GRASP

Graded Repetitive Arm Supplementary Program

Instructor's Manual For Hospital GRASP and Home GRASP Version 2

HEART & STROKE FOUNDATION

a place of mind THE UNIVERSITY OF BRITISH COLUMBIA

Vancouver CoastalHealth
GF Strong Rehabilitation Centre

Table of Contents

Section 1- Introduction to GRASP

Section 2- GRASP Program Protocol

Section 3- GRASP Implementation

SECTION 1: Introduction to GRASP

Overview of GRASP

GRASP is a self-directed arm and hand exercise program for which is supervised by a therapist, but done independently by the participant (and with their family if possible). GRASP has been shown to improve arm and hand function and strength after stroke. There are two versions of the program: Hospital GRASP and Home GRASP. Both versions prescribe one hour of daily GRASP exercise, plus encourage the patient to use the stroke-affected arm and hand as much as possible.

Brain Repair after Stroke

Following a stroke, brain structures and pathways are damaged. It can take hundreds, if not thousands of challenging repetitions of practice to improve activation of the brain and to relearn movements. In rehabilitation therapy sessions, stroke patients may need to work on many functions such as walking, balance, speech and cognition, and may have little time left to practice reaching and grasping. GRASP is a supplementary program that adds over 300 challenging repetitions per session and has been shown to improve arm and hand function after a stroke.

Goals of GRASP

√ Increase the potential for recovery of the hand and arm through challenging repetitions of practice and encouraging use of the stroke-affected hand in everyday activities

√ Facilitate the eventual transition to self-managed exercise programs post-discharge

√ Prevents the "learned non-use" syndrome often found after stroke

√ Engage the client and family in the therapy process and place an expectation of active participation on the patient

Role of Therapist

The brain has the most ability to repair and improve hand function in the first 3 months after a stroke. While improvements have been reported in more chronic patients, the gains will not be as great. During the first few months after stroke, the brain has enhanced plasticity and is more sensitive to stimuli and experience, such as fine motor exercise. However, patients can be very tired in this period, lack motivation to do exercise or find it frustrating to do a lot of challenging exercises. A therapist plays a key role in the GRASP program; in educating patients and families on the importance of exercise and hand activity early after stroke, teaching the exercises, as well as motivating and monitoring patients.

Who is appropriate for GRASP?

The GRASP program is designed for stroke participants who would like to improve their arm and hand function. The GRASP protocol is appropriate for people who are able to actively elevate their scapula (shoulder shrug) against gravity. In addition, they require palpatable wrist extension. Thus, if the participant rests their stroke-affected hand palm down on a table, they are able to start to lift the fingers off the table. A tiny bit of movement on the lift may be visible, otherwise, muscle activation can be felt over the wrist joint tendons. Participants who have a fixed hand and cannot partially open the hand or fingers are not appropriate for this exercise program, and may benefit from other therapies. For participants who have minimal hand movement (Level 1- per Hospital GRASP), we recommend that they attend a clinic or outpatient hospital unit where they can receive other treatments such as electrical stimulation, in conjunction with exercise to optimize their recovery.

Minimum Requirement Checklist

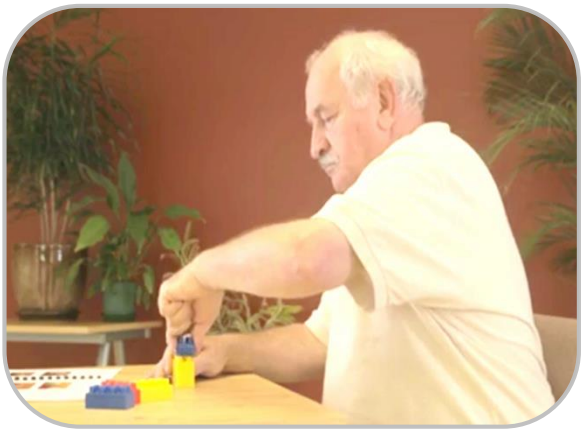
√ Some ability to move stroke affected wrist

√ Some ability to shrug their stroke-affected shoulder

√ Able to follow instructions and mimic exercises for an hour

√ Able to communicate any adverse effects, such as pain.

√ Independently carry out exercises or have caregiver assistance



GRASP Research Evidence

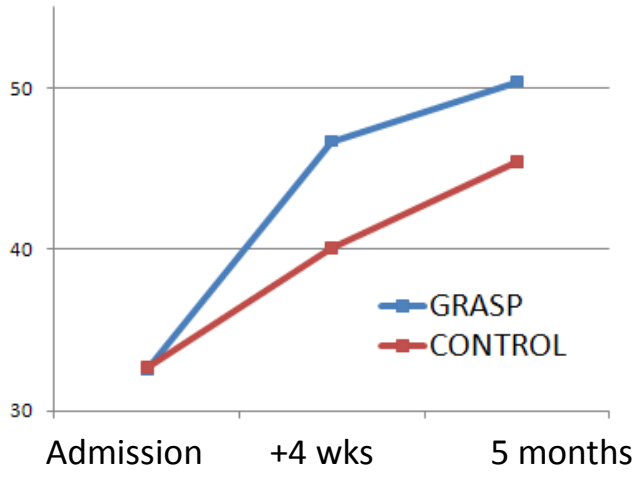
The GRASP Program was originally developed in Vancouver, Canada by Janice Eng, PhD, PT/OT and Jocelyn Harris, PhD, OT with valuable assistance from Andrew Dawson, MD, FRCP and Bill Miller, PhD, OT and with funding from the Heart and Stroke Foundation of BC and Yukon. The following table summarizes the findings. A number of advances in GRASP have been made with assistance from Louise Connell, PhD, PT and Lisa Simpson, MSc, OT.

