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Review article

Fear avoidance model of kinesiophobia and rehabilitation

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ABSTRACT

Kinesiophobia is defined as "an irrational, and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or re-injury" by those who coined the term. Pain catastrophizing and kinesiophobia (fear of movement and re-injury) magnify somatosensory perceptions, overstating this perception in terms of a pain-related exaggeration of fearful anticipation of the pain getting worse and worse. Fear of pain has a high prognostic value when it comes to the development of chronic musculoskeletal pain and impairment. Kinesiophobia is most closely linked to higher order brain mechanisms linked to anxiety. The Fear-Avoidance Model of Exaggerated Pain Perception, suggested by Lethem et al, represented the impact of fear on outcomes. They proposed that the sensory and emotional aspects of pain can contribute to the development of chronic musculoskeletal pain syndromes by inducing a fear of pain. The Tampa Scale is used to assess kinesiophobia, and patients with scores higher than 40 are considered to have a high degree of kinesiophobia "Psychological therapy" was the therapy include (1) psychological education; (2) cognition-behavior therapy; (3) perceptive stimulation in non-injured body areas such as virtual reality equipment, laser, and relaxation; (4) therapeutic milieu involves interpersonal communication such as group session and feedback session. One of the main reason of kinesiophobia is fear avoidance, sensory and emotional both factors are responsible. Depending on the cause of kinesiophobia the treatment will differ and different approaches should be considered.

Keywords: Kinesiophobia, Rehabilitation, Fear-Avoidance Model, Tampa Scale.

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INTRODUCTION

Musculoskeletal disorders and the following pain is very common in maximum people's life and the pain caused by musculoskeletal disorders is the second most known cause of disability. Physical, biological, cognitive, behavioral, social, and occupation, were correlated with the pain following musculoskeletal disorders. Kinesiophobia is an irrational, and debilitating fear of physical activity and movement resulting to painful injury or re-injury" by those who coined the term [1]. It has been attributed to lack of physical exercise [2]. Patients may experience kinesiophobia as a result of an excessive fear of injury during physical exercise after getting a diagnosis without appropriate education about the condition [2] People with chronic musculoskeletal pain are prone to catastrophizing and kinesiophobia [3]. Kinesiophobia is a psycho-cognitive element that makes it difficult to heal from a trauma [4]. This can lead to a decrease in physical exercise, which has a negative impact on the patient's

postoperative therapy and rehabilitation [5]. Avoidance action is a behavior pattern in which an individual avoids everyday activities such as exercising, socializing, and working, which exacerbates the pain experience [1]. Kinesiophobia (fear of re-injury and management) magnify somatosensory perceptions, overstating the perception of a pain-related exaggeration of anticipation of the pain in fear gets worse [6]. Furthermore, the anxiety avoidance hypothesis considers psychosomatic and psychological symptoms, such as depression or panic disorder, to be conditions that enhance pain sensations [6]. Kinesiophobia's treatment for modifying mobility gains after injury can be an innovative clinical option for enhancing long-term performance, since existing recovery techniques do not treat psychological impairments [7].

Kinesiophobia and Pain

Fear of pain has a high prognostic value as of the development of chronic musculoskeletal pain and impairment. Various

