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Process-Based Therapy in an Interdisciplinary Framework for Pain Recovery: from psychological processes to interdisciplinary processes

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Abstract

A new psychosocial approach has recently been proposed to overcome the limitations and challenges of psychological pain therapy research. Process-based Therapy is an intervention model focusing on therapeutic processes, based on a testable theory, which promotes individualisation by adopting a dynamic and timely approach to the selection of intervention treatment procedures. Although this framework already incorporates a biopsychosocial foundation, its application has so far been primarily confined to psychological intervention. However, the use of an interdisciplinary team approach has been well-established as both effective and cost-efficient in addressing the multiple dimensions of pain. Building upon the biopsychosocial principles of Process-based Therapy, the present proposal introduces an interdisciplinary enhancement—Process-based Interdisciplinary Therapy (PbIT)—to extend its implementation to coordinated, multi-domain pain recovery. Socio-demographic and mediating variables, together with specific therapeutic strategies and interventions, are key elements to integrate all biopsychosocial factors in a therapeutic context. The interdisciplinary approach presented provides an expanded Process-based Therapy that further operationalises and reinforces the biopsychosocial model of pain.

Keywords

Process-based Therapy, Interdisciplinary Management, Chronic Pain, Individualisation, Evidence-Based treatments

Background

Process-based therapy (Hofmann & Hayes, 2019), recently proposed for the management of chronic pain (McCracken, 2023), focuses on the individual and specific thought, emotion and behavioural processes that contribute to the generation and/or maintenance of pain. It is therefore a transdiagnostic and idiographic approach. To intervene in these processes, specific, scientifically based techniques and strategies are used, selected on the basis of vulnerability and maintenance factors in each individual case, rather than protocols derived from population averages.

With the aim of advancing the effectiveness of chronic pain treatment, this paper proposes the application of process-based therapy in an interdisciplinary framework as an innovation in its approach. It is proposed that interventions can be selected independently of the original theoretical model, using an approach based on scientific evidence and validated techniques for each process, rather than on standardised protocols. This approach seeks to offer an approach more adapted to the characteristics of each person and, at the same time, to address the problem identified in various research studies: a percentage of individuals do not improve with conventional therapeutic approaches (Eccleston et al., 2013; Williams et al., 2012). In addition, it aims for a more parsimonious treatment, avoiding the application of unnecessary techniques and prioritising those relevant to each case, with the aim of reducing the gap between research and clinical practice, a goal that protocol treatments have not yet fully achieved (Perlini et al., 2020).

Understanding the need for this advance in the context of psychological intervention in chronic pain, as well as its integration within an interdisciplinary approach, requires a review of the theoretical foundations that have led to the development of this proposal. In this sense, it is essential to address the following aspects: 1) the effectiveness and limitations of current psychological therapies for chronic pain; 2) the definition and core principles of process-based therapy; 3) the rationale for proposing process-based therapy within an interdisciplinary framework; 4) the role of socio-demographic and 5) mediating variables in chronic pain, 6) the rationale behind the selection of intervention techniques in interdisciplinary process-based therapy; and finally, 7) the application of biopsychosocial assessment in chronic pain.

Once the development of the different characteristic elements of pain management in this context has been understood, it becomes possible to propose 8) Process-based Interdisciplinary Therapy (PbIT) for pain recovery and its functioning model, and to explore 9) how this can be operationalized through methodological and clinical research pathways.

1. Psychological interventions for chronic pain: current limitations

Current psychological interventions for chronic pain range from traditional cognitive-behavioral and third-generation approaches to more recent and less disseminated approaches focusing on social and emotional factors (Table 1). Evidence from major international reviews supports the effectiveness of Cognitive Behavioural Therapy (CBT) and Acceptance and Commitment Therapy (ACT) for adults with chronic pain. Both the National Institute for Health and Care Excellence (NICE, 2021) and the most recent Cochrane review (Williams et al., 2021) identify these approaches as evidence-based interventions, while acknowledging that their effects are typically small to moderate. Mindfulness-based interventions have also shown benefits for individuals with chronic pain, primarily by improving attention regulation, emotion regulation, and acceptance of pain-related experiences (Veehof et al., 2016; Hilton et al., 2017). However, evidence for other emerging psychological approaches remains limited, and further research is needed to establish their clinical efficacy. Since these established psychological treatments for chronic pain show only

small to moderate effect sizes, there are concerns as to whether these methods have now reached their ceiling of effectiveness (Lumley & Schubiner, 2019; McCracken, 2023; Vlaeyen & Crombez, 2020).

Also, in terms of efficacy, despite an increasing number of studies into psychological interventions for pain, contradictory findings persist, further reducing confidence in these approaches (Albajes & Moix, 2021; Gómez-de-Regil & Estrella-Castillo, 2020). This results in a lack of clarity on what therapies are considered effective, for what purpose and for which populations. This is in part due to the complex nature of these therapies, which makes it hard to draw clear conclusions about their mechanisms and efficacy. It is challenging to know what works, and what does not, because of the difficulty in isolating which component of the intervention or therapy has led to the effect. Further, the composition of defined psychological therapies show significant overlap. In a literature review of psychological interventions for fibromyalgia, it was reported there were common procedures to several interventions that may act on mediating variables for certain therapeutic changes (Albajes & Moix, 2021). This suggests that studying the efficacy of these specific procedures - or techniques - would be more valuable than the study of named multi-faceted therapies and might also be a more efficient way for research to be translated in clinical practice. This aligns with a recently proposed paradigm shift in experimental settings to establish a link between specific treatment procedures and specific psychological changes (Vlaeyen & Crombez, 2020).

