

# Contemporary biopsychosocial exercise prescription for chronic low back pain: questioning core stability programs and considering context

Peter Stilwell, BKin, DC, MSc<sup>1</sup>  
Katherine Harman, PT, PhD<sup>1</sup>

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*This commentary explores the importance of considering the biopsychosocial model and contextual factors when prescribing exercise. Diverse exercise programs for patients with chronic low back pain (CLBP) produce similar outcomes, without one specific exercise protocol demonstrating clear superiority. One clear barrier to positive outcomes is poor exercise adherence. We suggest that there are certain common contextual factors present in all exercise prescription scenarios that may impact adherence and health-related outcomes. While challenging common core stability exercise prescription, we present an argument for enhancing and intentionally shaping the following contextual factors: the therapeutic alliance, patient education, expectations and attributions*

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*Cet article explore l'importance de considérer le modèle biopsychosocial et les facteurs contextuels avant de prescrire des exercices. Divers programmes d'exercices pour les patients qui souffrent de lombalgie chronique produisent des résultats semblables, sans qu'un protocole d'exercices particulier démontre une supériorité claire. Un obstacle évident à l'atteinte de résultats positifs est le fait de ne pas persister à faire les exercices. Nous laissons entendre qu'il existe certains facteurs contextuels communs dans tous les scénarios de prescription d'exercices pouvant avoir des répercussions sur la persistance et les résultats axés sur la santé. Tout en contestant la prescription d'exercices communs de stabilisation du tronc, nous présentons un argument en faveur de l'accroissement et l'élaboration intentionnelle des facteurs contextuels suivants : l'alliance thérapeutique, la sensibilisation du patient, les attentes et les attributions du succès ou de l'échec thérapeutique, ainsi que la maîtrise ou le contrôle cognitif d'un*

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<sup>1</sup> Dalhousie University

Corresponding author:  
Peter Stilwell  
Dalhousie University, 5869 University Ave. PO Box 15000 Halifax, NS B3H 4R2  
E-mail: peterstilwell@dal.ca  
Phone: 902-817-2280

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*of therapeutic success or failure, and mastery or cognitive control over a problem. Overall, this commentary argues that to improve exercise adherence and outcomes in the CLBP population, the context in which exercise is delivered and the meaning patients embody need to be considered and shaped by clinicians.*

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### Burden of low back pain

Low back pain (LBP) is the leading cause of disability worldwide.<sup>1</sup> Many individuals with a LBP episode will not be pain-free within a year, despite seeking care from a general practitioner or chiropractor.<sup>2</sup> Although many individuals with acute LBP (pain for less than three weeks) see improvements over time; up to 73% will have a recurrence within 12 months.<sup>3</sup> Individuals with chronic low back pain (CLBP; pain for greater than three months) also have poor outcomes; 60-80% of those seeking help will continue to have LBP after one year.<sup>4</sup> Data shows that disability from back pain has increased since the late 1990's, despite advances in technology, improved imaging techniques, and a plethora of available passive interventions.<sup>5</sup> In light of this high burden, it is worthwhile to examine the effectiveness of CLBP treatments; including frequently prescribed exercise programs.

### Prescribing exercise for CLBP

Exercise is one of the few interventions for CLBP that has consistently been demonstrated to reduce pain and improve function.<sup>6</sup> Exercise alone or in combination with education is also an effective LBP prevention strategy.<sup>7</sup> Although effect sizes for exercise are modest in reducing pain and improving function<sup>8,9</sup>, it is a desirable part of a treatment program because it is a safe self-management technique that can be performed outside of the clinical environment. As a result, it is possibly the most cost-effective and evidence-informed intervention currently available for CLBP. Unfortunately, while exercise can be effective, only a small percentage of patients with CLBP adhere to a prescribed exercise program, and poor adher-

*problème. Dans l'ensemble, cet article soutient qu'afin d'améliorer la persistance à effectuer les exercices et les résultats au sein de la population atteinte de lombalgie chronique, le contexte dans lequel l'exercice est fourni et la signification exprimée par le patient doivent être pris en considération par les cliniciens.*