questionnaires focused on different objectives like the fear of injury and kinesiophobia, fear avoidance attitudes, or pain aversion exist for the evaluation of Pain Related Fear. About scores show on the fear-anxiety spectrum, there is a huge argument. Fear is a response to an impending danger, and it prepares the person for "fight-flight-freeze," while fear is more diffuse. Brain science shows a functional distinction between fear and anxiety. The fear circuit regulates both emotions. However, subcortical regions seem to be more active in rapid and defensive fear responses (short defensive distance to threat), while cortical regions appear to be more interested in complex anxiety cognitions. As a result of developments in neuroimaging, it is now possible to investigate the subcortical/cortical contributions to Pain Related Fear models by analyzing the interrelationships between self-reported emotional states and brain reaction patterns. For a long time, the amygdala was thought to be a "fear center." However, as patients with amygdala lesions have shown, a heterogeneous structure made up of many nuclei is not needed for the experience of fear. The amygdala has been found to have a greater function in physiological and physiologic reactions to threats (i.e., protective processes); however, its position in complex cognitions such as fear and anxiety is still discussed. Fear circuit because of subcortical activity located around the amygdala does not trigger subjective symptoms of fear and anxiety. As a result, amygdala activation and mediated physiologic fear and anxiety reactions can only be a predictor to subjective feelings of fear and anxiety at best. Kinesiophobia is most closely linked to higher-order brain mechanisms linked to anxiety [8].

Fear-Avoidance Model

The Fear-Avoidance Model of Exaggerated Pain Perception, suggested by Lethem et al, represented the impact of fear on outcomes. They proposed that the sensory and emotional aspects of pain can contribute to the development of chronic musculoskeletal pain syndromes by inducing a fear of pain. The dynamic combination of physiologic (pain perception) and psychologic (pain emotional reaction) factors can result in a maladaptive response in which pain perception is exaggerated. Patients that have a desynchronized relationship between the physiologic and psychologic components can try and alleviate pain symptoms through reducing physical activity, which may contribute to chronic impairment over time. Pain-related fear has been linked to injury in many cross-sectional trials, and further evidence has shown that pain-related fear can contribute to poor health outcomes [9]. Different electrocortical and neurophysiological arousal, as well as anxiety impressions, is induced by different emotional triggers (neutral, fearful, and injury-related pictures). Negative psychological perceptions (fearful) have influenced joint stiffness. Neurocognitive perception appeared altered as a result of negative emotional sensory feedback. Negative emotional stimuli, in addition to a sudden occurrence (i.e. auditory startle), interfered with goal-directed

cognitive motor-planning techniques. This type of disrupted neurocognitive functioning can be inadequate to plan for and respond to unexpected, high-velocity movement tasks. Fear's negative effects on neuromuscular control may suggest that psychological treatments be integrated into neuromuscular-control exercise programs [10]. Greater kinesiophobia is linked with worse post-injury outcomes. Interventions aimed at improving everyday life skills may be suitable for less active patients, while those aimed at improving hop success and sport practices may be best fit for more active patients [11].

The Tampa Scale

For over a decade, the Tampa Scale of Kinesiophobia (TSK) has been used to study pain-related fear. However, there are discrepancies about which factor model to use [12]. The Tampa Scale is used to assess kinesiophobia, and patients with scores higher than 40 are considered to have a high degree of kinesiophobia [13]. Tampa scale originally had 17 items. Later, it was discovered that a 13-item version had stronger psychometric properties. TSK-13 severity levels were found to be closely linked to objective lifting success variables and psychosocial interventions, indicating that these severity levels can be used as a guideline for healthcare professionals and researchers when interpreting TSK-13 results [14]. For chronic pain patients, the TSK-11 is a simple, accurate, and reliable measure of fear of movement/(re)injury [15]. Higher TSK was related to worse physical functioning, and the full TSK explained more variations in physical function than the short form (TSK-4). The short form of the Tampa Scale for Kinesiophobia can be used as a simple screening method in patient care and study to assess if kinesiophobia has a specific impact on lower extremity limitations.

