



Research Article

Defining The Disease of Movement Dysfunction Related Low Back Pain - An Observational Study and Description of The Necessary Paradigm Shift Required to Cure the Root Cause of Globally Prevalent Low Back Pain Symptoms

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Abstract

Study Design: This observational study examined defined movement points of performance of a random sample of twenty-six subjects working in an inner-city tertiary hospital. Based on the observed biomechanical movement points of performance expressed, Movement Dysfunction or Movement Proficiency for a simple bending task was determined. No subjects declined participation in the study.

Background: Movement Dysfunction (MD) is hypothesised to be a significant contributor to the high prevalence of Non-Specific Low Back Pain (NSLBP) in our modern industrialized society. Treatment of low back pain symptoms is conventionally directed towards symptoms. This is clearly apparent by the misguided yet accepted diagnosis and often misused label of “Non-Specific Low Back Pain” which itself is not a diagnosis at all but an admission that the disease causing the symptom remains nebulous. This is unacceptable if progress is to be achieved in controlling the rising prevalence and economic burden of this condition. If the aforementioned hypothesis and authors are correct, in that the disease causing NSLBP symptoms is spino-pelvic Movement Dysfunction, a distinctive management paradigm shift can be implemented with the treatment targets being those of neurologically corrupted motor patterns which manifest as default poor bending technique during activities of daily living, be they trivial or physically demanding. Accelerated musculo-skeletal structural degeneration (degeneritis) and back pain symptoms are secondary sequelae. Tertiary sequelae include multifidus muscle fatty atrophy, micro-instability, symptomatic neural compression, macro-instability and central sensitisation. The progression from episodic back pain to chronic back pain and structural changes that require surgical consideration are all preventable if low back pain is considered to be a primary neurological movement disorder and we shift our focus away from common, expensive, invasive and often poorly efficacious strategies such as interventional nociceptor blocks (interventional pain blocks), strengthening and stretching exercise therapy, manual therapy adjustments and deep tissue release in favour of primarily restoring the primary condition of corrupted central nervous system motor patterns that express movement dysfunction of the lumbo-pelvic spine. This is observable as default poor bending technique for simple

activities of daily living. Accumulatively poor bending drives biomechanical stress that drives biological inflammation, pain, disability and progressive structural break down of the spinal integrity entrenching a feed back loop that is currently recognised as degeneration or spondylosis. This should be more appropriately referred to as accelerated symptomatic degeneration or degeneritis signifying its pathological attributes which are distinct from normal age related and pain free degeneration.

Objectives: Presently the critically important definition of MD in relation to low back pain and therefore its prevalence in the community has not been defined in peer reviewed scientific literature. This article defines and justifies the desired points of performance of healthy movement and highlights the high prevalence of movement dysfunction postulating that this is the root cause disease creating NSLBP symptoms.

Methods: Twenty-six consecutive random and convenient subjects were asked to perform a movement task of placing a cap screw top on a drink bottle positioned at knee height. A kinematic pass or fail mark was assigned by proficiency in what we have termed the “NeuroHAB” screening tool.

Results: Only two subjects (eight percent) out of twenty-six scored a pass whilst performing a simple bending movement task that would be expected to be representative of movement that occurs repetitively throughout ones normal activities of daily living in modern industrialised society.

Conclusions: Utilising the NeuroHAB screening we are able to characterise MD in a work place highly representative of the normal daily physical activity demands of everyday Australians to be at a surprisingly high prevalence consistent with the high and increasing prevalence of low back pain and supportive of the hypothesis that low back pain is primarily a functional movement disorder currently being poorly treated by targeting secondary structural changes and symptoms of MD with strength and conditioning and the ever increasing myriad of pain symptom interventions that have little to no ability to reverse corrupted neurologically derived motor patterns. Simply stated, effective rehabilitation should be focused on reversing the disease of Movement Dysfunction of the lumbo-pelvic spine if we are to make meaningful progress with the treatment of low back pain symptoms [1-13].

