take part for ethical reasons to do with gaining appropriate consent.

Do I have to take part?

No, **taking part is voluntary**. If you don’t want to take part, you do not have to give a reason and no pressure will be put on you to try and change your mind. You can stop the questionnaire at any time and close the web browser. Incomplete questionnaires will be permanently deleted from the data set.

What will happen if I take part?

If you agree to take part, you will first be asked to check that this study is right for you, and that you are happy to take part. You will then be asked to complete a set of online questionnaires.

We estimate that the questionnaire shall take no longer than 20 minutes to complete in a single, non-stop sitting. However, if you would feel more comfortable taking breaks, it is okay to leave the questionnaire from time to time, before returning to carry on. If you would like to do this, it is important to leave your computer switched on, and the questionnaire up on the screen. If you were to close the internet browser, or log off the computer then your answers so far would be lost.

All questions will be presented in English; unfortunately no other language options are available. As such you may want to consider if this will cause difficulties for you in anyway before agreeing to take part. You can do this in any location you choose. Though none of the questions are of a very personal nature, you may still wish to pick somewhere with reasonable privacy.

Once you have completed the questionnaire, you will have finished the study. There will be no further questionnaires or any other kind of follow up in the future.

Expenses and / or payments

At the end of the study, you will be offered the opportunity to enter a draw to win one of three £50 Amazon Vouchers as an expression of thanks for your time. If you wish to be entered into the draw, you will be asked to provide your email address. Once the study closes, the draw will take place and you will be informed by email whether or not you have been selected to receive a voucher. Your email address will be stored in a separate place to your questionnaire answers to ensure your anonymity and will be deleted once the draw has taken place.

Are there any risks in taking part?

There are no anticipated risks to taking part. If any of the questions raise concerns you are advised to contact your GP for support, and/or discuss them with someone you trust.

You can also gain support by contacting an independent support organisation such as the ones listed below:

- The Samaritans: 08457 90 90 90 or www.samaritans.org
- Pain Concern Helpline: 0300 123 0879 or www.painconcern.org.uk
- Action on Pain 'Painline': 0845 1593603 or www.action-on-pain.co.uk

These contact details will be shown again upon completion of the questionnaires, though you may like to save or print this webpage for information.

Are there any benefits in taking part?

There are no immediate benefits to participating in the research, besides the chance to win Amazon vouchers should you wish to enter the draw at the end.

What if I am unhappy or if there is a problem?

Please contact Joanne Iddon (joanne.iddon@liverpool.ac.uk) who will try to help. If you remain unhappy or have a complaint which you feel you cannot come to us with then you should contact the Research Governance Officer on 0151 794 8290 (ethics@liv.ac.uk). When contacting the Research Governance Officer, please provide details of the name or description of the study (so that it can be identified), the researcher(s) involved, and the details of the complaint you wish to make.

Will my participation be kept confidential?

If you choose to take part in the study, any information you give will be anonymised i.e., no one will know your identity. You will not be asked for your name, date of birth, or information regarding where you live. Your responses will only be viewed by the researchers involved in the study. If you choose to take part in the study and then decide it is not for you, you will be able to withdraw at anytime **during** the online questionnaire. You can do this by closing the internet browser. Incomplete data sets will be deleted from the study data. However, once you have fully completed the study, it will unfortunately not be possible to withdraw your data as there will be no way of identifying which set of answers is your own.

What will happen to the results of the study?

The results of the study will be written up as part of a Doctoral Degree in Clinical Psychology. The study may also be published in an academic journal, and the anonymised data may be used in other publications. A summary of the anonymised results of this study will be posted on the pain charity websites (i.e., the website where you saw the initial study advertisement).

What will happen if I want to stop taking part?

You have the right to stop answering the questionnaire at any point, without needing to give any explanation. Should you wish to do this, simply close the internet browsing window you are doing the questionnaire on. Any questionnaires that are not answered until the end will be withdrawn from the study and permanently deleted. Unfortunately, once you have completed the study it will not be possible to ask for your data to be removed, as we will have no way of identifying which sets or answers are your own.

Who can I contact if I have further questions?

