Author’s response to reviews

Title: A biomechanical study of gait initiation in Down syndrome

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Author’s response to reviews:

Dear Prof. Jules Becher,

Thank you very much for the opportunity to submit the revised version of the manuscript “A biomechanical study of gait initiation in Down syndrome” to BMC Neurology. We have thoroughly revised and modified the document according to Editor’s comments.

Attached please find our point-to-point reply to the issues raised by the Editor.

Do not hesitate to contact us for any further question.

Sincerely

Carolina Corsi
Veronica Cimolin
Paolo Capodaglio
Claudia Condoluci
Manuela Galli
Editor's comments:

Technical Comments:

1. Please include, at minimum the names, institutions, countries and email addresses of all authors, and the full postal address of the submitting author in the Title page.

We added them accordingly

Editor Comments:

Based on the reviewers reports, there are 2 important issues to clarify:

1. There are no data about the cognitive level of the persons with Down syndrome, while the authors state in the discussion that this is an important factor.

We added the IQ data according to your comment and another reviewer’s comment.

2. There is no comparison with persons with a raised BMI, while this is important also according the authors. Some estimation of the influence of the raised BMI should be made in the discussion.

We agree with you and with your comment. We added in the Discussion section some comments about the role of high BMI on Gait Initiation performance.

I am sorry for the long time used for the review process, but the combination of Down syndrome and gait analysis made it difficult to find reviewers.

We understand the difficulty; we appreciate very much your message.

Reviewer reports:

Hans Ulrich Bucher (Reviewer 1):

This paper reports results of an investigation of gate initiation in 17 adults with Down syndrome compared with 19 healthy adults. Subjects with Down syndrome showed significantly higher duration and lower velocity of the center of mass during gait initiation, a higher medio-lateral
excursion during the shift towards the stance foot phase and a shorter displacement of the center of mass. With a literature research in MEDLINE and SCOPUS I was not able to find a similar study and therefore think these results are new.

The paper is well written and can be easily understood even by a non-specialist for gate-investigation as myself.

I have one concern which the authors addressed themselves in the discussion (page 17, lines 3-4). In fact body mass index (BMI) of subjects with Down syndrome is much higher than that of the controls. Ideally the control group should have the same BMI as the target group. This was attempted in a paper comparing children with Prader Willi Syndrome with "healthy" subjects with about the same BMI (Vismara L et al. Clinical implications of gait analysis in the rehabilitation of adult patients with "Prader-Willi" Syndrome: a cross-sectional comparative study ("Prader-Willi" Syndrome vs matched obese patients and healthy subjects) J Neuroeng Rehabil. 2007 May 10;4:14.

We totally agree with you. As no data of obese subjects are available, we included only normal weight participants as control group and we added more considerations about this limitation in the Discussion.

Specific comments:

Page 6, lines 16-18: these features are already described page 5, lines 12 ff.

We agree and we removed the repetition at page 6.

Page 7, lines 5ff: Sample size seems to fixed by chance or by availability. There is no power calculation based on a hypothesized difference.

We added the requested details in Statistical analysis section

Page 7, lines 7-9: Median and quartiles or range for age, height and BMI would be more appropriate.

We corrected the values accordingly

Page 7, lines 13-14: What does "absence of congenital disturbances" mean?
We corrected it

Page 8, lines 1-3: I guess the majority of the participants gave informed consent themselves. Therefore I would change the order: All participants were volunteers and gave written consent which was confirmed by parents if necessary.

We agree with your consideration and we modifies the order as suggested.

Page 9, line 21: The pattern for 1st max and for 2nd min can hardly be distinguished (perhaps because of poor print quality). See also figures 2 and 3.

We modified the Figure 1 adding the label for each point so to help in distinguishing the interest points.

Page 11, lines 24 ff: For statistical comparison multivariate analysis with BMI, sex and age as cofactors would be advisable.

We performed it according to a comment of another reviewer.

Page 12, lines 2ff: As the parameters are not normally distributed in all tables the first and third quartile should be given in number, not as ± which is commonly used for standard deviation. Example in Tab. 1: dAPA1 0.21 (0.11, 0.31) if parameter distribution is symmetrical.

We modified it and by convenience we insert the interquartile range.

Page 16, lines 18-21: I especially like this paragraph on possible usefulness for rehabilitation.

Thank you for the positive consideration

Talita Dias Silva, Ph.D. (Reviewer 2):

1- Abstract: I recommend using more Keywords, such as "Gait" and "Gait analysis" in order to increase visibility of the paper.
Background:

2- First paragraph (page 5, lines 9-11) - there is no reference cited for this statement.

We added reference accordingly.

3- Second paragraph (page 5, lines 16-18) - this is only repetition of the beginning of the paragraph, I would recommend taking this off.

We removed this part following your suggestion.

4- Second and third paragraph (page 6, lines 6 - 13) - once the subject of the paragraphs is the same, I would keep both as one paragraph.

We create a unique paragraph.

5- The background lacks a justification other than only lack of studies about gait initiation. I believe that something about how the results would benefit people with DS, or professionals from rehabilitation, would be a good justification.

We agree and we added some considerations about it.

6- I strongly recommend citing more papers throughout the paragraphs, since there are endpoints with no citations, it can be understood that these statements are from the author.

We added additional citations as requested.

Methods:

7- Subjects, Second paragraph (page 7, lines 11 - 19) - how the visual and auditory impairments were assessed.

The visual and auditory impairments were assessed with traditional vision and audiological test.

