

MacHAND Performance Assessment Short Form (MPA-S)

Instructions and Scoring Manual

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MPA-S Instructions and Scoring Manual

The short form of the MacHAND Performance Assessment (MPA-S) was developed from the updated version of original full MPA (MPA 2.0) by 3 Canadian occupational therapists: Zoë Edger-Lacoursière and Bernadette Nedelec from Montreal, Quebec and Tara Packham from Hamilton, Ontario.

Each MPA-S item represents a functional task involving one or more specific grasp or pinch patterns of the hand. This target motion is specifically noted alongside the description of each item. Instructions and a scoring key are also provided for every item.

This assessment has been created for individuals **aged 16 years old and up** who present with any type of hand injury, condition, or impairment.

Items for Assessment Kit

The following items are needed to assemble the assessment battery. Some items have the option to be 3D printed to increase standardization (Indicated with this icon). If you do not have access to a 3D printer, we encourage you to contact local libraries and/or universities that could print them for you.



-Stopwatch

-Large peanut butter jar (Kraft™ 1kg size); lid is tightened by the therapist until snug and a mark is made across the lid and jar as the indicator line for standardization. If this is not available in your country, these are the dimensions and weight of the jar: 9cm diameter, 16cm height, 1060g weight. Due to the high prevalence of peanut allergies, we also suggest emptying the contents of the jar and replacing it with another solution or keeping the contents sealed within the jar.



-3D printed or Styrofoam™ slates 15mm thick (width); 4.5cm height, length = A = 11.5cm, B = 13cm, C = 14.5cm, D=16cm. The 3D printed STL files for the slates can be found here: <https://www.thingiverse.com/thing:6131151>



-1 Canadian penny & 1 aluminum washer similar in size to penny; 1 standard metal paper clip & 1 safety pin similar in size to paper clip; 1 1/8" square nut & 1 1/4" hex nut; 1 1" long wood screw. All of these items can also be 3D printed. The 3D printed STL files for all these items can be found here: <https://www.thingiverse.com/thing:6131134>

-PaperMate™ classic ballpoint pen and writing test paper.

-2 prong indoor extension cord type A for North, Central, South America, Thailand, China and Japan. For other countries, use an extension cord with the most commonly used type of outlet where a lateral pinch can be used.

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-10 Canadian dimes or 10 3D printed dimes. The 3D printed STL files for the 10 dimes can be found here: <https://www.thingiverse.com/thing:6131137>



-5 buttons sewn onto fabric like a shirt, spaced 5 cm apart; button sizes 23mm (2), 18mm (2), and 14mm (2); Mounted onto a wooden frame that can easily be pivoted to reflect the orientation of the opening to match the traditional presentation for men and women (refer to photo next to the item in the manual; commonly men buttons are on the right side and women buttons on the left side). The buttons can also be 3D printed. The 3D printed STL files for the buttons can be found here: <https://www.thingiverse.com/thing:6131140>

-Two 2L plastic jugs (ours were from Rubbermaid™) with volume markers on side (markings at 1/2L and 1L on one jug and markings at 1L and 2L in the other jug).

-3 qt. stainless steel saucepan (Betty Crocker™). If this is not available in your country, a stainless-steel saucepan weighing 830g without the lid that can contain a minimum of 1L of water can be used.

-Corelle™ cereal bowl (532ml). If this is not available in your country, these are the dimensions and weight of the bowl: 16cm diameter, 5cm height, 190g.

-1/2 c. dried navy beans.

-1 soup spoon (15ml, 70g).

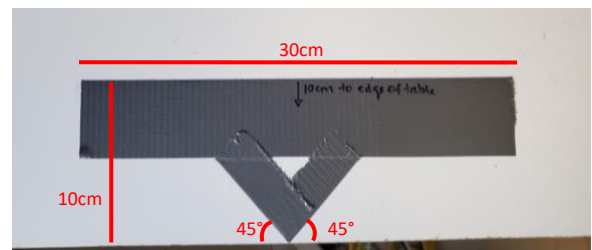
-900mL soup broth box. These are the dimensions and weight of the box: 6cm width, 18.5cm height, 9cm length, 940g.

-1.8kg box of dishwasher detergent. These are the dimensions and weight of the box: 5cm width, 23cm height, 18.5 cm length, 1655g.

