FLOWCHARTS

AREA OF EXERCISE PRACTISE: 2 METRES LONG AND 1 METRE WIDE, NEAR A WALL AND A STURDY CHAIR WITH ARMRESTS MUST BE IN PLACE

DAILY EXERCISE SESSION:

1. MOBILE/FITBIT RINGS 15 MINUTES BEFORE PREFERRED TIME FOR DAILY EXERCISE SESSION A REMINDER WITH A MESSAGE REMINDER TO TURN ON THE HOLOBALANCE SYSTEM
2. PATIENT TURNS ON HOLOBALANCE SYSTEM AND WEARS THE ACCELEROMETERS, INSOLE, HOLOLENS
3. THE HOLOBALANCE SYSTEM PERFORMS A SELF-CHECK THAT ALL SENSORS ARE IN PLACE AND COMMUNICATING
4. HOLOBALANCE SYSTEM GIVES THE GREEN LIGHT. (RED LIGHT BEEPS IF SENSORS NOT BEING RECORDED AND FOR WHICH SENSOR SPECIFICALLY)
5. HOLOGRAM APPEARS AND SESSIONS BEGINS WITH SAFETY SET-UP (SEE BELOW)

SAFETY AND SET-UP: HOLOGRAM VERBALLY ASKS THE PATIENT TO PLEASE ENSURE THAT

1. EXERCISE AREA IS CLEAR OF OBSTACLES (PATIENT REPLIES YES/NO/ NEED MORE TIME)
2. STURDY CHAIR IS POSITIONED NEAR THE WALL (PATIENT REPLIES YES/NO)
3. HOLOBALANCE RE-CONFIRMS EQUIPMENT IS BEING WORN AND COMMUNICATING
4. HOLOBALANCE CONFIRMS WITH A CALL OUT THE EXERCISES SESSION IS READY TO BEGIN “THE EXERCISE SESSION WILL NOW START.”
5. FIRST INSTRUCTION: IF YOU EXPERIENCE A MODERATE LEVEL OF DIZZINESS, PLEASE STOP THE EXERCISE SESSION AND CONTACT THE PHYSIOTHERAPIST; IF YOU EXPERIENCE A HEADACHE WITH PAIN AS A FEATURE, PLEASE STOP THE EXERCISE SESSION AND CONTACT THE PHYSIOTHERAPIST

MOTIVATION AT THE ENDPOINT OF EACH EXERCISE:

EXERCISE END NOTIFIED WITH A BEEP

1. IF PERFORMED CORRECTLY FOR FULL DURATION “WELL DONE”
2. IF PERFORMED WITH FREQUENT BREAKS OR CHANGE IN POSITION “GOOD TRY. YOU WILL IMPROVE WITH PRACTISE”
3. IF EXERCISE STOPPED BEFORE FULL DURATION, 2 FURTHER ATTEMPTS WILL BE MADE DURING THE SAME SESSION. WITH EACH SUBSEQUENT ATTEMPT, TIME WILL START AT 0 SECONDS IF NOT POSSIBLE, MOVE ON TO THE NEXT EXERCISE IN THE PROGRAMME

END OF SESSION ASSESSMENT:

1. WELLBEING SCALE QUERIES
2. DIZZINESS RATING SCALE (HOW DIZZY (I.E. LIGHTHEADED, GIDDY, SWIMMY) DO YOU FEEL ON A SCALE OF 0-10 WITH 0 BEING NO DIZZINESS AND 10 BEING SEVERE DIZZINESS SYMPTOMS)
3. DO YOU HAVE ANY HEADACHE SYMPTOMS? IF NO, NO FURTHER QUESTION; IF YES, PLEASE ASK PATIENT TO RATE ON A SCALE OF 1-10 WITH 1 = MILD AND 10 = EXCRUCIATING