Another relevant concern is how inclusive are the samples and populations that participate in the research of psychological interventions for pain. Populations that do not respond positively to general treatments shouldn't be omitted (Heiskanen et al., 2012). It is by exploring and better understanding the response of these groups that will lead to more generalisable findings. In a proof-of-concept RCT, Serrat and colleagues (2021) found that study participants who did not show improvement at the end of a multidisciplinary treatment with cognitive behavioral approaches had higher rates of depression at pre-assessment. This suggests that the more individualized studies that attend to the breadth of moderators and modulators would increase the robustness of research conclusions and potentially lead to more effective individualised treatment.

If a more personalised approach to treatment is the goal, where specific psychological procedures and techniques are selected, then it will also be important to enhance data collection throughout the treatment process. Analysis of a more comprehensive data set will be important to identify the detail and nuances of treatment effects and the sequences of change that lead to improvement (Vlaeyen & Crombez, 2020). In a similar vein, there is a call for dynamic and continuous updating and adjustment of the therapeutic approach based on the gathered data during treatment (Hofmann & Hayes, 2019; McCracken, 2023; Turk et al., 2010).

2. Process-based Therapy

In response to the same limitations and challenges of researching multi-faceted psychological therapies, a recent interventional approach in psychology has been proposed: Process-based Therapy is an intervention model that optimizes the knowledge about treatment procedures

gathered from studies of different theoretical frameworks, and different psychological therapies (Hofmann & Hayes, 2018; Hofmann & Hayes, 2019). It focuses on therapeutic processes (i.e. underlying mechanisms of change that lead to the achievement of a therapeutic goal) that are based on testable theory (Hofmann & Hayes, 2018). This approach promotes individualisation by adopting a dynamic and timely approach to the selection of treatment procedures for the intervention (Hofmann & Hayes, 2019).

Rather than representing a wholly new paradigm, Process-based Therapy can be understood as a contemporary synthesis and extension of long-standing traditions in case conceptualization and functional analysis dating back to mid-20th century behavioural and contextual models (e.g., Skinner, Kanfer, Goldfried). It re-integrates these foundational principles within a dynamic, empirically testable framework that emphasizes process-level mechanisms of change and overall human well-being.

Building on this process-oriented perspective, it becomes essential to develop methodological frameworks capable of mapping causal relations among biopsychosocial processes and supporting reasoning about which of these processes are most influential in maintaining or alleviating distress. Within this context, the developers of PBT have introduced the Complex Causal Network Model (CCNM) (Hofmann et al., 2016; Hofmann & Hayes, 2019) as a methodological tool for visualising and analysing how psychological and contextual processes interact over time. The CCNM conceptualises symptoms or behaviours as nodes within a causal network of mutual influences, allowing interventions to strategically target processes expected to exert broader systemic change.

However, because the CCNM originates from network science, it relies on strong statistical and causal assumptions, which may limit its direct application in clinical practice. Importantly, the CCNM is not a stand-alone theory but rather a methodological extension supported by the broader theoretical foundation of the Extended Evolutionary Meta-Model (EEMM) (Hofmann et al., 2022). The EEMM specifies the relevant domains and levels of biopsychosocial processes, providing a unifying framework that links evolutionary principles, contextual behavioural science, and clinical practice. Together, the EEMM and CCNM offer a coherent foundation for understanding, selecting, and evaluating process-level interventions across diverse psychological contexts—including chronic pain.

3. Adding interdisciplinarity to Process-based Therapy for pain recovery

Process-based Therapy has only recently been proposed as an intervention for chronic pain (McCracken et al., 2022; McCracken, 2023). By adopting an approach that focuses more on the individual and less on pathology, there is opportunity to extend the current limits of effectiveness of established psychological therapies, while drawing on the valuable knowledge gained from prior research into variables and processes that contribute to chronic pain.

Pain is biopsychosocial in nature and single-discipline approaches often have limited effectiveness. Therefore, it would seem important to explore Process-based Therapy for pain recovery from an interdisciplinary perspective. This enhancement of Process-based Therapy builds upon its biopsychosocial foundation and further recognises the complexity of the human pain experience and the interplay between biological, psychological and social aspects of a complex causal network. With the purpose of considering all these factors and contemplating, equally, their synergistic relationship, the clinical application demands the involvement of health professionals from different disciplines. This interdisciplinary team needs to collaborate and partner, work toward a common aim, and foster communication that enables the common goal to prevail (Turk et al., 2010). There is already a well-established history of physiotherapists and psychologists working collaboratively in cognitive-behavioural pain management programs (Harding & Williams, 1995; Stanford & Jones, 2012). While implementation of interdisciplinarity is not straightforward (McGeary et al., 2014), it has been shown to be cost effective as well as clinically beneficial to the person with pain (Danilov et al., 2020).

To date, there are few studies related to Process-based Therapy addressing chronic pain that include interdisciplinary pain management (Tatta et al., 2023). While several studies have already focused on the relationship between specific psychological variables and specific physiological processes (Flink et al., 2010; Linton & Fruzzeti, 2014; Boersma et al., 2019; Södemark et al., 2020), there is an opportunity to build on the established cross-disciplinary evidence, that supports psychological, social and physiological variables, shared processes, strategies and their interrelationship. This has the potential to lead to new ways of thinking and practicing, offering enhancements to existing interdisciplinary pain treatment approaches.

The Process-based Interdisciplinary Therapy (PbIT) is presented as a novel way of integrating several current and emerging aspects of chronic pain research: an individualized therapy grounded on evidence-based variables and processes (e.g. sociodemographic and mediating variables), incorporating evidence-based interventions for pain recovery linked to the mentioned processes, and based on an interdisciplinary holistic assessment.