Summary of Findings

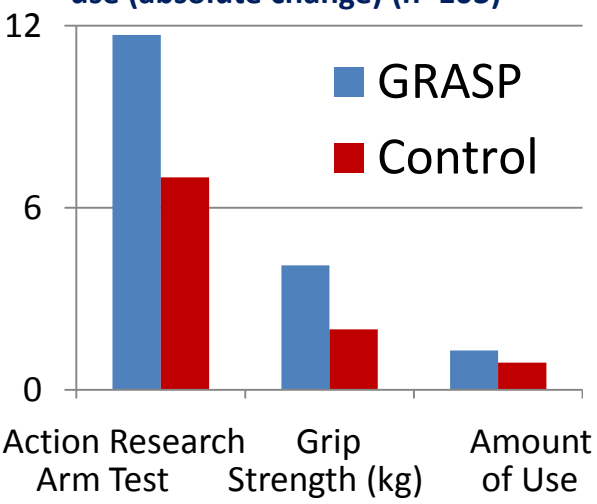
We showed in 103 stroke inpatients within their first 4 weeks of stroke that the GRASP Program (Hospital Version) improved arm and hand function (Chedoke Arm and Hand Activity Inventory, Action Research Arm Test), grip strength and amount of use. GRASP can result in more than 300 hand and arm repetitions per session. In addition, a small study (n=8) showed that community-dwelling individuals with stroke within their first year post-stroke benefited from a weekly phone-monitored and motivated Home Version of GRASP over 2 months.

Graphical presentation of results:

Chedoke Arm & Hand Activity Inventory (n=103)



Improvement of grip strength & hand use (absolute change) (n=103)



GRASP Research Evidence

All publications below are freely available through pubmed

Harris JE, Eng JJ, Miller WC, Dawson AS. A self-administered Graded Repetitive Arm Supplementary Program (GRASP) improves arm function during inpatient stroke rehabilitation: a multi-site randomized controlled trial. Stroke. 2009 Jun;40(6):2123-8.

Harris JE, Eng JJ, Miller WC, Dawson AS. The role of caregiver involvement in upper-limb treatment in individuals with subacute stroke. Physical Therapy. 2010 Sept; 90 (9): 1-9.

Connell L, McMahon NE, Harris JE, Watkins C, Eng JJ. A formative evaluation of the implementation of an upper limb stroke rehabilitation intervention in clinical practice: a qualitative interview study. Implementation Science. 2014, 9:90

Connell LA, McMahon NE, Watkins CL, Eng JJ. Therapists' use of the Graded Repetitive Arm Supplementary Program (GRASP) intervention: a practice implementation survey study. Phys Ther. 2014 May;94(5):632-43.

Connell LA, McMahon NE, Simpson LA, Watkins CL, Eng JJ. Investigating measures of intensity during a structured upper limb exercise program in stroke rehabilitation: an exploratory study. Arch Phys Med Rehabil. 2014 Dec;95(12):2410-9.

Simpson LA, Eng JJ, Chan M. H-GRASP: The feasibility of a novel upper limb home exercise program monitored by phone for individuals post stroke. Disabil Rehabil. 2016 Mar 26: 1-9.

SECTION 2: GRASP Program Protocol

Hospital or Home GRASP – which program should I use?

Motivating, monitoring and progressing the practice by a health professional are key requirements for success. Hospital or Home GRASP should be practiced one hour, 7 days a week. Exercise sessions can be divided up into two 30 minutes sessions if fatigue or attention is a problem.

The Hospital GRASP is four weeks long and fits typical patients admitted to inpatient rehabilitation settings within the first 4 weeks post-stroke where patients are also receiving standard upper extremity physical therapy and occupational therapy. The exercise can be done in the patient's room, although a good alternative is that some centres have initiated group GRASP programs where patients are supervised by a rehabilitation assistant in the department. The 3 levels were meant to accommodate the fast improvements that often occur in the first weeks after stroke. Once participants are discharged, they can continue the exercises in their home.

Home GRASP is initially prescribed face-to-face, and then monitored and progressed by phone. Home GRASP was designed as a 2-month program for patients who have already had some upper limb treatment and have now been discharged home after inpatient rehabilitation (typically 2 months post-stroke). Only one book level (levels 2 and 3 of Hospital GRASP) was designed as there are less changes expected in this time window. Individuals complete the exercises within their own home.

These rehabilitation models may not fit all jurisdictions. As such, the selection of the Hospital or Home GRASP may be dictated by how patients are moved through your system, and the type of monitoring determined by your resources. We recommend that patients in the first month post-stroke do receive more face-to-face monitoring and progression, give the potential for fast improvements that may occur early after stroke. Thus, if you have a patient discharged home in the first week post-stroke especially with minimal hand function, you may decide to use the Hospital GRASP books which have the Level 1 book, and progress the patient to the other Levels in time. In addition, it would be preferred to have more face-to-face therapeutic sessions to monitor the patient and to address other upper limb issues (e.g., pain, activities of daily living, assistive devices), given the newness of the injury.

GRASP can also be used as a supplementary home exercise program to outpatient therapy. In this case, you may select the Home GRASP (if the patient has some grasp and release) but monitor in person (rather than by phone) during the first few minutes of each outpatient session.

SECTION 2: GRASP Program Protocol

Cases to illustrate Hospital or Home GRASP use

As the acute and rehabilitation stay can vary depending on the jurisdiction, we provide a number of cases to illustrate the use of GRASP.

Case A: Mrs. A receives acute stroke care for 7 days, is then transferred to an inpatient stroke rehab facility for 4 weeks, and then receives outpatient rehab for another 5 weeks. During inpatient rehab, she receives OT and PT for arm and hand function, and is taught the Hospital GRASP program starting with Level 1 by the PT. Mrs. A does GRASP in the evenings. The PT monitors Mrs. A's adherence by checking her logged time, progresses her to level 2 and motivates her to use her affected hand daily in a variety of everyday activities. In outpatient rehab, Mrs. A continues to receive OT and PT, and as well, the outpatient PT progresses her to level 3 and reduces the size of the fine motor objects to make the program more challenging which Mrs. A does daily at home. Mrs. A feels that she has returned to doing most activities with her stroke-affected hand that she did before, and upper extremity PT/OT and GRASP are stopped.