-Wooden or melamine “open box” to create a shelf 16 inches (40cm) above the table (ours was 16” height x 24” length x 12” width outside measurements) made of recycled melamine shelving and aluminum brackets. Add tape on the side panels to indicate a height of 10cm (4”) and 15cm (6”) (see picture in item description #17)

-Visual analogue scale (VAS) to assess pain. (An attached VAS scale is provided in **appendix 1** if you wish to print a copy.)

-30cm masking tape or other type of tape to stick on the testing table parallel to the edge of the table at 10cm (4”) distance from the edge. 2 other pieces of tape should be placed on the table to indicate a 45° from the edge of the table (on the right and left). See picture:



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General Scoring Guidelines

- 5 Performs function within normal limits**
Subject is able to perform task without difficulty, stiffness, pain (VAS = 0), weakness or incoordination
- 4 Performs function with minimal difficulty**
Subject is able to perform task but with some difficulty due to awkwardness, weakness, incoordination or mild pain (VAS = 0-3)*. Subject may experience sensitivity but no stiffness.
- 3 Performs function with moderate difficulty**
Subject is able to perform task but with moderate difficulty due to some stiffness of digit(s) or joint(s), weakness, incoordination, or moderate pain (VAS= 3-6)*.
- 2 Performs function with great difficulty**
Subject is able to perform task but with great difficulty due to marked stiffness of digit(s) or joint(s), weakness, incoordination, severe pain (VAS > 6)*.
- 1 Performs function partially**
Subject is able to initiate but not complete the task due to severe stiffness or weakness. The movement being assessed must be present.
- 0 Performs no part of function**
Subject is not able to initiate the task nor is the movement assessed demonstrated.

*If the subject being tested reports pain for one of the tasks, the pain must be measured using the VAS.

Interpretation: The assessment is scored out of 50 if it is completed using the dominant hand **OR** scored out of 40 if it is completed using the non-dominant hand since the “Timed writing/copying” and “Simulated eating” tasks are only completed with the dominant hand. Higher scores represent higher levels of hand function.

IMPORTANT CONSIDERATIONS:

- 1) If both hands are affected, **the tested hand should be determined prior to the assessment (see scoring sheet)**. If the evaluator wishes to test both hands, the assessment must be repeated a 2nd time with the other hand after the initial hand has completed the entire assessment.
- 2) **Amputations:** For items requiring the use of all finger(s)(tips) – score with all available digits for amputees. In the presence of one or many finger amputations, for items requiring the use of specific prehension patterns or the use of specific fingers, if the subject can perform the function within normal limits (score of 5) with the residual fingers, the final score given should not be influenced by the fingers or type of prehension used to complete the task.
- 3) **Adaptive equipment:** For individuals using adaptive equipment (ex: universal cuff), **a list of the adaptive equipment used for each test item must be determined prior to the assessment (see scoring sheet)**. The use of an adaptive equipment does not affect the score. The subject must not require assistance to use the assistive device (Ex: must put the universal cuff on and off by themselves). If the subject requires assistance to use the assistive equipment, the administrator should consider this aspect when scoring the task (Ex: score of 5 with universal cuff = score of 4 if the subject needed help to put on the universal cuff, but could take it off. If the subject also needed help to take it off, the score would become 3 if they are still able to do the task within normal limits).
- 4) **Bimanual tasks:** The assessor may stabilize items when this is explicitly indicated in the task's instructions, which does not affect the score.
- 5) **Prosthetic training:** In the clinical setting, this evaluation can be done to evaluate prosthetic training progression. However, not all tasks will be able to be completed with all prosthetics.

Introduce the assessment by saying:

“This test is designed to look at all of the different ways we use our hands to grasp and pinch for everyday activities. You will be asked to do 10 (or 8) different tasks; and you will be given specific instructions for each task. Let me know if anything causes you pain, and it is ok to tell me if you need to stop at any time.”

****At the beginning of each task, the text written in quotation marks must be read out loud to the subject being tested.***

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1. **Pouring:** [power grasp, pronation/supination, coordination, endurance] – Standing, the subject pours: 1a) 1/2L from a jug containing 1L of water into a large saucepan, 1b) then pours the water back into the jug from the saucepan; then 2a) process is repeated using a second jug, pouring 1L from a jug containing 2L of water into saucepan and 2b) back again. If the subject performs the tasks sitting because they are not able to stand up, they are not penalised for this.

“You will need to stand up to do this task. Pour half of the water from jug number one into the saucepan.”

“Ok, now pour the water from the pan back into the jug, using the same hand.”

“Now we are going to do the same thing, this time with more water. Pour half of the water from jug number 2 into the pan.”

“Now pour the water from the pan back into the jug using the same hand.”

