International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 16s,2025
https://theaspd.com/index.php

# Association Of Forward Head Posture And Cervical Joint Position Sense In Patients With Or Without Neck Pain– A Systematic Review

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***Abstract***

***Background:*** *Forward head posture (FHP) is prevalent positional deviation seen in lateral view. According to recent studies, subjects who are having FHP also has somatosensory hypofunction and reduced proprioception which are essential afferent signals to maintain posture. There are no systematic reviews studying association of FHP and cervical joint position sense till date, which is important for further understanding and investigations. Considering the impairments associated with reduced cervical joint position sense it is important to know this relationship, and hence the need for this study.*

***Methods:*** *This study was performed according the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guideline (PROSPERO ID: CRD42024572197). Literature search was performed on PubMed, Web of Science, Scopus, and Google Scholar. Additionally, a manual search using the references of included papers was conducted. Observational studies that examined the connection between FHP and cervical joint position sense were among the studies that qualified. The Joanna Briggs Institute Critical Appraisal Checklist for Cross-Sectional Studies was used to evaluate the quality of the studies.*

***Results:*** *Seven studies were included for the final analysis after checking inclusion and exclusion criteria and quality assessment. The evidence supported that people with forward head posture have significant reduction in cervical joint position sense in all four directions. Limited evidence supporting association between FHP and cervical joint position sense in subjects with neck pain.*

***Conclusion:*** *The results of this systematic analysis consistently showed that subjects with FHP had decreased cervical proprioception. However, the evidence base is weakened by heterogeneity and a dearth of high-quality trials. But this study provides evidence for impact of Forward head posture and application of techniques to reduce dysfunction.*

***Keywords***: *Forward head posture, Cervical Joint Position Sense, Systematic review, Cervical spine, Cervical proprioception.*

## INTRODUCTION

Forward head posture (FHP) is one of the most common postural deviations in the sagittal plane [(1)]. FHP is generally manifested by an excessively anterior head position relative to the shoulder. A significant relationship exists between sagittal spinal alignment, postural control and fall risks[(1)]. Available studies indicates that subjects with FHP have reduced vestibular and proprioceptive functions, which are crucial sensory inputs for postural control[(2)].Proprioception refers to information sent by afferent receptors from peripheral muscles, capsules, ligaments and joints to the central nervous system that contributes to efficient neuromuscular control of movement and joint stability[(3)] Cervical proprioceptors, ocular inputs, and vestibular systems all contribute to the head and neck's sense of position [(4)]. Sensory input from mechanoreceptors in structures within and surrounding a joint is vital for joint stability [(3)]. The cervical position sensation is predominantly influenced by ascending inputs (afferent) from the neck muscle, capsule, and ligament receptors of the cervical spine [(5)]. Abnormal cervical afferent inputs cause impaired cervical position sensing, which is quantified as cervical joint position error (JPE) [(6)].

According to Previous studies it is claimed that the compressive forces to the cervical structures including apophyseal joints, ligaments, and posterior neck structures are increased in subjects with forward head posture [4]. Consequently, degenerative changes of intervertebral and facet joints are expected in patients with nek pain and forward head posture[5]. Given that cervical structures consist of a huge number of mechanoreceptors It is believed that the neck proprioceptive function is disturbed in individuals with FHP[6]. A systematic review focusing on the relationship between FHP and cervical joint position sense has been unavailable to date, which limits researchers' comprehension and additional exploration. Considering the significant effects of reduced cervical joint position sense, it is important to clarify these relationships. Further understanding and early warning of the effects of FHP can improve the planning and implementation of suitable interventions to prevent dysfunction and disability.

