

Topical review

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Pain psychology in the 21st century: lessons learned and moving forward

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Abstract

Background and aims: In the spring of 2019, Professor Steven J. Linton, the founder of the Center for Health and Medical Psychology (CHAMP) at Örebro University, Sweden, formally retired. As a tribute to his scholarly work covering decades of influence and inspiration to the field of pain psychology, the research center organized a topical conference titled “*Pain in the 21st century: Where do we come from and where are we going?*”, which

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resulted in this state-of-the-art synthesis. The aim of this declaration is to highlight lessons learned but not in the least is meant to inspire and guide our continued journey forward, developing pain psychology into the 21st century.

Methods: Several collaborators of Professor Linton have summarized and reflected on the current state-of-the-art of pain psychology from the perspective of his input to the field, as well as on developments from the last years of advancements in pain psychology.

Results: The topics have been divided into six themed sections covering the fear avoidance model, transdiagnostics, secondary prevention, risk- and protective factors, communication and contextual factors. The sections cover a broad spectrum, from basic experimental studies, integrating emotion and motivational theories into current theoretical models, to applied research on the effect of early interventions as well as sophisticated emotion-focused treatment models for pain patients with concurrent emotional ill-health.

Conclusions: There have been major advancements within pain psychology research during the last decades, moving the field towards a more comprehensive picture, taking emotional and motivational aspects into account to understand pain sufferers. Although psychologically informed interventions in general mainly focus on the individual, it has been put forward that pain management is highly influenced by the surrounding environment, including communication with health care providers, and the occupational and social context.

Implications: Professor Steven J. Linton has been at the forefront of pain psychology research during the last decades, and inspired by his work this journey will continue into the 21st century, with the ultimate goal of enhancing the understanding and treatment for all people suffering from persistent and disabling pain.

Keywords: pain psychology; fear-avoidance; risk factors; intervention.

Dedicated to: State-of-the-art declaration dedicated to the work of Steven J Linton.

1 Introduction

The field of pain psychology has taken significant steps forward during the last decades. Among the main advances is an increased awareness of the key role of psychological factors as determinants for debilitating pain. Some known risk factors, such as catastrophizing and avoidance of activities, may dramatically increase the risk of disability, whereas other factors such as optimism and positive affect may in fact buffer and protect against chronicity.

Professor Steven J. Linton has made a significant contribution to this field. Already in the late 90's, Linton and colleagues proposed a screening tool for early assessment of psychological (risk) factors in patients with back pain [1]. This paved the way for early screening and intervention for psychological risk factors in back pain, knowledge which has now spread throughout the world. About a decade later, Linton was also involved in refining the *fear-avoidance model*, today one of the most influential theoretical frameworks in clinical pain psychology [2–4]. This model has inspired major treatment advancements, not least by introducing exposure *in vivo* as a method to increase the activity levels of patients. Professor Linton has been involved in developing exposure methodology from early pilot trials [5, 6], to recent sophisticated attempts to integrate exposure *in vivo* with contemporary communication skills and emotion regulation training [7]. These are only a few examples of the major contributions that Linton has made to the field of clinical pain psychology.

In the early fall 2019, the Center for Health and Medical Psychology (CHAMP) at Örebro University in Sweden, gathered renowned researchers in the field of clinical pain psychology for a two-day conference titled “*Pain in the 21st century: Where do we come from and where are we going?*” As a tribute to Linton, the founder of CHAMP, this conference reflected on his contributions to the field, as he retired earlier 2019 from his position as Professor of Clinical Psychology and Director of CHAMP. This state-of-the-art declaration will summarize and reflect on topics covered during the conference. The aim of the declaration is to pinpoint lessons learned from the last decades, inspired by Linton's wisdom, expertise and insights. This state-of-the-art synthesis will summarize and reflect on topics covered during the conference with the aim of highlighting the lessons inspired by his research as a spur to us all to continue the journey of clinical pain psychology into the 21st century.

2 The Fear Avoidance Model in the 21st century (J.G. and J.W.S.V.)

Since its introduction in 1982 [8], the Fear-Avoidance Model (FAM) describing how individuals develop and maintain chronic pain has been one of the most influential behavioral pain models of the last 40 years [3].