POST SESSION ASSESSMENT

1. EXERCISE DATA WILL BE UPLOADED TO CLOUD DAILY (AVERAGE POSTURAL SWAY, TIME PERFORMANCE OF EXERCISE, HEART RATE, SPEED OF HEAD MOVEMENT AND GAIT PARAMETERS (GAIT SPEED (NECESSARY), CADENCE, STEP LENGTH (NECESSARY), TRANSFER OF BODY WEIGHT FORWARD WITH EACH STEP (INSOLES OR ACCELEROMETERS – GREAT IF POSSIBLE), HEAD POSITION UPRIGHT FOR MOST OF WALKING DURATION) AS APPROPRIATE FOR EACH EXERCISE.
2. WELLBEING, DIZZINESS AND HEADACHE DATA WILL BE UPLOADED TO CLOUD DAILY
3. PHYSIOTHERAPIST WILL REVIEW THE INFORMATION WEEKLY. PATIENTS NOT PERFORMING THE EXERCISES DAILY, NOT PRACTISING EXERCISES FOR FULL DURATION AT DAY 7 OR REPORTING AN INCREASED LEVEL OF SYMPTOMS COMPARED TO BASELINE AT DAY 7 WILL BE TELEPHONED AND EXERCISE PROGRAMME WILL BE REVIEW

