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Article

Assessment of Affective Temperament in Patients Undergoing Cyriax Method Therapy

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Abstract

The aim of the article is to assess the affective temperament in patients undergoing Cyriax method therapy. The article was inspired by a study conducted to assess the relationship between affective temperament and the effectiveness of Cyriax method therapy in patients with overload lumbar pain syndrome. The Cyriax method is a commonly used manual therapy technique that aims to improve spinal function and reduce pain. Affective temperament, defined as a stable set of emotional and motivational traits, may influence individual patient reactions to pain and their involvement in the rehabilitation process. The study used the TEMPS-A questionnaire to identify five dimensions of temperament: depressive, cyclothymic, hyperthymic, irritable, and anxious. The result analysis demonstrates potential links between specific temperamental traits and the effectiveness of manual therapy, which emphasizes the importance of considering psychological factors in planning and conducting rehabilitation of patients with spinal pain. The obtained results may constitute the basis for a more personalised therapeutic approach, increasing the effectiveness of treatment and improving the patients' quality of life.

Keywords: affective temperament; TEMPS-A; lumbar spine pain; overload pain syndrome; manual therapy; Cyriax method; rehabilitation; psychological factors; treatment effectiveness

1. Introduction

When attempting at assessing the affective temperament of patients undergoing Cyriax method therapy, the first step is to discuss three main facets stemming from the very structure of the topic at hand. The first facet involves overload lumbar pain syndrome, the second – Cyriax method, and the third – affective temperament.

Overload lumbar pain syndrome is one of the most common musculoskeletal conditions which carries both clinical and social significance. Lumbar pain limits patients' functional capabilities to a high degree, leading to reduced quality of life and – frequently – to long-term unfitness for work. The incidence of lumbar spinal pain reaches even 60–80% in the adult population, and its overload aspect is a significant etiopathogenetic factor of it. [3] Lumbar pain may result from excessive overloading of the spinal anatomy, including muscles, ligaments, facet joints, and intervertebral discs. Repetitive overloading leads to microdamage, inflammation, and degeneration, which present as chronic pain and limited range of motion. [4]

Effective rehabilitation is the foundation of treatment of overload lumbar pain syndrome. The therapy should involve both physiotherapeutic techniques, such as strengthening and stretching exercises for back and abdominal muscles, manual techniques, and patient education around ergonomics and lifestyle modification. [5] Appropriately selected rehabilitation methods lead to reduce pain, improve motor function, and prevent recurrence: this bears significance both for patients' health and for reduced social cost of sickness absence.

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The Cyriax method, also known as trigger point therapy or soft tissue techniques, is one of the manual therapy techniques commonly used to treat overload lumbar pain syndrome. Its prerequisite is precise clinical diagnosis allowing to identify pain source and assess the range of motion of spinal segments and soft tissues. [7] Cyriax techniques themselves focus on mobilising soft tissue, releasing trigger points, and improving musculofascial function. The therapist's manual manoeuvres aim to reduce muscle tone, improve tissue blood supply and tissue elasticity, and improve the range of motion within the lumbar spine. [8] The therapy involves both assessment by palpation and application of the appropriate therapeutic movements, which lead to improvement in spinal biomechanics.

When reviewing the literature, it must be stressed that clinical studies have shown that the Cyriax method may be effective in reducing pain and improving motor function in patients with overload lumbar pain syndrome. [9,10] Randomised clinical studies comparing the Cyriax method with other rehabilitation methods have demonstrated significant benefits in pain reduction and improvement in patients' quality of life. [11] However, it must be emphasised that there is a limited number of studies taking into account the individual differences between patients, such as age, stage of degeneration, or secondary diagnoses, which may affect therapy effectiveness. [12] Therefore, there is a need for further well-designed clinical studies to help adjust the Cyriax techniques to patients' individual needs and define the optimal therapeutic protocols in the context of overload lumbar pain syndrome. [13] Nevertheless, the method at hand remains a valuable puzzle piece of comprehensive care, combining diagnosis and manual therapy, which fosters improvements in musculoskeletal function.

As regards the third facet, or the affective temperament: it is defined as a relatively stable set of emotional traits, motivational features, and behavioural reactions determining an individual's way of responding to environmental stimuli, including how they experience the disease and the therapeutic process. [14] In the context of rehabilitation, temperament plays a significant role in the patient's adaptation to chronic pain and in their commitment to therapy, which may bear on effectiveness of therapy. The Affective Temperament Questionnaire (TEMPS-A) is a tool to specify five basic temperament dimensions: depressive, cyclothymic, hyperthymic, irritable, and anxious. [15] Each dimension is characterised by specific emotional and behavioural traits, which may differentiate the patients' way of experiencing and dealing with pain.

Psychological and clinical studies show that different temperament types carry the potential to modulate the subjective experience of pain and motivation to participate in rehabilitation. For instance, the anxious and depressive temperaments are frequently associated with intensified experience of pain and reduced participation in the therapeutic process, whereas the hyperthymic temperament may facilitate better adaptation and higher motivation to cooperate with the therapist. [16,17] In consequence, individual temperamental differences may affect therapy outcomes, which emphasises the need to consider these factors when planning the rehabilitation.