The strengths of this theoretical model have been its dynamic approach and its simplicity, making it useful for both basic and applied research. Because it contains modifiable variables, FAM has guided the development of psychological interventions as well. Over the decades, the FAM has been a good alternative to a more complex but less specific Bio-Psycho-Social Model [9]. Several paths of the FAM have been proven by extensive experimental work in pain-related fear condition e.g. [10] as well as correlational research e.g. [11]. The most prominent element of the model has been “avoidance”, predicting treatment success and disability in chronic pain more successfully than any other variables [12]. Pain-related fear and avoidance behavior are modifiable factors and therefore a potential target for treatment and prevention strategies. Exposure treatment is a successful treatment option explicitly addressing avoidance behaviors in pain across the lifespan [13, 14]. Overall, the last decades have seen a surge in the study of the FAM of pain and its elements in both basic and clinical investigations. The more recent literature mainly supports the basic assumptions of the model, but it also provides greater depth, inspiring future research and novel clinical applications.

Some important new developments that are not included in the current FAM will, and should be, the focus of the psychological pain research in the 21st century. Among those are the following:

1. **Motivational and Social context:** Avoidance of pain generally competes with other valued goals in the lives of individuals suffering chronic pain. The role of the social context, and the pursuit of socially-oriented goals have been largely neglected so far [15]. We expect that these motivational and social factors will attract more attention in the near future.
2. **New measures and definitions of avoidance:** Avoidance, so far, has been the central element of the FAM. However, there has been critique on how avoidance is currently assessed [12]. Thus, the behavioral part of the FAM – avoidance- and its assessment, might be the focus of further research. Since the self-report avoidance measures are inherently limited, behavioral tests [16] or assessment via virtual reality might

play a bigger role, probably leading to changes in how we conceptualize avoidance in the future.

3. The bidirectionality hypothesis: Avoidance behavior is usually considered emerging as a result of pain-related fear, but there is recent evidence that the opposite is true as well: the emittance of avoidance behavior can instigate fear, especially in situations where the opportunity to emit previously learned avoidance behavior is not available anymore [10]. This suggests that treatments focusing on avoidance behavior, and not just fear, are more likely to be successful.
4. Emotion regulation: Usually, pain-related fear is accompanied by other emotions as well. The role of emotions, (e.g. anger) and emotion regulation may facilitate extinction of pain-related fear during exposure treatments [7].
5. Pain as a drive: What is the relationship between pain-related fear, avoidance and pain responses? Several theorists have suggested that pain has more in common with homeostatic drives such as hunger and thirst, rather than the sensory experiences vision and hearing. A novel approach regarding pain as a drive would mean going away from pain as latent construct, but would, again, also mean that new paradigms of pain related conditioning, and new measures of avoidance behaviors will have to be developed [17].

In the late 21st century, the FAM model may also move towards computational modeling emphasizing expectations. Pain, fear and avoidance might be operationalized within a framework of predictive coding [18, 19], including interoceptive and proprioceptive input and interactions between motor and interoceptive signals. In essence, we conclude that the future of FAM is bright, opening new windows towards a better understanding of the transition from common acute pain episodes to chronic disabling pain.

3 Chronic primary pain from a transdiagnostic perspective: broadening the scope paves the way for treatment advancements (I.K.F. and M.K.N.)

There is a strong association between chronic pain, emotional distress, and interference in daily activities

[20, 21]. The recently updated International Classification of Diseases (ICD-11) recognizes chronic pain in its taxonomy, including the new diagnosis of “Chronic primary pain”, where pain and its accompanying problems is the focal point, as opposed to chronic secondary pain where pain occurs in the context of other diseases [22, 23]. This highlights that emotional distress and disability are not simply comorbid conditions; the suffering associated with pain is the pain problem.

The ICD-11 classification integrates emotional and behavioral aspects in the very definition of chronic pain; to be classified as chronic primary pain, the patient needs to suffer from “significant emotional distress ... or functional disability” [22, 23]. A recurring complaint of patients with chronic pain is that their pain and associated suffering are not recognized by their treatment providers [24]. Instead of using opaque labels such as “medically unexplained” or “psychosomatic”, it is hoped this new framework will facilitate acceptance of a patient’s experience of pain as real, regardless of physical findings. Accepting a patient’s pain as real through *validating communication* is known to decrease emotional distress in pain sufferers [25]. The diagnosis of chronic primary pain should also shift the focus from finding or excluding a physical cause to identifying many possible contributors; physical, psychological and social, thereby expanding the range of possible treatment opportunities for patients with chronic pain.

Emphasizing emotional and behavioral aspects of chronic primary pain could also shed light on shared mechanisms. The *transdiagnostic perspective* [26] proposes that similar underlying mechanisms may feed several affective and behavioral disturbances. In the case of chronic pain, Linton and colleagues have identified possible shared mechanisms underpinning chronic pain and associated emotional disturbance [27, 28]. One example is *generalized avoidance* [27, 28], a maladaptive behavioral strategy common to several conditions – including depression and chronic pain – which may hinder adaptation and functioning in daily life.