## METHODOLOGY

This review was conducted according to the preferred reporting guidelines for systematic review (PRISMA guidelines) and registration of this review was done in the PROSPERO International Prospective Register of Systematic Reviews (CRD42024572197). Eligibility: Studies which were included in this review were according to the population, exposure, comparator, outcome, and study design (PECOS framework)[7], as listed in Table 1.

| | Inclusion criteria | Exclusion criteria |
|---|---|---|
| Population | ● Samples with or without neck pain | ● Any other condition impairing cervical joint position sense and balance |
| Exposure | ● FHP measured by using reliable and objective methods (distance or angles between anatomical landmarks, e.g., craniovertebral angle, occiput-to-wall distance, cervical range of motion, and head shift distance)<br>● Cervical proprioception measured by Cervical joint position sense error (JPSE) | ● No FHP measured<br>● No reliable and objective methods used for JPSE<br>● No reliable and objective methods used for measuring cervical joint position sense. |
| Comparators | ● No FHP or lower severity of FHP | |
| Outcomes | ● Studies investigating a relationship between FHP and cervical joint position sense | ● Studies not investigating a direct relationship between FHP and cervical joint position sense |

| | | |
|---|---|---|
| Study design | ● Observational studies (e.g., cohort study, case-control study, or cross-sectional study)<br>● Human studies<br>● Published as research articles<br>● English only | ● All studies not including observational design (e.g., clinical trials)<br>● All studies using animals<br>● Full text not available |

Table 1: Inclusion and Exclusion Criteria according to PECOS framework.

**2.2. Information sources and search strategy**

A Thorough search was carried out in the following databases: Web of Science, PubMed, Scopus, and Google scholar. From the beginning to November 2024 search was performed, Human studies were the limitations imposed. English language, Observational study designs were the restrictions imposed for search strategy. There were no limitations on the participants' age, sex, or publication date. We also looked through the included papers' reference lists to find other researches. The entire search approach is provided in ATTACH SEARCH STRATERGY.

**2.3 Study Selection**

Studies Identified through Literature review was extracted in csv file format and imported to RAYYAN AI tool for further data extraction. After uploading data duplicates were removed and further studies were screened for Titles and Abstracts. Independent screening was done by both the researchers PS and DA according to inclusion and exclusion criteria. Two reviewers were blinded to each other's decisions before final comparisons. After titles and abstracts screening, full texts of potentially relevant studies were retrieved for further identification. The reasons for excluding studies were recorded. Discrepancies in decisions from the reviewers were resolved by discussion with a third reviewer (TP) until consensus was reached.

**2.4. Data extraction and data items**

Each qualifying study's data was independently extracted by the two reviewers using a standardized method. Extracted data was compared, and any discrepancies were settled through discussion. Data extracted from eligible studies were tabulated and presented in Tables 2 based on (1) general study information (authors and year), (2) participant demographics, (3) recruitment criteria, (4) FHP results and measurement techniques, (5) Outcome measures, (6) Statistical analysis, (7) Main outcomes, and (8) Conclusions.

**2.5. Quality assessment**

The Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Cross-Sectional Studies was utilized to evaluate the methodological quality.
Since every study that was included used a cross-sectional design, the JBI
A tool for appraisal was used (Table 3)[8]. There are eight components to it:
(1) sample selection criteria, (2) subject and context descriptions, (3) exposure measurement techniques, (4) condition measurement, (5) confounder identification, (6) confounder control strategies, (7) outcome measurement techniques, and (8) statistical analysis.

The methodological quality of each study was evaluated independently by the reviewers. When the information available was insufficient for a quality assessment, the corresponding authors were approached for further details.
When appropriate, disagreements amongst reviewers were settled by consulting a third reviewer. Despite the inclusion of all research that met eligibility requirements, the results of eligible studies of low quality were interpreted cautiously. Studies that failed to satisfy the eighth criterion for statistical analysis in quality evaluation were also disqualified from data synthesis.

### 2.6. Data synthesis

Results from high-quality studies with a low risk of bias were prioritised in data synthesis. The included studies were grouped. The retrieved data were synthesized and analysed using a narrative method due to significant variation in populations, diagnostic criteria for FHP, outcome measures, and data formats among studies.

## RESULTS

### 3.1. Study selection

The study selection process is presented as a flow diagram (Fig. 1) according to the PRISMA guideline.[9] A total of 4022 studies were identified across four selected databases through manual search. After the removal of duplicates, studies remained for further screening according to the eligibility criteria (Table 1). Full texts of 37 studies were assessed for eligibility. At the conclusion of the selection process, a total of 7 including two manually searched studies, were selected for this review, while 18 were excluded for specific reasons.