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**MOTS CLÉS :** chiropratique, lombalgie, chronique, exercice, prescription

ence is associated with poor outcomes.<sup>10,11</sup> In other words, patients have to do the exercise to reap the benefit. While there are many potential barriers to exercise adherence in patients with CLBP, diagnostic uncertainty and fear of pain or harm are among the most commonly cited.<sup>12</sup>

Clinicians often prescribe exercise for CLBP with a focus on biomechanics and the musculoskeletal system. This includes a focus on muscle strength, endurance, timing, or mobility. Although targeting the musculoskeletal system can lead to physical changes, current evidence suggests that these changes do not correlate well with meaningful clinical outcomes<sup>13,14</sup> and these structured impairment-based programs may not facilitate long-term adherence<sup>12</sup>. As outlined in the next sections, a contemporary biopsychosocial approach to exercise prescription with an increased focus on clinician-patient communication and contextual factors surrounding exercise prescription may improve adherence and patient outcomes.

### What type of exercise to prescribe?

Despite years of research, the active agent in therapeutic exercise for CLBP is elusive and we also lack high quality evidence to support the long-term effectiveness of one form of exercise over another for non-specific CLBP.<sup>8,15-25</sup> This includes a comparison of programs focused on: general exercise, low back strengthening, increasing flexibility, improving motor control, Pilates, Yoga, and various forms of aerobic exercise.<sup>8,15-25</sup> To further complicate things, many clinicians, researchers, and patients may be looking in the wrong place for the beneficial effect (i.e., the musculoskeletal system). In a systematic review of exercise therapy for non-specific CLBP, Steiger

and colleagues concluded that the treatment effects are not directly attributable to changes in the musculoskeletal system (e.g., muscle strength, mobility, or muscular endurance).<sup>13</sup> Their findings challenge long-held beliefs that exercise programs specifically targeting core stability/neuromuscular control have a regional structural or biomechanical impact and are key to successful CLBP rehabilitation. Furthermore, a systematic review of studies of transversus abdominis training for LBP patients reported that changes in muscle morphometry or activation were not associated with clinical outcomes.<sup>14</sup> They also found that the relationship between clinical improvements and changes in lumbar multifidus characteristics were unclear.<sup>14</sup> Another study found that even when individuals with LBP were subgrouped and those with motor control impairments were identified, there was no additional benefit to prescribing 'corrective' motor control impairment exercises compared to a general exercise program.<sup>19</sup> This finding is consistent with a recent Cochrane systematic review of studies of motor control exercises for non-specific CLBP which reported that no form of exercise is superior to another.<sup>21</sup>

Rather than only focusing on clinician-identified musculoskeletal impairments that have questionable relevance, we hypothesize that exercises for CLBP may be better selected and taught using a biopsychosocial approach<sup>26</sup>; considering patients' cognitions and self-identified functional goals or meaningful movements that have been avoided due to provoked pain or the expectation of pain. This could be combined with encouraging patients to engage in regular exercise that they expect will help and that they personally enjoy (e.g., walking in nature or yoga with meditation etc.). This is consistent with the World Health Organization (WHO) approach to disability, where a biopsychosocial approach is recommended, without making the mistake of "...reducing the whole, complex notion of disability to one of its aspects".<sup>27 p.9</sup> Unfortunately, many exercise programs used in clinical practice have deep-rooted patho-anatomic underpinnings that may be hard for clinicians to change from. The concern is that outdated or unfounded unidimensional tissue-based approaches that appear ubiquitous, ignore the current biopsychosocial understanding of pain.<sup>28</sup> Using the example of core stability exercises for CLBP that are popular with chiropractors and other clinicians, the next section describes how there may be drawbacks to the way they are

widely explained and prescribed. In turn, the benefits of viewing exercise prescription through a contemporary biopsychosocial lens and harnessing the therapeutic context may be better appreciated.