Keywords: Movement Dysfunction; NeuroHAB; Low Back Pain; Causation focused treatment; Intersegmental stability; Multifidus muscle

Introduction

Existing research reveals deranged trunk muscle contraction in the presence of low back pain and even after pain has subsided electromyographic abnormalities in trunk control may remain. [14,15] The corollary however has not been well investigated, that primarily corrupted motor patterns and subsequent movement deficiency over time contributes to reduced functional capacity and the development of NSLBP [16]. Mechanisms by which MD may contribute to NSLBP include both mechanical and central processes. The mechanical process involves the transformation of normal non-nociceptive degenerative elements of the lumbar spine into active nociceptors [17]. We have termed this transformation “degeneritis”.

We also postulate a central process that may shed light on chronic disabling NSLBP and other spinal pain in the presence of normal spinal integrity even in the absence of significant degenerative changes. The presence of persisting MD itself may behave as “physiological nociceptor” manifesting with an obligatory cautionary Central Nervous System (CNS) signal of

pain that is consistent with the clinical presentation of central sensitisation with the hallmarks of allodynia and hyperalgesia. Evolutionary wise, pain serves the purpose of cautioning the individual of real or potential threat. It is implicit that moving poorly leads to injury, therefore it is reasonable and logical that persisting movement dysfunction may behave as a nociceptor in the absence of recognizable nociceptive signaling from structural elements such as lumbar discs, facet joints and musculo-ligamentous structures. If this hypothesis is correct, then targeting movement dysfunction effectively and passing the NeuroHAB 5-point movement screening tool, would be a novel and exceptionally effective NSLBP treatment strategy.

Conceptually it is important to account for individuals with obvious MD who do not suffer from NSLBP. This observation was recognized in our study but does not breach the foundation of our original hypothesis on the premise that the development of pain requires the accumulation of micro injury and progression over time in order to become symptomatic. This is analogous to the fact that cigarette smoking does not cause symptomatic emphysema or shortness of breath after one packet. It is also important to recognise that symptoms of back pain can be tempered by lifestyle changes where by the functional demand of activities of daily living are steadily restricted on account of, and to match the ever

decreasing functional capacity of the individual suffering from MD. Analogous to the cigarette smoker progressively restricting physical exertion to avoid the symptoms of shortness of breath as emphysematous lungs evolve. In back pain clinical practice patients report a pseudo improvement in symptoms in association with time off work or task avoidance. This observation, is abundantly clear in worker's compensation back pain claims with return-to-work failure after lengthy but ineffective industry wide rehabilitation that fails to treat MD. This reinforces that the underlying disease process has not been effectively addressed by conventional treatment paradigms but rather a maladaptation by the patient with ongoing and unresolved MD and a declining functional capacity that must remain in equilibrium with physical functional demands if pain and disability is to be avoided. Returning to work creates an unfavorable mismatch between functional capacity and demand resulting in pain and disability and a failure of the return to work plan.

Our observation in current general and specialist clinical practice is that treatment is directed towards "hardware" spinal anatomy elements, such as facet joints, discs, motion segments and the myo-fascia rather than corrupted "software" central nervous system motor pattern driven movement dysfunction [18]. We also recognize that excruciating low back pain can occur whilst performing trivial tasks such as picking up a paper clip [19]. This reality lends further support to the hypothesis that the motor pattern and movement proficiency is the critical factor that determines spinal motion segment stability which remains fundamentally critical to prevent joint injury and pain regardless of physical load. Panjabi described three primary elements of spinal motion segment stability derived from active, passive and neural control of the segment. Clearly a trivial bending task can cause momentary motion segment instability and excruciating back pain and clearly high levels of active and passive core strength are not required for such a low physical demand movement task. It stands to reason and logic that the neurally controlled motor pattern and expression of coordinated bending is the primary critical element driving stability. Active and passive elements of stability play the more critical role in maintaining stability as functional demands increase. This remains as the capacity building phase of rehabilitation. Capacity building after back pain entrenches must occur on the foundation of first resolving MD with specific functional movement therapy. This explains the high failure rate for injured workers and return to work programs that ignore resolution of critically important MD. Functional capacity is discretionary to the individuals desire for domestic or sporting athleticism however movement proficiency or avoidance of MD for bending is mandatory to maintain lumbar motion segments that are healthy and pain free. Despite this, lifting capacity but not lifting kinematics appears to be the focus of return-to-work stipulations and certification desired from injured worker insurers or employers. This is significantly less

relevant than movement proficiency requirements. If movement proficiency requirements are strictly maintained the worst-case scenario for an injured worker trying to lift something heavier than they are capable of is that the object does not get lifted. Conversely if movement proficiency is not maintained injury or re-injury can occur under body weight alone with no external load if the trivial bending task is executed poorly. We accept that greater external loading does increase the susceptibility to expressing MD. It is important to make the point that external loading is association for injury whereas MD is causation.