Due to a relatively limited number of studies into direct links between the affective temperament and the effectiveness of manual therapy, including the Cyriax method, there is a justified need to conduct studies exploring this relationship in patients with overload lumbar pain syndrome. Better grasp of the effects of temperamental traits on rehabilitation outcomes may contribute to the personalisation of therapy and improvement in its effectiveness. [18]

Overload lumbar pain syndrome is a significant clinical problem because of its high incidence, considerable functional limitation of patients, and a negative impact on their quality of life and fitness for work. Management of the condition is increasingly relying on manual therapy methods, such as the Cyriax method, which prove effective in reducing pain and improving spinal range of motion. [7] However, manual therapy frequently varies in its effectiveness, which depends not only on physical factors, but also on the individual traits of the patient, including their affective temperament. The temperament affects the way they experience pain, how much they are motivated to cooperate with the therapist, and to what extent they are able to adapt to their chronic condition. [7] Overlooking these factors may lead to limited effectiveness of treatment and suboptimal rehabilitation outcomes.

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Studying the relationship between the affective temperament types and Cyriax method effectiveness will cast better light on the psychological determinants of treatment response and allow personalisation of the therapeutic approach. Such personalisation may contribute to higher levels of rehabilitation effectiveness, reduced treatment times, and lower risk of chronic pain and long-term unfitness for work. Moreover, the results of such a study may expand the interdisciplinary approach to rehabilitation by integrating psychological aspects with physiotherapeutic treatment methods, which is in line with the contemporary trends in patient-oriented healthcare. [20]

2. Materials and Methods

With the above in mind, the author conducted this study, which aims to explore the link between Cyriax method effectiveness and the affective temperament types in patients with overload lumbar pain syndrome. The study involves an analysis of potential dependences between the patients' affective temperament traits and Cyriax method therapy effectiveness. There is a need to establish whether the individual temperamental dimensions, such as its depressive, cyclothymic, hyperthymic, irritable, and anxious types, may affect therapy outcomes, particularly improved lumbar spinal range of motion.

This study involved formulation of a hypothesis and a set of research questions.

The hypothesis assumed that the affective temperament types, such as the depressive, cyclothymic, hyperthymic, irritable, and anxious temperaments, exert a significant impact on Cyriax method effectiveness in terms of improved lumbar spinal range of motion.

The research questions were as follows:

1. Is there a connection between the depressive temperament and Cyriax method effectiveness in terms of extension, flexion, left lateral rotation, right lateral rotation, left lateral flexion, and right lateral flexion of the lumbar spine?

2. Is there a connection between the depressive temperament and Cyriax method effectiveness in terms of extension, flexion, left lateral rotation, right lateral rotation, left lateral flexion, and right lateral flexion of the lumbar spine?

3. Is there a connection between the hyperthymic temperament and Cyriax method effectiveness in terms of extension, flexion, left lateral rotation, right lateral rotation, left lateral flexion, and right lateral flexion of the lumbar spine?

4. Is there a connection between the irritable temperament and Cyriax method effectiveness in terms of extension, flexion, left lateral rotation, right lateral rotation, left lateral flexion, and right lateral flexion of the lumbar spine?

5. Is there a connection between the anxious temperament and Cyriax method effectiveness in terms of extension, flexion, left lateral rotation, right lateral rotation, left lateral flexion, and right lateral flexion of the lumbar spine?

The study was conducted from 24 May 2016 to 31 December 2018 among patients from the Rehabilitation Clinic at Dr Jurasz's University Hospital no. 1. It was approved by the Bioethics Committee at the Collegium Medicum in Bydgoszcz of the Nicolaus Copernicus University in Toruń (decision no. KB379/2016).

The study enrolled patients above the age of 18 diagnosed with overload lumbar pain syndrome who gave their consent to participate in the study. Eligibility of patients was conducted by a neurologist, neurosurgeon, or medical rehabilitation practitioner as per the ICD-10 classification. The exclusion criteria included pregnant women, soldiers of mandatory military service, and individuals remaining in a professional relationship with the author. Significantly, the affective temperament was assessed with the TEMPS-A questionnaire (Temperament Evaluation of Memphis, Pisa, Paris and San Diego) [21,22] in its Polish adaptation as developed by the Department of Clinical Neuropsychology at the Collegium Medicum of the Nicolaus Copernicus University. The questionnaire evaluates the five temperamental dimensions: depressive, cyclothymic, hyperthymic, irritable, and anxious. The inventory includes 110 questions and is a form of self-evaluation. Cyriax method effectiveness was evaluated on the basis of range of motion changes in six basic planes:

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extension, flexion, left lateral rotation, right lateral rotation, left lateral flexion, and right lateral flexion. The changes were graded as follows: improvement (1), no change (2), and deterioration (3).