4. Sociodemographic and contextual moderating variables

The search for individualization of treatment in Process-based Therapy inherently leads to the consideration of all the distinctive sociodemographic variables of the patient subject. Thus, the potential effects of sociodemographic disadvantage, or advantage, are taken into account. Variables such as age, ethnicity, socioeconomic status, and rurality help to form the context of a person's pain presentation reflecting its complexity and potential influence on treatment outcomes (Day & Thorn, 2010). Based on research, when sociodemographic variables that influence pain outcomes are identified, the design of the intervention can focus on the specific needs and preferences of different population groups, tailoring the procedure according to their specific context, which favors informed and personalized decision making.

For instance, certain sociodemographic variables are considered risk factors, such as gender and geographic isolation. That is, being female has been associated with a higher likelihood of experiencing chronic pain with greater severity and duration (Day & Thorn, 2010). This higher prevalence among women is likely explained by an interplay of biological factors - such as hormonal fluctuations (e.g., menstrual cycle, pregnancy, menopause), and sex-related genetic, neuroimmune and pain modulatory differences- and psychosocial influences, including gender roles, expectations and patterns of pain expression (Keogh, 2025). In addition, living in rural areas is linked to poor treatment outcomes due to having less access to treatment resources and travel difficulties (Day & Thorn, 2010). In this regard, these variables can be palliated with longer treatments and with new means of remote consultations, respectively. Likewise, low literacy which has frequently been associated also with poor treatment results (Day & Thorn, 2010) can be mitigated with adapted educational resources (Castel et al., 2013). Therefore, sociodemographic variables help clinicians to build the patient's context in order to personalize treatment.

The personal context should be the first factor to take into account when designing a personalized intervention. Since an intervention will not work in the same way for each individual due to their context, from the perspective of Process-based Therapy, it would not make sense to implement an intervention without first knowing their context.

5. Mediating variables

In the same way that specific characteristics of the individuals are important to consider from the beginning, the differences and particular forms of interactions between the processes that influence treatment outcomes also need early attention. Underlying mechanisms or processes in pain have been studied with the aim of helping to understand the relationship between pain and specific dependent variables. Some of the mediating variables acting frequently on pain maintenance are: depression severity (IsHak et al., 2018), beliefs about the ability to control pain (Ang et al., 2010), beliefs that one is disabled by pain (Moseley et al., 2012), beliefs that pain signals physical harm (Moseley et al., 2017), experiential avoidance (Gilpin et al., 2019), coping style to pain (Turner et al., 2007), self-efficacy (Costa et al., 2011; Turner et al., 2007), pain acceptance (Akerblom et al., 2015; Samwel et al., 2009), physical functioning (Boonstra et al., 2015), psychological flexibility (Akerblom et al., 2021; Gilpin et al., 2018; Wicksell et al., 2010), fear of pain (Lee et al., 2015), rumination and catastrophizing (Craner et al., 2016; Kim et al., 2021), emotion regulation (Yuan et al., 2024), kinesiphobia (Aydemir et al., 2022), and perceived social support (López-Martínez et al., 2008).

An assumption that can be drawn is that pain is complex, emergent, contextual, and has dynamic qualities (Armstrong et al., 2024). From a pain mechanisms viewpoint, this has been conceptualised, in the physiotherapy literature, as involving central, regional and local factors which co-exist in a dynamic interplay (Jones & O'Shaughnessy, 2014). Management should be directed to the principal influence according to the individual clinical presentation, while recognising the need to attend or monitor the other influences identified. As the relative

contributions of mechanisms shift, including through treatment effects, the primary therapeutic target may also need to be changed.

Although mediating variables do not necessarily explain the processes of change and represent only the initial step in detecting mechanisms (Tryon, 2018), they can serve as a guide to identifying potential mechanisms involved in therapeutic change (Kazdin, 2007). Both physiological and psychological elements are considered in a dynamic interplay, such as the link between mental health and mobility, instead of static and isolated (Scrivano et al., 2023).

6. Therapeutic strategies and techniques

Given this diverse collection of variables can present in many combinations in a person with pain, an interdisciplinary Process-based Therapy methodology based on specific therapeutic procedures addressed at specific processes of change, seems appropriate. Physiotherapists and psychologists, for example, can contribute their own knowledge of each discipline and share knowledge at a point of intersection where both disciplines meet. Shared knowledge can contribute to understanding the language used in different disciplines and therefore improve communication between professionals, quality interdisciplinary support and improve patient referral processes when necessary. Within PbIT, disciplinary boundaries are understood as complementary rather than segregated. Clinicians contribute according to their process-level competencies rather than fixed professional labels. For example, physiotherapists trained in psychologically or trauma-informed approaches may engage in body-based emotional regulation, graded exposure, or interoceptive awareness work. Recently, physiotherapists have been encouraged and supported by psychologists to take a psychologically-informed approach to pain (Main et al., 2023). Similarly, psychologists may collaborate in enhancing physical self-efficacy and pain education. When psychologists and physiotherapists work in a coordinated way with people with pain, the scope of therapy is enhanced (Stanford & Jones, 2012).

Some evidence-based psychological strategies are psychoeducation, exposure, relaxation techniques, imagery-based interventions, psychodynamic methods to express unprocessed emotions, mindfulness-based procedures, behavioral activation, cognitive restructuring, compassion-based techniques, imagery rescripting and acceptance-based techniques (Albajes & Moix, 2021) (Table 2). Some evidence-based physiotherapists strategies include aerobic strengthening exercises, stretching exercises, body awareness exercises, motor control exercises (Ferro et al., 2021), emotion-focused exposure treatment (Boersma et al., 2019), and pain education (Moseley & Butler, 2023) (Table 3).

