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OPEN PEER REVIEW

Evaluating the Stability Limits Between Individuals with Mild and Moderate-to-Severe Grades of Forward Head Posture

Zahra Heidary, Nahid Pirayeh, Mohammad Mehravar, Mohammad Jafar Shaterzadeh Yazdi

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About this report

This open peer review (OPR) report shows the public comments made on this article during peer review, by the reviewers, the associate editor and the editor-in-chief, for every revision round, together with the authors' replies. Comments appear only with the consent of the people who wrote them. Reviewers who chose to sign their report are named; the others are shown as "Referee". Comments are edited for language only, and confidential remarks to the editors are not included.

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1 Original submission

3 comments · 14 Feb 2024 – 24 Feb 2024

Referee 1 Reviewer

MAJOR REVISION 14 Feb 2024

major revision

Associate Editor

MAJOR REVISION 19 Feb 2024

Based on the reviewers' comments on your article, the article needs major revision.

Editor-in-Chief

MAJOR REVISION 24 Feb 2024

Dear Authors
According to the reviewers' and associate editor's comments, your article requires major revision. When revising your manuscript, please consider all issues mentioned in the reviewers' comments carefully: please outline every change made in response to their comments and submit the required files.

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Revision 1

AUTHORS' RESPONSE TO REVIEWERS

Authors' reply to reviewers

The next pages contain the authors' point-by-point reply to the comments of this revision round, as submitted with the revised manuscript. It is published as the authors wrote it.

Dear Editor,

Thank you for sending us the constructive comments of the reviewers on our manuscript. Their criticisms were most helpful in revising the manuscript, which we believe has been much improved as a result. The changes that we made are highlighted in the text and our detailed responses are described on a point-by-point basis in the enclosed “response to the reviewers”.
All authors have contributed to the paper as submitted and are in agreement with its contents, which have neither been published previously, nor are under consideration for publication elsewhere. We are not aware of any conflict of interest that may have affected the outcomes of our study.

We are looking forward to hearing from you in due course.

Reviewer #1:

This manuscript provides valuable original research findings regarding postural control deficits in varying severities of forward head posture. The manuscript at this stage requires improvements. Below are suggestions with page and line indications:

Response

We appreciate the reviewer's comments. Therefore, we considered all the comments, point to point, in our manuscript as follows.

Comment# 1:

Line 146 & 147: In statistical analysis, When you use multiple T-tests it is necessary to use some correction e.g. Bonferonni correction for multiple comparisons. Also, I would strongly recommend using Effect size (ES) statistics for practical significance. Alternatively, you can use another proper statistical analysis such as MANOVA. Then mark the significant p-values in the table with a sign. Furthermore, review the discussion with the results of the new analysis.

Response

Thanks for your invaluable comment. Based on the constructive comment of the reviewer, an analysis of ANOVA was performed and Tables 2 and 3 were changed. Also, these sentences were added to the statistical analysis as follows:

Furthermore, for each LOS variable, we performed a separate 2 ×5 mixed model analysis of variance (ANOVA). The between-group factor was group (mild FHP, moderate-to-severe FHP) and the within-group factors were direction of the LOS (Forward, Backward, Right, Left, and Overall). If there was a significant interaction of group-by-directions of the LOS variables, a comparison between groups was performed using independent-sample t-tests.

Furthermore, these sentences were added to the results section as follows:

The results of ANOVA showed that the interaction of group by directions of the LOS variables was significant for RCT (F=11.29, P< .001), MVL (F=9.14, P< .001), EPE (F=11.14, P< .001), MXE (F=10.27, P< .001), and DCL (F=12.95, P< .001). A summary of ANOVA results is shown in Table 2. The results of the LOS variables in different directions between the two groups revealed that there was a significant difference between the mild and moderate-to-severe FHP groups in the LOS variables in directions of forward and backward (P<.05) while no significant difference between the two groups was observed in the LOS variables in directions of right, left, and overall (P>.05). In other words, the group with moderate-to-severe FHP compared to the group of mild FHP, had longer RCT, lower MVL, shorter distance traveled in the first attempt to reach the target and shorter MXE, and less DCL in order to reach the target in both anterior and posterior directions. The results of the LOS variables in different directions between the mild and moderate-to-severe FHP groups are reported in Table 3.

Comment# 2:

Line 179: What do you mean by forward posture? Do you mean the anterior shift of the center of gravity? Please review.