To conclude, the selected research methods and measurement tools informed a comprehensive analysis of the link between the affective temperament and manual therapy effectiveness. The study results should be of significance for the development of personalised rehabilitation and better adaptation of therapeutic methods to patients' psychological traits.

3. Results and Analysis

As regards the study group, the study enrolled 100 patients with overload lumbar pain syndrome, including 73 women and 27 men. The mean age of the patients was 47.4 years (SD = 11.0), body weight 78.1 kg (SD = 21.3), height 1.69 m (SD = 0.08), and mean BMI 27.2 (SD = 6.7). In the female group, the mean age of the patients was 46.9 years (SD = 11.2), body weight 72.6 kg (SD = 19.1), height 1.65 m (SD = 0.05), and mean BMI 26.5 (SD = 7.1). In the male group, the mean age of the patients was 48.7 years (SD = 10.5), body weight 93.2 kg (SD = 19.8), height 1.79 m (SD = 0.07), and mean BMI 29.0 (SD = 5.3). A comparative analysis of the anthropometric and demographic parameters between men and women demonstrated significant differences in body weight ($p < 0.001$), height ($p < 0.001$), and BMI ($p < 0.006$). No significant differences were found in terms of age ($p = 0.451$). These results show that men were significantly taller and heavier compared to women, and that the former's BMI was higher. In addition, the vast majority (81%) lived in an urban area, which was a statistically significant finding ($\chi^2(1, N=100) = 38.44$; $p < 0.001$). In terms of the nature of their occupation, 48% of the patients worked while standing and 52% while sitting; the difference, however, was not statistically significant ($\chi^2(1, N=100) = 0.16$; $p = 0.689$). The overwhelming majority of the patients (96%) reported pain in the lumbar spine ($\chi^2(1, N=100) = 84.64$; $p < 0.001$). Similarly, as many as 93% of the patients experienced pain in that region when working ($\chi^2(1, N=100) = 73.96$; $p < 0.001$).

The onset of pain occurred most commonly when lifting heavy objects (50%; $\chi^2(6, N=100) = 64.90$; $p < 0.001$); as for pain intensification, it occurred most commonly in relation to that same activity (46%; $\chi^2(5, N=100) = 43.70$; $p < 0.001$). The pain exacerbates the most in trunk hyperextension and movement of a load. It needs to be stressed that the occurrence of the pain varied – the most patients (36%) experienced the pain several times a day, and differences in the frequency distribution were statistically significant ($\chi^2(3, N=100) = 10.80$; $p = 0.013$). Most patients (52%) specified that the pain limited their daily functioning to a high extent, 39% assessed the limitation as slight, and merely 9% did not experience any limitations ($\chi^2(2, N=100) = 30.97$; $p < 0.001$). To ease the pain, the patients most frequently resorted to motor exercises (35%) or assumed the lying position (29%). The other solutions included passive rest (25%), pharmacotherapy (5%), physical therapy (4%), and other (2%) ($\chi^2(2, N=100) = 30.97$; $p < 0.001$).

In the study group, the most common physical activity was taken up 1–2 times a week (40%), which constituted a significant difference in the frequency distribution among different activity levels ($\chi^2(4, N=100) = 45.20$; $p < 0.001$). The other patients declared physical activity 3–5 times a week (26%), rare physical activity (24%), 1–2 times a month (4%), or absence of physical activity altogether (6%). As regards the current experience of pain, 40% of the patients defined it as moderate, which was a value significantly more commonly indicated compared to the other pain levels ($\chi^2(5, N=100) = 48.32$; $p < 0.001$). 15% of the patients declared absence of pain, and 5% reported unbearable pain.

The diagnostic results showed that 52% of the patients were identified with spinal degeneration, which was a significant majority in the distribution of the diagnosed diseases ($\chi^2(4, N=100) = 51.36$; $p < 0.001$). The other diagnoses included hernia (20%), abnormal spinal curvature (13%), ankylosing spondylitis (2%), and other conditions (13%). Most patients (53%) experienced pain flare-up mostly in the mornings ($\chi^2(3, N=100) = 50.96$; $p < 0.001$). The other times of day, like noon (10%) and night (9%), were indicated less frequently in this respect.

When asked about their own assessment of their physical fitness, 51% of the patients answered "neither good nor bad", which was the statistically dominant response ($\chi^2(4, N=100) = 95.80$; $p < 0.001$). Good or very good fitness levels were reported by 40% of the patients, and 9% admitted bad or very

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bad fitness. Nearly all patients (98%) denied using any facilitators, such as supplements for muscle growth or anabolic steroids ($\chi^2(3, N=100) = 92.16$; $p < 0.001$). As regards the preferred means of transport, 63% of the patients declared using a car, which was a significant majority ($\chi^2(2, N=100) = 43.94$; $p < 0.001$). The others chose walking (27%) or cycling (10%). Most patients (70%) spent their time actively outdoors, which was statistically significant as well ($\chi^2(1, N=100) = 16.00$; $p < 0.001$).