In order for the patient to engage fully in interdisciplinary treatment, they need to be open to a biopsychosocial view of pain. For this reason, pain education is a key element in any interdisciplinary treatment for pain. Education in the multidimensional aspects of pain should be considered a parallel process to interdisciplinary treatment for pain (Eneberg-Boldon et al., 2020). This strategy seeks to equip and provide patients with knowledge related to all possible factors that can contribute to pain, using a biopsychosocial framework (Moseley et al., 2023). Importantly,

it should go beyond imparting knowledge to enable the person to make optimal decisions about what is best for their treatment. This aligns with concepts of pain literacy (Moseley & Butler, 2023; Jones et al., 2025).

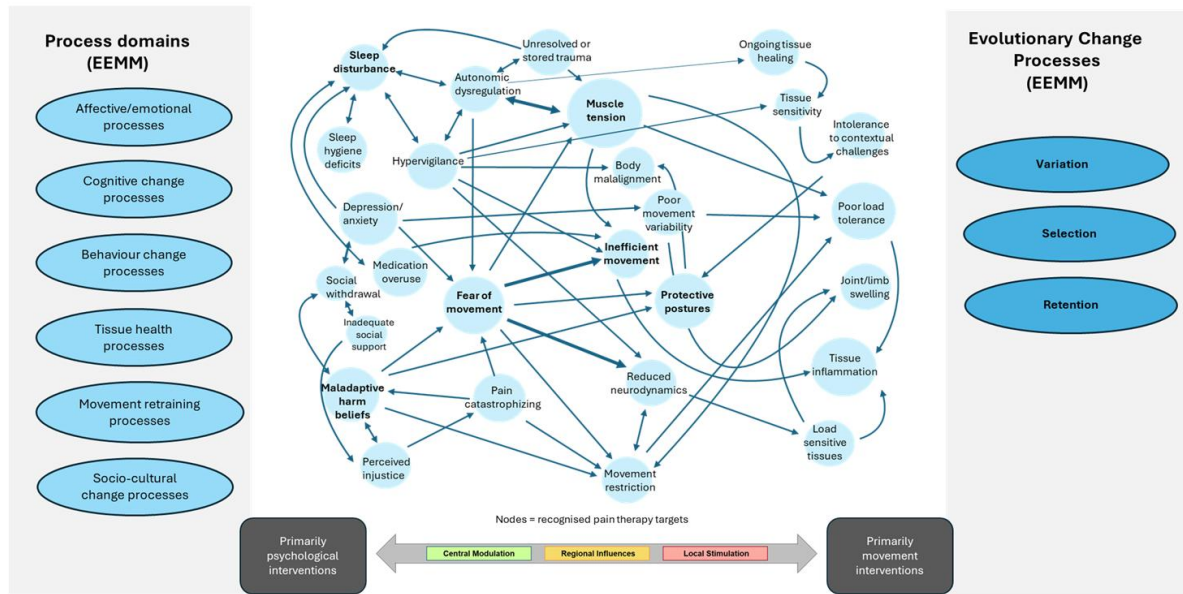
7. Assessing and integrating all biopsychosocial elements together

To integrate as much of all this complexity as possible, a clinical assessment performed by the interdisciplinary team needs to capture all the relevant information relating to the biopsychosocial interactions that influence pain. Formulation of a treatment plan, and the entire therapeutic process, is guided by this integrated assessment (Turk et al., 2010) which identifies the core biopsychosocial processes that contribute to the maintenance or worsening of pain and aligns with the framework of Process-based Functional Analysis (PBFA; Hayes, Hofmann, & Stanton, 2020). This identification relies on a parallel case conceptualization that helps which process may exert a stronger influence on the others. For example, if fear of movement-provoked pain is found to be the central factor, it may exacerbate pain through increased protective muscle tension and reduced physical activity, elevating sensitivity, while also affecting the pain buffering effects of social interactions and support.

Building on this, the Complex Causal Network Model (CCNM) developed by Hofmann and colleagues can be used to visualize how these processes interact dynamically across domains, helping the team identify the primary processes or modifiable mechanisms. However, while the CCNM provides an excellent methodological foundation for modelling psychological and contextual processes, it can be complemented by the Pain and Movement Reasoning Model (PMRM; Jones & O'Shaughnessy, 2014), which originates from physiotherapy and pain rehabilitation, and similarly can be described as representing an idiographic formulation. The PMRM is a clinical reasoning tool that offers a structured framework to integrate biological, psychological, and social influences on pain and movement using three domains to represent mechanisms at the site of pain (i.e. local stimulation), mechanisms relating to tissue structure and function remote to the site of pain (i.e. regional influences) and mechanisms that influence central pain processing (i.e. central modulation; Jones & O'Shaughnessy, 2014). The tool guides clinicians to identify the processes that appear most influential in shaping the individual's presentation and to direct management toward this dominant factor while recognizing and monitoring other contributing mechanisms. CCNM and PMRM supports PbIT in the evaluation of primary processes (i.e. most influential), which relies on a combination of clinical judgment, interdisciplinary discussion, standardized assessment tools, and (when available) real-time data.

Together, the CCNM and PMRM provide a hybrid reasoning framework (Figure 1) that bridges psychological and movement perspectives. In this framework, Figure 1 offers an illustrative overview of the process-level influences that can mediate pain recovery. This integration enables interdisciplinary teams addressing psychological processes and movement rehabilitation, to conceptualize pain as an emergent, dynamic phenomenon arising from reciprocal interactions

among central, regional, and local mechanisms. By combining the CCNM's capacity to model causal interactions among processes with the PMRM's structured focus on movement and biological modulation, PbIT teams can better identify key leverage points for change and adapt interventions as the network of influences evolves throughout treatment.