Response

Thanks for your constructive comment. This sentence was changed in the revised manuscript as follows:

Also, due to the anterior shift of the center of gravity in people with FHP compared to the normal posture, more tension occurs in extension muscles in the direction of the head, resulting in a reduction of ankle plantarflexion range of motion (1, 2).

Comment# 3:

Line 180, 181: Please explain clearly how the anterior shift of CoM causes stretch. Stretch which muscles (dorsiflexors and plantar flexors)? In which direction is the limitation of movement in the joints?

Response

Thanks for your constructive comment.

The myofascial network is a continuous network, and according to Myers' theory, among the 11 paths of myofascial lines, the dorsal superficial line extends from the gastrocnemius to the hamstring tendon, the ischial tuberosity, sacrotuberous ligament, thoracolumbar fascia, erector spine, iliocostalis, and frontal muscles (3). As the dorsal superficial line, transmits tension from the back or gastrocnemius to other parts, therefore in individuals with forward head posture due to tension of extension muscles in the direction of the head, results in a reduction of ankle plantarflexion range of motion. In other words, forward projection of the head results in the backward pull of muscles by the fascia, limiting normal ankle plantarflexion range of motion (1, 2).

Based on the constructive comment of the reviewer, these sentences were changed in the revised manuscript as follows:

As the superficial back line, transmits tension from the back or gastrocnemius to other parts, therefore, due to the anterior shift of the center of gravity in people with FHP compared to the normal posture, more tension occurs in extension muscles in the direction of the head, resulting in a reduction of ankle plantarflexion range of motion (1, 2).

Comment# 4:

Line 317 & 318: Please insert range or confidence intervals for the means.

Response

Thanks for your invaluable comment. The 95% confidence interval for the means in the two groups of mild and moderate-to-severe FHP was inserted in Table 3.

Comment# 5:

"Please consider including figures that illustrate all described procedures and provide a detailed description of each step. This will help readers to better understand the process."

Response

Thanks for alerting me with this review. Based on the constructive comment of the reviewer, Figures 1 and 2 were added.

Reviewer #2:

Major revision

Response

We appreciate the reviewer’s comments. Therefore, we considered all the comments, point to point, in our manuscript as follows.

Comment# 1:

Please summarize this section.

Response

Thanks for your constructive comment. Based on the constructive comment of the reviewer, the introduction of the abstract was summarized as follows: Forward head posture (FHP) leads to the anterior excursion of the center of gravity, which can affect a person's standing balance. Evaluating the balance in different degrees of severity of FHP can help to design and plan appropriate balance exercises for people with FHP. Therefore, this study aimed to evaluate the changes in the LOS in people with mild and moderate-to-severe grades of FHP.

Comment# 2:

There is no need to define the device characteristic in the abstract.

Response

Thanks for alerting me with this review. Based on the constructive comment of the reviewer, this sentence was removed from the abstract introduction.

Comment# 3:

please delete the two following sentences. Extra information about statistics is not needed.

Response

Thanks for your constructive comment. Based on the constructive comment of the reviewer, these sentences were removed from the methods section.

Comment# 4:

keywords are not present in the MeSH database. Please revise it.

Response

Thanks for your invaluable comment. Based on the constructive comment of the reviewer, the keywords were changed as follows:

Posture; Balance; Severity, Evaluation

Comment# 5:

What is the difference between stability and balance and postural stability? Why the balance and limits of stability were chosen as keywords?

Response

Thanks for your invaluable comment.

Postural control and balance are closely related but distinct concepts. Postural control refers to the ability to maintain stability and control body position during various tasks, including voluntary movements. It involves the integration of multisensory inputs and the coordination of different body parts and senses (4). On the other hand, balance refers to the ability to resist or control internal and external perturbations to keep the body segments oriented in three-dimensional space without falling. In other words, balance is ability to keep center of mass within the limits of base support, whether this is static or dynamic. It encompasses both postural equilibrium (stability) and postural orientation. While postural control focuses on the mechanisms and processes involved in maintaining stability, balance encompasses a broader scope, including the ability to initiate, inhibit, and adapt to various types of

motion (4). On the other hand, Stability refers to ability to control body during movement. In other words, it is ability to control forces, which might be unbalanced, in order to remain balanced. The Limits of Stability (LOS) is a commonly utilized protocol for evaluating balance during dynamic tasks. It measures an individual’s capability to intentionally shift their center of gravity to their limits of stability without compromising balance. This protocol offers valuable insight into an individual’s voluntary motor control (4).

