

Refinement of New Items in Assessment of Capacity for Myoelectric Control for Multi-Articulating Hands



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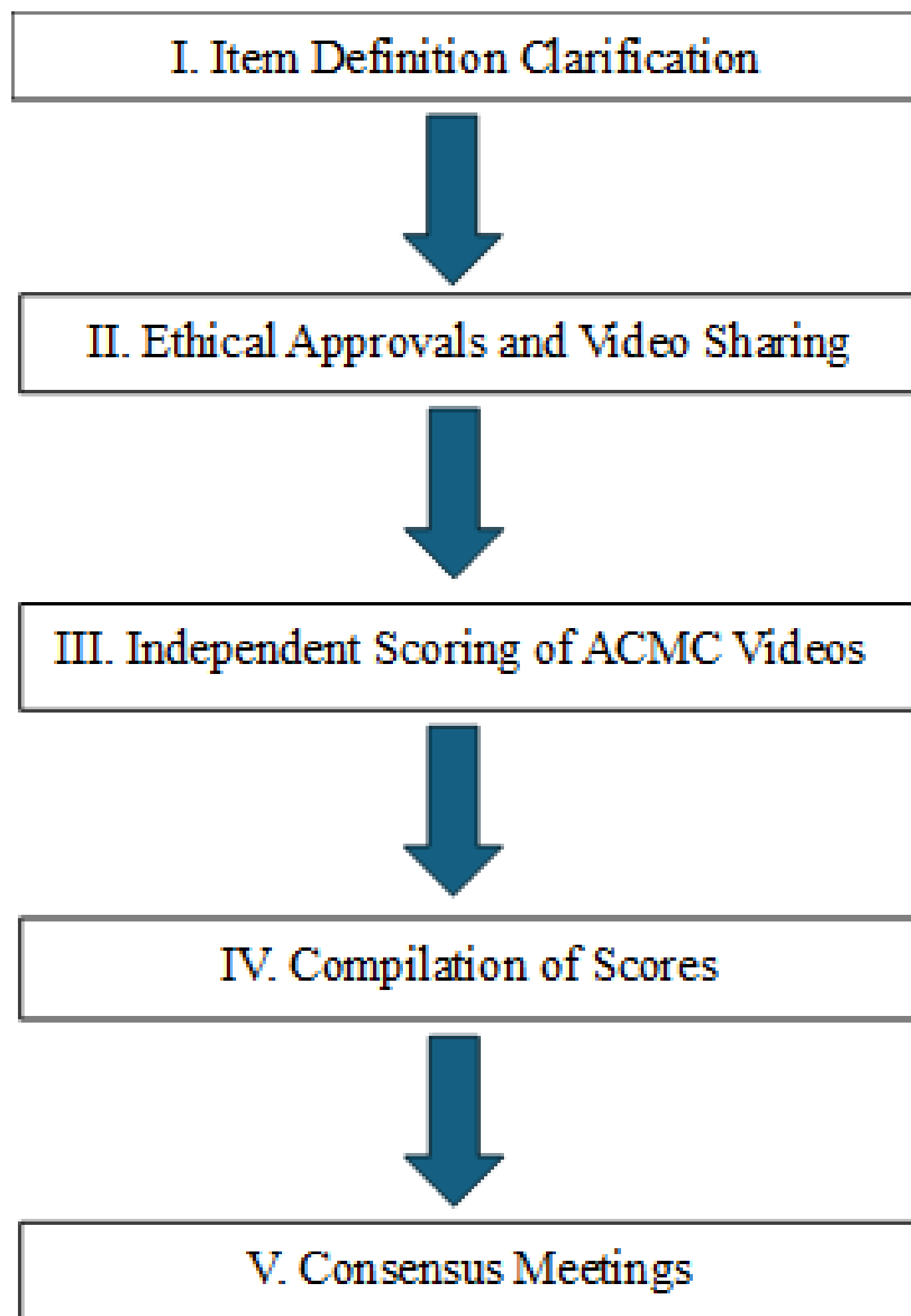
Introduction

- Advancements in multi-articulating hands improve function for those with upper limb loss
- The Assessment of Capacity for Myoelectric Control (ACMC) was developed to evaluate control of single-DOF myoelectric hands in bimanual tasks, not multi-articulating hands.
- Three new ACMC items were developed and tested for multi-articulating hand use using video analysis and consensus.

Methods

- Four experienced raters defined new ACMC items to capture the use and control strategies of multi-articulating hands.
- Two new certified ACMC raters in research labs provided feedback on the new items based on their experiences with participants.
- All raters participated in further discussions and refinement of item definitions (Figure 1).

Fig 1 Overview of item refinement.



Step I

- Raters agreed that refined names of each item:
 - Ability to switch grips
 - Positioning the hand for grasping
 - Choosing a secure grip for function

Step II

- Analyzed ACMC videos of various control strategies, limb loss levels, components, and multi-articulating hands (Figure 2).

Step III

- Videos were independently scored by five raters without discussion.

Step IV

- Each rater sent their ratings and justifications to a study facilitator, who compiled them for comparative assessment.

Results

- Consensus meetings defined item wording and rating scale definitions.
- **Example item/definition:** "Ability to switch grips" evaluates mechanics and consistency of switching grips.
 - **Videos demonstrated:** inadvertent, unintended, or delayed grip switches.
 - **Reasons:** hand unfamiliarity, user control limitations, or missed opportunities.
 - **Results:** raters initially assigned ratings of 1 or 2 for this item (Table 1), after discussion agreed to score of 2.

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5
Score	2	2	2	1	1
Notes taken by rater from video	Slight <u>delays</u> when switching	Switched well but there were some <u>delays</u>	Slight <u>delays</u> when switching grips in particular at tabletop activities; significant <u>delay</u> when going to counter	Pick up suitcase with fine pinch. <u>attempt</u> to switch grip. grip shoes with fingers (good). Switching grip before packing toiletries bag. Change to lateral for shoe bag	Capable of switching, it is questionable whether it switches to the one he <u>intended</u> . Some <u>delays</u> in some task.

Figure 2: Examples of attempting to switch grip, positioning, and choosing a secure grip.



Conclusion - Discussion

- Refined new ACMC item definitions for multi-articulating hand control using video analysis and consensus.
 - Refined definitions now include comprehensive language, examples, and detailed scoring criteria.
 - Achieved consensus on ratings for items like "Ability to switch grips" with refined definitions.
- Consensus process included raters from varied backgrounds and ACMC experience, clarifying item purposes and strengthening definitions.
 - **NEXT:** Validate the refined ACMC items and existing items with multi-articulating hand users.