SITTING EXERCISES

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| **INSTRUCTIONS HOLOGRAM WILL VERBALLY EXPLAIN AND VISUALLY DEMONSTRATE** | **EXERCISE** | **PROGRESSION 1** | **PROGRESSIONS 2** | **PROGRESSION 3** |
| HEAD &TRUNK SHOULD BE IN AN UPRIGHT POSITION  YAW ROTATION SHOULD BE 30 DEGREES LEFT AND RIGHT – CAN THIS BE MONITORED FROM THE SYSTEM?  Q: If the rotation is 30 degrees the exercise is correctly performed? What is the acceptable range? 30-45? Anything else is incorrect?  REPLY: 30 degrees only. If unable to achieve then less but no greater. | 1.WHILE FOCUSING ON A WORD PLACED AT EYE LEVEL AND ARMS’ LENGHT, TURN YOUR HEAD LEFT AND RIGHT ALWAYS TRYING TO KEEPING THE TARGET IN FOCUS. ONE MINUTE.  Q: Is there a required speed for turning your head?  How many turns should be done within a minute? What do we have to measure? Can we omit eye tracking which is required for checking that the patient indeed has his eyes in the word?  *REPLY: Based on speed from day before. Minimum 0.5 head turns per second; maximum 3 head turns (from 30 degrees left to 30 degrees right) per second for sitting, standing and walking exercise with horizontal or vertical head movement. NO EYE MOVEMENT RECORDING NEEDED* | GRADUALLY INCREASE THE SPEED AS THE EXERCISE BECOMES EASIER UNTIL YOU ARE ABLE TO PRACTISE AT A VERY FAST SPEED.  Q: how is very fast speed defined? Turns per minute?  Reply: As stated before. *Based on speed from day before. Minimum 0.5 head turns per second; maximum 3 head turns per second for sitting, standing and walking exercise with horizontal or vertical head movement. We need to monitor speed of movement (e.g. to confirm they are practicing it slower or faster as instructed but not how much this changes apart from minimum and maximum range)* | WHILE FOCUSING ON A WORD PLACED AT EYE LEVEL AND ARM’S LENGTH, TURN BOTH YOUR HEAD AND THE CARD LEFT AND RIGHT IN OPPOSITE DIRECTIONS ALWAYS TRYING TO KEEPING THE TARGET IN FOCUS. ONE MINUTE.  Q: Is there a required speed for turning your head?  How many turns should be done within a minute? What do we have to measure? Can we omit eye tracking which is required for checking that the patient indeed has his eyes in the card?  REPLY: As before and again NO eye movement recording required. | GRADUALLY INCREASE THE SPEED AS THE EXERCISE BECOMES EASIER UNTIL YOU ARE ABLE TO PRACTISE AT A VERY FAST SPEED.  Q: how is very fast speed defined? Turns per minute?  REPLY: As before. |
| HEAD &TRUNK SHOULD BE IN AN UPRIGHT POSITION.  So this is the 1st thing the sensors should evaluate. REPLY: Yes  PITCH ROTATION SHOULD BE 30 DEGREES LEFT AND RIGHT – CAN THIS BE MONITORED FROM THE SYSTEM?  Q: If the rotation is 30 degrees the exercise is correctly performed? What is the acceptable range? 30-45? Anything else is incorrect?  REPLY: 30 degrees only. If unable to achieve then less but no greater  PATIENTS WEARING BI- OR VARI-FOCAL GLASSESS MAY NOT BE ABLE TO PRACTISE THIS EXERCISE 1 AND 2, BUT WILL BE ABLE TO PRACTISE 3 & 4. THIS SHOULD BE ASSESSED BY THE PHYSIO AT BASELINE. | 2. WHILE FOCUSING ON A WORD PLACED AT EYE LEVEL AND ARM’S LENGTH, MOVE YOUR HEAD UP AND DOWN ALWAYS TRYING TO KEEPING THE TARGET IN FOCUS. ONE MINUTE.  Q: How many movements up and down per minute?  Is there a specific speed for the movement or it does not matter?  REPLY: Up and down +/-30 degrees or less if unable to but no greater. Speed 0.5 minimum to 3 movements (from 30 degrees extension to 30 degrees flexion) per second maximum | GRADUALLY INCREASE THE SPEED AS THE EXERCISE BECOMES EASIER UNTIL YOU CAN PRACTISE AT A VERY FAST SPEED.  Q: how is very fast speed defined? Up-down movements per minute?  *REPLY: Based on speed from day before at which exercise was performed at the end.* Up and down +/-30 degrees or less if unable to but no greater. Speed 0.5 minimum to 3 movements (from 30 degrees extension to 30 degrees flexion) per second maximum | MOVE YOUR HEAD UP TO LOOK AT THE CEILING AND DOWN TO LOOK AT THE GROUND. ONE MINUTE.  Here we should define the degrees for looking up and down. Then we need up-down movements per minute? Should anything else be measured?  Do we need virtual targets in the floor and in the ceiling? This way it would be easier to assess where the patients actually look.  REPLY: NO targets. We should be looking at the head movement to ensure there is extension and flexion, about 60 degrees maximum extension and 90 degrees maximum flexion. Limitation to not use this measure if kyphosis, scoliosis or other neck degenerative condition. This must be determined by therapist at baseline and input into Holobalance system – in these patients only dizziness and speed will be recorded not degree of head range of movement for this exercise. | GRADUALLY INCREASE THE SPEED AS THE EXERCISE BECOMES EASIER UNTIL YOU ARE ABLE TO PRACTISE AT A VERY FAST SPEED.  Q: how is very fast speed defined? Up-down movements per minute?  REPLY: Minimum is only the extension or flexion component of movement per second; maximum is no more than two full extension to flexion head movements (range as before) per second. |
| FOR BENDING OVER: AS YOU BEND OVER MAKE SURE TO BRING CHIN T CHEST AND RETURN HEAD TO NORMAL UPRIGHT AS YOU COME UP  Q: Here we should calculate degrees for bringing chin to chest? Anything else? Do we also need speed?  REPLY: Yes calculate degrees chin to chest and with regards to speed – each person’s comfortable speed. Minimum 3 seconds for a full bend over and return to upright movement; maximum 2 seconds per full movement. | SITTING DOWN WITH FEET FIRMLY ON THE GROUND. BEND OVER AS IF TO PICK UP AN OBJECT OFF THE FLOOR. RETURN TO UPRIGHT AND REPEAT. 5 REPETITIONS  Q: Bend over in front? Feet firmly on the ground is the first thing to check. The rest is a bit complicated as the correct bending over is different for each person and depends on the length of the arms, height of the seat etc. Do we need spine position-movement for assessing the correct performance of exercises?  REPLY: NO spine position movement recording required.  Do we need a virtual object –target in the floor? REPLY: NO | EXERCISE 1 WITH EYES CLOSED.  We definitely need camera or eye tracking for that.  By Exercise 1 you mean SITTING DOWN WITH FEET FIRMLY ON THE GROUND. BEND OVER AS IF TO PICK UP AN OBJECT OFF THE FLOOR. RETURN TO UPRIGHT AND REPEAT. 5 REPETITIONS or  REPLY: Yes this is the exercise we mean but with eyes closed. No monitoring for this is required. There also needs to be a trust element that patients – in clinical practice which is what this is based on we do not have cameras. This would be a big ethical issue for UK. | SITTING DOWN WITH FEET FIRMLY ON THE GROUND. BEND OVER SIDEWAYS TO THE LEFT AS IF TO PICK UP AN OBJECT OFF THE FLOOR. RETURN TO UPRIGHT. 5 REPETITIONS IN EACH DIRECTION.  Q: This is sideways while the previous one was in front?  Do we need a virtual object –target in the floor?  REPLY: Yes, this is a sideways bending over movement. No, we do not need a virtual target on the floor. | EXERCISE 3 WITH EYES CLOSED.  By exercise 3 you mean SITTING DOWN WITH FEET FIRMLY ON THE GROUND. BEND OVER SIDEWAYS TO THE LEFT AS IF TO PICK UP AN OBJECT OFF THE FLOOR. RETURN TO UPRIGHT. 5 REPETITIONS IN EACH DIRECTION.  REPLY: Yes we do. |