Based on the constructive comment of the reviewer, the keywords were presented based on the MeSH database, and the word limit of stability was deleted.

Comment# 6:

Please demonstrate the superiority of the outcomes extracted from CDP compared to the other indices's like Biodex balance system or other postural stability assessment tools here. Why should one use this device to assess the postural stability? to explore what aspect which is a gap ?knknowledge

Response

Thanks for your invaluable comment. Based on the constructive comment of the reviewer, these sentences were added to the introduction section as follows:

Presently, computerized dynamic posturography (CDP) represents the gold standard for the assessment of balance and postural control (5). Also, given moderate to high test-retest reliability (intraclass correlation coefficient = 0.69 to 0.96) for the LOS measures extracted from CDP (6, 7), it appears that the CDP provides more assessment information about LOS than other tools assessing LOS.

Comment# 7:

What are the results?

Response:

Thanks for alerting me with this review. Based on the constructive comment of the reviewer, this sentence was added to the introduction section as follows:

Although previous studies have revealed that there is reduced LOS in individuals with FHP compared to the control group (8-10), there was no study that evaluated LOS between individuals with mild and moderate-to-severe grades of FHP.

Comment# 8:

Why the severity of FHP is important? What is the proposed relationship between FHP severity and postural stability?

Response:

Thanks for your invaluable comment. Based on the constructive comment of the reviewer, these sentences were added to the introduction section as follows:

Understanding the differences in balance impairment between two groups of mild and moderate-to-severe FHP can help to identify individuals who are at risk of developing balance impairment and prevent this impairment in these individuals by focusing on early and appropriate treatment. In this way, individuals with moderate-to-severe FHP could have an appropriate treatment, and those with mild FHP could be prevented from balance disorder.

A systematic review conducted by Lin et al (2022) showed that current evidence supports an association between FHP and a detrimental alteration in the LOS (11). However, there was no study determined the relationship between FHP severity and postural stability. Therefore, it is recommended future research be designed to assess the relationship between FHP and balance measures.

Based on the constructive comment of the reviewer, these sentences were added to the limitations section.

Comment# 9:

What is the type of study?

Response

Thanks for your invaluable comment. This study was a cross-sectional observational research design study.

Based on the constructive comment of the reviewer, this sentence was added to the methods section.

Comment# 10:

How the sample size was estimated?

Response

Thanks for your invaluable comment. Based on the constructive comment of the reviewer, the calculation of sample size was added to the methods section as follows:

The sample size for this study was calculated using G power software and considering the Type I error (α= 0.05), and Type II error (β= 0.20), the power of the test = 80%, and the confidence interval= 95% to detect a group difference.

Comment# 11:

Having no pain in how much time?

Response:

Thanks for alerting me with this review. Based on the constructive comment of the reviewer, the inclusion criteria were changed as follows:

The inclusion criteria of the study were age between 17-45 years, suffering from FHP, without a history of neck pain or neck injury in the past 6 months.

Comment# 12:

Were other neurological conditions affecting balance like M.S considered in exclusion criteria?

Response:

Thanks for your invaluable comment.

We excluded neurological and neuromuscular disorders that affected balance.

Based on the constructive comment of the reviewer, the neurological and neuromuscular disorder was added to the exclusion criteria as follows:
Individuals who had a history of fracture or surgery in the neck area (10, 12), vision problems not corrected with glasses (13), neurological and neuromuscular disorders, inflammatory diseases, rheumatoid arthritis and congenital anomalies (14), moderate and severe scoliosis, severe kyphosis of thoracic or breathing problems (12, 15, 16), headache or dizziness, vestibular system disorder (13, 17), lower limb injuries (15, 16), acute, intermittent or radiating neck pain (13, 17), or drug or alcohol use in the previous 24 hours (17) were excluded from the study.

Comment# 13:

What is about the physiotherapy plan in the period of the research for FHP patients who were referred to the PT centers?

Response:

Thanks for your invaluable comment.
Since the people participating in our study were evaluated only once, their evaluation was before the start of their physiotherapy intervention so that it does not interfere with the results of our evaluation.

Comment# 14:

What are about the reliability of the parameters?
Thanks for your constructive comment.
Previous studies reported moderate to high test-retest reliability (intraclass correlation coefficient = 0.96 to 0.69) for the LOS measures extracted with the NeuroCom device (6, 7).
Based on the constructive comment of the reviewer, this sentence was added to the introduction section.

Comment# 15:

Please add photo about the procedures.