Case B: Mr. B receives acute stroke care for 5 days, and then is discharged home to a rural area which does not have any rehabilitation services. He is taught the Home GRASP exercises before he is discharged. An OT phones him weekly for 8 weeks to progress the exercises, check the logged time and provide motivation to use the arm and hand. After 8 weeks, Mr. B feels that he is still improving and continues GRASP for an additional month on his own.

Case C: Ms. C receives acute stroke care for 3 days, and is then discharged home with follow-up by a community outreach team for 1 month. She receives OT and PT once a week at home and the PT instructs her in the Home GRASP, checks her logged time and progresses the exercises. Ms. C's improvements have not plateaued, but governmental services have ended. The PT suggests that Ms. C might continue with private PT services which she does, and the private PT continues to progress the GRASP exercises done at home, as well as provide additional upper extremity treatment for another 6 weeks.

Case D: Mr. D receives acute stroke care for 10 days. At day 5, he starts participating in a daily group Hospital GRASP class supervised by a rehab assistant and overseen by an OT. He is then discharged home with Level 2 but attends outpatient rehab for 4 weeks where he continues GRASP at home which is monitored and motivated by the outpatient OT.

Hospital GRASP Program Levels

Hospital GRASP has 3 exercise levels to accommodate different levels of upper extremity function and ideally should begin within 4 weeks post-stroke. Each level has its own participant manual.

Typical patient function at start of level

Level 1

Practice of gross motor skills & introduction of fine motor skills

- Minimal hand function
- Minimal fine motor skills
- Active shoulder shrug & gravity assisted shoulder flexion

Level 2

Practice of gross motor skills & fine motor skills

- More graded control of hand grasp
- Some release and fine motor skills
- Some gravity assisted shoulder flexion, extension & retraction
- Some elbow extension & flexion
- Some finger flexion & extension
- Grade 2 to 3 wrist extension, therefore, can move almost against gravity

Level 3

Practice of gross motor skills & substantial fine motor skills.

- Substantial fine motor tasks
- Half of active range of motion for finger flexion and extension
- Grade 3-4 shoulder and grade 3 elbow and wrist, therefore, can move against gravity

Appropriate Fugl-Meyer scores or Chedoke Stage for each level:
Level 1 = Fugl-Meyer scores 10-25 or Chedoke stages 2-3
Level 2= Fugl-Meyer scores 26-45 or Chedoke stages 3-4
Level 3= Fugl-Meyer scores 46-58 or Chedoke stages 5-6

See appendices for details on determining the participant's Chedoke Stage.

ECLIPSE – The 7 "must-do" parts of GRASP

- **E**quip the patient with the GRASP book and equipment ☐
- **C**oach the patient and family on how to do the GRASP exercises ☐
- **L**og – ensure the patient logs the GRASP practice time ☐
- **I**nvolve family and caregivers with GRASP if available ☐
- **P**rogress the patient weekly so exercises are always challenging ☐
- **S**upport the patient – check weekly logs – work through barriers to doing daily GRASP exercises - motivate ☐
- **E**ncourage and set targets for stroke-affected hand use in everyday home activities ☐

GRASP is not "GRASP" without these 7 parts. GRASP will not be successful if the GRASP manual is simply given to the participant without regular monitoring and progression.

Understanding Stroke Impact on Upper Extremities

About 85% of participants admitted to hospital for stroke present with problems with their arms and hands. Stroke- related physical impairments such as muscle weakness, pain, and spasticity can lead to a reduction in the ability to use the stroke-affected arm and hand in daily activities. The avoidance of using one's stroke-affected arm is common and is referred to as the "learned non-use syndrome". Unfortunately, not using the stroke-affected arm can prevent the brain from repairing after a stroke and lead to a further loss in strength, range of motion, and fine motor skills. These can then result in contractures, pain and severe bone loss (osteoporosis).

Spasticity

Spasticity consists of exaggerated muscle reflexes, involuntary muscle contractions and stiffness in muscles. Spasticity can be painful and interfere with functional recovery of the upper extremity.

Pain

Pain can occur at various areas of the upper extremity and can result from weakness and spasticity. This occurs most often in the shoulder and pain levels and duration can vary between individuals.

Edema/Swelling

Edema is excess fluid trapped in the body's tissues. This can be due to decreases in muscle contractions, changes in blood vessel function and reductions in activity of the stroke-affected arm. Edema commonly occurs in the hand after stroke and can lead to pain and reduced range of motion.

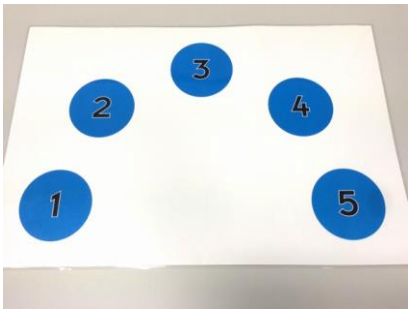
Potential Fractures

Following a stroke, the bone mineral density (BMD) and muscle mass usually decline. Changes to the stroke-affected side are more profound. In addition, with balance deficits, resulting from stroke, there is increased risk of fractures from falls. The most common fracture of the upper extremity is a wrist fracture due to a fall on the hand.

Exercise and use of the stroke-affected arm and hand can reduce the risk of the above complications.