8- I think more data about characterization of the DSG would better for the reader and for results comprehension (QI for example).
We added this detail in the inclusion criteria of DS Group

9.

Results

10- CoM analysis (page 10) - legends should be done for all abbreviations.

We added it accordingly, both for CoP and for CoM analysis

11- I would recommend perform a correlation analysis (or Generalized Linear Model) in order to find out if the factors: age, QI, sex, height, weight, BMI etc would influence the results.

We performed it but no significant results were obtained. We added it in the manuscript.

Discussion

12- The authors discuss the data initially by the point of view of the cognitive impairment in people with DS, but it was not assessed initially. The same for the statement "In particular, the higher duration could be related to some features of DS individuals like reduced height, ligamentous laxity, hypotonia and short foot, which may alter the initiation of the task," that has no data about and is only speculation. I think the previous recommendation I've made (about correlation/regression) would help in these statements made in the first paragraphs of the discussion, but if you don't have this data, consider to talk only about motor impairments.

We followed your suggestion and we limited the discussion to the limitations in motor pattern.

13- Page 15, line 9: the authors state that the Body mass was higher in the DSG, but there was no statistical analysis that evidences it.

We added it at the beginning of the results section.

14- Page 16, lines 15 to 21: there is much speculation, with no references.

We added some references accordingly.
Andrea Bandini, Ph.D. (Reviewer 3):

In this paper, the authors characterized gait initiation (GI) in individuals with Down syndrome (DS) by using center of pressure (CoP) and center of mass (CoM) parameters and comparing them with a group of healthy control subjects. Overall, the manuscript is well structured and easy to read. However, I have major concerns regarding the actual impact that this work may have in the fields of biomechanics and physical therapy. This impact is relegated at the bottom of discussion with a couple of sentences (P16, L18-21). I would like the authors to elaborate a bit more on this, expanding the impact and future steps of this work. Also, there are some grammar mistakes that I reported below in the detailed list. I would recommend a proofreading by a native speaker of English anyway.

We followed your suggestion and we try to better elaborate it in the Discussion section.

We asked to a native speaker of English for the proofreading of the manuscript.

ALL SECTIONS:

- Avoid the use of "DS subjects" or "DS people". Replace with "individuals with DS"

We corrected it accordingly.

- Keep consistency in the use of acronyms throughout the paper (e.g., CoP or COP? CoM or COM?)

We modified according to your suggestion.

ABSTRACT:

- L7-8: Rephrase the first sentence of the "Methods" section: "17 individuals with DS (…age…) and 19 healthy subjects (..age…) were enrolled in the study."

We modified the sentence

- L20-22: Rephrase. "DS group also presented longer CoP excursion during the second anticipatory phase, whereas a shorter excursion was present during the first anticipatory and locomotor phases."

We followed your suggestion
- The Conclusions paragraph (L23 onwards) looks like a repetition of results and discussion. Add the impact of this work instead.

We modified the paragraph.

BACKGROUND:

- P5, L6: "main motor milestones"

We corrected it.

- P5, L9-11: Add references to this statement (which previous studies?)

We added the reference

- P5, L15: change to "… typical development. In addition, these individuals have "clumsy" movements and …"

We modified it

- P5, L18: "… allowing to achieve a greater balance overall." Greater than what? Than normal?

According to another reviewer, we removed the sentence.

- P5, L20: "… different balance control WITH respect to healthy subjects"

We added “with”

- P5, L22-23: rephrase "… found instabilities in both lateral and anterior-posterior directions."

We corrected it.

- P6, L9-10: "… and occurS prior to gross …."

We added "prior to"
We modified it.

- P7, L1-2: rephrase "… using parameters DERIVED FROM the …"

We modified it.

METHODS:

- P7, L8-10: Please, use lowercase "k" to indicate kilograms. "K" is the unit of temperature (Kelvin) according to the International System of Units.

We corrected it.

- P7, L12-15: Regarding the inclusion criteria: did the authors perform any cognitive assessment on the participants with DS?

They were selected according to IQ from low to medium. We added it in the inclusion criteria.

- P8, L7: "… includes an optoelectronic MOTION CAPTURE system …"

We modified accordingly.

- P8, L8: Disabbreviate the acronym "TVC" the first time it's introduced in the text.

We changed TVC with “cameras”

- P8, L22-23: "Acquisition of force platform …" I am not sure about the meaning of this sentence. Please rephrase it to make it clearer.

We followed your suggestion.

- P9, L1-2: Rephrase "6 GI trials were requested for each participant (i.e., three starting with the left foot and three with the right foot)"

We modified the sentence.
DATA ANALYSIS:
- P9, L5: the acronym APAs was already introduced. There is no need to redefine it again. (Same at P14, L16,17)
We removed them.

RESULTS:
- Tables 1 and 2: I wonder why the authors reported length and excursion measures in "mm/m" and "m/m". Since these measures were normalized by the subjects' height, these parameters should be adimensional. So, the authors can either convert the parameters (length and excursion) to the same unit of height, or report the height to the same unit of the parameters, and then perform the normalization. Either way, avoid the use of mm/m and m/m or justify the reasons why these units are used.
We followed your suggestion and we removed the unit of the parameters.

DISCUSSION AND CONCLUSION:
- P14, L17-18: rephrase "Our results demonstrated that DSG exhibited longer durations than CG during all phases"
We modified it accordingly.

- P15, L9: "people WITH DS"
We changed it.

- P16, L18-21: This part should be expanded, providing more details regarding the usefulness and impact of the results. Also, a few sentences on the impact of this work must be added in the conclusion.
We added it according to your comment in the first part of the letter.