The justification or explanation for the high prevalence of MD in our society is attributed to modern lifestyle actively suppressing the athletic capabilities of natural human functional movement. Our lifestyles which are plagued with modern conveniences and prolonged inactivity result in a compromise to the three inherent constituents necessary for proficiency of functional movement, well conditioned soft tissues of the musculo-skeletal system, coordination, and adequate strength to meet physical demands. The requirement for proficient movement inherently integrates the principles of Panjabi's spinal stability model. With the decline in these domains, maladaptive movements are employed which further compound deficiencies and functional capacity, pushing one cyclically closer to a mismatch between functional capacity and functional demand, and therefore pain, accounting for the exceedingly high prevalence and suffering from NSLBP in industrialized nations distinctively different to third world countries where the toils of labour, functional movement and lumbar motion segment stability are far more likely to be maintained [20-23].

Assessment of lumbo-pelvic spine movement proficiency in relation to low back pain has not previously been described. Therefore, we developed the Functional Movement Training NeuroHAB Screening Tool which is a 5-point screen that determines a pass/fail in our observation of simple movement patterns to perform tasks requiring forward bending and lowering of the torso. A pass is required in criteria 1,2,3,4 to gain an overall pass. Criterion 5 based on range of motion is not essential to pass because range of motion may be limited in the presence of a proficient motor pattern. Functional capacity will however be limited by poor range of motion and practical tasks are likely to be restricted in the presence of poor range of motion. None the less, the motor pattern initiating movement may still be maintained up to the restricted range. With ongoing expression of proficient movement range of motion improves as musculo-skeletal soft tissues become conditioned and pain subsides.

These criteria for proficient movement were defined because they represent the points of performance of natural spinal health maintaining powerful functional human movement regardless of age, be they a naturally squatting toddler, an

Olympic weightlifting champion or a pain free and independently functioning elder [24,25]. The most important muscle dictating lumbar intersegmental stability of the lumbar motion segment are the multiple small and tightly clustered and deep lumbar multifidus muscles. Multifidus activity and concentric contraction of this muscle serves to hold the lumbar spine segments in neutral extension during forward inclination. The multifidus muscles also play a crucial role in proprioceptive feedback of spinal position by way of the disproportionate high density of muscle spindles giving them a physiologically important sensory role in addition to active intersegmental stabilising role. [26] The stabilising multifidus muscles are involuntarily activated through co-contraction with other larger and more superficial voluntary mobiliser and general stabiliser muscles during movement. [26] By way of the action of the multifidus, their integrity and function is dependent on movement proficiency as defined by NeuroHAB. Because the multifidus are involuntary, we do not have the ability to purposefully maintain their health in the absence of neutral spine inclination (NeuroHAB defined movement proficiency for bending). This is undeniably true for other involuntary muscles in the body such as the oesophageal muscles, the pupillary muscles, the respiratory and cardiac muscles. Their health and integrity is maintained by the normal expression of contraction and movement for the task designated to them. It stands to reason and validated by the high association and odds ratio of significant multifidus muscle fatty atrophy observed in patients with MD and low back pain symptoms. [26] Additional supporting evidence supporting the requirement to maintain multifidus muscle health through movement proficiency comes from robustly favorable outcomes observed in chronic back pain management with specific functional neurostimulation therapy targeting the lumbar multifidus muscle via electrically stimulating the L2 medial branch nerve with the ReActiv8 implantable pulse generator. By three years post functional stimulation of the multifidus muscle, 83% of participants experienced clinically substantial improvements in pain, disability, or both. [43] Functional capacity of course is vastly different for all individuals however motor patterns and virtuosity in executing lumbo-pelvic movement according to these criteria should be identical and be able to be maintained throughout life if low back pain symptoms are to be avoided. Other research has shown that motor control of the spine is corrupted in the presence of chronic low back pain, and we have observed in clinical practice this being manifested by gross deficiencies in the elements of movement criteria selected in our NeuroHAB screening tool [27-29].