Equipment List

Buttoned shirt



Target Board
Template in appendices

Tennis ball

Bean bag

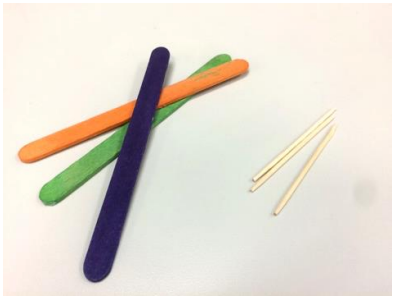
Wrist weight
0.5-1lb

Hand Gripper- 5lb resistance

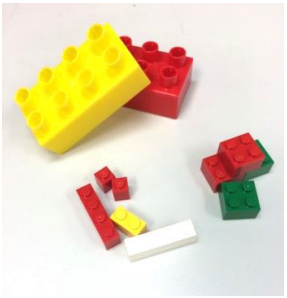
Knife & Fork

Towel

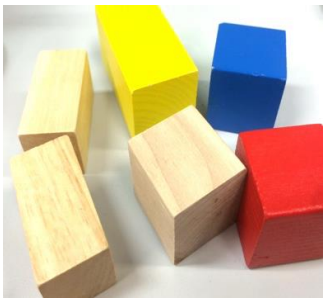
Cup



Popsicle sticks & toothpicks



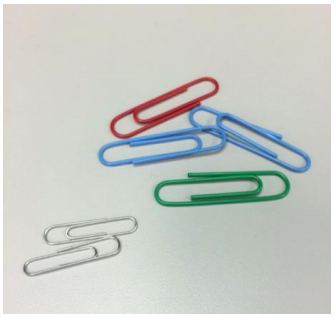
Various sizes of Lego



Various sizes of blocks

Poker chips, pennies, dimes

Various sizes of clothes pins



Various sizes of paper clips

Theraputty

Various jars

Sanitization of Equipment

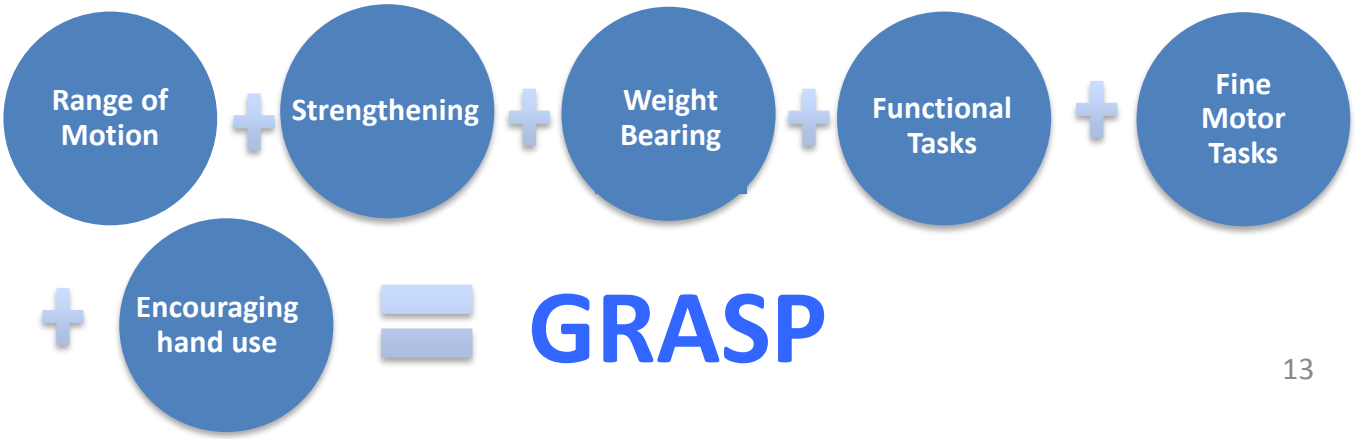
Ensure equipment used in the GRASP program is frequently cleaned by sanitization solution or disinfection wipes, especially if equipment is shared.

Roles

Instructor	Caregiver or Family
Understand issues specific to stroke and its impact on upper extremities.	Help organize exercise equipment for quick changes between exercises. Help put equipment away after each exercise.
Teach GRASP exercises, monitor amount of GRASP done and progress to challenge the participant.	Help keep track of exercises on the daily log sheet.
Brainstorm activities that the participant can do in their own environment to increase their stroke-affected hand use.	Assist with exercises that require a partner.
Encourage and motivate!	Encourage and motivate!

NOTE: It is important to engage the family if possible, as family involvement with GRASP leads to better outcomes.

Format of Upper Extremity Exercises



GRASP Program Components

The GRASP Program consists of exercises grouped into 5 sections within the book: 1. Stretching, 2. Arm Strengthening, 3. Hand Strengthening, 4. Coordination, and 5. Hand Skills. These sections comprise six main exercise components: 1. Range of motion, 2. Strengthening, 3. Repetitions of the stroke-affected arm and hand, 4. Weight-bearing, 5. Trunk control and 6. Repetitions using both arms.

#1-Range of Motion



Loss of joint range commonly develop after stroke and interferes with upper extremity function. Therefore, it is important to maintain extensibility of the muscles to promote subsequent strengthening through full range of motion.

#2-Strengthening



Muscle strengthening after stroke has not been found to increase spasticity, rather strengthening has been found to be effective in improving upper extremity function after stroke. Upper extremity muscle strengthening can improve bone density and the ability to perform activities of daily living involving the upper extremities.

#3: Repetitions of the stroke-affected arm and hand



Hundreds if not thousands of challenging upper extremity repetitions can help the brain recover and result in improvements with the arm and hand after stroke. Varying accuracy and speed requirements are integrated within the fine motor and gross motor repetitive tasks.

#4: Weight Bearing



With a reduction in arm use, there is reduced loading to muscle, bone and sensory receptors. Controlled weight-bearing through the hand is one method to increase muscle activation without weights. In addition, weight-bearing will help to reduce the known bone loss which occurs early after stroke

#5: Trunk Control



Better trunk control is known to facilitate arm reaching. Thus, exercises to challenge trunk movements are important for upper extremity function.