### Questioning core stability exercise prescription

Popular core stability exercise programs commonly focus on bracing or activating the trunk muscles that are believed to support the spine. This includes exercises such as: crunches, planks, bird-dogs, or those aimed at specifically targeting the transversus abdominis. While it is agreed that core stability/neuromuscular control are needed to perform activities of daily living, only low levels of muscle contraction that occur beyond conscious control are needed to stabilize the spine.<sup>29,30</sup> Meanwhile, current biomechanics literature demonstrates that individuals with LBP already have increased levels of abdominal and lumbar muscle activity<sup>31</sup>, which persist despite symptom improvement<sup>32</sup>. With this increased muscle activity, it is of little surprise that patients with LBP have increased trunk stiffness<sup>33</sup>, which is even higher in patients with kinesiophobia<sup>34,35</sup> and catastrophizing<sup>36</sup>. Although this increased muscle co-contraction and trunk stiffness may provide short-term protection, in the long-term it appears to be maladaptive as it can increase lumbar spine compression and limit movement.<sup>33,37-39</sup> Considering this evidence, we must question the value of core stability exercise programs that promote bracing or excessively increasing trunk muscle activation, especially for CLBP patients that are exhibiting fear and guarding to avoid lumbar spine movement. Alternatively, many CLBP patients may be better instructed to perform trunk muscle relaxation techniques with movement, rather than trunk muscle activation.<sup>40</sup> Indeed, many contemporary approaches to core stability focus on neuromuscular control, where patients are instructed to find a balance between movement and spinal stiffness to optimally perform a task. While this is a positive step away from programs promoting excessive bracing and stiffness; still, the relationships among pain, movement, and injury remain unclear<sup>41</sup> and the theories of dysfunctional neuromuscular control in patients with LBP continue to be challenged<sup>19,42-45</sup>.

Furthermore, the way core stability exercises are prescribed may be problematic, as it may create rather than reduce negative cognitions about the patient's back. A systematic review with meta-analysis of stabilization exer-

cises for LBP by Smith and colleagues found that there is strong evidence that core stability exercises are not more effective than any other form of exercise in the long-term (pain or disability) and that the rationale provided for the need of core stability could increase fear-avoidance as compared to other exercises.<sup>22</sup> In addition, the Military (POLM) cluster randomized trial (n = 4,147) by George *et al.*<sup>46</sup> found, as compared to traditional lumbar exercises, there was no benefit of core stability exercises for preventing the onset of LBP that resulted in healthcare seeking. Instead, a brief psychosocial education program aimed at reducing fear and threat of LBP in combination with either exercise program resulted in lower two-year incidence of healthcare seeking for LBP. These studies suggest that the context of exercise prescription is important. When anatomical explanations or words like spinal ‘weakness’ or ‘instability’ are used to explain why patients get pain or continue to have pain, the meaning patients embody may create and reinforce hyper-vigilance and enduring beliefs that the spine is vulnerable and in need of protection.<sup>47-50</sup> As clinicians focus on structural explanations for persistent pain, this presents a dilemma which is nicely summarized by Moseley (2003): “However, there is a vast body of evidence to the contrary; nociception is neither sufficient nor necessary to evoke pain and psychosocial factors are more important than physical factors in the development of chronic nonspecific pain. The latter finding is reflected in management guidelines for spinal pain throughout the world.”<sup>51</sup> p.184 Furthermore, there is research suggesting that patients are actually quite unfamiliar with words such as ‘instability’ and ‘muscle weakness’, leading to misunderstanding.<sup>52</sup> This includes believing that their problem is permanent, it will progress, and that their spine can ‘go’ at any time – so they must remain on edge, expecting the worst and unable to relax.<sup>52</sup> As highlighted above, these beliefs may unconsciously produce more lumbar spine compression, fear-avoidance, and reduced range of motion. Once again, this demonstrates the importance of exploring the context of exercise prescription and considering the complex interplay between biological, psychological, and social factors.