Joanne Iddon
Trainee Clinical Psychologist
Doctorate of Clinical Psychology Programme
University of Liverpool
Email: joanne.iddon@liverpool.ac.uk
This study is supervised by Dr Jen Unwin at Southport & Ormskirk Hospital NHS Trust and Dr Joanne Dickson at the University of Liverpool.

Appendix F- Consent form

Consent Form

Title of Research Project:	Relationships between Chronic Pain and Mental Well-being	**Please check box**
Researcher(s)	Joanne Iddon Dr Joanne Dickson Dr Jen Unwin	
1. I confirm that I am 18 years of age or older.		☐
2. I confirm that I am a resident of the United Kingdom.		☐
3. I confirm that I have read and have understood the information for the above study. I have had the opportunity to consider the information, ask questions by contacting the lead researcher (details below) and have had these answered satisfactorily.		☐
4. I understand that my participation is voluntary and that I am free to stop taking part at any time without giving any reason (by closing the internet browser page).		☐
5. I agree to take part in the above study.		☐

Appendix G- Study measures

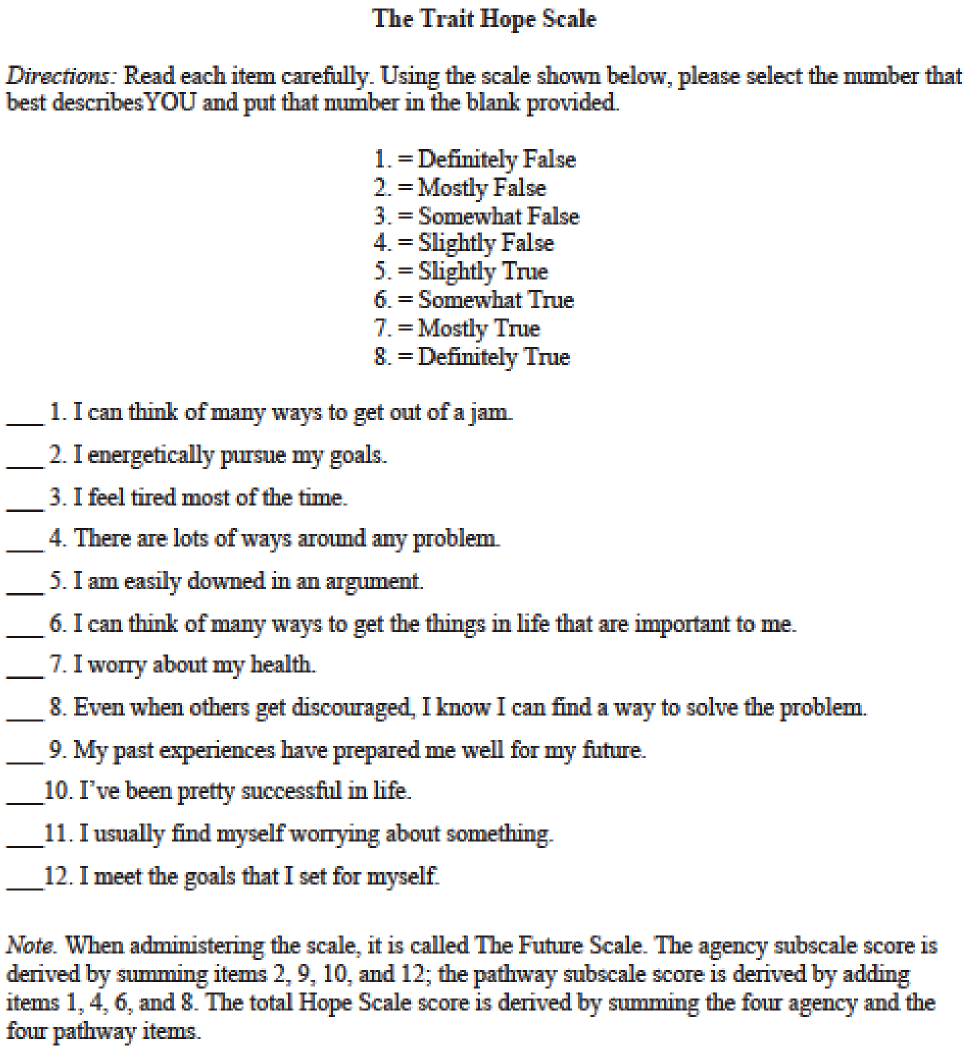
Solution Focused Inventory

Please read the following questions and circle the response that indicates the degree to which you agree or disagree with each of the statements. Try to be accurate, but work quite quickly.