#6: Repetitions Using Both Arms



The majority of daily tasks use both arms and hands. Repetitive bilateral arm training has been shown to improve arm and fine motor function. Bilateral tasks are realistic of the many activities of daily living, which require bilateral arm and hand coordination.

Note: Repetition

It is known that many repetitions are required for improving motor learning. Thus, exercises are generally done in “sets” of 5 or 10 and then repeated as tolerated.

SECTION 3: GRASP Implementation

GRASP- Implementation Overview

1. Describe program to participant and family. Do behavioural contract and confidence assessment with participant/family. Discuss barriers and feasibility if confidence is low.

2. Provide participant HOME GRASP manual or with appropriate level of the HOSPITAL GRASP Manual (Level 1, 2, or 3). Review exercises with the participant and family.

3. Provide participant with equipment. Alternatively, show sample kit with equipment items and give suggested equipment list for client to purchase. Help source more difficult items (weight, therapy, gripper)

4. Instruct participant and family on how to perform exercises with the equipment and modify if needed. Exercises are done outside of formal one-on-one therapy and can be done in the hospital room, in a group GRASP program or at home.

5. Encourage the participant to rest as necessary but a goal should be to work towards 60 continuous minutes of exercise.

6. Do not limit movement if the person is unable to do the movement properly. It is important that they are encouraged to move their stroke-affected arm as best they can. **Improper movement should not be the cause of omitting an exercise.**

7. Review the Daily Exercise Log Sheet with the participant and family and emphasize the importance of tracking their exercises.

1. Encourage the participant to use their stroke-affected arm as much as possible for daily activities. Set weekly targets (eg, use their stroke-affected hand 20% of time when they have tasks that require their arm/hands). Brainstorm tasks to increase amount of use of the stroke-affected hand. Examples include: Opening the door, brushing teeth, eating lunch.

1. Progress exercises with participant on a weekly basis (in person or by phone), as well monitor for adverse events (eg. Pain). Challenge the participant with an appropriate level of graded exercise. Exercises must be challenging to the participant to result in improvements**.** If the participants is able to complete exercise sets without making any mistakes (eg, dropping or mishandling item) or without fatigue, the exercises should be advanced.

GRASP Detailed Implementation Timeline (face-to-face visits)

FIRST VISIT

1. Explain purpose and benefits of program and what is expected of them
a) GRASP exercise daily either for one 60 minute period or two 30 minute periods
b) Importance of continuing regular therapy if they are receiving it (eg. OT/PT)
c) Importance of using the stroke-affected arm and hand as much as possible during waking hours
2. Complete behavioural contract and confidence form – brainstorm barriers/facilitators and decide if the program is realistic
3. Show the participant and family how to do each exercise and have participant do selection of exercises. Assign the appropriate grade of sets.
4. Show participant and family how to fill out the log sheet. Let them know when you will see them again

approx 60 min

SECOND VISIT

1. Have participant and family demonstrate some of the GRASP exercises to you (i.e. you observe their exercise session)
2. Ask the participant and family if there are any issues with the exercises (query if too easy, too hard; query pain)
3. Check to see if log sheets are done. Discuss barriers and potential solutions if exercise compliance is low (< 45 min daily).
4. Progress exercises to ensure they are challenging eg. should drop or mishandle fine motor items at least once per set or muscles are tired during strengthening
5. Set targets for waking hour stroke-affected hand use in participant's environment and brainstorm activities to increase use. Let them know when you will see them again

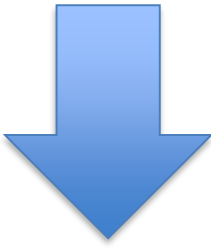
approx 30 min- ideally the next day

GRASP Detailed Implementation Timeline

THIRD VISIT

1. Observe 6 exercises (choose two from strengthening, two from coordination, and two from hand skills categories)
2. Ask the participant and family if there are any issues with the exercises (too easy, too hard; query pain)
3. Progress exercises to ensure they are challenging, eg. should drop or mishandle fine motor objects at least once per set or muscles are tired during strengthening
4. Check log sheets and and discuss barriers and potential solutions if exercise compliance is low (< 45 min daily).
5. Check on targets (and set new ones) for stroke-affected hand use in own environment and brain storm activities to increase use. Let them know when you will see them again

NOTE: The first 3 visits would ideally occur within the first 10 days of enrollment in the program.



approx 10 min, 1 week after 2nd visit

WEEKLY VISIT

Same as Third Visit

approx 10 min

LAST VISIT BEFORE DISCHARGE

1. If the stroke took place recently (e.g., last month), at least 4 weeks of GRASP should be trialled. Participants with more chronic stroke may need more weeks; we found positive results with an 8-week GRASP program for people 4-12 months post-stroke. However, if the participant is no longer making any gains, GRASP should be stopped.
2. If further improvements are expected (e.g., participant has not plateaued), but no further services can be provided, then explain to the participant and family the importance of continuing the exercises at home until no further improvements are being experienced.

SECTION 3: Implementation

GRASP- Implementation (phone monitoring)

1. Implementation when phone monitoring is similar to face-to-face. GRASP exercises need to be taught face-to-face with the participant (participant visits clinic or therapist provides home visit). Telehealth applications (video-conferencing) might be possible as well. Participants need to log their exercise minutes. The more detailed Exercise Progress Check Form can be used to facilitate the review of exercises with the therapist over the phone.

2. Check in with the participant on a weekly basis and progress the exercises. Monitor for adherence to exercise. Brainstorm with the participant on daily activities they can use their stroke-affected hand. Discuss barriers and solutions if GRASP minutes are less than 45 min daily. See the sample telephone follow-up script.