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Figure 1. Hybrid (CCNM and PMRM) conceptual and visual reasoning framework for interdisciplinary therapeutic decision-making for pain recovery

Note. In this figure, the CCNM is used solely as a conceptual and visual reasoning tool rather than as a statistical network model. Directional arrows represent hypothesised influences based on clinical reasoning, not empirically estimated causal pathways. Nodes represent biopsychosocial processes involved in the individual's pain experience; only a subset of these—typically those appearing to exert a broader influence on other processes—are considered primary treatment targets, whereas downstream processes may improve once central mechanisms are addressed. The distinction between central, regional, and local mechanisms follows the PMRM and refers respectively to processes primarily related to central modulation (e.g., cognitive–emotional regulation), regional functional patterns (e.g., movement or behavioural adaptations), and local nociceptive or tissue-related factors. In clinical practice, the allocation of a process to the central, regional, or local level is determined through structured clinical reasoning combining clinical judgment, interdisciplinary discussion, and standardized assessment findings.

This integration also provides a functional basis for role allocation within the interdisciplinary team. By combining the causal mapping capacity of the CCNM with the team's consensus on clinical priorities, facilitated by the PMRM, PbIT allows clinicians to determine not only which processes are most influential, but also at which level—central, regional, or local—these influences operate. This, in turn, helps identify which professional domain should take a leading role in addressing each process. For example, central mechanisms such as cognitive-emotional dysregulation or sensitization may be primarily targeted by psychological and considered medical interventions, while regional behavioral patterns and local physiological processes may be addressed through physiotherapy or occupational therapy. This structure ensures that interdisciplinary collaboration is functionally distributed rather than merely parallel, with each clinician contributing process-specific expertise toward shared therapeutic goals.

8. The Process-based Interdisciplinary Therapy (PbIT)

The PbIT (Figure 2) starts with a complete interdisciplinary process-based assessment, which will then consider and incorporate the patient's goals in order to select the corresponding strategies and implement them. In the course of therapy, the gradual changes obtained will be re-evaluated from a biopsychosocial approach, considering always shared decision making by the interdisciplinary team to guide the selection and implementation of strategies while respecting updating the patient's goals.

Evidence-based interventions and strategies specific to the initial formulation can be implemented, or replaced with an alternate technique, through a decision-making process that occurs in parallel to the patient's progress and with the patient's active involvement (Turk et al., 2010). Therapists, therefore, should ensure that treatment goals are aligned with the patient's values, as this personal relevance enhances the likelihood of adherence to the interventions (Coppack et al., 2012).

Within this model, pharmacological or interventional strategies can be intentionally aligned with psychological and behavioral interventions to reduce pain sensitivity, support engagement in exposure-based or physical rehabilitation procedures, improve sleep, or regulate emotional distress. In moments of acute pain exacerbation, biomedical strategies may be essential to modulate the pain experience and enable participation in other therapeutic processes. This collaborative approach ensures that biological, psychological, and social processes are addressed in a dynamic interaction, rather than being conceptualized hierarchically or in isolation.

Health care providers such as physicians, anesthesiologists, occupational therapists, and psychiatrists should be included. Interdisciplinary collaboration therefore extends beyond the psychology-physiotherapy and encompasses the contribution of all disciplines across the continuum of care, integrating them within a shared process-based case formulation that also considers relevant comorbidities.

This process will be repeated cyclically throughout the treatment, changing accordingly the established objectives according to the changes and/or advances of the related processes. The continuous monitoring acknowledges that patients may need to establish new goals during treatment due to changing circumstances. For example, new life stressors or significant life events may alter the patient's priorities, making previously set goals less relevant. Thus, the treatment plan remains flexible and responsive to the patient's evolving needs. This approach provides a unified and thorough explanatory approach for treating persistent pain by integrating, rather than separating, different disciplines and considering the dynamic causal relationships between biological, psychological, and social factors.

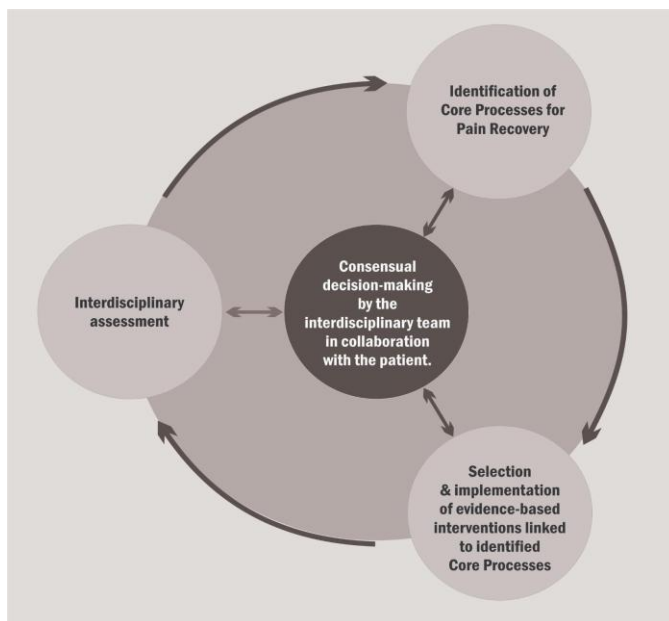


Figure 2. Conceptual model of the Process-based Interdisciplinary Therapy (PbIT)
Note. This figure is adapted from McCracken (2023), expanding the original process-based therapy diagram to include interdisciplinary collaboration and shared decision-making across professional domains.

Achieving an effective PbIT approach requires deliberate coordination from the very first point of clinical contact. While existing interdisciplinary pain clinics have demonstrated substantial benefits, persistent challenges—such as fragmented coordination and the lack of a shared clinical language among professionals—have also been documented (Hylands-White et al., 2017; Loeser & Cahana, 2013; Wählberg et al., 2024). This model directly addresses these limitations by establishing structured, process-based communication and shared reasoning from the outset. This initial consultation may be led by a physiotherapist, psychologist, pain physician, or another health professional. From that moment, the responsibility of the first clinician is to identify the core processes involved in the patient's presentation, determine which disciplines may be relevant to addressing them, and initiate appropriate referrals. However, referral alone is insufficient. PbIT

depends on ongoing interdisciplinary communication in which the referring clinician shares their assessment of relevant processes and remains open to feedback and complementary perspectives from other professionals.