### Common contextual factors

If there are similar effect sizes and long-term outcomes for a large variety of exercise programs, this leads us to consider the context of exercise prescription. The context

of exercise prescription may produce positive or negative effects, in addition to any specific exercise-derived musculoskeletal effects. A similar inquiry applied to psychotherapy interventions led to what is now understood as common contextual factors that are therapeutically valuable, possibly producing even more potent effects than those derived from specific intended interventions.<sup>53,54</sup> Common contextual factors are clearly not limited to just psychotherapy; they are also present in the clinical encounters that chiropractors<sup>55</sup> and physiotherapists<sup>56</sup> create with their patients – they are just not commonly appreciated or discussed.

### Placebo and nocebo effects

While exercise behavior change is ultimately the responsibility of the patient, clinicians can have a significant impact because “...with every utterance, the practitioner has the power to make things better or worse, and influence the outcome.”<sup>57</sup> p.3 The concept of common contextual factors overlap with placebo and nocebo effects. As clinicians work with patients, the context that is created can have a positive impact beyond the specific efficacy of the treatment intervention or natural fluctuations in pain and function.<sup>58</sup> This is commonly known also as the placebo effect. In contrast, clinicians can also promote a negative context and poor outcomes; the lesser-discussed nocebo effect.<sup>59,60</sup>

Historically, the term placebo has carried negative connotations, viewed as something inert, non-specific, or fake.<sup>58</sup> More recently, placebo is not being viewed just as a sugar pill or an inactive ‘sham’ treatment, instead clinicians are being encouraged to embrace the contextual elements of treatment that can produce positive effects.<sup>54,58,61</sup> Indeed, Miller and Kaptchuck have suggested that the term placebo effect should be abandoned, promoting a non-stigmatized term such as ‘contextual healing’.<sup>58</sup> Häuser and colleagues recently published a concise and all-encompassing description of placebo and nocebo effects, stating that they can be viewed as: “...psychobiological phenomena that arise from the therapeutic context in its entirety (sham treatments, the patients’ treatment expectations and previous experience, verbal and non-verbal communications by the person administering the treatment, and the interaction between that person and the patient).”<sup>62</sup> p.465

While harnessing placebo effects or ‘contextual heal-

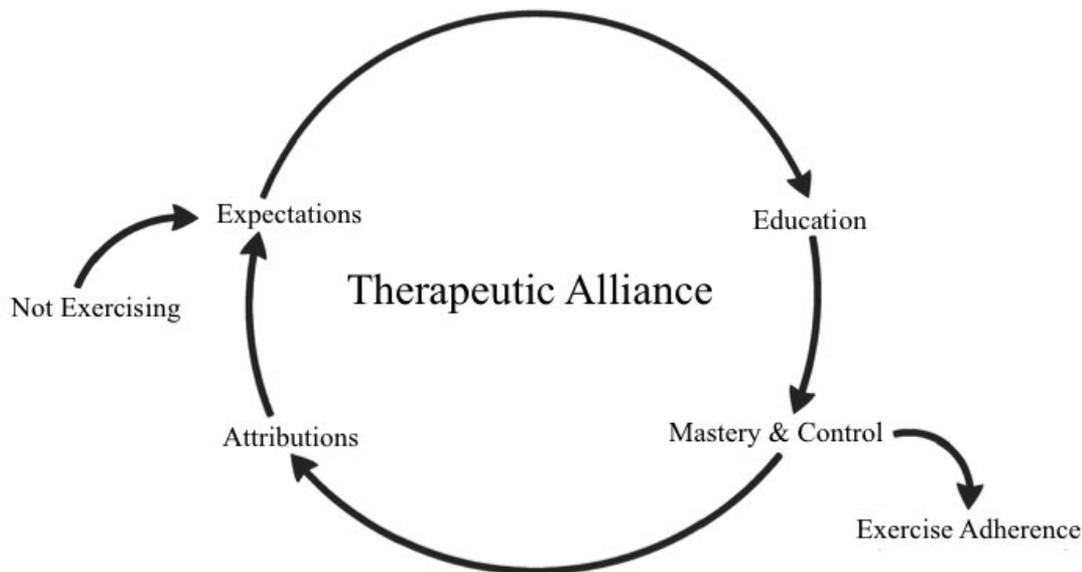


Figure 1.