5. Modify exercises as appropriate. Ensure activities are challenging (eg. should drop or mishandle fine motor objects at least once per set or muscles are tired during strengthening) and suggest ways to advance the challenge. See section on Grading for more information.

Home GRASP- Phone Follow Up Sample

Hello! My name is ____. I am an occupational/physical therapist with___. May I speak with: Mr./Mrs. ____Hi, Mr. (Mrs.) "___", This is ___ from _hospital and I am calling you to see how you are doing with the GRASP program for your hand. Your ___(wife/husband/friend) was going to join us on this call. Can you put them on the speaker phone?

Do you have your GRASP book and log sheet with you? Could you please go get your GRASP book and logsheet? (note some patients will not be able to hold phone and turn pages of GRASP at same time). Are you ready?

In the past week, how many minutes did you do the GRASP exercise each day?
Mon: _____ Tues: _____ Wed: _____Thurs: _____ Fri: _____Sat: _____Sun: _____

If less than 45 min daily, probe barriers and brainstorm potential solutions.

Have you had any increase in arm or shoulder pain over the week? If yes, need to probe on what exercises, where is the pain, and how severe. Can then adjust exercises – i.e. emphasize to shoulder height only, reduce weight or no weight, reduce repetitions.

Are you able to get thru all the exercises in the book each day? We had prescribed 3 sets of 5 (or 8, 10) for most of your exercises. Are you able to do this many repetitions? Why not? Did you have any problems with any of the specific exercises over the past week? *Common issues are fatigue, pain, time commitment, motivation, lack of caregiver support.* (ideally, arrange for the caregiver to be available for the phone call)

Are the exercises challenging to you or difficult to do? Probe if they drop or mishandle objects on the fine motor tasks at least once per set or if their muscles feel tired in the strengthening tasks. If not, advance fine motor (eg, reduce size of fine motor objects) and strengthening tasks. See Grading section.

Now probe target use of the arm. When I last spoke to you, you set a target to use your weaker hand about X% of the time to do anything that requires your arms and hands. Do you think you reached that target over the last week? If not, probe barriers/solutions.

You mentioned that you were going to try to use your weaker hand during ____, ____, and _____, Were you able to use your weaker hand for these tasks? Discuss barriers and solutions.

Can you think of tasks that you could try this week to increase the amount you use your weaker hand? You can try to brainstorm tasks that are safe for that patient (e.g., turning book, turning door knob, brushing teeth, combing hair, using towel with 2 hands, doing up buttons/zippers). Especially promote the weaker hand to be the active "doer" and not just stabilizer.

What percent of the time do you think you can use your weaker hand during tasks that require your arms and hand over the next week? Let's set that as your target for next week.
Wrap up emphasizing how hundreds of hand repetitions and lots of everyday use of the arm/hand can promote activation of brain pathways, and help recover after a stroke.

GRASP- Exercise Progress Check

Do you have problem doing .....

How many sets and repetitions do you do for this exercise? Is it easy or hard for you? Any problems?

	Items	# Sets	# Reps	Easy? Hard?	Note
1	Total Arm Stretch				
2	Shoulder Shrug				
3	The Twist				
4	Hand and wrist Stretch				
5	Push–ups				
6	One arm push–ups				
7	Chair–ups				
Tips					
8	Shoulder exercise: Arm to Front				
9	Shoulder exercise: Arm to Side				
10	Elbow exercise				
11	Wrist Exercises – Part 1				
12	Wrist Exercises – Part 2				
Use your stroke-affected hand as much as possible today					
Tips					
13	Grip Power				
14	Finger Power				
15	Finger Twist				
16	Finger Strength				
17	Cutting				
18	Waiter				
19	Advanced Waiter				
Tips					
20	Pouring				
21	Start the ball rolling				
22	Start the ball rolling- Advanced				
23	Drop and Catch				
24	Total Arm Stretch (again)				
Tips					
25	Laundry				
26	Button				
27	Hanging up the Clothes				
28	Lego				
29	Block Towers				
30	Pickup sticks				
31	Paper Clips –part 1				
32	Paper Clips –part 2				
33	Flip Over				
34	Jar				
35	Drying Off				

GRASP Behavioral Change Techniques

Behavioral strategies should be built into the protocol to ensure exercise adherence and promote integration of the stroke-affected upper limb into daily activities. See below for some suggestions that a therapist can do which will benefit the participant in between sessions:

ACCOUNTABILITY

Weekly phone calls to participants to inquire about adherence to program, ascertain level of challenge and progress the program as needed.

COLLABORATIVE GOAL SETTING

Work collaboratively to identify weekly task goals for increasing upper limb use during daily activities.

Review participant's experience in completing weekly task goals.

SOCIAL SUPPORT:

Encourage participants to invite caregivers to training sessions and be involved with exercise program and upper limb task goals.

INTENTION FORMATION:

Ask participants to identify their level of confidence to adhere to exercise targets. If confidence is less than 80%, discuss facilitators and barriers to adherence and problem solve strategies for overcoming barriers.

FEEDBACK ON PERFORMANCE

Ask participants to report the % of time they were using their affected upper limb over the day in tasks that required the arms or hands.

BARRIER IDENTIFICATION

Ask participants to identify barriers to completing GRASP exercise and using the arm/hand. Assist participants to problem solve solutions.

BEHAVIORAL CONTRACT

Emphasize the need for commitment through a behavioral contract where participants (and caregivers) agree to adhere to exercise targets.

GRASP Behavioral Contract- Sample

Explain the GRASP Behavioral contract and confidence form to the participant. Ask the participant to fill out this confidence form so that you can discuss ways that might help the participant meet the exercise targets. Record the level of confidence for your records. If confidence is low (less than 8), then discussion is required to brainstorm barriers/facilitators and to decide if the program is realistic.

Stroke participant:

I will do the GRASP exercises ONE hour each day, seven times a week starting _____(date) and ending _____(date).