Do not spend too much time on any question. There are no “right” or “wrong” answers – only your personal perspective. Answer every question. All responses are confidential.

1. I tend to spend more time analysing my problems than working on possible solutions	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
2. I tend to get stuck in thinking about problems	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
3. There is always a solution to every problem	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
4. I tend to focus on the negative	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
5. I’m not very good at noticing when things are going well	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
6. There are always enough resources to solve a problem if you know where to look	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
7. Most people are more resilient than they realise	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
8. Setbacks are a real opportunity to turn failure into success	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
9. I imagine my goals and then work towards them	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
10. I keep track of my progress towards my goals	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
11. I’m very good at developing effective action plans	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6
12. I always achieve my goals	Disagree Strongly 1	Disagree 2	Disagree Slightly 3	Agree Slightly 4	Agree 5	Agree Strongly 6

The Adult Hope Scale



The Trait Hope Scale

Directions: Read each item carefully. Using the scale shown below, please select the number that best describesYOU and put that number in the blank provided.

1. = Definitely False
2. = Mostly False
3. = Somewhat False
4. = Slightly False
5. = Slightly True
6. = Somewhat True
7. = Mostly True
8. = Definitely True

___ 1. I can think of many ways to get out of a jam.

___ 2. I energetically pursue my goals.

___ 3. I feel tired most of the time.

___ 4. There are lots of ways around any problem.

___ 5. I am easily downed in an argument.

___ 6. I can think of many ways to get the things in life that are important to me.

___ 7. I worry about my health.

___ 8. Even when others get discouraged, I know I can find a way to solve the problem.

___ 9. My past experiences have prepared me well for my future.

___10. I've been pretty successful in life.

___11. I usually find myself worrying about something.

___12. I meet the goals that I set for myself.

Note. When administering the scale, it is called The Future Scale. The agency subscale score is derived by summing items 2, 9, 10, and 12; the pathway subscale score is derived by adding items 1, 4, 6, and 8. The total Hope Scale score is derived by summing the four agency and the four pathway items.

The Warwick-Edinburgh Mental Well-being Scale (WEMWBS)

Below are some statements about feelings and thoughts.