*Common contextual factor interplay. The Therapeutic Alliance is presented as a key contextual factor, providing the foundation for the others. Each of the five contextual factors presented (1. Therapeutic Alliance. 2. Education. 3. Expectations. 4. Attributions. 5. Mastery & Control) overlap and influence the others, potentially producing positive (placebo) or negative (nocebo) effects. Embedded within each contextual factor is the opportunity to facilitate positive beliefs and behavior change - working towards improved exercise adherence and patient outcomes.*

ing' is a worthy endeavor, avoiding nocebo effects may be just as, or even more important, because the magnitude of nocebo effects in pain can be large.<sup>63</sup> Furthermore, the power of negative communication and nocebo in health care consultations has been suggested to be stronger than positive communication and placebo.<sup>64</sup> Studying placebo and nocebo effects in health care is complex, as there are many contextual factors linked to these effects. Furthermore, some patients and conditions may be more susceptible to placebo and nocebo than others.<sup>60, 65, 66</sup> By exploring common exercise prescription contextual factors and their possible effects, a clinician can see beyond the spine for the positive or negative impacts of their interactions and interventions.

### Exploring common contextual factors

We argue that the following contextual factors can significantly impact prescribed exercise adherence and outcomes: 1. The therapeutic alliance (relationship between

the clinician and the patient), 2. Patient education, 3. Expectations (of therapeutic success or failure), 4. Attributions (of therapeutic success or failure), and 5. Providing an experience of mastery or cognitive control over a problem.<sup>54</sup>

### 1. The therapeutic alliance

The therapeutic alliance has been defined as “a trusting connection and rapport established between therapist and client through collaboration, communication, therapist empathy and mutual understanding and respect”.<sup>67 p.44</sup> Furthermore, the therapeutic alliance is based on: collaborative goal setting, agreeing upon interventions, assigning tasks linked to goals, and bonding as rapport and trust are established.<sup>68</sup> Specific to chiropractic, the therapeutic alliance is known to be forged in an environment of emotional support, which fosters the growth of the belief that the problem (i.e., CLBP) is manageable<sup>69</sup> promoting the placebo effect<sup>55</sup>. As noted in Figure 1, we

are suggesting that the therapeutic alliance provides the central foundation for patients to receive the benefits from other contextual factors and their placebo effects, further improving health-related outcomes and exercise adherence. Research is starting to support this as positive effects on pain and disability have been found when the therapeutic alliance is enhanced during the delivery of LBP interventions.<sup>70-73</sup> In contrast, the therapeutic alliance can be weakened by clinician behaviors such as discrediting and blaming a patient, or being non-supportive.<sup>64</sup> We hypothesize that this may stimulate potent nocebo effects, and have a negative impact on self-efficacy, exercise adherence, and patient outcomes.

## 2. Education

Not all education and exercise prescription are equal, as during their delivery there is potential for both placebo and nocebo effects. The following quotations from a qualitative study by Slade and colleagues<sup>74 p.563</sup> highlight how, in the absence of an easy explanation for CLBP, clinicians may resort to blaming past practitioners and the patient:

*“You’ve got to sell it, show them what they do wrong, and that’s the hardest thing” and “It’s because you’re doing everything wrong, you’ll continue to get your back pain”.*<sup>74 p.563</sup>

Yet, they deliver their own questionable and potentially fear-inducing persistent LBP explanations and exercise advice:

*“I generally talk about instability... you’ve got instability at this level and your movement pattern aggravates and it’s because you’re moving through one area too much” and “We see bad movement patterns... it’s all about correcting movement patterns”.*<sup>74 p.563</sup>