Before starting therapy, descriptive statistics for the VAS (Visual Analogue Scale – for assessing pain) and Beck's Depression Inventory (scale for assessing severity of depressive symptoms) were analysed in the entire group and separately in the male and female subgroups.

As for the entire group, the mean VAS score was 6.09 (median = 6.00; SD = 2.05) and Beck score was 6.89 (median = 6.00; SD = 5.60). The Shapiro–Wilk test demonstrated that neither variable showed normal distribution (VAS: W=0.96, p=0.004; Beck: W=0.92, p<0.001). The distribution of both variables was characterised by moderate asymmetry and kurtosis. In the female group, the mean VAS score was 6.04 (median = 6.00; SD = 2.14), and the mean Beck score was 7.21 (median = 6.00; SD = 5.86); in the male group, the mean scores were 6.22 (median = 7.00; SD = 1.80) for VAS and 6.04 (median = 6.00; SD = 4.79) for Beck. Normality tests demonstrated deviations from the normal distribution.

Comparison of results between men and women with a Mann–Whitney U test did not demonstrate significant differences both in VAS pain assessment ($Z = -0.33$, $p = 0.738$) and in Beck scores ($Z = -0.67$, $p = 0.501$). Effect size coefficients were low ($r < 0.1$, $\eta^2 \approx 0$), which indicates absence of differences between the sexes that would be significant in practice.

After therapy ended, another pain assessment was performed with VAS. In the entire study group, the mean VAS score decreased to 3.86 (median = 4.00; SD = 2.31). The Shapiro–Wilk test demonstrated absence of normal distribution ($W = 0.95$, $p < 0.001$).

The mean post-therapy VAS score was 3.63 (median = 4.00; SD =2.40) in the female group and 4.48 (median = 5.00; SD =1.97) in the male group, and normality tests showed deviations from normal distribution.

Comparison of the post-therapy VAS score between men and women showed no statistically significant differences ($Z = -1.75$, $p = 0.080$). The effect size coefficients ($r < 0.17$, $\eta^2 \approx 0.03$) suggest a small difference effect, which did not reach statistical significance.

In the entire study group, the mean values for individual affective temperaments were as follows: ca. 7.2 for the depressive temperament, ca. 6.5 for the cyclothymic temperament, ca. 10.4 for the hyperthymic temperament, 3.3 for the irritable temperament, and ca. 8.6 for the anxious temperament. Normality tests showed that the scores of most scales deviated from the normal distribution (Shapiro–Wilk test significance $p < 0.05$), particularly for the depressive, cyclothymic, irritable, and anxious temperaments. In the female group, the mean values for the depressive and anxious temperaments were higher compared to the others, at ca. 7.7 and 9.0, respectively; in the male group, their respective values were ca. 5.9 and 7.6. The mean for cyclothymic temperament was ca. 6.9 for women and ca. 5.2 for men. The hyperthymic temperament demonstrated similar values in both groups (ca. 10.3–10.5), and the irritable temperament averaged at ca. 3.3 for both sexes.

Statistical comparisons showed that women had significantly higher scores in the depressive ($p = 0.004$) and cyclothymic ($p = 0.040$) temperaments compared to men. In the other temperaments, no statistically significant differences between the sexes were found.

Before therapy, the values obtained with the Cyriax method indicated varied spinal range of motion in the specific directions. The highest range of motion was noted in spinal flexion (mean at ca. 42.5), and the lowest in extension (mean at ca. 12.8) and rotations (ca. 15). Normality tests showed absence of normal distribution in most measurements. After therapy, spinal range of motion changed. Pre- and post-therapy comparative analysis found a statistically significant increase in the range of motion in the left lateral rotation ($p = 0.032$) and the left lateral flexion ($p = 0.021$). In the case of the other range of motion types (extension, flexion, left lateral rotation, and right lateral flexion), the changes were not statistically significant.

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It needs to be noted that therapy brought about improvement in certain spinal movements, particularly in the right lateral rotation and the left lateral flexion, which may indicate it is effective in improving motor function.

In the study group, links between severity of pain (assessed with VAS pre- and post-therapy), severity of depressive symptoms (Beck scale), temperamental traits (TEMPS), and lumbar spinal function (outcomes obtained with the Cyriax method) on one hand and the patients' ways to deal with pain (passive, physical activity, lying down) on the other were analysed.

A Kruskal-Wallis statistical analysis demonstrated significant differences in the severity of depressive symptoms (Beck scale) between groups using different strategies to deal with pain ($H = 10.74$; $p = 0.005$; $\eta^2 = 1.15$). Post hoc analyses detected that the patients using passive pain management ($M = 7.84$; $SD = 6.32$) and lying down ($M = 8.38$; $SD = 5.43$) developed higher severity of depressive disorders that was statistically significant, compared to patients who were physically active ($M = 4.37$; $SD = 4.34$) ($p = 0.020$ and $p = 0.002$, respectively). No significant differences between the groups employing passive rest and lying down. However, in relation to pre- and post-therapy VAS pain assessment, temperamental traits (TEMPS), and range of motion (Cyriax method), no statistically significant differences were observed between the groups in the way they dealt with pain ($p > 0.05$).