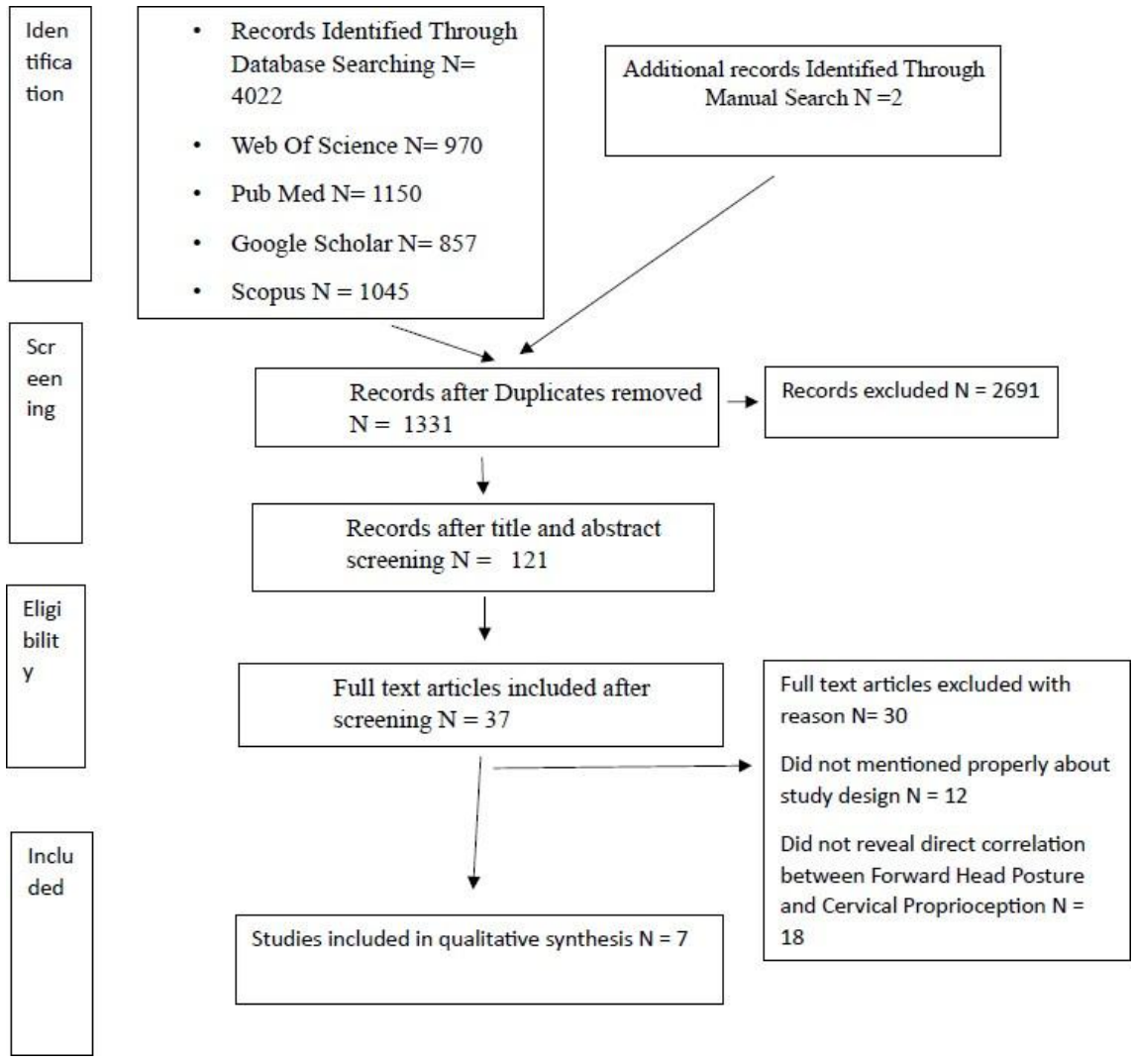


Fig 1. Prisma Chart.

### 3.2. Study characteristics

All studies included in this review were cross-sectional studies published between 2014-2020. Six studies recruited participants with habitual FHP and neutral head posture [10–15], while the one study instructed healthy participants to simulate FHP for 40 mins while using mobile phone[16]. Six studies with a

comparison group only reported correlation data between FHP and relevant topics[10,11,13–16]. In one study corelation is done only among subject with forward head posture, no comparator group was present[12] .The overview of the studies and the retrieved data are presented in Tables 2.
Attached Excel sheet.