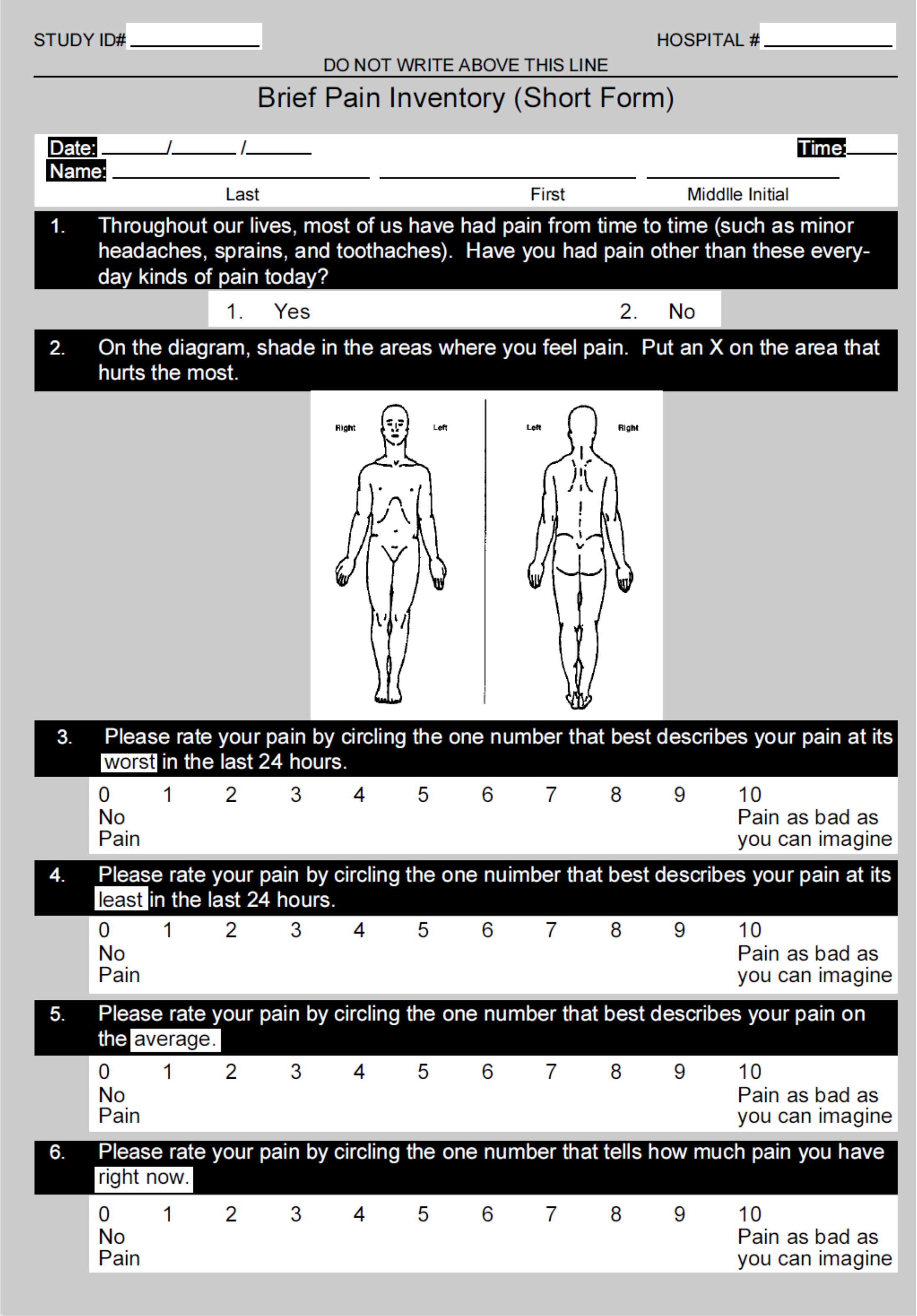
Please tick the box that best describes your experience of each over the last 2 weeks

STATEMENTS	None of the time	Rarely	Some of the time	Often	All of the time
I've been feeling optimistic about the future	1	2	3	4	5
I've been feeling useful	1	2	3	4	5
I've been feeling relaxed	1	2	3	4	5
I've been feeling interested in other people	1	2	3	4	5
I've had energy to spare	1	2	3	4	5
I've been dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling good about myself	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been feeling confident	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5
I've been feeling loved	1	2	3	4	5
I've been interested in new things	1	2	3	4	5
I've been feeling cheerful	1	2	3	4	5

Warwick-Edinburgh Mental Well-Being Scale (WEMWBS)

Brief Pain Inventory- Short Form

Items 3,4,5,6 & 9 only
Averages are used to derive pain intensity (3, 4, 5& 6) and
Pain interference (9a,9b,9c,9d,9e,9f,9g) subscales



STUDY ID# ____________ HOSPITAL # ____________

DO NOT WRITE ABOVE THIS LINE

Brief Pain Inventory (Short Form)

Date: ______/______ /______ **Time:**_____

Name: ____________________ ____________________ ____________________

Last First Middlle Initial

1. Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain other than these every-day kinds of pain today?