Condition related to Kinesiophobia

In the event of an anterior cruciate ligament injury, an anterior cruciate ligament repair (ACLR) is performed to maintain functional knee stabilization [16]. Increased pain and the sequelae of physical impairments that occur following ACL injury and ACLR may contribute to fear-based avoidance of certain movements in order to reduce the loading applied to the ACLR limb. Individuals with ACLR who have high levels of kinesiophobia are more likely to change the intensity and frequency of their physical exercise in order to avoid loading on their ACLR limb [7]. Reduced hamstring strength, hop performance, and patient-reported function were all correlated with higher kinesiophobia. Greater hamstring fatigue accounted for increased kinesiophobia in patients who reported Low physical activity. Greater kinesiophobia was explained by lower triple hop symmetry, crossover hop distance, and IKDC in patients who reported HIGH physical activity [11]. Patients with higher self-reported fear were less active, had lower single-leg hop output and isometric quadriceps power, and had a higher chance of re-injuring their ACL in the 24 months following return to sports [17]. Many patients had a poor rate of

recovery, with the most important cause being fear of reinjury. The IKDC and TSK-11 scores of a participant, on the other hand, were related factors for return to sports, so maximizing those factors after surgery is critical. Multiple causes, including avoidance of injury, influence return to sport after ACLR [18]. The activities that provoke fear in patients differ, but fear of cutting is general. After advanced group training, the severity of typical fears decreased after ACLR, and significant impact sizes were observed for almost all of the fears studied [19]. The TSK-J is a reliable tool for evaluating patients with ACL injuries. However, because of its poor validity and responsiveness, it is not the safest patient-reported success test for psychological causes in ACL injury patients [20]. Total hip replacement has a high rate of success, with complete reconstruction of joint function and absence of painful symptoms almost always expected. Preoperative functional capacity is compromised in people with elevated levels of kinesiophobia [13]. Kinesiophobia has also been found to have a detrimental impact on the outcome of TKA and spinal surgery for degenerative disorders of the cervical and lumbar spine. Kinesiophobia and pain catastrophizing in patients increase significantly one year following hip arthroscopy [5]. The most frequent cause of pain under the heel is plantar heel pain (also known as plantar fasciitis). People with chronic musculoskeletal discomfort are prone to catastrophizing and kinesiophobia. People with foot and ankle pain have been shown to have higher levels of kinesiophobia. In this group, doctors should consider the role of pain catastrophizing and kinesiophobia [3]. Hallux valgus (HV) has already been linked to psychological disorders. HV can reduce quality of life in terms of foot health, increase depression, and change muscle or connective tissue morphology in the plantar area, which appears to be relevant to the degree of deformity. Greater kinesiophobia symptoms and levels, as well as pain, were linked to higher HV deformity degrees, especially extreme and/or moderate HV versus no and/or mild HV. Greater HV deformity degree and age expected kinesiophobia and pain severity [21]. Osteoporosis is a chronic skeletal condition that induces bone weakening, increasing the likelihood of fractures. Hip fractures, in particular, impose a significant physical, psychological, social, and economic strain on both patients and their families. When compared to age and gender-matched stable participants, subjects with osteoporosis have higher levels of kinesiophobia. Kinesiophobia can have an effect on the quality of life of people who have osteoporosis [2].

Treatment methods

The emotional coaching model involves quantitative and qualitative components to demonstrate certain assumptions applicable to modern physical therapy recovery approaches that take into account emotional, cognitive, and behavioral factors of people, whether or not they are athletes [22]. A 21-week multimodal recovery program resulted in clinically significant changes in pain, kinesiophobia, and

function. Pain education, self-management techniques, and gradual loading of the involved tissues through a phased regimen of exercises and running retraining were all part of the treatment plan [23]. Greater results were seen in the PNE of knee joint mobilization patients with psychosocial factors such as pain catastrophizing and kinesiophobia [24]. Total knee arthroplasty (TKA) is a standard and reliable treatment option for chronic degenerative knee joint disorders. The patient's consciousness during TKA procedures is a significant factor that interferes with the progress of postoperative kinesiophobia, which can play a crucial role in influencing early mobility and outcome measures. To summarize, anesthesia approaches used during TKA procedures are significant factors influencing post-operative kinesiophobia [25].