Grade 5: All steps of each task are completed with normal power grasp and no restriction anywhere in the extremity.

Grade 4: Both components of the tasks are performed with minimal difficulty or discomfort.

Grade 3: The subject is able to complete both components of the tasks with moderate difficulty.

Grade 2: The subject is able to complete only task 1a & 1b with no difficulty, but is unable to complete with the heavier jug **OR** is able to complete both tasks with great difficulty.

Grade 1: Subject is able to complete only steps 1a & 1b with difficulty **OR** is able to pour from both jugs without difficulty (1a & 2a), but is unable to manipulate the saucepan (1b & 2b)

Grade 0: Subject is unable to complete any step.



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2. **Jar:** [*spherical grasp with elbow flexion*] – The subject opens and unscrews a tightly screwed peanut butter jar lid, removing it completely; the jar is held by the contralateral hand using a cylindrical grasp. After removal, the subject re-applies the lid and refastens to the indicator line. If the subject cannot open the tightly screwed lid, they are asked to re-try the task once the assessor loosens the lid slightly.

**Note: Jar can be stabilized by assessor, focus is on the hand removing the lid.

“Using your (hand not being tested), hold onto the jar of peanut butter, then use your (hand being tested) to open the lid. Try to use all your fingers and remove the lid completely.”

“Ok, now put the lid back on the jar until it is tight.”

Grade 5: All digits are used without any difficulty or pain and the subject is able to loosen the lid, unscrew it and screw it back on tightly without difficulty or discomfort.

Grade 4: Task is completed with slight discomfort (VAS = 0-3) or minimal difficulty.

Grade 3: Subject is able to perform task but has moderate difficulty due to some stiffness of digit(s) or joint(s), weakness, incoordination, or moderate pain (VAS = 3-6) **OR** Subject is able to unscrew and screw on the lid but does not use all of the available digits **OR** Subject is only able to unscrew lid **after therapist has loosened it slightly**. Once loosened, the subject is able to unscrew the lid and put it back on using all of the available digits without any difficulty.

Grade 2: Subject is able to perform task but with great difficulty due to marked stiffness of digit(s) or joint(s), weakness, incoordination, severe pain (VAS = 6) **OR The lid is loosened** by the therapist and the subject is able to unscrew and replace the lid with some difficulty or pain (VAS = 0-3), using all available digits.

Grade 1: Subject is able to unscrew and replace the **loosened lid** with moderate difficulty, pain (VAS = 3-6) or clumsiness.

Grade 0: Subject is unable to initiate task or assume grasp position when the **lid is loosened**.



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3. **Plug:** [*lateral pinch*] – The subject pulls out and fully replaces a plug in the socket of an extension cord, using a lateral pinch.

**Note: Assessor can stabilize the socket side, focus is on the hand holding the plug side.

“Please hold the socket in your (hand not being tested) hand, and then use your thumb and the side of your index (demonstrate) to pull out the plug and push it all the way back in.”

Grade 5: The subject holds the socket in the non-tested hand and is able to pull out and replace the plug without difficulty or discomfort, using the thumb, and side of index.

Grade 4: Same as above, but done with some discomfort, pain (VAS = 0-3) or minimal difficulty.

Grade 3: The task is performed with moderate difficulty or pain (VAS= 3-6).

Grade 2: The subject is able to perform the task with great difficulty or pain (VAS >6); may slowly ease or wiggle the plug out of the socket and/or may only replace it partially.

Grade 1: The subject attempts to pull out the plug using the appropriate pinch (if all digits are present) but cannot complete the task due to severe stiffness or weakness.

Grade 0: The subject is unable to initiate the task or assume a lateral pinch (if no thumb/index amputation).



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4. **Dimes:** [*pad pinch with dexterity and in-hand manipulation*] – The subject picks up 10 dimes from the surface of the table, collecting all the coins in the same hand, until all 10 dimes are picked up and held in their palm. The dimes are placed so that they are not touching each other on the table.

“Pick up all of the coins one at a time and hold them in your hand. Do not slide them off the edge of the table; you need to pick them up directly.”

Grade 5: All dimes are picked up and held in the hand without difficulty.