1. Yes 2. No

2. On the diagram, shade in the areas where you feel pain. Put an X on the area that hurts the most.

3. Please rate your pain by circling the one number that best describes your pain at its worst in the last 24 hours.

0 No Pain	1	2	3	4	5	6	7	8	9	10 Pain as bad as you can imagine

4. Please rate your pain by circling the one nuimber that best describes your pain at its least in the last 24 hours.

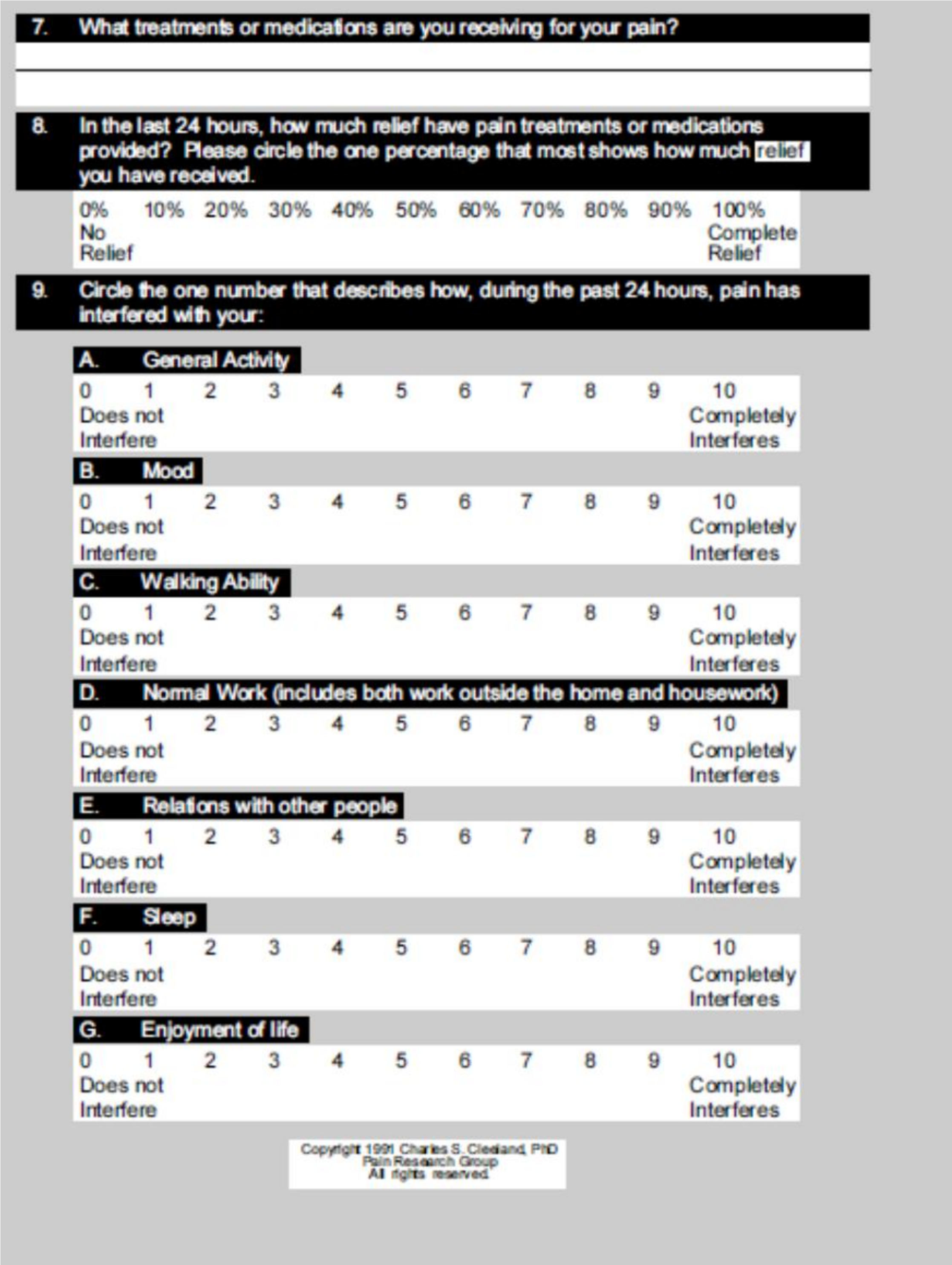
0 No Pain	1	2	3	4	5	6	7	8	9	10 Pain as bad as you can imagine

5. Please rate your pain by circling the one number that best describes your pain on the average.

0 No Pain	1	2	3	4	5	6	7	8	9	10 Pain as bad as you can imagine

6. Please rate your pain by circling the one number that tells how much pain you have right now.

0 No Pain	1	2	3	4	5	6	7	8	9	10 Pain as bad as you can imagine



7. What treatments or medications are you receiving for your pain?

8. In the last 24 hours, how much relief have pain treatments or medications provided? Please circle the one percentage that most shows how much relief you have received.

