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Research Protocol

Physiotherapy Section

# Effect of Cyriax Manipulation on Individuals with Text Neck Syndrome: A Research Protocol for Quasi-experimental Study

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## ABSTRACT

**Introduction:** Text Neck Syndrome (TNS) is a modern-day problem resulting from prolonged and excessive use of electronic devices such as Smartphones (SP), tablets, and laptops. This condition is characterised by the forward tilting of the head and neck, leading to strain on the cervical spine. Symptoms may include neck pain, stiffness, headaches, and shoulder discomfort. As technology continues to dominate our lives, understanding and addressing the implications of TNS is crucial for maintaining musculoskeletal health in the digital era.

**Need for the study:** Although the Cyriax approach is widely used to treat musculoskeletal issues, there is no literature on its application to treat TNS.

**Aim:** To evaluate the significance of Cyriax manipulation in individuals with TNS in terms of pain and disability.

**Materials and Methods:** A quasi-experimental design will be applied. The study will be conducted in the Department of Musculoskeletal Outpatient Department (OPD), Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, Maharishi Markandeshwar Deemed to be University, Mullana, Ambala, Haryana, India, from December 2021 to March 2023. Participants will be chosen from a group of 18-30-year-olds who have been using SP for a long duration for the present quasi-experimental study. Each subject's complete demographic information, including name, age, gender, weight, and height, will be recorded. Normal distribution of the data will be verified by Shapiro-Wilk's test. The level of significance or alpha level will be set at a p-value <0.05 to be considered statistically significant. Two treatment sessions will be provided per week. Neck Disability Index (NDI), Visual Analogue Scale (VAS), and Craniovertebral Angle (CVA) will be used to assess pain, disability, and forward head posture.


**Keywords:** Neck pain, Posture, Smartphone

## INTRODUCTION

A "text neck" is a repetitive stress injury or overuse condition in which a person's head hangs or curves forward and is bent over for long periods of time [1]. Smartphone (SP) users often hold their device with one or two hands below their eye level and type on or touch the touchscreen display mostly with their thumbs [2]. Currently, a significant proportion of the global population uses smartphones. Unfortunately, the negative effects of extended smartphone usage are increasingly recognised as a significant problem [3]. Improper and frequent use of a mobile phone may result in "TNS," a complex set of clinical symptoms [4].

Texting, web surfing, and video-watching all resulted in head flexion angles between 37.28 and 46.88 degrees. Smartphone users flexed their heads more while sitting than standing, with texting causing the most head flexion [2]. Bending the head, neck, and shoulders while using cell phones and handheld devices, as well as maintaining a distorted neck alignment while sitting, studying, or watching TV, can incrementally increase strains in the cervical spine area [1]. During the Coronavirus Disease-19 (COVID-19) pandemic, many people have had to change their screen usage habits [5]. The time people spend on their phones and applications has undoubtedly increased as a result. Due to lockdowns and remote work, many students and young adults have spent long durations working online [4,6].

The TNS is exacerbated by long work hours and poor neck posture [6]. According to a recent study, approximately 79% of individuals aged 18-44 have their cell phones with them almost all the time during their waking day [1]. Over half of the smartphone users experienced minor neck impairments, and 53.75% and 46.25% had poor sleep quality. The study found that 37.8% of respondents had moderate neck impairments [7].

Full-grown heads weigh over 5 kg. A 15-degree head flexion doubles neck stress. Repeated forward flexion alters cervical spine curvature. Today, teenagers use phones and other devices for 5-7 hours a day, resulting in hazardous cervical spine stress for 1825-2555 hours per year [4]. These strains can cause early wear and tear, degeneration, and even surgery. Additionally, other developmental, physical, psychological, and social issues are a source of concern for many young people [1]. Degenerative changes to the cervical spine often lead to neck pain by reducing segmental or global lordosis, although these changes may be clinically silent [8].