Each discipline contributes its own evaluation of key processes while remaining within its professional scope. Thus, coordinated PbIT emerges not from isolated interventions but from structured communication and shared clinical reasoning. Through this process, the team collaboratively evaluates the available evidence-based interventions, discussing which options are most suitable for the identified processes and mechanisms of change. Together with the patient, they establish clear and measurable therapeutic goals and determine the specific role and contribution of each professional toward those objectives. The result is a coordinated treatment plan that reflects both scientific rationale and personal relevance, enhancing engagement, coherence, and adherence across the course of therapy.

9. Operationalising Methodology and Clinical Research Pathways for PbIT

Building on the theoretical foundations outlined above—particularly the Extended Evolutionary Meta-Model (EEMM) and the complex causal network perspective, and the Pain and Movement Reasoning Model—PbIT can be operationalised through methodological approaches that capture dynamic change across biopsychosocial processes. By identifying and targeting the most influential mechanisms for maintaining pain, other related processes may improve, increasing treatment efficiency and reducing the need for ongoing care. Progress can be monitored using Ecological Momentary Assessment (EMA), which provides real-time data on patients' experiences within their natural contexts, capturing fluctuations in pain, affect, and behaviour while minimising recall bias (Shiffman et al., 2008).

In addition, PbIT can be investigated and refined through network analysis, which models the interactions among biological, psychological, and social processes; Single-Case Experimental Designs (SCEDs), which examine individual-level mechanisms of change; and Structural Equation Modelling (SEM), which validates hypothesised pathways across time and domains.

Integrating these methodologies allows PbIT to function as both a clinical and research framework, supporting continuous feedback between practice and evidence. This methodological grounding strengthens the model's capacity to evaluate process-level change and to guide interdisciplinary decision-making based on real-time, functional data.

Future research should explore how PbIT can be further developed, evaluated, and implemented in real-world healthcare settings, examining how professionals communicate about core processes across disciplines, how these are integrated into treatment planning, and how such coordination influences outcomes. Research should also assess its feasibility, acceptability, and clinical effectiveness across contexts, develop standardized process measures for interdisciplinary use, and test the model's predictive validity through longitudinal and network-based analyses.

Implementation studies are needed to identify the organizational, cultural, and training factors that facilitate successful adoption, ensuring the translation of PbIT from a conceptual framework into an empirically supported model of interdisciplinary pain care. Promoting familiarity with process-based reasoning among healthcare professionals will also be essential, as even when clinicians do not explicitly label their work as process-based, the intentional coordination of interventions through shared processes and their adaptation to evolving biopsychosocial interactions already embody this approach. Encouraging this understanding may foster broader adoption and fidelity to PbIT, supporting a gradual shift from single-discipline or protocol-driven care toward collaborative, individualized, process-based pain treatment.

Final considerations

This paper proposes an innovative extension of Process-Based Therapy by embedding it within an interdisciplinary framework for pain recovery. Rather than replacing existing therapies, this model builds upon their established evidence base and seeks to take them a step further. While Process-Based Therapy already incorporates a biopsychosocial foundation, the proposed Process-Based Interdisciplinary Therapy (PbIT) enhances it by adding structured interdisciplinarity—bringing together diverse clinical perspectives within a shared process-based formulation. In doing so, PbIT integrates the collective expertise of different health professionals to address the biological, psychological, and social dimensions of pain in a coordinated and dynamic manner. This evolution represents a natural progression in the history of the biopsychosocial model: just as pain requires the integration of multiple mechanisms for effective care, so too must clinical practice integrate all relevant disciplines to achieve meaningful and individualized recovery.

In this sense, PbIT explicitly challenges the traditional bias toward a predominantly biomedical model of pain management by providing a cohesive, process-based framework that integrates biological, psychological, and social mechanisms into a unified clinical reasoning system. Through this integration, PbIT promotes genuine interdisciplinarity, enabling clinicians from all domains—biological, psychological, and social—to work collaboratively toward shared process-level goals rather than parallel discipline-specific outcomes.

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Conflicts of interest

The authors have no known conflicts of interest to disclose.

Data availability

There are no primary data associated with this conceptual article.

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Table 1

Current evidence-based psychological treatments for chronic pain

Level 1a approaches (strong evidence) for chronic pain		
Intervention	Description	Evidence
Cognitive Behavioral Therapy (CBT)	Aimed at helping individuals to cope with pain and to enhance their quality of life. It targets the relationship between thoughts, emotions, and behaviors, with the goal of reshaping negative thought patterns and unhelpful behaviors that contribute to chronic pain.	In a systematic review and meta-analysis of randomized controlled trials (RCTs) (Bernardy et al., 2010), the results showed that CBT had a small effect on pain, with a standardized mean difference (SMD) of -0.24 (95% CI: -0.54 to 0.05), indicating a non-significant reduction in pain after treatment. For fatigue, the effect size was minimal, with an SMD of 0.05 (95% CI: -0.23 to 0.34), showing no significant improvement in fatigue levels.