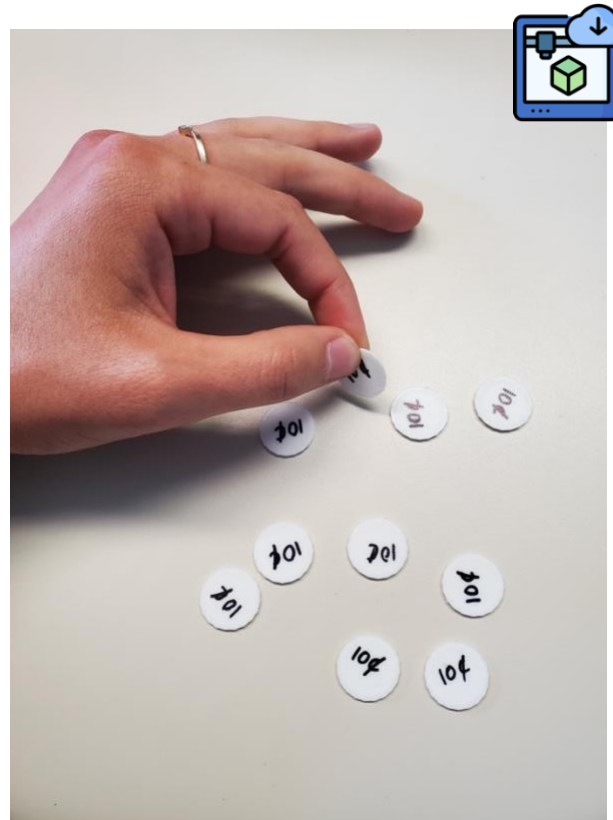
Grade 4: The subject is able to pick up all dimes as outlined above but does it slowly or with awkwardness.

Grade 3: The task is completed with difficulty **OR** the subject is only able to pick up and hold 6 or more dimes.

Grade 2: The subject is able to pick up and hold only 3-5 dimes.

Grade 1: The subject is able to pick up one or two dimes but may be unable to hold them in the hand.

Grade 0: The subject is unable to pick up dimes.



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5. **Buttons:** [*power pinch with dexterity*] – The subject unbuttons, then re-buttons 3 different sizes of buttons on a button board, held in front of their chest in the gender-appropriate orientation (or according to the type of shirt the subject usually wears). To change the orientation, simply turn the board 180° (see picture).

**Note: Assessor can stabilize the board, but not replace the untested hand.

“Hold the board in front of you like a shirt. Now unbutton the top three buttons using your (test) hand and your untested hand to stabilize and then do them back up again.”

Grade 5: The subject is able unbutton and refasten all three sizes of buttons without difficulty.

Grade 4: Task is performed with minimal difficulty.

Grade 3: Task is performed with moderate difficulty **OR** can only unbutton and button two sizes of button with no difficulty.

Grade 2: The subject can unbutton all buttons but not refasten them **OR** the task is performed with great difficulty.

Grade 1: The subject is only able to unbutton partially **OR** can unbuttons 1 or 2 buttons.

Grade 0: The subject is unable to button or unbutton any buttons.



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6. Timed writing/copying (dominant hand only): [*Tripod pinch, fine motor coordination, endurance*] – The subject copies 3 rows of 10 repeats of 5 different symbols, using a Papermate™ pen and task sheets. **Task is ONLY completed with the tested hand if it is the dominant hand.**

“Working as quickly as you can, copy each of the symbols into the rows of boxes. This is a timed test, and I am not looking at neatness. Make sure you fill in every box in all three rows for each of the five symbols.”

“Ready, go.” (start stopwatch)

Grade 5: Subject is able to complete the task without difficulty or discomfort, **OR** requires:

Dominant: < 3 minutes

Grade 4: Subject is able to complete task with minimal difficulty, discomfort or incoordination due to minimal pain (VAS = 0-3), **OR** requires:

Dominant: 3-5 minutes

Grade 3: Subject is able to complete the task within the times specified for Grade 4 with moderate difficulty, discomfort, or incoordination due to pain (VAS = 3-6) or stiffness.

Grade 2: Tripod pinch is altered due to finger deformity, sensory changes or severe pain (VAS > 6) **OR** requires:

Dominant: 5-7 minutes

Grade 1: Subject has great difficulty picking up and positioning pen **OR** cannot complete the task due to severe fatigue, **OR** requires:

Dominant: >7 minutes

Grade 0: Subject is unable to pick up the pen and assume the appropriate grasp.

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7. **Simulated eating (dominant hand only):** [*lateral pinch, supination, elbow flexion / extension*] – Using a soup spoon, the subject picks up 10-15 dried navy beans from a cereal bowl containing 1/2 cup of beans and brings the spoon to the mouth. The beans are then replaced in the bowl. **Task is ONLY completed with the tested hand if it is the dominant hand.**

“This task looks at how you would use a spoon to eat with. Scoop up about 10 beans on the spoon, and bring it up near your face, as if you were pretending to take a bite. Ok, now you can put the beans back into the bowl.”