**3.3. Quality assessment**

Results of the quality assessment using the JBI Critical Appraisal Checklist for Cross-Sectional Studies are presented in Table 3. The inter-reviewer agreement for quality assessment was 91.63 %. Of the all studies included, All the studies received affirmative scores over 80 % [10–16]. The second criterion of the JBI checklist was the frequently missed component, particularly in locations and time periods of the study setting[10,12,14] . The fifth and sixth criteria, involving confounders identification and strategies, were not applicable in three studies[10,12]. One study did not report the demographic characteristics of participants [14]. Additionally, all the studies have performed appropriate statistical analysis tool according to the aims and objectives of the study [12-18].

| | | Criteria for sample selection | descriptions of subjects and setting | Exposure measurement methods | Measurement of the condition | Confounder identification, | Strategies for confounder control | Outcome measurement methods | Statistical analysis. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Studies | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Total | Percentage |
| 1 | Sun-Young Ha | Y | N | Y | Y | NA | NA | Y | Y | 5 | 83.33 |
| 2 | Khan et al. | Y | Y | Y | Y | Y | Y | Y | Y | 8 | 100 |
| 3 | Lee et al. | Y | N | Y | Y | NA | NA | Y | Y | 5 | 83.17 |
| 4 | Yong et al. | Y | N | Y | Y | NA | NA | Y | Y | 5 | 83.17 |
| 5 | Moustafa et al. | Y | Y | Y | Y | Y | Y | Y | Y | 8 | 100 |
| 6 | Ravi Shankar Reddy | Y | Y | Y | Y | Y | Y | Y | Y | 8 | 100 |
| 7 | Elaheh Sajjadi | Y | N | Y | Y | Y | Y | Y | Y | 7 | 87.5 |

Table 3: Quality assessment of the included studies

### 3.4. FHP assessment

To assess FHP, all research used reliable and objective techniques (Tables 2 and 3). All studies used the craniovertebral angle (CVA) to quantify FHP, although with varying diagnostic criteria: (1) <53 degrees for two studies [13,15,16]; (2) <50 degrees for one study [12,18]; and (3) <49 degrees for three studies [14]. Overall, there appeared to be no consensus or defined standards regarding FHP assessment, however CVA was the most common measure employed in the research, and photogrammetry is the most often used technology for measuring CVA.

### 3.5 Association of FHP and Cervical Proprioception

The finding of Seven studies demonstrated a consensus that FHP was significantly associated with head position sense error [12-18]. Results of study done by Sung HA stated that of change (Pre- post) in the cervical joint position sensing did show a significant difference between the two groups (P<0.05). also subjects with induced forward head posture did not show significant changes in deep neck flexor muscles, static balance, and vestibular function [18]. Khan et al.[15] reported statistically significant differences in head position sense error in six motion directions between FHP and control groups, subjects with forward head posture showed increased activation of Upper trapezius and Sternocleidomastoid muscle.Moustafa et al. [13] compared repositioning errors in right and left rotation between the FHP and control groups, and also revealed a significant negative correlation between CVA and horizontal head rotation along with affected sensorimotor control and abnormal autonomic nervous control. Lee et al. [12], Young et al [12], Ravi Shankar Reddy [13] et al showed in results that there is significant negative corelation between Craniovertebral angle and cervical range of motion of all the directions in subjects with forward head posture. As per the results of Elaheh Sajjadi, both groups didn't show significant difference in values of absolute and constant errors whereas variable errors are significantly high in subjects with forward head posture (p<0.05)[16]. The measurement processes and metrics of the repositioning error varied across these studies, although all seven studies employed the head repositioning accuracy test.