A total of 37.8% of SP users reported moderate neck pain, while 46.25% experienced poor sleep, including headaches, tiredness, poor focus, sleeplessness, and hearing problems [5,7]. Young adults lack knowledge about text neck, and this group also lacks prevention knowledge [9]. Extended neck flexion can lead to near-sightedness, eye strain, and dry eyes as the eyes focus on a close object. Screen time and smartphone addiction can cause health problems [5]. Slouching forward can strain the heart and lungs [10]. The method of treatment depends on the nature of the disorder. Typical forms of treatment include manipulation, gentle passive mobilisation, active motions, injection and infiltration techniques, and deep friction massage. Spinal rotation manipulation distributes torsion stress throughout a segment of the spine rather than acting on a single vertebra [11]. Cervical mobilisations are helpful in reducing movement-associated pain, increasing range of motion and velocity, and improving patient perceptions of improvement [12]. The aim of the study will be to evaluate the significance of Cyriax manipulation in individuals with TNS.

The objective of the present study will be to determine the impact of Cyriax manipulation on individuals with TNS using VAS, NDI

and CVA measurements. The alternate hypothesis of the study will be that Cyriax manipulation improves neck disability, discomfort, and CVA.

The null hypothesis suggests that Cyriax manipulation does not improve neck disability, discomfort, and CVA.

## REVIEW OF LITERATURE

In a quasi-experimental study conducted in 2021, the benefits of Pilates and conventional exercise programs for treating TNS among college students were compared. Prolonged chin lowering during musculoskeletal discomfort often leads to TNS in students. Thirty individuals showing signs of TNS participated in a six-week quasi-experimental study to investigate the effects of treatment. Convenience sampling was used to divide them into two groups, with group A participating in a standard exercise program and group B adding Pilates to their routine in addition to the standard exercise regimen. Data were collected before and after therapy and analysed using Statistical Package for Social Sciences (SPSS) 26.0. The significance of the treatment was analysed using paired and unpaired t-tests. Both groups reported statistically significant reductions in pain, disability, muscular weakness, and fatigue after therapy. The improvement was greater in group B, and this difference was statistically significant. The study showed that the addition of Pilates to a standard exercise regimen improved outcomes for people with TNS [13].

In 2023, a comparative study was conducted to determine the impact of myofascial release and dynamic neck exercises on pain. A total of 44 eligible participants took part in the study and were assigned to two groups. The assessment of participants for TNS was conducted using the SP Addiction Scale (SAS), Tragus to Wall Test, Numerical Pain Rating Scale (NPRS), and NDI. Group A participants received Myofascial Facial Release (MFR) treatment, while group B participants underwent dynamic neck exercises. Both interventions were administered over a period of four weeks, consisting of 10 sessions. Both groups were provided with isometric exercises and stretching routines. Outcome measures such as NPRS and NDI were reassessed after the 4-week intervention period. According to the final analysis, MFR was found to be a more effective treatment for TNS compared to dynamic neck exercises. It was determined that both MFR and dynamic neck exercises had a significant impact on reducing pain and improving neck disability. The results indicate that a combination of MFR with isometric neck exercises and stretching is a more efficacious approach than dynamic neck exercises [14].

In a case report conducted in 2021, the progression of TNS in an adult was halted. A 24-year-old man had been experiencing head and neck discomfort and paraesthesia in his right upper limb for the previous 12 months. The patient spent three years editing and publishing films on YouTube. A year before seeking equivalent care from his general doctor, cervical spondylosis was identified through cervical radiography. Prior treatment included muscle relaxants and painkillers. Interventions included recurrent physiotherapy, traction acupuncture, which provided temporary relief in the following year. However, after experiencing a significant increase in symptoms brought on by prolonged use of his smartphone, the patient sought chiropractic care. Paraspinal muscles were found to be hypertonic, and there was paraesthesia in the right C6 dermatome distribution, along with cervical kyphosis and C5 vertebral rotation. These findings were consistent with TNS, characterised by cervical spondylosis and right radiculopathy at C6. The treatments included traction therapy, cervical manipulation, and improved posture when texting. After nine months of therapy sessions, radiographic changes showed correction in the cervical spine curve and normal paraspinal muscle tension on surface electromyography, demonstrating clinical and functional improvement [10].