Another aspect of the conducted analysis was the assessment whether the time of day when the patients experience pain affects its severity, intensification of depressive symptoms, temperamental traits, and spinal function.

Considerable differences were noted in pre-therapy VAS scores depending on the time of day ($H = 14.51$; $p = 0.002$; $\eta^2 = 2.11$). The highest pain severity was reported by the patients experiencing pain in the morning ($M = 6.70$; $SD = 2.01$), and the lowest in the patients experiencing it in the afternoon ($M = 4.96$; $SD = 1.53$). Post hoc analyses confirmed significant differences between the morning and afternoon groups ($p < 0.001$). Moreover, significant differences were observed in pre-therapy lumbar spinal flexion between the groups ($H = 8.98$; $p = 0.030$; $\eta^2 = 0.83$). Post hoc analyses showed differences in flexion between the morning group and noon group, noon group and afternoon group, and afternoon group and evening group ($p < 0.05$). It needs to be pointed out that no significant differences were found in depression severity (Beck scale), TEMPS temperamental traits, or spinal range of motion in other planes (extension, rotations) depending on the time of day ($p > 0.05$). Therefore, study results demonstrate that the way patients deal with pain is related to the severity of depressive symptoms – physically active patients show those symptoms at a lower severity compared to patients following passive strategies, such as lying down or passive rest. That being said, the severity of pain experienced pre-therapy and the range of motion in lumbar spinal flexion do differ depending on the time of day, which may be of significance for therapy planning and therapeutic progress monitoring.

Analysis was also performed on inks between pain severity as per VAS (pre- and post-therapy), severity of depressive symptoms (Beck scale), temperamental trais (TEMPS), and results on lumbar spinal function as obtained by the Cyriax method (pre- and post-therapy) on one hand and the preferred means of transport (car, cycling, walking) on the other in the entire group.

An analysis of variance with a Kruskal–Wallis test did not show any statistically significant differences between the groups in terms of pain severity both pre-therapy ($H = 1.75$; $p = 0.417$; $\eta^2 = 0.03$), and post-therapy ($H = 1.32$; $p = 0.516$; $\eta^2 = 0.02$). Similarly, no significant differences were seen in the severity of depressive symptoms as evaluated with the Beck scale ($H = 3.40$; $p = 0.183$; $\eta^2 = 0.12$) nor for the depressive temperament ($H = 4.41$; $p = 0.110$; $\eta^2 = 0.19$). TEMPS temperamental traits were analysed as well, demonstrating no significant differences among the cyclothymic ($H = 5.65$; $p = 0.059$; $\eta^2 = 0.32$), hyperthymic ($H = 2.02$; $p = 0.364$; $\eta^2 = 0.04$), irritable ($H = 0.30$; $p = 0.863$; $\eta^2 = 0.01$), and anxious ($H = 1.25$; $p = 0.536$; $\eta^2 = 0.02$) temperaments. Similarly, the lumbar spinal range of motion pre-therapy (extension, flexion, and rotations) and post-therapy did not differ significantly depending on the preferred means of transport ($p > 0.05$), although a tendency was observed for greater range of flexion post-therapy in cycling patients ($M = 49.69$; $SD = 7.94$) compared to the other groups. However, these differences were not statistically significant ($H = 2.99$; $p = 0.224$; $\eta^2 = 0.09$).

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Given the results obtained, the preferred means of transport has no statistically significant bearing on pain severity, severity of depressive symptoms, temperamental traits, or lumbar spinal function in the studied population, both pre- and post-therapy.

The study also compared Beck scores, pre- and post-therapy VAS, affective temperament as evaluated with the TEMPS questionnaire, and the range of motion as evaluated with the Cyriax method in patients active and non-active outdoors. In the active group, significantly lower results in the depressive ($M = 6.77$, $SD = 2.41$ vs $M = 8.27$, $SD = 3.26$; $Z = -2.21$, $p = 0.027$, $\eta^2 = 0.05$) and cyclothymic ($M = 5.81$, $SD = 3.87$ vs. $M = 7.93$, $SD = 4.03$; $Z = -2.47$, $p = 0.013$, $\eta^2 = 0.06$) temperaments. No significant differences were found in Beck scores, VAS scores, and range of motion parameters as assessed with the Cyriax method.