| | Studies | Participants | Recruitment criteria | FHP measurement | | | Outcome measures | Statistical tests | Main outcomes | Conclusions |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Method | Position | Results | | | | |
| 1 | Sun-Young Ha | N = 22 Experimental group N=11 Variable Experimental group (n=11) Height (cm) 171.91±7.98 Weight (kg) 66.91±12.96 Age (yr) 21.82±1.78 Sex Male 7, Female 4 Control group (n=11)Height (cm) 167.18±4.92 Weight (kg) 61.09±8.73 Age (yr) 21.82±1.78 21.36±1.43 Sex Male 7, 5 Femal 4,6 | I: a) no visual impairment, (b) no musculoskeletal disease, (c) no arthritis or other inflammatory disease, and (d) no neck pain. E: (a) those who had trauma or surgery within the past 6 months, and (b) those who had vestibular or neurological disorders | CVA by photo (<49 degrees) for experimental group & (>50 degree ) for control group | Sitting | N/A | Area of the longus colli and longus capitis muscles : ultrasonongraphy Cervi-cal joint position sense : HRA test Static balance : Romberg test , Vestibular function : subjective visual vertical test, and subjective visual horizontal test | Independent t test | •Position sense error values for all six directions were greater in FHP (P<0.05), including flexion, extension, right rotation, left rotation, right side flexion and left side flexion | According to the results of this study, proprioception was significantly different when watching the smartphone for 40 min with induced FHP, but deep neck flexor muscles, static balance, and vestibular function were not significantly different. |
| 2 | Khan et al. | N=44 •Experimental group: N=22 Age=25.7±2.59 years Height=164 ±6.04 cm Weight=64.9 ±14.8 kg BMI=23.9±4.99 kg/m2 •Control group: N=22 Age=24.3±2.19 years Height=160.2 ±6.80 cm Weight=62.1 ±1.32 kg BMI=24.1±3.99 kg/m2 | I: no symptoms of neck pain E: history of traumatic neck injuries, inflammatory joint disease, cervical spine infection, severe osteoporosis, cervical spine disc protrusion, foramen nerve blockage, cervical spine fracture or dislocation, cervical surgery, severe migraine, vestibular disorders, or vertebrobasilar insufficiency | CVA by photo (≤53 degrees) | Standing | •Experimental group: 50.0 ±1.77 degrees • Control group: 67.4±7.89 degrees | •EMG: UT and SCM muscles •Proprioception: HRA test (cervical position sense error value; sitting; full ROM) | Independent ttest, Pearson's correlation coefficient | •Position sense error values for all six directions were greater in FHP (P<0.05), including flexion, extension, right rotation, left rotation, right side flexion and left side flexion •EMG activity of UT and SCM muscles were raised (P<0.05) at rest and during activity | Cervicocephalic kinaesthesia and activation patterns of the neck muscles may be significantly altered in individuals with FHP. Also, cervicocephalic kinaesthesia is significantly associated with the severity of FHP. |
| 3 | Lee et al. | N=39 •Experimental group: N=19 (M 7/F 12) Age=22.2±1.9 years Height=166.0 ±7.4 cm Weight=63.8 ±12.3 kg •Control group: N=20 (M 12/F 8) Age=22.7±2.1 years | I: no history of neuromuscular disorder, fracture, or moderate or severe scoliosis | CVA by photo (<53 degrees) | N/A | N/A | •Proprioception: HRA test (cervical position sense error value; full ROM) | independent ttest, Pearson correlation coefficients | •Position sense error values for all four directions were greater in FHP (P<0.05), including flexion, extension, right rotation, and left rotation •Inverse correlation between FHP and error values of position | FHP was associated with reduced proprioception. Also, proprioception worsened as FHP became more severe. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | Yong et al. | N= 72 (M 35/F 37) Age=22.26±2.10 years Height=167.98 ±11.89 cm Weight=62.56 ±11.89 kg | I: no history of fracture, neuromuscular disorder, or pain in the cervical region | CVA by photo ( No range mentioned) | Standing | 53.70±5.05 degrees | •Proprioception: joint position sense of cervical spine by a dual digital inclinometer (standing; | Spearman's correlation coefficient | •Negative correlation between CVA and position sense error for flexion (P<0.05) and extension | The current study concluded that FHP is correlated with greater repositioning error than a more upright posture. |
