Reviewer’s report

Title: Muscle activity and head kinematics in subjects with chronic neck pain; cervical motor dysfunction or simply low exertion motor output?

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Reviewer: Tina Juhl Juul

Reviewer’s report:

This is an interesting article, which investigates whether changes in movement irregularity found in patients with Whiplash Associated Disorders are associated with changes in movement displacement and velocity. Even through, the objective is highly relevant there are methodological challenges that need to be addressed before this article can be considered for publication. Please see specific comments below.

Major Compulsory Revisions

Overall:
The article needs to undergo a linguistic proofreading. For the majority of this article the written English affects the transparency as well as the reader-friendliness to such a degree that it hampers a clear structure. The results are of great importance to its field and it is truly frustrating to receive an otherwise interesting and important manuscript where basic elements such as lack of references and linguistic proofreading is an issue. One can only wonder why the quality of the written English has not been properly addressed, since e.g. the last author professor Nina Vøllestad has published articles for nearly three decades. Therefore, I strongly recommend a thorough reworking of this article before it is considered for publication.

I order to help the authors with the reworking process I have addressed grammatical and structural issues related to the background. However, I have NOT included a review of the remaining article. Once the reworking of the article has taken place, I will be more than happy to review the article again.

Background:
The background presents unfocused with a lack of a clear red line. Therefore,
please consider a major reworking. The article addressed an extremely important aspect in its field – both from a scientific and a clinical viewpoint. Unfortunately, the clinical perspective is confined to addressing clinical assessment tests.

Throughout the background statements such as “Subjects suffering from long term musculoskeletal neck pain after motor vehicle accidents (Whiplash associated disorders- WAD) may have pronounced disability that affect daily living”, “One of the most prominent clinical manifestations in subjects with long term WAD is cervical motor dysfunction, signified by altered neck muscle activation and motor output” (first paragraph) and “Such irregular movement patterns have been suggested to be a consequence of motor control disturbance in subjects with persistent WAD” (second paragraph) are provided. However, with no references presented. Following good reference practice state the reference for each specific statement. Therefore, please make sure that every time a statement is given, which is based upon the existing literature, please make sure it is followed by a reference(s).

"Subjects suffering from long term musculoskeletal neck pain after motor vehicle accidents (Whiplash Associated Disorders (WAD)) displace pronounced disabilities (such as…. please state examples), which have been proven to affect the patient’s everyday life (REFERENCE). One of the most prominent clinical manifestations in subjects with long term WAD is cervical motor dysfunction (REFERENCE), signified by altered neck muscle activation and motor output (REFERENCE). Cervical motor dysfunction is often assessed using performance measures (REFERENCE), which are directly or indirectly dependent on a peak volitional effort (REFERENCE), while tests resembling activities of daily living are scarce (REFERENCE). Peak performance measures (e.g. low load isometric endurance or maximum voluntary isometric contraction force) for neck- and shoulder girdle muscles are reduced in subjects with persistent WAD [1-7].”

“In line with these findings, the electromyographic (EMG) activity in several agonistic and antagonistic neck muscles are affected during moderate isometric contractions in WAD sufferers compared with controls [4, 8].” (First paragraph). Incorrect phrasing, please rephrase this sentence.

“Furthermore, studies examining dynamic movements show that kinematic variables such as peak acceleration and velocity are lower than in healthy subjects [9-11].” (first paragraph). This sentence is a continuation of the above mentioned line of reasoning. Therefore, it should not be separate from the paragraph.

“In addition, the regularity or smoothness of neck movements in subjects with long lasting neck pain are observed to be reduced as compared with healthy
controls [10, 14, 17, 18]. As compared with smooth movements which are characterized by approximately bell-shaped and unimodal velocity profiles [19], movements of reduced smoothness exhibit multi-peaked, irregular velocity profiles containing a series of accelerative and decelerative phases. Such irregular movement patterns have been suggested to be a consequence of motor control disturbance in subjects with persistent WAD” (second paragraph). Please rephrase this sentence. The grammar and linguistic syntactic structures are incorrect.

“In a previous study, the irregularity of movement were shown to be strongly related to both the movement velocity and displacement across a series of different head movements in healthy, pain free participants [20]. Since it is known that subjects with long lasting WAD perform both reduced movement velocity and reduced displacement as compared with controls, it raises the possibility that the reduced smoothness of movements observed in subjects with persistent WAD may simply be caused by altered movement velocity and displacement and not altered movement control strategies.” (Second paragraph).

Please rephrase this sentence. The grammar and linguistic syntactic structures are incorrect.

“In this study we compared head kinematics and muscle activation in relatively unconstrained neck movements at three different speeds in participants with—and without long lasting WAD. In addition comparisons were completed when taking both movement velocity and displacement into consideration.” (Third paragraph). In my opinion the purpose is not clearly stated. You state what you did, but not what was the purpose of this study. Please rewrite.

Level of interest: The article is important in its field.

Quality of written English: Unacceptable.

**Level of interest:** An article of importance in its field

**Quality of written English:** Not suitable for publication unless extensively edited

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

Declaration of competing interests:

‘I declare that I have no competing interests’.