How confident am I that I will do this? _____
Use a scale of 0 to 10, with 0 being not at all confident and 10 being completely confident.

Signed _____ (patient)

Family/Caregiver

I will assist _____(patient name) with the GRASP exercises _____times per week starting (date) and ending _____date()
How confident am I that I will do this? _____
Use a scale of 0 to 10, with 0 being not at all confident and 10 being completely confident.

Signed _____ (family/caregiver)

Tips for Modifying Exercises

Condition	Possible Modification
Participants with shoulder pain	• Decrease repetitions • Restrict shoulder movements to below the horizontal • Reduce or eliminate the weights • Encourage more rest breaks
Participants using major compensatory movements (i.e. shoulder hiking, shoulder abduction etc. for reaching)	• Do exercises in front of a mirror to encourage proper movement but compensatory motions should not be a reason to avoid an exercise • Participants can use the stronger hand to correct themselves. For example, if the right shoulder hikes when reaching, they can place the left hand on the right shoulder as a reminder. • Correcting a compensation can be used to make the exercise more difficult. For example, when pouring one cup of water into another, a participant may accomplish this with trunk tilting and shoulder abduction due to poor pronation/supination and wrist control. A mirror may be helpful to reduce compensations.
Participants with whom tone substantially increases with the exercises	• Modify gripping exercise by using ball instead of gripper • Use gripper with less resistance • Encourage stretching and weight-bearing thru arm
Participants unable to maintain upright position	• Place support behind the participant's back and appropriate safety belts. Do exercises in supportive wheelchair

Grading of the Exercises

Hospital GRASP
Each manual level has graded exercises within them. Work with your participant to determine which level to start with for each exercise. For example strengthening exercises start at 1 set of 5 and then increase to 3 sets of 5. Once the participant progresses to GRASP Manual Level 3, the exercises can be made more challenging by using different equipment or by increasing the number of repetitions. For instance, smaller pieces (ie. small Lego, Pick Up sticks) can be used. Check in frequently with your participant to ensure that they are doing the exercises at the appropriate level of difficulty. If the participant completes the exercise without making any mistakes, such as mishandling or dropping the object once per set, you need to make it more difficult.

Home GRASP
Each exercise in the manual is graded. Work with your participant to determine which level to start with for each exercise. It is important that the exercises are challenging. If the participant completes the exercise without making any mistakes, such as mishandling or dropping the object, you need to make it more difficult.

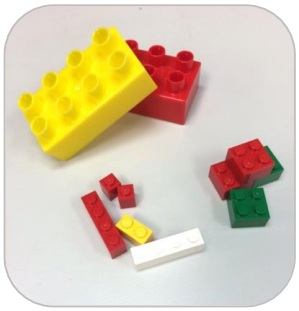
Grading Overview

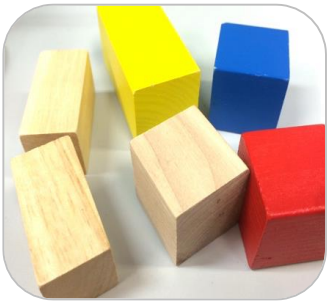
These exercises need to be challenging to the participant to improve brain function. For instance, if the participant completes the hand exercise without making any mistakes, such as mishandling or dropping the object, the exercises need to be made more difficult. See below for some ideas of how to make the exercises more challenging:

Use smaller objects for the fine motor exercises

Use toothpicks instead of popsicle sticks

Use smaller pegs





Use smaller coins, lego or blocks

Use various sized objects for the exercises. For instance, a variety of jars with different mouth sizes (eg. Narrow, wide)

Grading Overview Continued

Increase the resistance for strengthening tasks

Increase the weight of the wrist weights, select a higher theraputty grade, or increase the resistance of the gripper.

For the pouring exercise, more water can be added to increase the weight of the cups.

Increase the number of repetitions for each exercise

- ☐ **3 sets of 5 repetitions**
- ☐ **3 sets of 8 repetitions**
- ☐ **3 sets of 10 repetitions**

Try to do the exercises faster but still accurately

Implementation Options- Group GRASP

GROUP GRASP PROGRAM

- Use of rehab assistants to undertake a group GRASP class
- Requires large table and books/equipment available
- Ensure compliance with exercise and progression to next levels
- Socialization is helpful, but ensure that intensity does not decline with chatting (not all patients can talk and exercise at same time!)
- Rehab assistants assist with documentation of minutes and challenge of task, as well as monitor compliance and motivate participants
- Given multiple participants, the detailed GRASP Exercise Program Check form should be completed
- Participants can take turns sharing how they used their stroke-affected hand in the previous day, and what activities they plan to use their stroke-affected hand with over the next day to increase its use

Maximizing Adherence & Having Fun

Emphasize reasons for doing exercise

Emphasize that the greatest recovery of the brain occurs in the first months after a stroke and the need to maximize one's abilities during this time period

Emphasize that thousands of challenging repetitions of the stroke-affected arm and hand are needed to maximize outcomes

Emphasize that it is normal to feel frustrated when doing difficult repetitions or challenging daily tasks with the stroke-affected hand

Seek solutions for poor adherence

Therapists should explore reasons behind non-adherence with the participant to determine whether there are solutions to the problems

Consider clarification of exercises, equipment adaptation, as well as caregiver or family support

Encourage socialization

Some stroke units are now using GRASP as a group inpatient or outpatient program led by a therapist or rehabilitation assistant.

Families, friends and caregivers can be involved to motivate and encourage the participant, help with the exercises, record the daily log or simply do the exercises together

Maximize feedback of performance to the participant

The exercises are designed to maximize sensory or visual feedback. Thus, moving a cup of water on a target board allows the participant to be aware of their abilities (they may spill water or not reach the target). In addition, grading the exercises will make the participant aware of their improvement.