STANDING EXERCISES:

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| **INSTRUCTIONS HOLOGRAM WILL VERBALLY EXPLAIN AND VISUALLY DEMONSTRATE** | **EXERCISE** | **PROGRESSION 1** | **PROGRESSIONS 2** | **PROGRESSION 3** |
| HEAD &TRUNK SHOULD BE IN AN UPRIGHT POSITION, WEIGHT SHOULD BE FELT ACROSS THE BALL OF THE FOOT. AS SOON AS YOU FEEL PRESSURE ON THE TOES OR HEELS RETURN TO THE CENTRE POSITION WITH WEIGHT ACROSS THE BALL OF THE FOOT  head &trunk, i.e. posture (?), in an upright position is the first measurement  REPLY: Yes, and actually for this we believe we will need the trunk accelerometer. For this exercise there should be no trunk flexion or extension throughout the minute.  Weight and pressure on the toes or heels can only be assessed with pressure in the insoles, socks etc  Do we need anything else? REPLY: NO | 1.STAND WITH FEET HWA, EO. TRY TO MAINTAIN YOUR BALANCE IN THIS POSITION FOR ONE MINUTE  HIP WIDTH APART is the one measurement  EYES OPEN is the second measurement  How we measure balance? Differences in pressure? Even minor accelerometer or gyroscope measurements? Any minor imbalance experienced during the exercise means that it is not correctly performed? What is the acceptable range?  REPLY: The centre of gravity will need to be measured in this normal standing position. If pressure is over the heels or toes the patient is too far displaced posterior or anterior respectively and will need to be given correcting advice by the system. If the patient is displaced 4 degrees in either direction from the centre of gravity position an alarm sound is needed to bring weight back to centre. Head and trunk should remain upright throughout. Any head or trunk flexion/extension will need to be corrected with a verbal command by the system during the exercise. | STAND WITH FCT, EO. TRY TO MAINTAIN YOUR BALANCE IN THIS POSITION FOR ONE MINUTE  FEET CLOSE TOGETHER is the one measurement.  EYES OPEN is the second measurement  How we measure balance? Differences in pressure? Even minor accelerometer or gyroscope measurements? Any minor imbalance experienced during the exercise means that it is not correctly performed? What is the acceptable range?  REPLY: As in previous column. | STAND WITH FEET HWA, EC. TRY TO MAINTAIN YOUR BALANCE IN THIS POSITION FOR ONE MINUTE  HIP WIDTH APART is the one measurement  EYES CLOSED is the second measurement  How we measure balance? Differences in pressure? Even minor accelerometer or gyroscope measurements? Any minor imbalance experienced during the exercise means that it is not correctly performed? What is the acceptable range?  REPLY: As in previous column. | STAND WITH FCT, EC. TRY TO MAINTAIN YOUR BALANCE IN THIS POSITION FOR ONE MINUTE  FEET CLOSE TOGETHER is the one measurement.  EYES CLOSED is the second measurement  How we measure balance? Differences in pressure? Even minor accelerometer or gyroscope measurements? Any minor imbalance experienced during the exercise means that it is not correctly performed? What is the acceptable range?  REPLY: As in previous column. |
| HEAD &TRUNK SHOULD BE IN AN UPRIGHT POSITION. AS SOON AS YOU FEEL PRESSURE ON THE TOES OR HEELS RETURN TO THE CENTRE POSITION WITH WEIGHT ACROSS THE BALL OF THE FOOT  The difference from the one just above is the foam cushion, right? Does it change anything regarding measurements?  REPLY: Yes, this is correct. No extra required. | 2.STAND ON A FOAM CUSHION, FEET HWA, EO. TRY TO MAINTAIN YOUR BALANCE IN THIS POSITION FOR ONE MINUTE  As above or the foam cushion adds another measurement?  REPLY: As in previous column. | STAND ON A FOAM CUSHION, FCT, EO. TRY TO MAINTAIN YOUR BALANCE IN THIS POSITION FOR ONE MINUTE  As above or the foam cushion adds another measurement?  REPLY: As in previous column. | STAND ON A FOAM CUSHION, FHWA, EC. TRY TO MAINTAIN YOUR BALANCE IN THIS POSITION FOR ONE MINUTE  As above or the foam cushion adds another measurement?  REPLY: As in previous column. | STAND ON A FOAM CUSHION, FCT, EC. TRY TO MAINTAIN YOUR BALANCE IN THIS POSITION FOR ONE MINUTE  As above or the foam cushion adds another measurement?  REPLY: As in previous column. |