The present randomised control trial conducted in 2023 aimed to determine the prevalence of ND and functional limitation among SP users with TNS after receiving either postfacilitation stretching or Elongation Longitudinaux avec Decoaption Osteo-articulaire (ELDOA). Forty SP users aged 18 to 35 years with an NDI score of 10 or higher due to neck distress without unilateral arm symptoms were recruited for the study. Twenty participants were assigned to the ELDOA group, and 20 participants were assigned to the stretching group. Three treatment sessions per week were conducted for a total of six weeks. Pain intensity, functional impairment, and SP addiction were measured using NPRS, NDI, and SAS at baseline and after 18 therapy sessions. After six weeks, pain and functional impairment significantly decreased in the ELDOA group. There was no significant difference in SP dependency between the two groups, but the NPRS, NDI, and SAS scores varied greatly between groups [15].

## MATERIALS AND METHODS

A quasi-experimental design will be used for this study, following the Standard Protocol Items under the SPIRIT Protocol. The study will be reported according to the SPIRIT protocol checklist [16]. The study will take place from December 2021 to March 2023 at the Department of Musculoskeletal OPD, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, Maharishi Markandeshwar Deemed to be University Mullana, Ambala, Haryana, India.

**Ethical clearance:** The study will be approved by the University and conducted in accordance with the Helsinki Declaration revised in 2013 and the National Ethical Guidelines for Biomedical Research involving Human Participants, 2017, IEC-2234. The study is registered at the clinical trial registry-India CTRI/2022/12/048198.

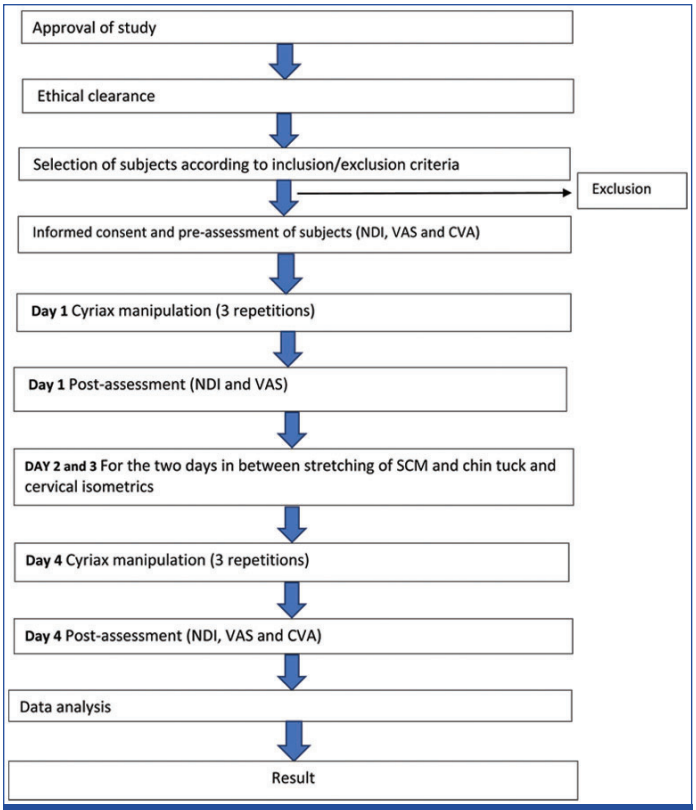
**Sample size estimation:** The sample size will be estimated using G*Power 3.1.9.4 software, with an effect size of 0.62 [17], a significance level of 5%, and a power of 95%. The estimated sample size is 36, considering a 10% dropout rate, the final sample size will be 40.

**Inclusion and Exclusion criteria:** The inclusion criteria are male and female individuals between the ages of 18 and 30 years who engage in prolonged computer and phone usage and express a willingness to participate. The exclusion criteria include conditions such as universal hypermobility, inflammatory joint disorders, muscle diseases, rheumatoid arthritis, neuropathy, vertigo, and fractures of the shoulder complex or neck.

