Author's response to reviews

Title: Arm hand skilled performance in cerebral palsy: activity preferences and their movement components.

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Author's response to reviews: see over
We would like to thank the reviewers for their comments and suggestions. We have revised our manuscript based on these comments, and explained our changes in this document. The changes made in the manuscript are marked with yellow.

**Reviewer:** Maurizio Petrarca

**Concerning:**

1. The goal of this paper is not clearly addressed. The main aims are redefined in different paragraphs. Probably the reader could improve its understanding if the main aim was resumed as reported at page 15, as an attempt to identify “a set of standardized test situations for upper extremity skill research may be fine-tuned, relative to a specific research question”. Afterwards, the items listed at the beginning of the discussion paragraph, at page 12, could follow. But this also represent the main limits of this work. Why the main aim needs the definition of the three sub items: a) upper extremity-related ADL children with CP want to improve on, b) movement components constituting these activities, and c) the top-10 most preferred activities in three age groups? This is an assumption of the authors not a demonstrated consequence. The text needs a logical reorganization.

**Answer:**

We agree with the reviewer and have reformulated the last paragraph in the introduction section (page 5-6). The newly formulate text: ‘This study is not aimed at providing an ultimate set of standardized test situations. It rather provides the reader with useful information with which a set of standardized test situations for upper extremity skill research may be fine-tuned, relative to a specific research question. The aim of this study is to a) identify upper extremity related ADL children with CP want to improve on, b) determine the 10 most preferred goals of children with CP in three different age groups, and c) identify movement components of all goals identified’.

We have formulated the three sub items because we think the combination of information of all three items is necessary to provide the information needed to create/fine-tune a set of standardized test situations. We made changes regarding the logical reorganization and adjusted the flow chart to make the procedures more clear. See page 7-10.
2. The summary of the main aims in the abstract and at page 12 had to be clarified. While the aims defined in the point a) and b) are clear and clinically relevant the point c) sounds ambiguous. High level functional activities is the target of point c). It is interesting the attempt to define the different preferred activities at different age, but the limits of this attempt needs to be declared stronger. The goals change with the individuals development as consequences of social and biological elements that depends in this case not only by the individual attitude, but also by the specific social niche in which he lives and by the personal abilities as consequence of the early damage.

Answer:

We have adjusted the summary of the main aims in the abstract and in the discussion section to clarify the aims. We agree with the reviewer that the socio-economic status might influence the goal setting. It was not in the scope of the current paper to determine the effects of socio-economic background on the choice of the goals. We have added a description of the socio-economic background of the children on page 10 (results section). The following text is added to the manuscript: ‘The socio-economic background of the children included in this study did not differ from the general population.’

And we have added a paragraph to the consideration section in the discussion, to mention the effects of socio-economic background. The following text is added to the manuscript: ‘The choice of goals children wanted to improve on might have been influenced by the socio-economic background of the children and their family. It was not the scope of this paper to investigate this influence. And because the socio-economic background of the children included in this study did not differ from the general population, no large effects were expected.’

Concerning:

From the great variability of activities that children may want to improve and preferred activities, the selection of the item proposed in the paper seems more the results of the selection of the most repeated rather than the most preferred, a local mode with a not specified dispersion, that could differ in a different region.

Answer:

By giving a preference score we combined two elements: 1) the ranking of goal within an individual, i.e. the more important the goal is for the child, the higher the ranking and the higher the preference score; and 2) the number of time a goal is listed as important by children. We agree with the reviewer that the number of times a goal is repeated is included in this score, but in our opinion this also reflects the importance of a goal. If more children find a goal important, this must be reflected in the results.
We have added a sentence in the methods section (page 7) to further clarify the preference score more.

Concerning:

3. The most preferred goals seem summarized in similar way for the three age groups, the only difference is the leisure for younger and computer using for the older. Both activities mean ‘social activities’ that change their expression form with the age.

Answer:

On page 11 we have added a few sentences to explain that leisure activities are important in all age groups, but that the goals regarding leisure differ with age. The following text has been added to the manuscript: ‘Goals concerning leisure were present in all age groups, but the goals changed with age, i.e. from climbing and playing on the swings in the youngest group to activities with a ball in the age group 6-11 years and using the computer in the oldest age group.’

Minor Essential Revisions

Concerning:

1. Eating, dressing, self-care and computer using goals could be accomplished with a comment on the distinction between primary individual needs and social demands.

Answer:

On page 14, the distinction is made between primary individual needs and social demands. The following text is added to the manuscript: ‘It is possible to make a distinction between primary individual needs, including goals regarding dressing and eating, and social demands, including leisure activities. In all age groups, the top-10 goals consisted of both primary needs and social demands.’
Reviewer: Styliani Milioti

Major Compulsory Revisions

Concerning:

Overall: In my opinion the section “Procedure and data analysis” need rewriting.

Answer:

We have rewritten the section “Procedure and data analysis”. See the answers on the comments below for the detailed description of the changes.

Concerning:

1. In this section the “Identification of 10 most preferred goals” must be placed immediately after the “Identification of goals and preference scores” and before the “Inventory of movement components”. It will become easier for the reader to follow the procedure of the study.