| FOR BENDING OVER: AS YOU BEND OVER MAKE SURE TO BRING CHIN T CHEST AND RETURN HEAD TO NORMAL UPRIGHT AS YOU COME UP.  SPEED OF BENDING OVER SHOULD BE INCREASED TO A FAST SPEED GRADUALLY AS THE EXERCISE BECOMES EASIER.  Similar to sitting exercise 3, right?  How much is the required speed for correct performance? Increased speed in one measurement, but how fast speed is defined? Should we measure times of bending over or something else?  REPLY: Normal speed will be speed is between 1 complete movement in approximately 3 seconds. Faster speed will be based on each person’s ability up to 1 full movement in 2 seconds. | 3.STAND WITH FNWA. BEND OVER AS IF TO PICK UP AN OBJECT OFF THE FLOOR. RETURN TO UPRIGHT AND REPEAT. 5 REPETITIONS  FEET NORMAL WIDTH APART: how much is the normal width?  REPLY: Normal width is one foot apart (30.4 cm) | STAND WITH FCT. BEND OVER AS IF TO PICK UP AN OBJECT OFF THE FLOOR. RETURN TO UPRIGHT AND REPEAT. 5 REPETITIONS  Feet closed together means width is zero or, e.g., up to 10 cms is ok?  REPLY: Width is 0 if possible (heels and toes touching) | STAND WITH FNWA.  REACH UP AS IF TO TAKE AN ITEM OUT OF A CUPBOARD. TILT HEAD BACK SLIGHTLY AS YOU REACH UP. 5 REPETITIONS.  The cupboard should be part of the virtual environment? We need to define it.  How is slightly measured?  REPLY: No, we do not require a cupboard as part of the virtual environment. Head extension should be no more than 30 degrees when looking up into a cupboard. | STAND WITH FNWA. REACH UP AS IF TO TAKE AN ITEM OUT OF A CUPBOARD. TILT HEAD BACK SLIGHTLY AS YOU REACH UP AND LIFT YOUR HEELS OFF THE FLOOR (HEEL RISE). 5 REPETITIONS.  Like the previous exercises of this line with heel rise measurement being added  REPLY: Yes. |
| HEAD &TRUNK SHOULD BE IN AN UPRIGHT POSITION, WEIGHT SHOULD BE FELT ACROSS THE BALL OF THE FOOT. AS YOU TURN TO THE LEFT LIFT YOUR LEFT FOOT OFF THE GROUND TO TAKE THE FIRST STEP, THEN TAKE A STEP WITH YOUR RIGHT FOOT AND REPEAT. AS YOU TURN TRY TO TAKE BIG STEPS AND TO MAINTAIN THE WEIGHT OVER THE BALL OF THE FOOT WHEN THE FOOT IS ON THE GROUND .TRY NOT TO MAKE SWIVEL TURNING.  HEAD &TRUNK IN AN UPRIGHT POSITION is the first measurement  WEIGHT FELT ACROSS THE BALL OF THE FOOT is the second measurement  AS YOU TURN TO THE LEFT LIFT YOUR LEFT FOOT OFF THE GROUND TO TAKE THE FIRST STEP, THEN TAKE A STEP WITH YOUR RIGHT FOOT AND REPEAT: the sequence should be exactly as described?  REPLY: Yes, but they can choose which direction they would like to begin with.  How big steps are defined/ measured?  REPLY: 30 cm; measurement please tell us your thoughts.  WEIGHT OVER THE BALL OF THE FOOT only with insoles, socks REPLY: ok  SWIVEL TURNING also needs to be assessed. REPLY: No need to assess; only assess if not lifting foot off the ground.  Many measurements should they all be performed 100% as instructed or there is an accepted range for some of them? REPLY: As above. | STAND WITH FNWA. TURN TO FACE THE OPPOSITE DIRECTION. 3 REPETITIONS TO THE LEFT AND 3 REPETITIONS TO THE RIGHT.  FEET NORMAL WIDTH APART: how much is the normal width?  REPLY: As above.  TURN TO FACE THE OPPOSITE DIRECTION: 180 degrees??  REPLY: Yes. | GRADUALLY INCREASE THE SPEED AS THE EXERCISE BECOMES EASIER UNTIL YOU CAN PRACTISE AT A FAST SPEED.  How is speed measured? Time for completing 3 REPETITIONS TO THE LEFT AND 3 REPETITIONS TO THE RIGHT?  REPLY: If not dizzy, a realistic normal speed for an older adult would be 10 seconds. Faster will be dependent on each person’s abilities. |  |  |