0% No Relief	10%	20%	30%	40%	50%	60%	70%	80%	90%	100% Complete Relief

9. Circle the one number that describes how, during the past 24 hours, pain has interfered with your:

A. General Activity

0 Does not Interfere	1	2	3	4	5	6	7	8	9	10 Completely Interferes

B. Mood

0 Does not Interfere	1	2	3	4	5	6	7	8	9	10 Completely Interferes

C. Walking Ability

0 Does not Interfere	1	2	3	4	5	6	7	8	9	10 Completely Interferes

D. Normal Work (includes both work outside the home and housework)

0 Does not Interfere	1	2	3	4	5	6	7	8	9	10 Completely Interferes

E. Relations with other people

0 Does not Interfere	1	2	3	4	5	6	7	8	9	10 Completely Interferes

F. Sleep

0 Does not Interfere	1	2	3	4	5	6	7	8	9	10 Completely Interferes

G. Enjoyment of life

0 Does not Interfere	1	2	3	4	5	6	7	8	9	10 Completely Interferes

Appendix H- Summary report for pain charities

Relationships between Chronic Pain and Mental Well-being.

SUMMARY OF FINDINGS

Researcher: Joanne Iddon, Trainee Clinical Psychologist, University of Liverpool

This study was supervised by Dr Jen Unwin at Southport & Ormskirk Hospital NHS Trust and Dr Joanne Dickson at the University of Liverpool.

THANK YOU!

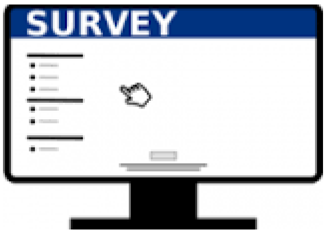
Thank you to all those who took part in the survey and to the pain charities for sharing the study link!

The prize draw has now been completed and the winners have been notified.

What was the study about?

The purpose of the study was to explore which psychological factors may contribute to well-being in people living with chronic pain. There has been lots of research that shows that people with physical health conditions (such as chronic pain) who maintain higher levels of well-being do well. For example they live longer, and need fewer healthcare appointments.

A total of 586 people over 18 years old who had experienced pain for three months or longer completed the online questionnaire between February 2015 and January 2016. Participants completed questionnaires investigating their levels of pain, the extent to which the pain interfered with daily activates and questions relating to psychological well-being. The survey also included questionnaires assessing participants' levels of hope. A 'solution-focused' questionnaire measured participants' ability to focus upon possibilities and solutions, to set and achieve goals and recognise their personal strengths, despite the presence of chronic pain.



The study was advertised on pain charities' social media pages and websites. The charities who took part were: Pain UK, Fibromyalgia Association UK, Pain Concern, Arthritis Care, Fibroaction, BackCare, Endometriosis UK, Lupus UK, Trigeminal Neuralgia Association UK, Hypermobility Syndromes Association, National Osteoporosis Society and Spinal Injuries Association.

What did we find?

As expected, we found that people experiencing greater pain intensity and interference (i.e., the impact of the pain upon daily activities) reported lower levels of psychological well-being. People who reported greater levels of hope and ‘solution-focused thinking’ experienced greater levels of psychological well-being.

The relationships between hope, ‘solution-focused thinking’ and psychological well-being were found to be important even when we took into account participants’ levels of pain intensity and interference.

How is this information helpful to clinicians?

The findings of the study have implications for clinicians working with people who have chronic pain. Firstly, psychologists could aim to routinely identify those low in hope and those less likely to have a ‘solution-focused’ mind-set in clinical practice. Identifying individuals low in these factors upon referral to pain management services may lead to the early-identification of those who are potentially at an elevated risk of experiencing lower levels of psychological well-being.

From there, individual or group-based psychological interventions which aim to enhance a person’s sense of hope and ‘solution-focused thinking’ may be developed and delivered in clinical services. By doing so it is anticipated that the psychological well-being of these individuals might be improved, *despite* the presence of long-term pain. Future researchers and clinicians in the field may also investigate whether the presence or enhancement of other positive traits (such as optimism and resilience) contribute to improvements in psychological well-being.