Low Back Pain Functional Movement NeuroHAB Screening.

1. Hip centric rotation
2. Neutral spine maintenance
3. Posterior kinetic chain powered movement (weight and

power driven through flat feet {"weight through heels"} and not transitioning onto tip toes which disconnects the posterior chain favouring dysfunctional anterior chain activation and knee loading – see point 4).

4. Unloaded knees (avoid anteriorly directed knee position with deactivation of the posterior chain)
5. Adequate range of motion for required task.

Methods

Overview

The study was an observational study that directly observed healthy hospital staff subjects performing a simple bending movement-based task, one subject at a time. The study was conducted in vacant spaces of several wards, office departments and the operating theatre at a tertiary metropolitan hospital.

Subjects

A random and convenient sample of twenty-six subjects currently working at a tertiary metropolitan hospital were chosen to participate in the study. Subjects included medical and nursing staff, as well as administration and kitchen/utility department employees. Subjects were recruited one at a time via verbal request during the course of their normal duties, with all subjects agreeing to participate in the study. As the study did not intend to draw inferences between the subjects' performance outcome and their demographic variables, information such as age, occupation and race was not recorded, in keeping with the fundamental principle that that motor patterns and movement proficiency should be maintained by everyone regardless of other demographic variables.

Observation Protocol

Subjects were observed performing the given task during the course of their day shift. One of the study team members recorded the subjects' task performance using a handheld video recording device, while the other team member assessed their performance as being either a pass or fail based on the points of performance criteria considered critical for movement proficiency in relation to maintaining a healthy lumbar spine.

NeuroHAB Functional Movement points of performance assessed in performing the bending movement task

1. Hip centric rotation
2. Neutral spine maintenance during inclination
3. Posterior kinetic chain activation (weight through heels)
4. Unloaded knee position
5. Range of motion – adequate to perform the task

A pass or fail rating was applied to each subject upon observing the motor pattern employed by the subject to perform the task. Video replay was also available to the investigators for further close assessment.

Procedure – The simple bending task

The study task comprised replacing a screw cap onto a water bottle placed on top of a plastic box which positioned the top of the bottle at approximately knee height for all study participants. This sequence was verbally explained to the subjects who were then asked to perform the task in their ordinary manner. They were told not to pick the bottle up from the surface of the box, thus the task mandated movement downwards and forwards toward the bottle top at approximately knee height. Verbal clarification was given if required but without demonstration. The subjects were given enough space to carry out the task and no verbal feedback was given during or after the task. The observations were conducted with two observers. One observer recorded the task performance using the handheld device while the other observer assessed the performance as being pass or fail based on the above mentioned 5-point performance criteria.

Results

Only 2 of the 26 subjects, or eight percent of a convenient representative adult population of modern industrialised society in a standard workplace of mixed tasks demands, passed the simple bending functional movement task with proficiency in movement based upon the defined 5-point NeuroHAB functional movement screen. Extrapolation of this finding is that only 2 subjects were able to perform the bending movement task with default movement proficiency by maintaining hip centric rotation, a neutral spine, posterior kinetic chain activation, and adequate range of motion with no loading of the knee joint. All other subjects in some form precipitated mechanical stress on the lumbar spine motion segments and suppressed multifidus muscle activation through expression of intra-lumbar flexion, a vertical stacked lumbar spine, knee joint loading and a disconnected posterior kinetic chain. MD promotes more deconditioning of the posterior kinetic chain and further range of motion restriction and multifidus muscle dysfunction that feeds back cyclically to promote more MD and further maladaptive compensations. This was most frequently observed as a kneel or squat-kneel (squeal). In this position observed in 14 fails, the subject maintains a vertical lumbar spine, balances on their tiptoes, knee loads and has an inactive posterior kinetic chain. In the remaining 10 fails the subject stooped forward with straight or mildly flexed knees and a rounded thoraco-lumbar spine displaying intra-lumbar flexion. The observation reveals significant missed opportunities for conditioning of the crucially important lumbar spine stability system when one recognises that bending tasks of this nature are repeated in the order of thousands