Response:

Thanks for alerting me with this review. Based on the constructive comment of the reviewer, Figures 1 and 2 were added.

Comment# 16:

Did you assess any relationship between limits of stability and FHP severity? If you did not, the title should revise.

Response

Thanks for your invaluable comment.

In this study, it was important for us to compare the limit of stability test between two groups with mild and moderate-to-severe degrees of FHP. In other words, we wanted to investigate the difference in the LOS between two groups with different intensities of FHP. Therefore, we did not assess the relationship between limits of stability and FHP severity.

As mentioned in the title of the manuscript, we evaluated the limit of stability between individuals with mild and moderate-to-severe FHP.

Comment# 17:

You did not compare the limits of stability between healthy and FHP people. How can you interpret the effect of FHP on the stability limits?

Response:

Thanks for your invaluable comment.

In this study, we investigated the difference in the LOS between two groups with different intensities of FHP. Since no study had evaluated the LOS between individuals with mild and moderate-to-severe degrees of FHP, we inevitably compared the results of our study with those of previous studies (1, 2, 18) that examined the LOS in individuals with FHP compared to the normal group. The results of these studies showed that individuals with FHP have decreased balancing ability as compared with the normal head posture group.

Comment# 18:

Why you did not observe the changes in stability limits on other directions and also overall indices's? Please discuss about it.

Response:

Thanks for your invaluable comment. Based on the constructive comment of the reviewer, these sentences were added to the discussion section as follows:

Our study results did not show a significant difference in these variables of the LOS test in other directions between the two groups of mild and moderate-to-severe FHP. Despite the exaggerated anterior location of COG with FHP, the absence of body asymmetry on the right and left sides contributes to maintaining the ability to control direction and movement in the other directions (2).

Comment#19:

I think one major limitation is the lack of a group with non-FHP people. Other limitation I thinks is a sample size.

Response:

Thanks for alerting me with this review. Based on the constructive comment of the reviewer, these sentences were added to the limitations:

Other limitations of our study were the lack of a group with non-FHP people and, the small sample size. Therefore, we recommend conducting further studies by increasing the sample size to evaluate the LOS between individuals with different severity of FHP compared to non-FHP individuals.

Comment# 20:

What is about the sensitivity and specificity of the craniovertebral angle with regard to FHP severity?

Response:

Thanks for your constructive comment.

According to Mostafaee et al’ study, CVA has good accuracy (AUC=0.88) in discriminating between two groups of individuals with mild and moderate-to-

severe FHP. Also, this angle has a sensitivity of 0.93 and a specificity of 0.62, thus it can be valuable in correctly identifying mild FHP and screening moderate and severe grades of FHP(19).

Comment# 21:

What is the relationship between these parameters and fall incident?

Response:

Thanks for your constructive comment.

There is limited evidence on fall incidence in people with FHP. For example, Imagama et al (2013) reported that a significant association exists between sagittal spinal alignment, postural control, and fall risks (20), and a radiographic study further demonstrates that alterations in sagittal cervical alignment are associated with decreased postural control (21). Of course, Limited evidence exists to support the increased fall incidence in older individuals with FHP. (22, 23)

Comment# 22:

Please define the statistically significant values in the table.

Please define the mean and SDs. in both tables.

Please correct the values.

Response:

Thanks for alerting me with this review. Based on the constructive comment of the reviewer, these corrections were made in Table 3.

Reviewer #3:

This is a well-written manuscript that only needs to undergo a few minor changes:

Response

We appreciate the reviewer’s comments. Therefore, we considered all the comments, point to point, in our manuscript as follows.

Comment# 1:

abstract:

please remove the sentences about the CDP in the introduction section and mention the importance of balance assessment in FHP.

Response

Thanks for your invaluable comment. Based on the constructive comment of the reviewer, these corrections were made.

Comment# 2:

introduction:

The authors conduct very relevant research, but fail to emphasize the relevance in their introduction specially the importance of CDP 's parameters. what was the novelty of your study except using the new tool?

Response

Thanks for alerting me with this review. Based on the constructive comment of the reviewer, these sentences were added to the introduction as follows:

Although previous studies have revealed that there is reduced LOS in individuals with FHP compared to the control group (8-10), there was no study that evaluated LOS between individuals with mild and moderate-to-severe grades of FHP.