Understanding chronic primary pain from a transdiagnostic perspective could also extend the options for treatment development. For example, by identifying shared mechanisms between the pain, distress, and disability associated with chronic primary pain, treatment could be more efficient and effective than by addressing each of these separately. Recently, Boersma et al. [7] reported the outcomes of a randomized controlled trial of transdiagnostic emotion-focused exposure treatment for patients with chronic pain. This treatment, initially developed and tested by Linton and Fruzzetti [29], combines cognitive-behavioral methods for regulating pain as

well as emotions, with the aim of reducing behavioral and emotional avoidance, to facilitate adaptation to pain and reduced pain-related disability. The successful outcomes reported by Boersma et al. provide strong support for the efficacy of the transdiagnostic treatment model in this patient group.

By focusing on shared mechanisms and the broader framework encompassed in this diagnosis of chronic primary pain, a promising way forward is revealed for enhancing the management of chronic pain in the 21st century.

4 The development and evolution of secondary prevention (SP) (C.J.M. and H.B.J.)

SP includes preventive measures that lead to early diagnosis and prompt and adequate treatment of a disease, illness or injury. Within pain management (PM), the modern approach to SP has its origins in the behavioral approach developed in the 1960s/1970s in Seattle [30]. This evolved into the cognitive-behavioral approach to pain which sits within the biopsychosocial approach to the management of pain and illness.

This PM approach contrasts with both the traditional biomedical/biomechanical approach and principal focus of the cure of pain; and also with pain as a type of mental illness. Sternbach's [31] early emphasis on the role of individual differences stimulated the identification of psychological factors and attempts at typology, but most influential perhaps has been the Gate Control Theory of Pain [32] which *inter alia* developed a focus on central mechanisms as well as peripheral pain pathways.

Professor Linton was at the forefront not only of the study of PM in occupational settings [33] but, more generally of the development of SP, with his landmark textbook in 2002 [34], and co-authorship of the Flags framework [35] which has been widely adopted as a way of thinking about SP. In particular the distinctions between (a) modifiable and unmodifiable risk factors and (b) psychological and socio-occupational and more general contextual factors. Central to this framework is communication with the patient.

Over the last 3–4 decades we have amassed evidence for the important role of psychological factors such as fear, catastrophizing, anxiety/somatic awareness, self-efficacy and flexibility, not only as mediators of treatment outcome but as potential targets for intervention.

Increasing evidence has emerged for the efficacy and cost-effectiveness of SP, but with relatively modest

treatment effects, a consequence in part of the adoption of the group approach (one size fits all) to interventions, but perhaps also to relative disregard of the nature of the treatment process and its implementation.

However, three recent developments merit mention: The development of stratified care (such as STaRT-Back [36]) linking (mainly psychological) risk factors with treatment targeting has energized interest in SP, particularly at the Primary Care Level. Second, new screening tools such as the short form of the Örebro Musculoskeletal Pain Screening Questionnaire (ÖPMSQ; 37) which potentially has broader applicability than the STaRTBack tool, and has been used in both clinical and occupational settings such as the recent Work Injury Screening and Early intervention (WISE) trial in Australia [37]. Finally, the development of Psychologically Informed Practice, or PiP [38], which encompasses the range of core psychological elements of cognitive behavioral approaches, and recent variants such as Acceptance and Commitment Therapy (ACT), and has stimulated re-examination of the nature of consultations and emphasized the role of experiential learning in the training of PiP professionals [39].

4.1 Future directions

There is interest currently in factors such as social capital, resilience and emotional dysregulation, and contextual influences on social communication models merit further investigation, but the most immediate priorities appraise the *process* of intervention and the nature of communication [40].

This requires the identification of the determinants of the behavior change we are targeting, while helping our clients/patients implement and sustain the behavior change both during and after our contact with them and as mentioned above, structured communication models such as the expanded four habits model [41] can serve as a useful scaffolding for the clinician when performing PM and thus become central in SP.

5 The other side of the coin: resilience as a pathway for improving treatment results (K.B. and M.P.)

While cognitive behavioral therapies (CBT) for chronic musculoskeletal pain, including CBT informed

multidisciplinary programs, have been found to be effective, the improvements in outcomes are modest [42, 43]. This calls for continued development of our understanding of what works for whom, and for refining our intervention models. A recent systematic review and meta-analysis investigated which factors were prognostic for long-term physical functioning after multidisciplinary pain rehabilitation [44]. The aim was not merely to identify outcome predictors, but also to identify factors that could be novel treatment targets. The results showed that emotional distress, maladaptive pain coping and low levels of protective factors such as optimism and acceptance were predictive of poor long-term physical functioning.