of times per day. And furthermore ninety two percent of subjects are unnecessarily biomechanically stressing (particularly lower) lumbar motion segment integrity by loading the posterior disc annulus and other passive structures under tensile injurious force in the absence of the biomechanical advantage provided by intersegmental stabilisers (multifidus) and mobilisers (iliocostalis and longissimus lumborum) afforded by the neutral inclined bending kinematic [24].

More simply stated, neutral spine, hip centric bending with posterior kinetic chain activation creates a muscular shield around the lumbar motion segments mitigating injurious forces and by definition is ultimately stable. Incidental bending is highly repetitive throughout life and when performed proficiently most of the time affords opportunistic conditioning of the critical active and passive stabilising elements of the lumbar spine, such that when movement is performed occasionally or accidentally poorly stability is still likely to be maintained. This is consistent with the 80/20 rule of Pareto. For some one who is without back pain, moving well 80 percent of the time by default will afford a stable protected lumbar spine on the 20 percent of occasions they move poorly. When movement (therapy) is being utilised to treat back pain and disability associated with MD, movement proficiency should be expressed 100 percent of the time until such time that the patient has “earned” the privilege to apply the 80/20 rule.

Discussion

NeuroHAB is a term used to distinguish it as a central nervous system motor pattern focused screening tool for forward bending movement of the lumbo-pelvic spine and as a rehabilitative therapeutic method specifically addressing this form of MD that causes the majority of low back pain symptoms.

Movement proficiency for lumbopelvic spinal movement has not been clearly defined in published peer-reviewed literature. We utilised fundamental principles gleaned from the goals of spinal surgical stabilisation and elite athletic functional movement which is epitomized in Olympic Weightlifting to define NeuroHAB optimal movement proficiency criteria as:

- **Hip-centric rotation and minimising lumbar centric flexion**

The hip is a ball and socket joint with anatomical form and function optimised for rotation. The intersegmental spinal tripod joint system of the two zygapophyseal joints and the disc-vertebral joint is susceptible to accelerated structural deterioration with repetitive flexion and extension.

- **Neutral spine maintenance during bending tasks**

The multifidus muscle is the most important intersegmental stabiliser of the lumbar spine. Its concentric contraction function

extends the lumbar spine and prevents anterior subluxation. This critical stability-focused muscle group is conditioned predominantly through hip-centric hinging with a neutral lumbar lordotic positioned spine. This is commonly called a hip hinge when a shallow range of motion is the movement task. If a greater range of motion is required, a proficient squat or lunge is performed to maintain this movement's performance points. Conversely, default intra-lumbar flexion diminishes activity of the multifidus muscle favouring inactive "hanging" on passive soft tissues and ultimately leads to neuro-muscular inhibition of the multifidus muscle, and the adverse serious consequences of motion segment micro-instability.

- **Posterior kinetic chain-powered movement**

The lumbar spine is situated behind our centre of gravity, and modern humans have adopted a bipedal upright gait for evolutionary advantages. However, this has increased our susceptibility to movement dysfunction and deconditioning of the posterior kinetic chain in contrast to our quadrupedal ancestors with highly developed posterior musculature, particularly the gluteal and hamstring muscles. The repetitive activity of the muscular-elastic posterior kinetic chain, comprised of critically important intersegmental stabilisers, general stabilisers and extensor mobiliser muscles of the lumbar spine, critically enhances stability and functional capacity.

- **Unloaded knee position**

During bending tasks, a conscious effort to avoid loading the knees through a kneeling kinematic ensures the loading and default conditioning of the posterior kinetic chain. Knee loading during bending, in effect, breaks the tension, potential energy and power of the posterior kinetic chain, leading to accumulative deconditioning and neuro-muscular inhibition.