Grade 5: The task is completed without difficulty as described above.

Grade 4: The subject is able to complete the task but experiences some awkwardness of motion.

Grade 3: The task is performed with moderate difficulty.

Grade 2: The task is performed with great difficulty.

Grade 1: The subject is able to pick up the spoon but is unable to bring it to their mouth.

Grade 0: The subject is unable to pick up the spoon.



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8. **Pick-up and identify:** [*dexterity, sensation, and stereognosis*] – The subject is required to pick up and identify the following objects without seeing them, removing from a small cereal bowl without sliding the object up the side of the bowl: Canadian penny, washer, paper clip, safety pin, square nut, hex nut, screw. Subject is shown objects before starting the task, and the name of each object is verbally reviewed. The task is completed without the assistance of vision and each object is dropped on the table before picking up a new one. The subject may return to the items on the table if unsure without looking at them. ***If the person being tested has difficulties with language because of cognitive or linguistic concerns, a second set of objects can be used for the subject to identify by pointing

“Take a look at the objects in this bowl. There is a Canadian penny (indicate by pointing), a washer, paper clip, safety pin, square nut, hex nut and screw. With your eyes closed, I would like you to pick them up one at a time and tell me what they are just by the feel of them. You need to pick them up without sliding them up the sides of the bowl, and I would like you drop them on the table when you are done. Do you understand? (if no, repeat instructions and demonstrate) You can hold the bowl on the table with your other hand. Ok, now close your eyes, and tell me what you are feeling as you pick up each item.”

Grade 5: All objects are picked up without difficulty and identified correctly without hesitation.

Grade 4: All objects are identified correctly but manipulation or picking up of the objects is done with minimal difficulty.

Grade 3: One or 2 mistakes are made in identification of objects **OR** subject experiences moderate difficulty with manipulation or picking up of objects.

Grade 2: 3 or 4 mistakes are made in identification **OR** subject experiences great difficulty picking up and manipulating objects.

Grade 1: More than 4 mistakes are made in identification of objects **OR** is able to pick up some objects but has great difficulty in manipulating or holding.

Grade 0: Subject is unable to pick up objects or manipulate them for identification.



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9. **Slates:** [*span*] – The subject picks up 4 rectangular slates on their long edge: 15mm (width); 4.5cm height, length= A = 11.5cm, B = 13cm, C = 14.5cm, D=16cm using the thumb and index for A, thumb and middle for B, thumb and ring for C, and thumb and small for D. Each slate is replaced on the table before proceeding to the next. **If the subject has amputation(s), allow them to pick up the slates using any combination of digits and grade based on the number of slates that were successfully picked up as described below.** Slates are placed in a row parallel to table edge about 10cm from edge.

“Try to pick up each slate using the thumb and their associated finger (A=index, B=middle, C=ring, D=small) (demonstrate). Lift it up off the table, then set it back down and try the next one.”

If amputation: “Try to pick up each slate using any available digit (demonstrate). Lift it up off the table, then set it back down and try the next one.”

Grade 5: All of the slates are picked up with each of the above combinations of fingers **without any difficulty**, pain or limitation.

Grade 4: The subject is able to pick up all of the slates with the above combinations with **minimal difficulty OR** the subject is able to pick up any 3 of the 4 slates with **no difficulty**.

Grade 3: The subject is able to pick up all combinations **with moderate difficulty OR** the subject is able to pick up any 2 of the 4 slates **with no difficulty**.

Grade 2: The subject is able to pick up all of the slates with the above combinations with **great difficulty OR** the subject is able to pick up any one of the 4 slates **with no difficulty**.

Grade 1: Subject is only able to pick up any one of the 4 slates **with difficulty**.

Grade 0: Subject is unable to do anything that is described above.



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10. **Lifting boxes onto shelf:** [*lumbrical grasp with functional reach, shoulder flexion/extension, endurance*] – The subject picks up a 900mL box of soup broth and places it onto a shelf 16” (40cm) above table height, then replaces it to the table (one repetition). Task is repeated using a 1.8kg box of dishwasher soap (3 repetitions).

**Note: If needed, subject may support object with hand not being tested (grade 1).

“Lift the small box up onto the shelf, then set it back down again.”

“This time, pick the big box up and set it on the shelf, then bring it back down again.”