The identified prognostic factors confirm the importance of the main tenets of the fear-avoidance model of chronic pain [2] but additionally point to a role for resilience factors. Indeed, the latest version of the fear-avoidance model incorporates positive affect and optimism as factors that may counteract inflexible engagement in pain control and subsequent disability by fostering priority to pursuing valued life goals [3]. The recognition that both risk and resilience factors are prognostic of recovery can potentially be used to bolster treatment effects. Harnessing psychological resilience may tap into so far unexploited pathways of change and consequently, combining this with the more traditional risk-focused intervention techniques could lead to more robust clinical gains.

During recent years, several promising laboratory and clinical studies have been performed, demonstrating that resilience-based interventions can positively affect how an individual perceives pain and how pain interferes with functioning. For example, increasing optimism by means of a “Best Possible Self” writing and visualization exercise led to significantly lower pain reports during an experimental cold pressor task, and this effect was mediated by decreased pain catastrophizing [45]. Furthermore, this intervention reduced the impact of experimental pain on cognitive functioning [46], suggesting that targeting optimism in patients with chronic pain could alleviate pain interference in daily life.

As a first clinical study, Flink et al. [47] piloted a positive psychology intervention for patients with chronic pain using a single case experimental design. This “Happy Despite Pain” intervention aimed at increasing self-compassion, positive affect and optimism and by that exert a positive impact on wellbeing and functioning. The pilot study showed feasibility and acceptability of the program. Next, a randomized controlled trial was conducted in which the effect of an internet-delivered self-help version of this intervention was compared to that of an internet-delivered CBT intervention [48]. This

study showed long-term beneficial effects of the positive psychology intervention on well-being and depressive symptoms that were similar but not superior to those of the CBT intervention.

An interesting avenue for future studies is to examine how interventions focusing on increasing protective factors and interventions focusing on decreasing risk factors may be combined. We propose that augmenting resilience may enhance the effects of other, already established interventions. A recent trial using a treatment format that combined emotion regulation skills training, including those that build on positive resources, with exposure techniques indicated that combining these strategies could be a way to improve results beyond the effects of traditional treatment [7]. Thus, an increased focus on strengths and resilience may provide a promising way forward for enhancing the management of chronic pain in the 21st century.

6 Pain communication: what is next? (M.G.S.S. and A.W.)

Pain does not occur in a vacuum, but in a social context in which interpersonal interactions and communication may affect an individual’s pain experience [15, 49, 50]. Pain communication in all its complexity poses a challenge for diagnosis and treatment [51]. Therefore, and because communication is one of the most powerful components of pain treatment, gaining a better understanding of interpersonal communication in the context of pain is timely and important. Despite the progress made in studying pain communication, several important questions remain that have yet to be addressed or fully understood.

Studies of pain communication tend to focus on the extent and modes of behavioral expression by the person with pain, and on judgements and related responses made by the other person within the social contact [52]. These studies often address encoding and decoding of behavior separately. The interaction between behavioral and emotional responses of the pain patient and those close to him or her has been understudied. The other person is usually a partner or family member, or a clinician, with a somewhat narrow focus in older research, on instrumental help and operant reinforcement. This is a particularly misleading focus when both of a couple experience disabling chronic pain, which is not uncommon in older adults. More recently, the framework of validation and invalidation [53] has provided a basis for more emotionally focused investigation [51, 54–57].

There are many broader topics to explore, including expectations and beliefs in pain communication. Expectations about future pain outcomes are among the strongest predictors of pain, pain behavior, and treatment outcomes [58, 59]. It is therefore worth considering that the possible impact of different communication patterns, such as reassurance, validation, or invalidation, may be explained by disconfirmation or reinforcement of expectations that patients hold about pain and treatment outcomes [60]. A better understanding of the maintenance of (dysfunctional) pain expectations and their modification through effective communication strategies could help develop more targeted, optimized interventions [61].

Considering the social context of interpersonal interactions and communication, the perceived role of the partner in the patient's pain experience (e.g. pain in sexual activity) deserves further attention. Moreover studies involving encounters of the person with pain with strangers or acquaintances are rare [62], or for the child or adolescent of encounters inside and outside school. Lacking too are observations of enacted stigma [63], particularly in clinical settings [64], to complement those on experience of stigmatization.