Answer:

We have changed the order of the text. We have placed the section “Identification of 10 most preferred goals” after “Identification of goals and preference scores”, followed by the section “Inventory of movement components”. To make it more clear that the identification of the top-10 and the inventory of movement components are two separated parts we have referred to these section as in ‘study A’ and ‘study B’. This is explained in the text on page 8 of the manuscript and added in the flowchart. The following text is added to the manuscript: ‘After the identification of the goals, two studies were performed, i.e. study A to determine the 10 most preferred goals of children with CP in three different age groups and study B to identify movement components of all goals identified. Figure 1 depicts the process of i) goal identification, ii) inventory of most preferred goals and iii) inventory of movement components.’

Furthermore, the flow chart has moved to the beginning of the method section to clarify the procedures of this study.
Concerning:

2. In section “Inventory of movement components” it is not clear how many goals were analyzed, the final 10 or all 70? If the analysis was made for the 70 goals, which was the aim for it? In addition no data have been presented regarding these 70 goals neither any discussion about the results was made.

Answer:

The inventory of movement components was done for 70 goals. For two (additional) goals, the inventory of movement components was not performed since these goals were too vaguely described. The gross list of goals consists of 72 goals. In the previous version of the manuscript a small error was made, describing that the gross list consisted of 70 goals. In the current version, this has been corrected.

The text in the methods and results section has been extended to clarify that all 72 goals were analysed as too their kinematic components (page 9 and 12 respectively).

Furthermore, a paragraph has been added to the discussion section (page 17) to explain the reasons why all 70 goals were evaluated and not only the top-10. The following text has been added to the discussion section: ‘The inventory of movement components was not restricted to the top-10 most preferred goals but to all goals identified, because it is highly likely that not all movement components will be covered by the top-10 most preferred goals.’

Regarding the data of the analysis of the 70 goals, additional file 2 is added to the manuscript containing these data.

Concerning:

3. In section “Inventory of movement components” there is no information concerning the guidelines that the experts follow for the analysis of the goals and also the specific criteria they have used in order to identify the “most prominent component” for each goal.

Answer:

For the inventory of movement components, the definitions of the movement components were used as guideline to decide whether the movement component is present in the goal or not, in combination with the agreements about the starting position and the agreement to use the execution of the goal by a healthy subject as reference. We have changed the text at page 10 to explain this better.
Concerning:

4. In section “Inventory of movement components” there is no information concerning the criteria that the experts follow in order to clarify “the leading arm/hand” and the “assisting arm-hand”. It is necessary to become clear what the authors mean about leading and assisting arm-hand for example concerning the goals: “Catch a bal”, Put on socks, “Dress a doll” and others.

Answer:

On page 9 it is elaborated what we mean with the leading arm-hand and the assisting arm-hand. The following text has been added to the manuscript: ‘The leading arm-hand (i.e. the non-impaired arm-hand in children with CP and the dominant arm-hand in healthy children) is preferred for precision tasks, whereas the assisting arm-hand (the impaired arm-hand in children with CP and the non-dominant arm-hand in healthy children) has a more complementary, holding and stabilizing role. For each goal, it was specified a-priori which hand is the leading hand and which hand is the assisting hand. For instance for the goal ‘playing tennis’ the leading hand would hold the racket and the assisting hand would manipulate the ball (See additional file 1).’

Furthermore, for the goals in which the performance of the leading arm-hand (LH) differs from the performance of the assisting arm-hand (AH), the role of each hand in the activity described in additional file 1.

Concerning:

1. In the last paragraph in section “Main findings regarding the goals and their movement components” the authors concluded that “The components ‘reach’ and ‘release’, present in many goals, though not often indicated as most prominent, are more general movements. To be able to grasp an object, reaching and releasing are required.” What do the authors mean by the term “general movements”, separated them from “movement components”? This issue must become clear.

Answer:

We agree with the reviewer that the term ‘general movements’ is misleading. We have deleted this term in the manuscript.
Concerning:

2. In my opinion the section “Implication for the development of the set standardized test situations” need rewriting in order to become obvious which was the significance of the study.

Answer:

We have rewritten this section. The following text has been added to the manuscript: ‘In order to be able to test the validity and reliability of newly developed instruments to assess actual performance, a set of standardized test situations is needed. This study is not aimed at providing an ultimate set of standardized test situations. It rather provides the reader with information with which a set of standardized test situations for upper extremity skill research may be fine-tuned, relative to a specific research question. In selecting activities for a valid test set, the following points should be taken into account:

- All movement components of arm-hand skilled performance should be covered.
- For every movement component, an activity should be included in which that component is identified as being most prominent, ensuring that all components are represented adequately in the test set.
- Activities should be included which are important for children with CP.’

Minor Essential Revisions
Inventory of movement components

Concerning:

1. 1st Paragraph, 1st sentence (“The goals .....components.”). In this sentence the words “further evaluated” must be replaced with the word “analyzed”. The word further must be deleted since it is the first time that the authors reporting an analysis of the goals into components.