- **Proficiency limited execution**

If proficiency through movement points of performance 1-4 becomes corrupted due to the demand of the movement task, be it due to range of motion, load, endurance or speed, the task needs to be scaled back or regressed to maintain proficiency. Over time, with consistent default expression of movement proficiency and the resolution of Movement Dysfunction, a steady improvement in the health and condition of the musculoskeletal system is expected. Simultaneously, restrictions on range of motion, load, speed, and duration of movement tasks can be lifted. This equates to a greater functional capacity and quality of life.

In our study, these bending movement characteristics are referred to as the NeuroHAB Movement Points of Performance. These criteria for proficient movement were chosen because they represent the performance points for default biomechanically stable and, therefore, healthy lumbopelvic bending tasks.

Maintaining relatively proficient, powerful, functional human movement regardless of age, whether a naturally squatting toddler, an Olympic Weightlifting Champion or a pain-free and independently functioning elder, is considered virtuous for lifelong musculoskeletal health. Functional capacity, of course, is vastly different for all individuals; however, motor patterns and virtuosity in executing proficient spinopelvic movement according to these criteria can reasonably be preserved and maintained throughout life. Movement Dysfunction, by inference, is a failure to express these movement standards as default when performing simple bending tasks, be they trivial or physically demanding.

Low back pain is a global leading cause of disability with an associated mounting economic burden, particularly in industrialized nations and this is despite increasing technology and research dedicated to arresting the prevalence of this chronic disease [1,21-23,30]. The increasing prevalence strongly points to a lack of efficacious treatment and/or a dramatically increasing incidence or more than likely both processes occurring simultaneously leading to the observation of progression from episodic acute relapsing and remitting low back pain to persistence and chronicity in our society [1]. This study and few before it suggests that the root cause of low back pain is movement dysfunction and not failings of spinal core stability or flexibility which is all too often the conventional target of physical therapy and strengthening and stretching rehabilitation. [16,28,30]. The back pain therapeutic industry is clearly failing to deliver specific and distinctive movement therapy. This is a necessary paradigm shift in management and primary care back pain management guidelines must be amended to reflect this. The education of medical health care providers and allied health physical therapists from all disciplines need to adopt defined movement therapy to reverse the MD causation as their primary pursuit. The multiple symptom-based interventions unique to the myriad of sub-disciplines within the back pain therapeutic industry are purely ancillary and should be applied according to patient preference and individual structural pain generator differences and serve only to enable the development of critically important and mandatory movement proficiency.

Intuitively movement dysfunction doesn't immediately cause pain but does contribute to lowering functional capacity and increasing the substrate level of degeneration, which in its own right may be pain free. It is often referred to as "normal degeneration" when in fact its accelerated development is pathological. Extensive wrinkles on the face of a teenager is acceptably pathological but the same wrinkles on an 80 year old is reasonably normal. The same fundamental principles must be adhered to in relation to musculoskeletal conditions and pathomechanisms must be effectively addressed. Accelerated degenerative changes are the result of MD and can be addressed with functional movement therapy.

For many, restricting lifestyle and functional demands to match decreasing functional capacity is not an option if one needs to be working and raising a family household. The current observation is that patients with back pain lean further on symptom-based strategies. This accounts for the concerning opioid crisis. The crisis in fact is not opioids but an industry wide failure to be accountable for poor rehabilitation outcomes through the failure to address the root cause of musculoskeletal pain, in particular low back pain with valid, specific and defined movement proficiency focused rehabilitation.

Research indicates that for every episode of acute low back pain 90% recover within 3 months, however 10% transition to chronicity and 75% of individuals have a recurrent episode within one year [31]. Further more chronicity also increases the secondary development of central sensitisation with an amplification of pain in the absence of an increase in structural injury or compromise as evidenced by radiological imaging reporting normal lumbar (albeit accelerated) degeneration in a high proportion of patients with chronic debilitating low back pain and disability [31,32]. This undeniably exposes what we refer to as failed rehabilitation syndrome and a conventional treatment paradigm that ignores causation for the world's most ubiquitous disease. A ubiquitous and highly prevalent condition must, by definition have a common ubiquitous cause. The common cause is MD. We have demonstrated this in our observational study and explained it biomechanically. MD related low back pain should replace the term NSLBP which is unhelpful, indirectly harmful and, for these reasons should be abandoned.