Finally, the clinical encounter is a rich source of understanding the course of chronic pain within a broader social communication context [40, 65]. Although clinical findings point to associations between pain and the social context in which it occurs, the modulation of pain by interpersonal factors, and especially communication messages, has received only little experimental attention to date [50]. Moreover, methods from ethology, social research [66], and social network analysis are barely used but offer richer understanding of social experiences of the person in pain (including isolation and loneliness), also considering dynamics across contexts and over time [67]. These areas may also offer interventions worth testing for the person in pain in social communication contexts.

7 Shall we focus on the individual, the organization or the community? (W.S. and S.R.)

Persistent pain is not an isolated phenomenon detached from social, environmental, and occupational context. The ability of an individual to prevent, self-manage, and cope with intermittent or episodic pain can depend on factors and constraints from the people and systems around them, from the closest family and friends to the larger

community and social system [68]. The ability to contextualize the experience of pain outside of clinical encounters is a hallmark of Linton's research and practice guides. In the following section we will briefly review some of these contexts and how it relates to persistent pain and PM.

7.1 The family

A growing body of research by Linton and others has shown the importance of spousal support and communication in PM. In particular, recent studies have shown the effects of partner validation on emotions in people with chronic pain [56], and couple interactions may affect pain coping through a number of possible mechanisms [69], including an analgesic effect on pain [70]. Apart from issues of spousal support, chronic pain can have a major impact on other important family roles: caregiving for a dependent child or elder; financial support for housing and education; shifting family responsibilities; and work-family conflict. The consistent evidence linking social support to reduced pain implies an integration of social support and intimacy in clinical care models [70].

7.2 The workplace

The workplace is where we spend a large amount of our waking time, and is as such an important source of influence as well as an arena for intervention. Professor Linton has made many significant contributions in this area including the identification of workplace risk factors for pain chronicity and disability [71, 72], a taxonomy of return-to-work obstacles [73], the need for supervisor training to respond to pain effectively [74], and the development of scales designed to assess psychosocial and workplace risk factors [73, 75, 76]. These innovations have supported intervention strategies leading to fewer days off work, fewer health care visits and better perceived health [77]. Similar results previously reported from the US, emphasize the importance of supervisors' communication skills for pain and work disability [78].

7.3 The community

Initial conceptualizations of psychosocial risk factors for chronic pain and disability presumed these to be individual traits (e.g. pain catastrophizing, fear avoidant beliefs), but recent work has highlighted how these factors also reflect social learning, environmental cues,

local history, cultural beliefs, and environmental rewards and reinforcement. Thus, psychosocial influences on pain outcomes may be a product of many circumstances, and individual factors may not be so individual after all [79]. Linton's research has shown that health care providers may hold beliefs reflecting fear-avoidance that can influence patient beliefs and behavior [80]. Organizational structures within our social context seem to play a role in shaping how all stakeholders see and emotionally respond to pain.

7.4 The social systems

Expanding to an even broader context, one might also say that pain is, in some respects, a system-level problem requiring system-level solutions. Issues of stigma, social insurance policies, social burden, health care systems, acceptance of behavioral approaches to PM, and the ability to affect health care provider practices – all of these are important social influences captured in the study designs and writings of Linton and his collaborators [81]. His work has also highlighted the risk of serious and life-changing outcomes that can sometimes result from common episodes of musculoskeletal pain and the need to implement evidence-based guidelines into clinical practice [82]. Improving pain care may involve some universal preventive efforts, including provider training and education, altering public views about pain and disability, and adopting government policies that support rehabilitation efforts that map onto known risk factors [83].

It is thus neither possible nor desirable to focus on either the individual, the organization or the community. They all coexist and mutually influence each other, and this needs to be taken into account when designing and implementing interventions.

8 Conclusion

In this state-of-the-art synthesis, we have summarized and reflected on developments from the last years of advancements in pain psychology. The topics have covered a broad spectrum, from basic experimental studies, integrating emotion and motivational theories into current theoretical models, to applied research on the effect of early interventions as well as sophisticated emotion-focused treatment models for pain patients with concurrent emotional ill-health. Although psychologically informed interventions in general mainly focus on the individual, it has been put

forward that PM is highly influenced by the surrounding environment, including communication with health care providers, and the occupational and social context. Professor Steven J. Linton has been at the forefront of pain psychology research during the last decades, and inspired by his work this journey will continue into the 21st century, with the ultimate goal of enhancing the understanding and treatment for all people suffering from persistent and disabling pain.

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