A comparative analysis of the results regarding the declared functional limitations demonstrated that the patients reporting considerable limitations scored higher in VAS pre-therapy ($M = 7.33$; $SD = 1.46$ vs $M = 4.75$, $SD = 1.73$; $Z = -6.33$, $p < 0.001$, $\eta^2 = 0.40$) and in Beck scale ($M = 8.21$, $SD = 5.85$ vs $M = 5.46$, $SD = 4.98$; $Z = -2.57$, $p = 0.010$, $\eta^2 = 0.07$). Moreover, these patients scored higher in the anxious temperament as per TEMPS ($M = 9.56$, $SD = 5.45$ vs $M = 7.65$, $SD = 5.53$; $Z = -2.02$, $p = 0.044$, $\eta^2 = 0.04$). Differences in range of motion as evaluated by the Cyriax method were evident in right lateral flexion and right lateral rotation: patients with considerable limitations had a lower range of right lateral flexion pre-therapy ($M = 17.18$; $SD = 6.40$ vs $M = 20.26$, $SD = 8.19$; $Z = -1.96$, $p = 0.050$, $\eta^2 = 0.04$) and a lower range of right lateral rotation post-therapy ($M = 14.57$, $SD = 4.97$ vs $M = 17.64$, $SD = 6.78$; $Z = -2.24$, $p = 0.025$, $\eta^2 = 0.05$).

It needs to be stated, therefore, that outdoors activities led to lower severity of depressive and cyclothymic temperamental traits, and considerable functional limitations correlated with higher pain severity, higher levels of depressive and anxious symptoms, and limited range of motion as evaluated with the Cyriax method.

Assessment of therapy effectiveness for the lumbar spinal range of motion was an important facet of the study. Therapy effectiveness was evaluated based on the determined thresholds of change in the range of motion: extension (30°), flexion (40°), left and right lateral flexion (30°), and left and right lateral rotation (5°).

An analysis of classification of cases into effective and ineffective showed that the therapy was ineffective in the case of flexion, left lateral flexion, and right lateral flexion as no effective improvement was observed in nearly any patient (0–1% effective cases). However, as for the left and right lateral rotation, therapy proved effective in 25% of the patients, which showed a statistically significant difference to the distribution of the ineffective cases ($\chi^2(1, N=100) = 25.00$, $p < 0.001$). In addition, an analysis of the patients with increased or decreased range of motion demonstrated a significant predominance solely of improvement within the right lateral rotation (63% of patients with increase vs 37% of patients with decrease; $\chi^2(1, N=100) = 6.76$, $p = 0.009$). In the case of the other range of motion parameters, no statistically significant difference was found between the number of patients with increased and decreased range of motion ($p > 0.05$).

According to the results, the therapy proved effective only in improving the right lateral rotation in the lumbar spine in a significant number of the patients, but it brought about no significant change in terms of extension, flexion, and lateral flexion.

An analysis of correlations between the subjective experience of pain as per VAS and the lumbar spinal range of motions as evaluated with the Cyriax method pre-therapy showed merely a weak, yet statistically significant, dependence between the VAS scale and the right lateral flexion ($r_s = -0.24$; $p = 0.016$). This means that higher pain was slightly related to a lower range of motion during right lateral flexion. For the other studied range of motion parameters (extension, flexion, left and right lateral rotation, left lateral flexion) no statistically significant correlations were observed with the VAS scores pre-therapy ($p > 0.05$).

It needs to be added that a weak, yet statistically significant, correlation was found post-therapy between the VAS scores and the range of motion during lumbar spinal extension ($r_s = -0.24$; $p = 0.017$), which indicates that lower pain levels post-therapy was related to a greater range of motion in

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extension. No significant dependences with the VAS scores post-therapy were demonstrated dor the other range-of-motion parameters (flexion, rotations, and lateral flexion) ($p > 0.05$).

An analysis of correlations between the Beck scores and pre-therapy spinal range-of-motion measurements demonstrated merely a weak, yet statistically significant, correlation with the left lateral flexion ($rs = -0.23$; $p = 0.022$). This means that higher levels of depressive symptoms as per the Beck scale was related to a slightly limited range of motion during the left lateral flexion. In case of the other range-of-motion parameters, no statistically significant dependences were found with the Beck scale ($p > 0.05$). Results showed, that the subjective experience of pain (VAS) demonstrates only a weak, yet statistically significant, correlation with certain range of motion parameters (pre-therapy right lateral flexion and post-therapy extension). However, the levels of depressive symptoms (Beck scale) showed a weak, yet significant, correlation with pre-therapy left lateral flexion. The other range-of-motion parameters did not show considerable relationships with the said scales.

In turn, an analysis of correlation demonstrated a weak, yet statistically significant, dependence between the Beck scores and the post-therapy range of motion during the right lateral rotation ($rs = -0.21$; $p = 0.036$). This means that higher levels of depressive symptoms were related to a slightly lower post-therapy spinal range of motion during right lateral rotation. For the other range of motion parameters (extension, flexion, left lateral rotation, lateral flexions), no significant correlations were demonstrated with the Beck scores post-therapy ($p > 0.05$).

As regards the dependence between the TEMPS temperaments and the results obtained with the Cyriax method pre-therapy, the correlation results showed a weak, yet statistically significant, negative correlations between the depressive temperament and pre-therapy flexion ($rs = -0.22$; $p = 0.031$) and between the cyclothymic temperament and pre-therapy flexion ($rs = -0.24$; $p = 0.018$). This means that higher levels of depressive or cyclothymic traits was associated with a slightly limited lumbar spinal range of motion during pre-therapy flexion. For the other temperamental traits (hyperthymic, irritable, anxious) and the other range-of-motion parameters, no statistically significant relationships were observed ($p > 0.05$).