Answer:

We have adjusted the text accordingly.
Concerning:

2. The components ‘manipulate’, ‘fixate’ and ‘push/pull/shove’ are quit specific and characterize a goal.

Answer:

We agree with the reviewer. However, in our opinion no changes to the text are necessary, as the meaning of each of these elements is quite clear to the reader.
Reviewer: Lijuan Wang

Major Compulsory Revisions (which the author must respond to before a decision on publication can be reached)

Concerning:

1. Please clarify the diagnostic criteria of CP in your study.

Answer:

We have described this inclusion criterion better on page 6 and have added a references of the guideline used by the Dutch Rehabilitation Physicians to diagnose CP.

Concerning:

2. The fifth inclusion criterion is “mentally able to comprehend and perform tasks”. how do you assess the mental status of the CP children? If any instruments or scales are employed in your assessment, please clarify it.

Answer:

The rehabilitation physician judges whether the child is mentally able to comprehend and perform tasks. No specific measurement instruments were used, for this. We have added the following text on 6 to clarify this: ‘mentally able to comprehend and perform tasks, as judged by the rehabilitation physician.’

Concerning:

3. The first exclusion criteria of methods (severe structural contractures of the muscles of the upper extremity) is difficult to understand, please describe it more clearly and elaborate the details correctly.

Answer:

We have rewritten this exclusion criterion on page 6 of the manuscript. The following text is added to the manuscript: ‘1) severe structural contractures of the muscles of the upper extremity, i.e. a) passive elbow extension less than 160 degrees, b) supination less than 30 degrees from neutral position, c) wrist dorsal flexion less than 20 degrees (children aged 2.5-6 years) or less than 45 degrees (children aged 7-18 years)’
This description is now analogous to the description used in the trial registration:
http://www.controlled-trials.com/ISRCTN69541857

Concerning:

4. Statistical analysis should be involved in order to testify the reliability and validity of your research.

Answer:

As this study is a descriptive cross-sectional study with only qualitative data, we did not perform statistical tests. We performed this study analogous to the study of Timmermans et all (Arm and hand skills: training preferences after stroke, Disabil Rehabil, 2009, p1344-52).

Concerning:

5. The severity of disease may affect the patients’ arm-hand skilled performance and the ADL they want to improve on. Have you ever consider this factor? And if so, please clarify it.

Answer:

We agree with the reviewer that disease severity might affect the choice of the goals. Therefore, we have presented the MACS and GMFCS scores in table 2 to give a better insight in our patient population. We have added a paragraph in the consideration section (pages 18-19) in the discussion to clarify our opinion on the influence of disease severity in this study. The following text has been added to the manuscript:  ‘Disease severity is another factor that might influence the choice of goals of the children. In this study, only children with a MACS score of I, II or III and a GMFCS score of I or II were included. Children with severe structural contractures and severe impairment of the hand were excluded. This must be kept in mind when interpreting these data, together with the relatively low sample size.’

Concerning:

6. Patients with CP may have difficulty in verbal and gestural expression, which could affect the assessment of their motor functions and identification of goals, so how do you make sure those factor may not affect the assessment of arm-hand skilled performance?

Answer:

If the child had difficulties with his verbal and/or gestural expression, the parent and therapist helped with the goal setting. We have added the following text on page 8: ‘Depending on the age of the child and whether the child had difficulties with verbal and/or
gestural expression, the goals were set by the child itself (cognitive age >6 years), or with help of the parent(s) and therapist, and goals were ranked based on importance.’

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Concerning:

1. As to the writing of the title, “arm hand “ should be replaced with “arm-hand”.

Answer:

We agree with the reviewer that arm-hand is better than arm hand. However, we have chosen to use ‘arm hand’ in the title because this enlarges the traceability of the paper in online databases.

Concerning:

2. The methods and conclusions in abstract need to be further refined.

Answer:

We have adjusted the abstract accordingly.

Concerning:

3. CP patients with severe structural or functional impairment of the arm-hand were excluded in your study, which could potentially produce inclusion bias. It will be more objective to state this as study limitation in your manuscript. 4. A total of only 53 patients were included in your study and divided into three age subgroups. Such a small sample size will weaken the power and validity of your data. Please state this clearly as your study limitation or enlarge your sample size.

Answer:

These points are now described in the consideration section in the discussion (page 19). The following text has been added to the manuscript: ‘Children with severe structural contractures and severe impairment of the hand were excluded. This must be kept in mind when interpreting these data, together with the relatively low sample size.’
Concerning:

1. **According to your paper, the third purpose that “c) determine the 10 most preferred goals of children with CP in three different age groups” is mainly illustrated other than the other two purposes. The purpose of a and b are somewhat redundant.**

**Answer:**

We agree with the other reviewer (MP) that aim a and b (after reorganisation aim a and c in the current version) are clinically relevant. Therefore, we made no further changes as to this point.

Concerning:

2. **It is reported that there are difference between girls and boys with respect to the motor performance. Have you considered that gender may be another factor that affects patients’ goal and should taken into consideration.**

**Answer:**

We have considered gender, but because the sample size is relatively low, the number of classifiers should be kept to a minimum. Because we do not expect large differences between males and females we did not include this factor in our analysis.