Early combined eccentric-concentric recovery after TKA tends to be correlated with better results in terms of both physical function and quality of life as compared to classic concentric rehabilitation protocols. The assessment and treatment of kinesiophobia should be incorporated into therapeutic procedure guidelines [26]. During postoperative therapy, the incidence of kinesiophobia reduces, but high kinesiophobia remains in a significant percentage of patients following ACLR. 3 months after ACLR, the timing of regeneration seems to be the most important indicator of high kinesiophobia [16]. Prophylactic knee brace and kinesiio-taping applications could be a good way to help with ACLR. Both knee brace and kinesiio-taping have beneficial implications in people who have had an ACLR, which can help them reduce kinesiophobia as they return to their pre-injury activity levels, with knee brace likely to provide improved knee function than kinesiio-taping. After ACLR, treating psychological risk factors with a cognitive-behavioral-based physical therapy (CBPT-ACLR) program is viable and rational [27]. From the baseline evaluation to six weeks after the lower limb exercise program, kinesiophobia decreased. Cycling, treadmill walking, cross training, step machines, wall squats with a swiss ball, mini-squats with an elastic band, trampette, step-ups, heel raises, hip extension over a plinth, crab walking with an elastic band, monster walking with an elastic band, standing on a tilt table, and single leg stands were among the exercises performed [28]. WeChat can be used to teach patients about the disease and can be delivered in a variety of formats, including audio, text, and even video, which is well suited for recovery advice during neocoronary pneumonia. After unilateral complete knee arthroplasty, Individuals should be advised and counselled about osteoporosis and the value of physical exercise to combat kinesiophobia, since physical activity is important for bone and general wellbeing [2]. WeChat micro-video may alleviate the fear of movement score and pain score in patients with kinesiophobia, shorten the first time out of bed, and increase joint function and everyday living ability [29].

Psychological therapy and Kinesiophobia

“Psychological therapy” was the therapy include (1) psychological education; (2) cognition-behavior therapy; (3) perceptive stimulation in non-injured body areas such as virtual reality equipment, laser, and relaxation; (4) therapeutic milieu involves interpersonal communication such as group session and feedback session. It should be emphasized that if the doctor-patient communication in the intervention involved only an explanation of the treatment or only guidance of exercise or only supervision in training, the intervention wouldn't be regarded as psychological therapy. People with kinesiophobia would change their movements to avoid pain and adjust their motor behaviors. Therefore, a greater degree of kinesiophobia predicted greater levels of fear of pain and a great inclination to avoid physical movements. In rehabilitation program kinesiophobia plays a major role while dealing with patients with kinesiophobia psychological aspect should be considered. Rehabilitation while paying attention to psychological aspect should be done. Multimodal therapy including physical therapy and psychological therapy should be given. Psychological therapies had an advantage over therapies from a physical perspective, no matter the physical therapy was passive or active. Psychophysiological aspect are important in treating kinesiophobia as well as in physical rehabilitation of patients with kinesiophobia.

CONCLUSION

By the points discussed above strategies and approaches to manage kinesiophobia differ depending on the cause of kinesiophobia but the approach must be multidirectional. One of the main reason of kinesiophobia is fear avoidance, sensory and emotional both factors are responsible. Kinesiophobia depends on the frequency and intensity of the movement. Psychological and physical therapy should be given to manage kinesiophobia.

Competing interests

The authors declare that they have no conflict of interest.

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Authors' contributions

PP suggested the study. PP and PG led to creation of the study. PG searched for literature and wrote a basic outline of the article. VW added to the manuscript and divided the data under all the headings. NC and SPA contributed in writing and polishing the manuscript. All authors read and approved the final manuscript for publication.

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List of Abbreviation

1. TSK - Tampa Scale of Kinesiophobia
2. ACLR- Anterior cruciate ligament repair
3. ACL- Anterior Cruciate Ligament

4. IKDC- International Knee Documentation Committee
5. HV- Hallux Valgus
6. TKA- Total Knee Arthroplasty
7. CBPT- Cognitive-Behavioral-Based Physical therapy

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