| 5 | Moustafa et al. (2020) | N=160 (sex-, age- and BMImatched) •Experimental group: N=80 •Control group: N=80 (M 50/F 30) Age: 20-25 years (n=30), 25-30 years (n=40), 30-35 years (n=10) BMI: <25 kg/m2 (n=20), 25-30 kg/m2 (n=51), >30 kg/m2 (n=9) Smoking | I: Significant anterior head translation as measured by the CVA E: (1) Systemic pathology, including any inflammatory joint disease; (2) prior history of apparent injury or surgery relating to musculoskeletal system or disorder connected to spine and extremities; (3) musculoskeletal pain in previous three months. | CVA (<50 degrees) | N/A | N/A | •Dynamic balance: Biodex balance system SD (level 4) •Proprioception: HRA test (cervical joint position sense testing by CROM device; sitting; 30• rotation) •Head and eye movement control: SPNT by electrooculography •Sympathetic skin response: surface EMG | Student's t-test, Pearson's correlation | Sensorimotor variables (P<0.05) •SPNT •DSI •Repositioning error in right and left rotation Neurophysiological variables •SSR amplitude (P<0.05) •SSR latency (P>0.05) Correlations in both FHP and control groups (P<0.05) •SSR amplitude •SSR Latency •SPNT | Forward Head Posture is associated with abnormal cervical proprioception, sensorimotor control and abnormal automotic nervous control. |
| 6 | Ravi Shankar Red | N = 84, Healthy group (n=40) Age (Yrs.) 33.20 ± 6.99, Height (cm) 172.27 ± 8.45,Weight (kg) 66.02 ± 8.95, BMI (kg/m2) 22.33 ± 3.18, FHP group (n=44) Age (Yrs.) 34.95 ± 6.68, Height (cm) 173.77 ± 11.69, Weight (kg) 66.36 ± 8.17,BMI (kg/m2) 22.14 ± 3.19 | I: Eighty-four dentist were recruited and divided into two groups based on their craniovertebral (CV) angles. With the CV angle less than 49°: FHP group (n=44) and the angle more than 49°: control group (n=40). E: fractures, neck pain or upper quarter pain or any | CVA by photogrammetry CVA <49 | Standing | Healthy group (n=40) C-V angle (°) 54.10 ± 1.70, FHP group (n=44), C-V angle (°) 44.53 ± 2.19 | •Proprioception: joint position sense of cervical spine By Head Target Position (sitting by Using CROM) | Independent sample t-tests- differences in JPE between subjects with and without FHP. The correlation between FHP and cervical JPE- Pearson correlation coefficient (r). | •Position sense error values for all four directions were greater in FHP (P<0.001), including flexion, extension, right rotation, and left rotation •Inverse correlation between FHP and error values of position sense in | This study results established that Dentist with FHP demonstrate significant impairment in cervical proprioception in four direction. |
| 7 | Elaheh Sajjadi (20 | N = 37, Normal Head posture group N= 17, Age (years) 23.93 (2.68), Height (meters) 1.72 (9.50), Weight (kg) 63.70 (11.54), BMI (kg/m2) 21.22 (2.00). Forward Head Posture group (n=20), Age (years) 23.50 (3.26), Height (meters) 1.66 (11.13), Weight (kg) 61.97 (13.13). BMI (kg/m2) | I: Healthy individuals E:chronic and acute neck pain, headache, vertigo, history of trauma to the neck, neck vertebra fracture, history of surgery in the cervical region and cardiac and neurological disorders | CVA by photogrammetry CVA <49 | Standing | Normal Head posture group C-H angle (degree) 54.04 (2.37), Forward head posture C-H angle (degree) 44.65 (3.37) | •Proprioception: joint : Cervicocephalic relocation test (CRT) to Neutral head position (NHP) | Independent sample t-tests- differences in JPE between subjects with and without FHP at (P<0.005) | •Position sense error values for all four directions were greater in FHP (P<0.005), including flexion, extension, right rotation, and left rotation | FHP subjects is that FHP may lead to the use of different motor synergy strategies when trying to relocate the head to neutral position and this can lead to a higher variability in responses and therefore a higher VE error |