However, an analysis of relationships between the TEMPS temperamental scale and the results obtained with the Cyriax method post-therapy showed a weak, yet statistically significant, negative correlation post-therapy between the cyclothymic temperament and the range of spinal flexion ($rs = -0.25$; $p = 0.013$). This means that the cyclothymic temperamental traits were associated with slightly limited spinal flexion post-therapy as well. No significant correlations were observed for the other temperaments and range-of-motion parameters ($p > 0.05$).

Therefore, the results show that the affective temperament, particularly the depressive and cyclothymic ones, are weakly, yet significantly, correlated with the range of lumbar spinal flexion both pre- and post-therapy. Moreover, the severity of depressive symptoms as per the Beck scale post-therapy was associated with a slightly poorer range of the right lateral rotation. The other temperamental traits and range-of-motion parameters did not demonstrated any significant correlations.

However, the analysis showed statistically significant correlations between Beck scores and the individual affective temperaments as evaluated with TEMPS. A positive and moderately strong correlation was observed between the depressive temperament ($rs = 0.43$; $p < 0.001$) and the severity of depressive temperament and a strong positive correlation with the cyclothymic temperament ($rs = 0.57$; $p < 0.001$). In the case of the irritable ($rs = 0.33$; $p < 0.001$) and anxious ($rs = 0.48$; $p < 0.001$) temperaments, positive correlations of moderate strength were noted as well. In turn, for the hyperthymic temperament, a negative correlation was seen ($rs = -0.35$; $p < 0.001$), which may indicate that it is carries a potential to protect from depressive symptoms.

However, no statistically significant dependence was demonstrated between pre-therapy VAS pain severity and the specific affective temperaments. All analysed correlation coefficients were statistically insignificant ($p > 0.05$), which implies that the temperamental traits did not significantly affected pain experience pre-therapy. No statistically significant correlations were observed between the VAS pain severity assessment and the temperaments. The values obtained for correlation

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coefficients remained low and failed to reach statistical significance ($p > 0.05$), which confirms that the temperamental traits do not exert a significant impact on the subjective experience of pain post-therapy.

The results demonstrated a significant correlation between the severity of depressive symptoms and selected affective temperaments, particularly the depressive, cyclothymic, anxious, and irritable, where the hyperthymic temperament showed a reverse dependence. At the same time, no significant dependences were observed between the temperamental traits and pain severity assessed pre- and post-therapy, which may suggest that the subjective pain assessment is dependent on the stable personality traits, such as temperament, to a lesser extent.

In addition, an analysis of dependences between pre-therapy pain severity (VAS) and severity of depressive symptoms (Beck scale) did not show a statistically significant correlation ($rs = 0.19$; $p = 0.063$). This indicates that in the study group, the severity of pain experienced pre-therapy was not linked to the severity of depressive symptoms.

Just like before therapy, no statistically significant correlation was found between the VAS score and the severity of depressive symptoms as per the Beck scale ($rs = 0.03$; $p = 0.804$) post-therapy. This result suggests that depression severity did not affect the subjective assessment of pain after a given therapeutic intervention was finished.

An analysis of dependences between the specific affective temperaments (TEMPS) and demographic and somatic variables was performed, demonstrating merely one significant correlation. A negative correlation was found between height and the strength of the depressive temperament ($rs = -0.25$; $p = 0.011$), which may indicate that shorter patients scored higher in depressive traits. However, this correlation is weak. As regards the other variables – age, body weight, and body mass index (BMI) – no statistically significant correlations were found with any of the affective temperaments.

A statistically significant, yet weak, correlation between age and BMI ($rs = 0.23$; $p = 0.021$) and between age and pre-therapy pain severity (VAS) ($rs = 0.23$; $p = 0.020$) needs to be noted as well. This suggests that older patients had higher BMI and, simultaneously, reported higher pain severity pre-therapy. The correlation between age and post-therapy pain assessment (VAS) failed to reach statistical significance ($rs = 0.17$; $p = 0.083$). However, the analysis demonstrated a statistically significant negative correlations between age and the spinal range-of-motion parameters as evaluated with the Cyriax method pre-therapy. This hold true to flexion ($rs = -0.29$; $p = 0.004$), left lateral flexion ($rs = -0.23$; $p = 0.024$), and right lateral flexion ($rs = -0.32$; $p = 0.001$). These results show that older patients experienced lower lumbar spinal range of motion before a therapeutic intervention. The other parameters, such as extension or rotation, were not significantly correlated with age.

In turn, significant, yet weak, negative correlations were observed post-therapy between age and the range of motion for extension ($rs = -0.21$; $p = 0.037$), flexion ($rs = -0.20$; $p = 0.042$), left lateral flexion ($rs = -0.25$; $p = 0.011$), and right lateral flexion ($rs = -0.25$; $p = 0.011$). This means that older patients showed lower range of motion within the lumbar spine post-therapy as well. These dependences confirm the effects age has on the musculoskeletal function, both before and after intervention.