In past studies, several laboratory tools such as the force plate and the Biodex Balance System have been used to evaluate balance in people with FHP (8-10, 16). Most of these studies have reported a reduced balance in people with FHP compared to otherwise normal people (8-10). However, there is an essential need to a reliable and accurate tool to best diagnose and classify balance impairments in these individuals. Presently, computerized dynamic posturography (CDP) represents the gold standard for the assessment of balance and postural control (5). Also, given moderate to high test-retest reliability (intraclass correlation coefficient = 0.96 to 0.69) for the LOS measures extracted from CDP (6, 7), it appears that the CDP provides more assessment information about LOS than other tools assessing LOS.

Comment# 3:

what was the type of your study?

Response

Thanks for your invaluable comment. This study was a cross-sectional observational research design study.

Based on the constructive comment of the reviewer, this sentence was added to the methods section.

Comment# 4:

please mention the scales in table 2. please report the 95% Confidence interval values in both groups.

please specify which parameters were difference between (P- values) group in table 2.

please design the tables according to the academic writing principles like remove the vertical lines and ...

Response

Thanks for your invaluable comment. Based on the constructive comment of the reviewer, these corrections were made in Table 3.

Comment# 5:

please clarify the relation between Myers' theory and FHP. please explain more.

Response

Thanks for alerting me with this review.

Myers summarized fascias connecting human body muscles into 11 major myofascial meridians. The superficial back line is one of these meridians. It connects the gastrocnemius to the hamstrings attached to the ischial tuberosity, the sacrotuberous ligament, thoracolumbar fascia, erector spinae, iliocostalis, epicranial, galea aponeurotica, and frontalis muscles to transmit tension from the head or gastrocnemius to other connected parts (3). Forward head posture results in eccentric contraction of the posterior cervical muscles which influence balance control by delivering tension to

plantarflexion of the ankle through integration with the effect of the fascia. Therefore, forward head posture can influence balance through continuous eccentric contraction of extension muscles in the neck, which is transmitted to the gastrocnemius through the myofascial meridian (24).

Based on the constructive comment of the reviewer, these sentences were added to the discussion section:
The myofascial network is a continuous network, and according to Myers' theory, among the 11 paths of myofascial lines, the superficial back line extends from the gastrocnemius to the hamstring tendon, the ischial tuberosity, sacrotuberous ligament, thoracolumbar fascia, erector spine, iliocostalis, and frontal muscles. Therefore, it can transfer tension from the head or gastrocnemius to other connected parts (3). Thus, in conditions of structural imbalance, such as the position of the head facing forward, where the center of gravity of the body is shifted from its normal position and moved to the front, more muscle activity is needed to achieve balance. In other words, forward head posture results in eccentric contraction of the posterior cervical muscles which influence balance control by delivering tension to plantarflexion of the ankle through integration with the effect of the fascia (24).

Comment# 6:
Did you use radiological examinations in your study as mentioned in the limitation section?
Response
Thanks for your invaluable comment.
We conducted physical and radiological examinations for excluding cervical disorders that may affect balancing ability.
Based on the constructive comment of the reviewer, this sentence was added to the limitations section as follows:

The main limitation of this study is that we did not use precise tests such as an MRI to exclude cervical disorders that may affect balancing ability. However, we only conducted physical and radiological examinations for this purpose. Therefore, the possible presence of musculoskeletal disorders cannot be definitely ruled out.

Comment# 7:

please mention the results of study as clinical as possible. what the clinical presentation of RCT and MVL during balance assessment process.

Response

Thanks for your invaluable comment. Based on the constructive comment of the reviewer, these sentences were added to conclusion as follows:

The moderate-to-severe FHP group had longer RCT and MVL and a lower percentage of movement in performing the LOS test compared with the group with mild FHP. In other words, the individuals with moderate-to-severe grades of FHP showed decreased balancing ability as compared to individuals with mild grades. A restricted LOS significantly influences the ability to react to perturbations in the balance control system. Therefore, it is necessary to design appropriate targeted interventions to prevent falls in individuals with FHP. Specifically, these individuals should receive balance exercises in dynamic situations.

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2 Revision 1

3 comments · 21 Apr 2024 – 24 Apr 2024

Referee 1 Reviewer

ACCEPT 21 Apr 2024

Hello dear editor.
All comments have been addressed, and I think the manuscript has been edited adequately. So I do not have any other comments.

Associate Editor

ACCEPT 23 Apr 2024

Based on the reviewers' comments, your article is acceptable.

Editor-in-Chief

ACCEPT 24 Apr 2024

Dear Authors
We are pleased to inform you that your article is accepted for publication in the MEJRHS. We hope to receive other qualified articles from your group.