This type of blaming may not only cause patient confusion, the language delivered to certain patients may elicit nocebo effects and reinforce the fear that they are failing to get better because they are incompetent and that they have something seriously wrong with their back. Instead, explaining persistent pain using modern neuroscience approaches may not only open the door to exercise prescription, it may also improve exercise adherence and patient

outcomes.<sup>75</sup> Pain neuroscience education resources such as Explain Pain<sup>76</sup> or Therapeutic Neuroscience Education<sup>77</sup> are becoming popular as they can help demystify and unravel the complex and sometimes unpredictable nature of CLBP. These resources provide illustrations and explanations about the neurophysiology of pain and can be used to help patients change their understanding and beliefs about the pain that they are experiencing.<sup>78</sup> In essence, education and learning about pain can reduce uncertainty and perceived threat, which can reduce pain.<sup>76</sup> We believe that patients with CLBP can then begin to view their backs as sensitized rather than fragile and prone to injury or damage. While research examining pain science education is relatively new, evidence is rapidly building that supports its use with patients experiencing CLBP.<sup>79-84</sup>

## 3. Expectations of therapeutic success or failure

There is a large body of literature that demonstrates the strong positive relationship between beliefs and outcomes [for review see Maddux]<sup>85</sup> – that is, if a patient expects they will have a positive result from a treatment, there is a strong likelihood that they will experience a positive result from that treatment<sup>86-89</sup>. There is also evidence that expectations can be modified to produce better intervention outcomes through placebo effects.<sup>71,90,91</sup> But we must also consider potential nocebo effects on patients. Individuals in stressful positions are vulnerable to nocebo effects<sup>60</sup> and living with CLBP is distressing, accompanied by a sense of loss, lowered self-worth, and fear of the future<sup>92</sup>. Unfortunately, as previously discussed, clinicians may create or facilitate negative expectations through poor communication or inappropriate language, which can then lead to poorer patient outcomes.<sup>59</sup> It is also possible that messages from the media, family, and friends could facilitate negative expectations about the back and exercise, impacting exercise adherence and health-related outcomes. When clinicians explain pain and the purpose of an exercise, “... it may be healthier to err on the side of optimism...”<sup>60 p.610</sup> This is especially true with the non-specific LBP population where there is no significant underlying pathology, yet patient fear-avoidance beliefs can be high – already negatively affecting outcomes.<sup>93</sup> Once again, we argue that evidence-based pain neuroscience education should be used to promote positive expectations while avoiding nocebo effects (e.g., pain does not equal damage, the back is inherently strong, and the spine/nervous system is adaptable).

#### 4. Attributions of therapeutic success or failure

Attributions are an individual's explanation or understanding of why things have occurred the way they did – it is a way of making sense of past experiences.<sup>54</sup> Attributions help us to create a useful understanding of the world, as far as we can predict or control events.<sup>94</sup> When an intervention is judged as a success or failure in the past, it shapes expectations of success/failure for similar interventions in the future.<sup>85</sup> Another important impact of attribution is on the strength or stability of treatment outcomes. If a patient believes that their improvement was due to what a clinician did, then any beneficial effect is significantly shorter than if a patient believes that they improved because of their own actions.<sup>54</sup> Furthermore, people act on their beliefs,<sup>95</sup> if a patient attributes their back pain to the fact that their spine is unstable or weak, and they are educated on how they are failing to do an exercise properly, it should not be a surprise that they would expect to get worse if they engaged in exercise or load their spine. This type of unintended nocebo effect created by clinicians is clearly demonstrated in the following quote from a study by Darlow and colleagues:<sup>47 p.532</sup>

*“Basically all I've kind of been told to do by physios is to work on my core...I've been tested by various different physios, and Pilates, and I'm **apparently ridiculously weak** .... I had an abortion because I didn't think I could have a baby. I didn't think I could handle it...carrying it, and having extra weight on my stomach.”<sup>47 p.532</sup> (**Bolding** added for emphasis).*

This last quote may be an extreme example of how education can shape attributions and expectations, and how these beliefs can shape behaviors. Still, as highlighted above, the increased use of individualized approaches that facilitate positive beliefs about the back and empower patients with CLBP is clearly needed.