“Can you do this two more times?”

Grade 5: The subject is able to lift the smaller box once, and the larger box 3 times without difficulty.

Grade 4: The subject has no difficulty with the smaller box, but has some difficulty with the larger box.

Grade 3: The subject is able to complete with no difficulty using the small box, but is unable to do task with big box **OR** the subject can complete the task with both boxes with moderate difficulty.

Grade 2: The subject can complete the task with the small box with minimal difficulty, but not the big box.

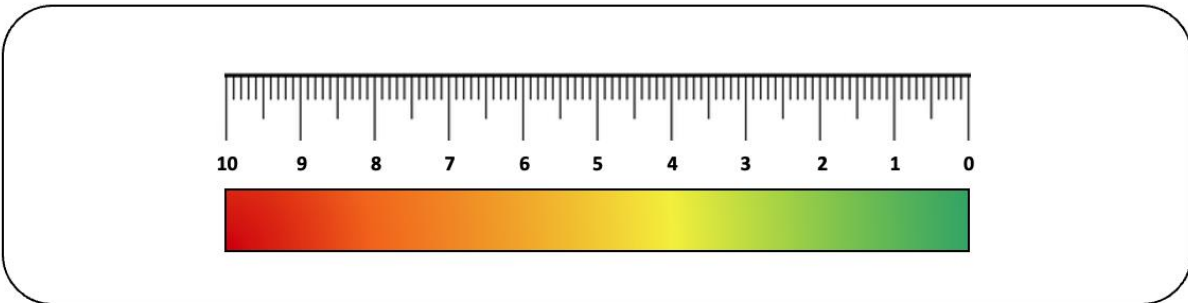
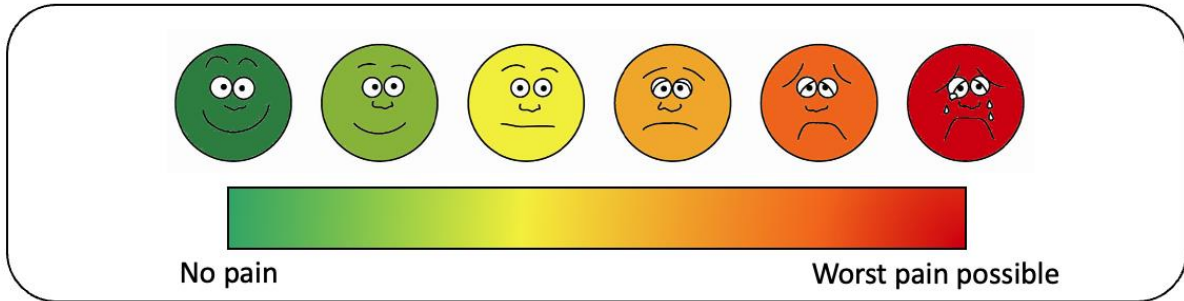
Grade 1: The subject is able to pick up the small box but is unable to lift it onto the shelf **OR** the subject is able to complete both tasks using both hands to complete the tasks.

Grade 0: The subject is unable to complete the task using both hands.



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Appendix 1: VAS scale to print and assemble.



Instructions to assemble:

To assemble, the ruler should be glued at the back of the front image (image with faces) so that the colors match on both sides (red face on front image match the red thermometer on the back image with the ruler). The subject should mark their pain with a movable Post-it™ flag on the front image (side with the faces), so that the assessor can determine the associated number score on the back of the scale.

Patient ID: _____

Affected hand(s): L R

Tested hand: L R

Rater: _____

Date: _____

Dominance: L R

MPA-S SCORING FORM

ITEM	TASK	FOCUS	ADAPTIVE EQUIPEMENT USED	GRADE	COMMENTS
1.	Pouring	Power grasp, pronation/supination, coordination, endurance			
2.	Jar	Spherical grasp with elbow flexion			
3.	Plug	Lateral pinch			
4.	Dimes	Pad pinch with dexterity and in-hand manipulation			
5.	Buttons	Power pinch with dexterity			
6. <i>Dominant hand only</i>	Timed writing	Tripod pinch, fine motor coordination, endurance			
7. <i>Dominant hand only</i>	Simulated eating	Lateral pinch, supination and elbow flexion/extension			
8.	Pick up and identify	Dexterity, sensation and stereognosis			
9.	Slates	Span			
10.	Lifting box	Lumbrical with functional reach, shoulder flexion/extension, endurance			
TOTAL				/50 /40	Dominant hand Non-dominant hand