Based on the studied data, no statistically significant dependences were noted between the severity of depressive symptoms (Beck scale) and the subjective experience of pain (VAS), both pre- and post-therapy. This suggests that the depression levels did not impact pain severity assessment in the study group.

As regards dependences between the affective temperament and somatic traits, only a weak, yet significant, negative correlation between height and the levels of depressive traits in the temperamental profile. This means that shorter patients had higher levels of depressive traits. The other somatic traits, such as age, body weight, and BMI, did not demonstrated significant links to the affective temperament profiles.

However, it was established that the patients' age significantly, albeit weakly, correlates with higher BMI and higher pain severity pre-therapy. This shows that older patients were more

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frequently overweight and experienced stronger pain before intervention more often. The correlation between age and the range-of-motion parameters as evaluated by the Cyriax method showed that older patients demonstrated lower ranges of motion, particularly in flexion and lateral flexions, both pre- and post-therapy. These results confirm that age is a significant limiter of the lumbar spinal function regardless of the therapy pursued.

The aim of this study was to analyse correlations between Cyriax method therapy effectiveness and affective temperamental traits in patients with overload lumbar pain syndrome. The starting point was the hypothesis assuming that temperamental traits – depressive, cyclothymic, hyperthymic, irritable, and anxious – may have a significant impact on therapy effectiveness understood as improvement in the lumbar spinal range of motion post intervention.

The data analysis showed that therapy effectiveness varied depending on the patients' age: older patients showed worse range-of-motion parameters both pre- and post-therapy, which was confirmed by significant negative correlations between age and movements such as flexion, left lateral flexion, right lateral flexion, and extension. Simultaneously, it was observed that higher age was significantly associated with higher BMI and higher pre-therapy pain severity (VAS), but not higher post-therapy pain severity.

As regards the affective temperamental traits, the only significant statistical dependence included a weak negative correlation between height and the severity of depressive traits as per TEMPS, which points to the fact that shorter patients scored slightly lower in depressive temperament levels. In all the other cases, no statistically significant correlations were observed between the specific temperamental types and somatic traits (age, body weight, BMI).

What is more, analysis results did not confirm a significant correlation between the severity of depressive symptoms (as per the Beck scale) and pain assessment (VAS) – both pre- and post-therapy. The absence of correlation between those variables shows that the levels of experienced pain were not significantly linked with the patients' mental state in terms of depressive symptoms.

4. Conclusions

This study analysed the relationships between Cyriax method therapy and affective temperamental traits and selected demographic and somatic traits in patients with overload lumbar pain syndrome. The results showed that the patients' age bears significantly on the lumbar spinal range of motion and the subjective assessment of pain severity before commencement of therapy. Older patients showed a significantly lower range of motion both before and after therapeutic intervention, which was confirmed by negative correlations with extension, flexion, and lateral flexions as evaluated with the Cyriax method. Moreover, age was linked to BMI increase and higher pain severity before therapy; however, these dependences did not survive completion of therapy.

The severity of depressive symptoms as measured with the Beck scale was not significantly correlated with subjective pain assessment (VAS) neither before, nor after therapy, which suggests that the levels of depression had no effect on the experience of pain in the study group. In the context of affective temperament, only a weak, yet statistically significant, negative correlation was noted between height and the severity of depressive traits, whereas the other temperamental traits were not significantly correlated either with somatic traits or therapy outcomes. Therefore, the hypothesis of significant effects of temperament on therapy effectiveness remains unproven at this stage of study.

In view of research integrity, it needs to be emphasised that even though the analysis covered numerous covariates, full understanding of the relationship between the affective temperamental traits and improvement in spinal range of motion warrants further investigations. In order to verify the hypothesis in a more precise manner and obtain a comprehensive answer to the research questions, it is recommended to conduct additional analyses on correlations between TEMPS scales and post-therapy changes in the range of motion. Further, extended studies are needed in this respect.

The obtained results underscore the intricate nature of the factors affecting the course and outcomes of therapy in overload lumbar pain syndrome. A special role is played by the patients' age,

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which limits spinal function and augments pain regardless of the severity of depressive symptoms or temperament. Therefore, further studies will cast brighter light on the potential psychological determinants of therapy effectiveness and allow personalisation of therapy for patients with overload lumbar pain syndrome.

Author Contributions: For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, K.O. and A.O.; methodology, K.O.; software, I.D.; validation, K.O., I.D. and A.O.; formal analysis, K.O.; investigation, I.D.; resources, K.O.; data curation, A.O.; writing—original draft preparation, K.O.; writing—review and editing, K.O.; visualization, A.O.; supervision, K.O.; project administration, K.O.; funding acquisition, A.O. All authors have read and agreed to the published version of the manuscript." Please turn to the CRediT taxonomy for the term explanation. Authorship must be limited to those who have contributed substantially to the work reported.

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