Furthermore, researchers and clinicians traditionally look at the impact that chronic pain has upon a person in terms of the elevated levels of distress they experience. This commonly involves assessing for the presence of psychological difficulties which may occur as a result of the experience of chronic pain (e.g., including depression and anxiety). The results of this study suggest that it is relevant to measure growth in psychological well-being in clinical practice, as well as reductions in psychological distress or difficulties.

Thank you again for your participation in this project, it is very much appreciated.

If you have any questions please contact Joanne Iddon at joanne.iddon@liverpool.ac.uk

Appendix I- Demographic information for non-completers (*N*=171)

The majority of non-completers were female (92.4%, *n*=158). The average age was 37.2 (*SD*= 12.0, range 18-71 years). In total, 94.2% (*n*=161) had received a formal diagnosis of a chronic pain condition from a health professional. Specific diagnoses varied (see table below). A total of 92.4% (*n*= 158) reported taking analgesic medication on a regular basis to manage pain-related symptoms.

The range in duration since the initial onset of the pain also varied, with the slight majority of participants (25.1%) reporting having experienced pain for between five and ten years. The next most common duration (20.5%) was ‘More than 15 years’. The lower pain duration time since the initial onset (compared to those who completed all study items) perhaps reflects the overall younger age of non-completers compared to those who completed all of the survey measures. Nevertheless, the χ^2 test of independence revealed no significant difference between the expected and actual counts between the two groups, suggesting that the distribution between the pain duration brackets for both completers and non-completers was similar. The pain conditions reported by non-completers are listed in the table below.

Pain conditions reported by individuals who completed the demographic information though did not complete the study in its entirety are listed in the table below.

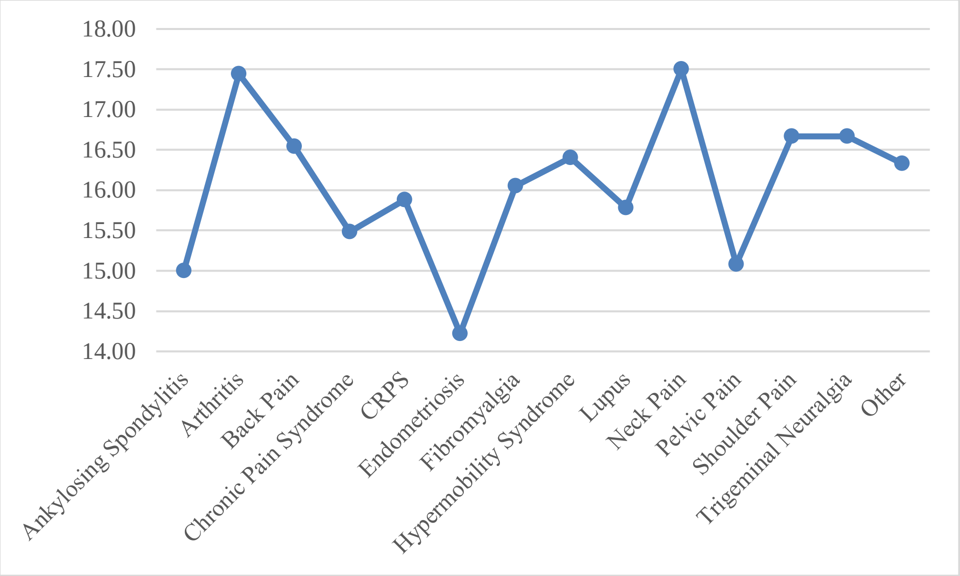
Pain condition	***n***
Ankylosing Spondylitis	0
Arthritis	16
Back Pain	6
Chronic Pain Syndrome	3
CRPS	2
Endometriosis	88
Fibromyalgia	25
Hypermobility Syndrome	2
Lupus	3
Neck Pain	1
Pelvic Pain	8
Shoulder Pain	1
Trigeminal Neuralgia	4
Other	12
Total	171

Appendix J- Pain conditions of study participants (*N*=586)