#### 5. Mastery or cognitive control over a problem

Mastery is defined as “control over those circumstances that importantly bear on the life of the individual”.<sup>96 p.164</sup> In the context of musculoskeletal rehabilitation, both cognitive and physical control is needed to achieve mastery - which often requires deliberate practice with performance feedback.<sup>97-100</sup> Emerging neuroscience re-

search suggests that positive neuroplastic changes appear to be enhanced by slowly increasing the complexity of motor skill tasks, promoting cognitive effort and learning.<sup>101</sup> This process is thought of as ‘working through’ the new behavior while paying attention to thoughts and responses to the movement.<sup>54</sup> With practice, patients can learn and believe that they are capable of consistently overcoming their challenging movement tasks, which can increase their self-efficacy and result in mastery.<sup>95</sup> These ideas are supported by findings in a recent synthesis of systematic reviews that identified self-efficacy as one of the most consistent predictors of exercise participation.<sup>102</sup> Furthermore, a reciprocal relationship between improved exercise adherence and self-efficacy has been demonstrated. Simply put: participation in exercise tends to increase exercise self-efficacy, which in turn reinforces exercise behavior and continued exercise participation.<sup>103</sup> Positive beliefs are a key feature in self-efficacy and mastery, but they can also modulate the placebo effect.<sup>104</sup> This suggests that if an exercise is expected by a patient to reduce pain and improve function, the patient is not only more likely to do it, they are also more likely to derive benefit from it. In contrast, the potential for nocebo effects through conditioning and expectation should also be considered. If a patient repeatedly fails when attempting their meaningful movement task(s) and the clinician provides poor education and negative comments, such as telling them how they move wrong, their spine is unstable, or how a passive ‘fix’ is the key to success – the end result can be something like learned helplessness.<sup>105</sup> This occurs when a patient feels that they do not have control over their situation and their pain, and that they only make things worse when they try to help themselves, so they give up.

We believe that once the patients' self-identified movement goals are achieved, they should be encouraged to engage in regular exercise that they expect will help and that they personally enjoy. Here, patient preferences should be key considerations when prescribing exercise. When a patient can select the exercise they enjoy and/or expect will help, the beneficial effects of the exercise may not only be potentiated through expectations/placebo effects<sup>104</sup>, but also through improved practice/adherence, leading to improved self-efficacy and mastery<sup>106</sup>. Research supports this idea, as it has been found that incorporating patient preference and tailoring treatment programs to patients

is associated with improved self-management adherence and health-related outcomes.<sup>107,108</sup>

The complex positive feedback loop in Figure 1 can now be better appreciated; a strong therapeutic alliance with effective education can promote placebo effects, while avoiding nocebo effects. We argue that positive changes in attribution and expectations can then result in exercise engagement, which can feed forward into increased exercise self-efficacy and mastery.

### Conclusion

Evidence keeps building about the multi-system benefits of exercise<sup>109</sup>; this includes therapeutic exercise for CLBP. As suggested throughout this commentary, a focus on gross biological changes alone (muscle strength, endurance etc.) has limited value. Instead, more research is needed to examine the interplay between biological, psychological, and social factors - as this may have novel exercise prescription implications for patients with CLBP. This commentary provided an overview of some of the contextual factors that have biopsychosocial implications. It was described how these contextual factors can facilitate placebo or nocebo effects, impacting patients' behaviors and outcomes. The therapeutic alliance was presented as an important foundation, impacting patient education, expectations and attributions of therapeutic success or failure, and the patient's sense of mastery or control. Current evidence suggests that a strong therapeutic alliance, pain neuroscience education, and incorporating the functional needs and preferences of the patient can positively impact patients' beliefs and behaviors. Overall, this commentary suggests that to improve exercise adherence and health-related outcomes in the CLBP population, the context in which exercise is delivered and the meaning patients embody need to be carefully considered and shaped by clinicians. More research is needed to further define and measure the active components within the common contextual factors presented in this commentary, as well as others factors shaping patients' exercise beliefs and behaviors.

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