Acceptance and Commitment Therapy (ACT)	Contrasts with traditional Cognitive Behavioral Therapy (CBT) by prioritizing psychological flexibility over symptom reduction. Whereas CBT typically focuses on modifying negative thoughts and behaviors to ease symptoms, ACT encourages individuals to embrace their thoughts and emotions while committing to actions aligned with their values. This approach promotes engaging in meaningful activities, even in the presence of pain or distress, highlighting a more comprehensive perspective on mental health that focuses on living a fulfilling life rather than simply minimizing symptoms.	A systematic review (Hann & McCracken, 2014) revealed that ACT had beneficial effects on several outcomes related to chronic pain management. Participants undergoing ACT showed improvements in physical functioning, pain acceptance, and overall quality of life. Nonetheless, the review also pointed out inconsistencies in the methodologies and outcomes across the studies, indicating that while ACT appears to be a promising treatment for chronic pain, additional research is required to confirm its effectiveness and clarify the mechanisms responsible for its benefits.
Mindfulness	Mindfulness for chronic pain involves using meditation techniques to help individuals manage pain by fostering non-judgmental awareness of bodily sensations and emotions. It aims to reduce the emotional impact of pain, improve coping strategies, and address related issues like anxiety and depression. Mindfulness practices have been shown to enhance quality of life and provide a sense of control over pain, though more research is needed to confirm the full extent of its benefits. This approach offers a holistic way to manage chronic pain, integrating mental and physical well-being.	In a systematic review and meta-analysis (Hilton et al., 2017) Mindfulness meditation was linked to a small but statistically significant reduction in pain compared to control groups (-0.19% vs. -0.08%, $p = 0.0031$). Participants also experienced notable improvements in depression symptoms and reported better quality of life. Some studies suggested a reduction in analgesic use, though the findings were inconsistent. However, there were no significant differences in functional impairment between the mindfulness and control groups.

Level 1b approaches (moderate or emerging evidence) focusing on social and emotional factors		
Intervention	Description	Evidence
Hybrid emotion-focused Treatment.	Transdiagnostic treatment that integrates exposure interventions and emotion regulation techniques to address both chronic pain and associated comorbid problems.	In an RCT (Boersma et al., 2019) the hybrid treatment significantly improved pain catastrophizing ($d = 0.39$) and pain interference ($d = 0.63$) compared to iCBT.
Short-term Psychodynamic Psychotherapy (STPP)	Centers on the emotional and relational dynamics associated with a person's development, unresolved conflicts, and past difficulties. Its goal is to assist individuals in understanding and working through their emotions, especially those connected to troubled relationships, whether from the past or the present.	A meta-analysis of 37 studies (Abbass et al., 2021) demonstrated that STPP results in substantial decreases in somatic symptoms after treatment. The effect sizes were significant at all follow-up intervals: short-term (SMD = -1.07), medium-term (SMD = -0.92), and long-term (SMD = -0.90).

Emotional Awareness and Expression Therapy (EAET).	Combines methods from trauma- and emotion-focused therapies to help patients identify and articulate the emotions associated with their pain. By fostering emotional awareness and encouraging adaptive expression, the therapy seeks to diminish pain amplification and enhance overall well-being.	In an RCT (Lumley et al., 2017) a higher percentage of EAET patients reported being “very much/much improved” at follow-up compared to those receiving CBT EAET led to a significantly higher rate of patients achieving at least 50% reduction in pain (22.5% vs. 8.3%).
Pain Reprocessing Therapy (PRT)	Psychological intervention intended to help individuals view their chronic pain as a misinterpretation by the brain rather than a sign of physical harm. The therapy works to change patients' perceptions of their pain, emphasizing that chronic pain may be reversible and associated with brain activity rather than ongoing tissue damage.	A study (Ashar et al., 2022) demonstrated that PRT was markedly more effective than both placebo and standard care in alleviating chronic back pain (CBP). Notably, 66% of participants who received PRT reported being pain-free or nearly pain-free after treatment, compared to just 20% in the placebo group and 10% in the standard care group. These improvements in pain relief were largely sustained over a 1-year follow-up period.

Guided imagery (GI)	Therapeutic approach that utilizes mental visualization to create sensory experiences and foster relaxation. This method involves generating mental images—encompassing sights, sounds, smells, and emotions—to achieve specific goals such as relieving pain or reducing stress. By engaging the senses and emotions through imaginative processes, guided imagery helps promote a state of calm and well-being.	A systematic review (Posadzki & Ernst, 2011) concluded that guided imagery (GI) may lead to a significant reduction in musculoskeletal pain (MSP) based on the results of eight out of nine randomized clinical trials (RCTs) included in the review. However, the evidence is described as encouraging but inconclusive due to the limited number of rigorous studies available
Personal Construct Therapy (PCT)	Psychological approach that examines how individuals perceive and interpret their experiences. It highlights the connection between emotional experiences and the personal constructs—mental frameworks—people use to make sense of their world. PCT also emphasizes the role of social context, recognizing that personal constructs are often influenced by interpersonal relationships and social interactions.	In an RCT (Aguilera et al., 2022) comparing PCT and CBT for depressive symptoms in women with fibromyalgia, both treatments were equally effective. There were no significant differences between PCT and CBT at post-treatment ($b=-0.47$, $t=-0.49$, $p=0.63$) or follow-up ($b=-1.12$, $t=-1.09$, $p=0.28$), indicating that PCT is a viable alternative to CBT.

Table 2

Evidence-based psychological strategies.

Psychological Strategy	Description	Evidence
Psychoeducation	Psychoeducation involves providing information and guidance to help patients understand their pain, reducing anxiety and uncertainty. It also aims to promote behavioral changes to improve pain management.	A systematic review (Puri & Theodoratou, 2023) evaluated the efficacy of psychoeducation in managing low back pain by analyzing evidence from randomized controlled trials. The findings suggest that psychoeducation can be an effective approach, especially when personalized and designed to enhance patients' understanding of pain and promote behavioral changes to improve their management and recovery.