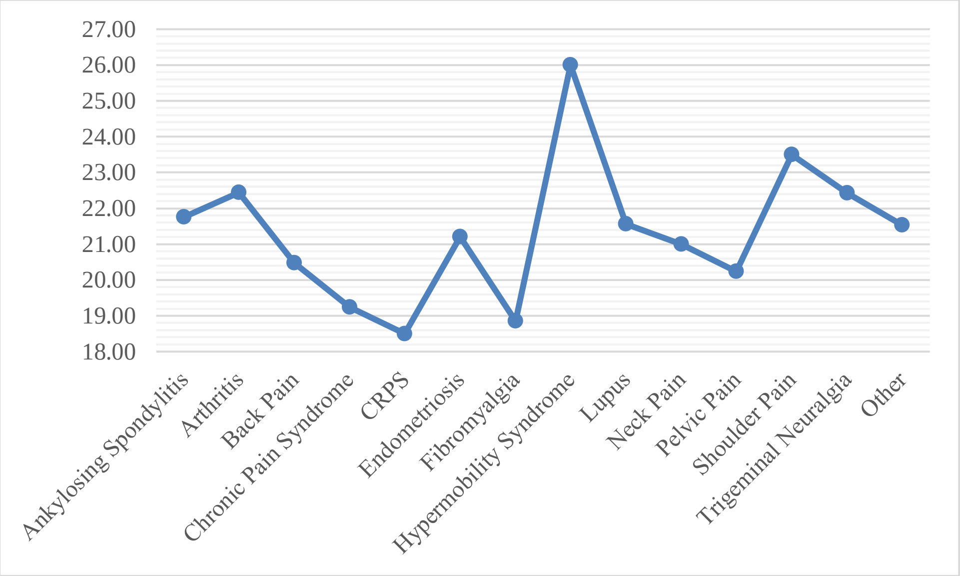
Pain condition	***n***
Ankylosing Spondylitis	8
Arthritis	54
Back Pain	48
Chronic Pain Syndrome	25
CRPS	16
Endometriosis	198
Fibromyalgia	148
Hypermobility Syndrome	5
Lupus	9
Neck Pain	8
Pelvic Pain	13
Shoulder Pain	6
Trigeminal Neuralgia	12
Other	36
Total	586

Appendix K- Means plots for all significant ANOVAs of key study variables across different pain conditions

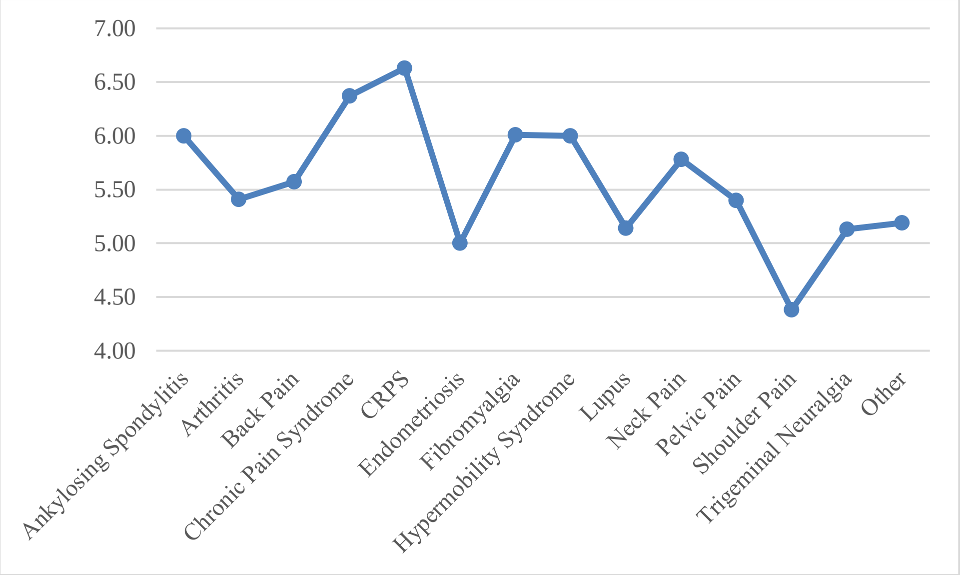
SFI Problem Disengagement (PD)



AHS Agency



BPI-SF Intensity



BPI-SF Interference