Create a positive environment for exercise

The book and equipment should be accessible to the participant and stored in view as a reminder to do the exercises (and not in a closed cupboard). Participants say that the books are easier to use if printed in colour. A selection of music of an hour length may help to cue the participant that they have done sufficient exercises.

Appendices

GRASP Daily Log sheet

Target Board Print-out

Chedoke-McMaster Stages

GRASP Daily Log Sheet

Customize the calendar by writing in month and dates on the lines. Write the number of minutes you did GRASP exercises each day. Note unusual events such as flu or surgery that may have prevented GRASP practice. Also note if pain or excessive fatigue.

Month: _____

Day	Mon	Tues	Wed	Thur	Fri	Sat	Sun
GRASP minutes	_____	_____	_____	_____	_____	_____	_____
GRASP minutes	_____	_____	_____	_____	_____	_____	_____
GRASP minutes	_____	_____	_____	_____	_____	_____	_____
GRASP minutes	_____	_____	_____	_____	_____	_____	_____
GRASP minutes	_____	_____	_____	_____	_____	_____	_____

Chedoke Assessment Stages

To determine which Chedoke Stage, have the participant perform the following tasks. Begin with Stage 3 and move a stage up or down from there.

The participant should be in the standard sitting position with feet supported: sitting with the forearm in the lap, or supported on a pillow, in neutral position, wrist at 0 degrees and fingers slightly flexed. The participant can sit either supported or unsupported. Encourage good sitting posture for testing.

Stage 1

Does not have at least TWO of Stage 2 tasks.

Stage 2

NOTE: Support the limb as necessary while facilitating the movements.

Task #1: Positive Hoffman.
"Let me move your fingers"
• *With one hand support the participant's middle phalanx of middle finger. With the other hand, snap the distal phalanx of middle finger into flexion. A positive response is flexion of fingers and/or thumb.*

Task #2: Resistance to passive wrist or finger extension.
"Let me move your hand". *Flex and extend wrist or fingers 5 times quickly. A positive response is resistance to passive movement and possible contraction of wrist/finger flexors.*

Task #3: Facilitated finger flexion
"Bend your fingers". A positive response is some active finger flexion.

Stage 3

Task #1: "Bend wrist backwards"
•*Active wrist Extension greater than ½ of range. Can support forearm and movement may be in synergy.*

Task #2: "Make a fist"
•*Finger or wrist flexion greater than ½ of range*

Task #3: "Touch your index finger with your thumb". Can support hand in supination and movement may be in synergy.

Chedoke Assessment Stages

Stage 4

Task #1: "Stretch your fingers out straight, then make a tight fist"
•*Greater than half range of extension followed by full flexion of PIP and DIP.*

Task #2: Hold piece of paper between thumb and index finger. "Straighten your thumb, then bring it down to hold onto the paper."
•*Thumb extension greater than ½ range, some pressure to hold paper.*

Task #3: "Make a tight fist and bring your thumb down to your index finger. Don't let me move your thumb." Therapist tries to move thumb away from the index finger
•*Finger flexion to close hands and active thumb flexion.*

Stage 5

Task #1: "Make a tight fist then straighten fingers"
•*Smooth reversal from full flexion to full extension of fingers.*

Task #2: "Spread fingers apart as far as you can"
•*Full range finger abduction without wrist of finger flexion*

Task #3: "Touch the tip of your little finger with the tip of your thumb"
•*Opposition of thumb to little finger without wrist flexion*

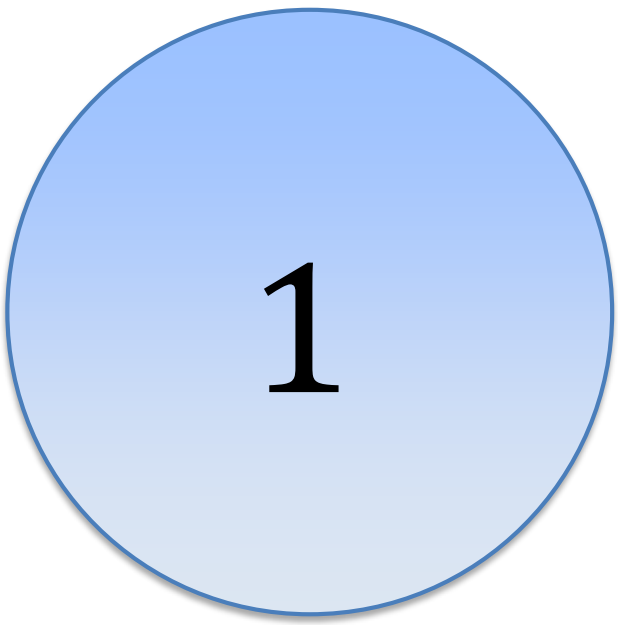
Stage 6

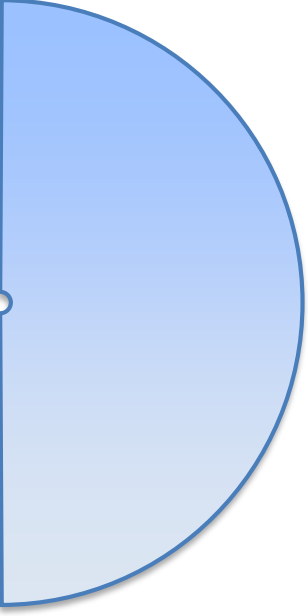
Task #1: "Keeping your fingers straight, tap your index finger as quickly as you can"
Taps index finger 10 times in 5 seconds without wrist or IP motion.

Task #2: Start in pistol grip. "Bend and straighten your index finger without moving anything else."
•*Full range of PIP and DIP without index MCP or thumb motion.*

Task #3: "Lift your wrist as far up as you can and then stretch your fingers apart"
•*Full range of wrist and finger extension with finger abduction*

Target Board Print-Out





4

5