Exposure	Exposure involves systematically confronting situations or activities that patients may fear or avoid due to their pain. This method is grounded in cognitive-behavioral principles and is often implemented through graded exposure therapy.	A systematic review and meta-analysis by López-de-Uralde-Villanueva et al. (2015) assessed the effectiveness of graded exposure (GEXP) versus graded activity (GA) for chronic nonspecific low back pain. Overall, GEXP appeared slightly more effective than GA in addressing pain-related catastrophizing, though both approaches showed similar outcomes in physical disability and pain intensity.
Relaxation techniques	Relaxation techniques for chronic pain are non-pharmacological approaches designed to reduce stress and improve the overall well-being of individuals. By inducing a state of relaxation, these techniques help alleviate pain by reducing the tension and stress that often worsen discomfort.	A systematic review of RCTs on relaxation techniques for chronic pain (Vambheim et al., 2021) found that 21 studies showed significant improvements in pain and secondary outcomes like anxiety and depression. However, four studies found no significant benefits, indicating variability in effectiveness. The most common techniques used were progressive relaxation, autogenic training, and guided imagery. Effectiveness varied by individual and pain type, with better results in whiplash patients. Continued practice was necessary for sustained relief.

Behavioural activation	Behavioural Activation (BA) is a therapeutic approach originally developed to treat depression by encouraging individuals to engage in meaningful and enjoyable activities, which improves mood and well-being. In the context of chronic pain, it helps patients confront pain-related avoidance behaviours, re-engage with life, and rebuild a sense of control through activities that align with their values. By scheduling and gradually increasing participation in valued activities, BA aims to reduce both depressive symptoms and the perception of pain over time.	A systematic scoping review on the effectiveness of BA for managing pain found mixed results (Walsh et al., 2022). While most participants reported reduced pain or less impact from pain after BA, the studies varied in quality and sample size, making definitive conclusions difficult. BA often showed better outcomes than other interventions, but its delivery format was inconsistent across studies. It was administered by various healthcare professionals, indicating its broad applicability
Cognitive restructuring	Cognitive restructuring in the context of chronic pain is a psychological intervention designed to change irrational or maladaptive thoughts and beliefs about pain. This approach aims to replace negative thought patterns with more rational and constructive ones, ultimately shifting the perception and intensity of chronic pain experienced by individuals.	A meta-analysis on cognitive restructuring and chronic pain (Pintea & Maier, 2024) found a large overall effect size ($d=0.94$), indicating a significant reduction in pain intensity. It highlighted that the effects were less pronounced in females compared to males and that higher-quality studies showed stronger effects. Both individual and group interventions were effective, though there was no significant difference in effect size between them.

Compassion-based techniques	Compassion-based techniques for managing chronic pain generally aim to cultivate self-compassion, strengthen emotional resilience, and nurture a supportive attitude toward one's own suffering.	A randomized controlled trial on Mindful Self-Compassion (MSC) for chronic pain patients (Torrijos-Zarcero, 2021) revealed several positive outcomes. MSC significantly increased self-compassion, which helped participants better cope with pain-related stressors. It was more effective than cognitive-behavioral therapy (CBT) in reducing anxiety and improving emotional well-being. MSC also led to better pain acceptance, reducing the emotional burden of chronic pain, and less interference of pain in daily activities. Additionally, it showed a trend in reducing catastrophizing and fostered overall emotional resilience and acceptance, enhancing the quality of life for participants.
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Table 3

Evidence-based physiotherapist strategies.

Intervention	Description	Evidence
Exercise (various modalities)	Exercise interventions for various chronic pain conditions along the nociplastic pain continuum, highlighting the importance of tailoring exercise prescriptions to the predominant pain mechanism, patient preferences, and the expertise of the therapist.	A systematic review and meta-analysis (Ferro Moura Franco et al., 2021) suggests that evidence-based physiotherapy strategies for treating chronic pain, particularly in nociplastic pain conditions like fibromyalgia and chronic idiopathic neck pain, should include a combination of aerobic exercises, strengthening exercises, stretching, body awareness, and motor control exercises. These interventions not only improve physical function and quality of life but can also help reduce pain intensity and enhance overall well-being. Personalizing exercise programs to account for individual patient characteristics and the predominance of nociplastic pain is crucial for maximizing therapeutic benefits and minimizing the risk of pain exacerbation.

Pain Science Education	Pain Science Education (PSE) is an educational approach aimed at enhancing patients' understanding of pain and its mechanisms to facilitate behavioral change and improve pain management outcomes. It encompasses a broad range of pain sciences, including neurophysiology, psychology, immunology, and endocrinology, rather than focusing solely on neurophysiology. The primary objectives of PSE are to reduce the perceived threat of pain and empower individuals to adopt adaptive behaviors that enhance their quality of life.	Pain Science Education (PSE) results in reduced pain intensity and disability across various conditions, while enhancing patients' understanding of pain mechanisms (Moseley et al., 2023). It empowers individuals to adopt self-management strategies and overcome barriers like fear of movement. Improved two-way communication fosters engagement and motivation, helping patients identify personal motivations for managing pain. Overall, PSE effectively transforms pain understanding and promotes positive behavioral changes for better pain management.
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Aerobic Exercise	Aerobic exercise involves continuous, rhythmic movements that engage large muscle groups, leading to an increase in heart rate and respiration.	A systematic review (Tan et al., 2020) describes an intervention involving aerobic exercise, such as walking or cycling, performed one or multiple times per week over a period of 2 to 12 weeks. The primary goal was to improve pain sensitization, as evidenced by increased pressure pain thresholds and reduced pain ratings in individuals with chronic musculoskeletal pain. The findings suggest that this aerobic exercise regimen is effective in producing a hypoalgesic effect, helping to reduce pain sensitivity.
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