Table 4: Details of Studies analyzed

## DISCUSSION

Aim of this systematic review was to find out a relationship between FHP and Cervical joint position sense in patients with or without neck pain. Consistent evidence supported that people with FHP had significant alterations in cervical joint position sense [12-17]. Very less evidence existed to support a correlation of FHP and cervical joint position sense in patients with neck pain.

### 4.1 Relationship between Forward Head Posture and Cervical Joint Position Sense

One of the primary findings of the current study demonstrated that cervical proprioception was significantly affected in individuals with FHP compared to normal head posture individuals [12,13,16,17]. The impaired proprioception is linked to muscle spindle function as a length sensor [19]. Weon et al. [1] stated that FHP causes prolonged cervical spine loading, which changes the length-tension relationship of the neck's anterior and posterior muscles, capsuloligamentous structures, and mechanoreceptors. This, effectively affects the activity of muscle spindles which are essential for maintaining head position sense [20].People with FHP have been found to have more muscle fatigue and weakness in both the deep flexor and extensor muscles than people with normal head posture, according to research by Arzoo Khan

et al. on the EMG activity of the deep cervical flexor muscles in subjects with forward head posture strength of deep cervical flexors is reduced [17,21]. Therefore, a change in the length-tension relationship, a loss in muscular strength, or an increase in muscle fatigue may modify the way sensory receptors fire, which in turn may affect afferent inputs that influence proprioceptors.
The study by Mustaffa et al. found that sensorimotor and neurophysiological outcomes are changing in patients with forward head posture due to changed sagittal alignment. Through a modified afferent input from altered cervical spine kinematics and altered soft tissue stresses, their investigation demonstrated that altered sagittal cervical spine alignment may potentially result in altered sensorimotor integration [22]. This study further clarified how the Lordotic position affects the sympathetic nervous system because the brainstem is located near to the neck area. Increased cervical lordosis may have a negative impact on brainstem tension as well as strain on cranial nerves 5–12, particularly cranial nerve 10, which alters the sympathetic response of the skin [23]
Due to extremely variable reactions, people with FHP may have used variable motor synergy methods to move their heads to a neutral position, which may have contributed to the greater error values found in this study [24].

**4.2 Induced Forward Head Posture and Cervical Joint Position Sense**

Sun Hung Ha's study involved putting normal people in a forward head posture and having them watch mobile phones for forty minutes. The cervical proprioception and the thickness of the longus colli and longus capitis were then measured. According to the study's findings, proprioception changed considerably after 40 minutes of smartphone use with generated FHP, while vestibular function, deep neck flexor muscles, and static balance did not [18]. The two groups' areas at rest and throughout the cranio-cervical flexion test were identical. This outcome results from the participants' brief maintenance of FHP and the inability of short-term tension changes to impact the deep neck flexor muscles [25]
These findings may be explained by the fact that the FHP-induced alterations in neck muscle length have a detrimental impact on proprioceptive muscle spindle activity, which in turn reduces joint position sensing [18].

**4.3 Relationship between Forward Head Posture and Cervical Joint Position Sense in subjects with neck pain**

This study attempted to examine the connection between these two factors in neck pain patients. Prior research indicates that individuals with persistent neck discomfort exhibit decreased cervical proprioception [5]. Neck pain itself may disrupt afferent signals from the neck's proprioceptors, resulting in inaccurate proprioceptive information, according to a narrative review by Peng B et al. Additionally, the incorrect proprioceptive input may cause the reflex activation of the neck muscles to increase and last longer, which may eventually result in neck pain, creating a vicious cycle [5]. Additionally, research has demonstrated a strong link between forward head posture and neck pain, particularly in the senior population. But unfortunately, we couldn't find any study directly stating correlation of Forward head posture and cervical joint position sense in subjects with neck pain.

**4.4. Diagnostic criteria for FHP**

There doesn't seem to be a consensus on FHP diagnostic criteria or a consistent approach to FHP assessment. The most often used technique in the included research is CVA by photogrammetry, which has strong discrimination and great intra- and inter-rater reliability [26]. Accurate degrees of FHP can be obtained by combining a lateral photo with software analysis. Whether or not participants with FHP self-reported neck pain determined the majority of the cut-off points. The diagnosis of FHP based solely on subjective pain, without taking into account other FHP-related abnormalities, seems arbitrary. Without a doubt, the absence of a single, accepted standard is detrimental to the diagnosis and management of FHP. Additionally, a diagnostic standard for FHP that takes into account particular functions (such gait and postural control) might be helpful to clinical screening and precaution.

## CONCLUSION

This systematic review found consistent evidence supporting reductions in cervical joint position sense in all the directions in subjects with forward head posture without neck pain.

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