### Study Procedure

**Recruitment:** Participants will be recruited based on their eligibility criteria from both male and female populations attending the OPD of the respective institute. Demographic data, including name, age, gender, occupation, and address, will be documented using a predesigned form for eligible patients. Potential participants will undergo pre and postassessments to confirm their eligibility before the baseline evaluation. Written consent will be obtained from the participants.

**Intervention:** The treatment protocol, as shown in [Table/Fig-1], will consist of the Cyriax manipulation protocol (3 repetitions per treatment session) twice a week for one week (on day 1 and 4). Additionally, cervical isometrics, self-stretching of SCM, and chin tuck-in exercises will be performed twice a week with five repetitions in one set, holding for 15 seconds (on day 2 and 3). Pretreatment (day 0), first post-treatment outcome (day 1), and second post-treatment outcome (day 4) measures will be taken using the NDA, VAS and CVA at baseline and after the final session, as shown in [Table/Fig-1].




**[Table/Fig-1]:** Flowchart of the study procedure.

as severe as possible" to indicate their pain level. The total score ranges from 0 to 100 mm based on the position of the mark [18].

- **Craniovertebral Angle (CVA):** CVA is measured by marking the subject's tragus and 7th cervical vertebra. The seventh cervical vertebra is identified and marked by asking the individual to bend and extend their head three times to locate its bony landmark, the seventh spinous process. A photograph was taken while instructing the person to stand in a relaxed position. An angle value less than 50° was used to identify the presence of Forward Head Posture (FHP). The angle between the tragus of the ear and the seventh cervical vertebra, relative to the horizontal plane, was computed using Adobe Photoshop 14.2 [2]. The standard protocol for recommendations in interventional trials is shown in [Table/Fig-2].

## STATISTICAL ANALYSIS

Statistical analyses will be performed using IBM® SPSS® Statistics 20.0. The normal distribution of the data will be verified using the Shapiro-Wilk's test. The level of significance or alpha level will be set at a p-value <0.05 to be considered statistically significant. Repeated-measures Analysis of Variance (ANOVA) and the Friedman test will be used to compare NDI and VAS, taking into account the normality of the data. Within-group analysis will be conducted using paired t-tests and the Wilcoxon signed-rank test for NDI, VAS, and CVA.

| | Study period | | | | | | |
|---|---|---|---|---|---|---|---|
| | Enrollment | Allocation | Post-allocation | | | | Close-out the treatment |
| Time point | 0 week | 0 weeks | Day 1 | Day 2 | Day 3 | Day 4 | After completing the treatment on 4th day |
| **Enrollment** | | | | | | | |
| Eligibility screen | X | | | | | | |
| Informed consent | X | | | | | | |
| According to inclusion and exclusion criteria | X | | | | | | |
| Allocation | | | | | | | |
| **Interventions** | | | | | | | |
| Cyriax protocol | | | X | | | X | |
| Chin tucks, SCM stretching, cervical isometrics | | | X | X | X | X | |
| **Assessments** | | | | | | | |
| Demographic data | X | | | | | | |
| Visual Analogue Scale (VAS) | X | | X | | | X | X |
| Neck Disability Index (NDI) | X | | X | | | X | X |
| Cervicothoracic angle | X | | X | | | X | X |

**[Table/Fig-2]:** Standard protocol items: Recommendations for interventional trials schedule for participation.

## OUTCOME MEASURES

### Primary Outcome:

- **Neck Disability Index (NDI):** The NDI evaluation consists of a 10-item, 50-point index questionnaire that assesses the impact of neck pain and symptoms on various functional activities. Four of the ten elements are subjective (pain intensity, headache, focus, and sleep), four are activities of daily living, and two are optional (personal care, reading). A score of 0 indicates no discomfort, while 5 indicates severe pain. The maximum score is 50, with higher scores indicating greater neck impairment [1].

### Secondary Outcomes:

- **Visual Analogue Scales (VAS):** VAS is commonly used to measure outcomes or calculate a health utility index. It consists of a 10-centimetre-long straight line with labels on both ends to indicate the scale. Patients are asked to mark a point on the line between the anchors "no pain" and "pain

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