Restoration of motor patterns which represents a CNS "software" remedy as opposed to a more conventional musculoskeletal "hardware" remedy is given little to no priority due to a distinct lack of specific quality and efficacious movement training programs. [33] We use the coined term NeuroHAB as it emphasizes rehabilitation of the neurologically derived motor patterns controlling movement and removes the focus away from exercise, fitness, and strength. These remain quantitative metrics rather than more valuable qualitative skill metrics. Patients suffering from low back pain need to become more skillful and coordinated with their muscle contractions not more powerful. We would rather our patients be weaker and moving proficiently than stronger and moving dysfunctionally. A weak person moving well will recover from their low back pain symptoms and steadily be able to develop strength on the foundation of movement proficiency. In contrast a strong person moving poorly will have low back pain or will acquire it in future and subsequently lose their strength over time.

Few studies have focused on optimizing the specific kinematics of movement primarily as a prevention target and secondarily as a treatment target for low back pain. We recognize

workplace health and safety lifting guidelines to be commonplace but there is little literature to support the movement pattern that is commonly advocated [34]. We were unable to identify any literature that offers practical guidelines that are reproducible and applicable to reverse movement dysfunction other than our own work and past publications. One may look to commonly performed Motor Control Exercise (MCE) therapy, posture and Pilates exercise for guidance in this field however all these movement and stability-based approaches have been disappointing in the management of non-specific chronic low back pain [12,13,29]. We postulate that this may be a factor that has resulted in a lull of research focusing on movement proficiency as a therapeutic target and why the term NSLBP was popularised. We believe that the majority of prior MCE research should not be specifically regarded as meeting the requirement or criteria of effective central nervous system motor pattern rehabilitation or distinctive functional movement therapy. Conventional MCE is overtly non-functional in its implementation and consequently inherently lacking in relative intensity, practical application and fails to translate to real world functional movement tasks or the ability to move relatively large loads, large distances, repetitively and quickly, equating to possession of a high functional capacity. Currently employed and poorly effective motor control training approaches can be likened to teaching someone to play golf with substitute surrogate exercises for the golf swing but never allowing them to hold a golf club and swing at a golf ball under repeat instruction and correction. These factors all play an important role in contributing to stimulation of neuro-endocrine favourable physiological, structural and biomechanical adaptations that promote "healing" and a cure of the disease of MD related low back pain. The maladaptive patho-neurophysiological state of central sensitisation is also likely to be favourably influenced through the effects of adaptive relative intensity potentiated neuro-homonal stimulation. The central nervous system's hijacked and amplified requirement to signal caution subsides as the threat from MD subsides [35-38].

This paradigm shift, cause focused, fundamentally logical approach has profound favorable economic consequences for insurers, employers and the nation's health department, hospital resources and the community directly.

Conclusion

The term non-specific low back pain that is assigned to the vast majority of chronic low back pain diagnoses implies a nebulous and unexplained causation [39]. We demonstrated in our study that ninety-two percent of working individuals fail a simple movement screen based on healthy natural and mandatory kinematic movement criteria. Repetition of this poor proficiency movement throughout all activities of daily living intuitively reduces functional capacity. Future studies are required to reverse this defeated attitude implied in the label of "Non-Specific" and a

cure for low back pain is desperately needed by invigorating the concept that non-specific low back pain is not nebulous, but in fact “specific low back pain secondary to movement dysfunction”. Movement dysfunction is primarily linked to the development, persistence and recurrence of low back pain, effective functional movement-based training therapies can be developed and replicated globally. Our study highlights the prevalence of poor movement proficiency in the community and sets the benchmark for movement points of performance research utilising the NeuroHAB Screen that should be specifically targeted with effective functional movement therapy that is inherently and relatively intense, promoting physiological adaptation and arresting the suffering from low back pain. Our group’s additional research has also shown strong correlations between restoring movement proficiency based on the NeuroHAB screen and improvement in pain and disability in patients with chronic low back pain [24,33,40-42].

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