ABBREVIATIONS: HWA: HIP WIDTH APART; EO: EYES OPEN; EC: EYES CLOSED; FCT: FEET CLOSE TOGETHER; FNWA: FEET NORMAL WIDTH APART

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| **INSTRUCTIONS HOLOGRAM WILL VERBALLY EXPLAIN AND VISUALLY DEMONSTRATE** | **EXERCISE** | **PROGRESSION 1** | **PROGRESSIONS 2** | **PROGRESSION 3** |
| HEAD &TRUNK SHOULD BE IN AN UPRIGHT POSITION, INITIAL STARTING POSITION WILL BE FEET NORMAL WIDTH APART (NO MORE THAN A FOOT) AND WEIGHT SHOULD BE FELT ACROSS THE BALL OF THE FOOT.  FEET NORMAL WIDTH APART: NO MORE THAN A FOOT is also for all standing exercises? REPLY: For the standing exercises it depends on the specific exercise. See above. | 1. ACROSS THE ROOM MAKING SURE TO A. LOOK OUT AT THE HORIZON RATHER THAN DOWN AT THE FLOOR CONTSTANTLY  B. TRANSFER BODY WEIGHT FORWARD WITH EACH STEP (PRETEND THERE IS A LINE FROM THE TIP OF YOUR NOSE TO YOUR BIG TOE – AS YOUR BIG TOE COMES TO THE GROUND WITH EACH STEP YOUR NOSE SHOULD ALSO MOVE FORWARD  C. INCORPORATE ARM SWING  LOOK OUT AT THE HORIZON RATHER THAN DOWN AT THE FLOOR CONTSTANTLY: it can be assessed with eye tracking and maybe with camera (if it is close). Should we provide virtual target in the horizon?  REPLY: NO eyes tracking. We need to monitor that head is in an upright position.  TRANSFER BODY WEIGHT FORWARD WITH EACH STEP (PRETEND THERE IS A LINE FROM THE TIP OF YOUR NOSE TO YOUR BIG TOE – AS YOUR BIG TOE COMES TO THE GROUND WITH EACH STEP YOUR NOSE SHOULD ALSO MOVE FORWARD: Tricky; maybe with accelerometer in head and foot?  REPLY: This is a typical explanation given in clinic to help the patient visualize it and practice. The body weight transfer forward should be monitored with the accelerometors/insole to ensure this is happening.  INCORPORATE ARM SWING: acceptable range?  REPLY: No range, no measurement.  How much is the lower acceptable speed? R | CONTINUE AS BEFORE GRADUALLY INCREASING THE WALKING SPEED AS THE EXERCISE BECOMES EASIER (MAX 1.6 m/s as needed to cross the road – need to confirm speed)  Lower speed?  REPLY: Person dependent. |  |  |
| HEAD &TRUNK SHOULD BE IN AN UPRIGHT POSITION, INITIAL STARTING POSITION WILL BE FEET NORMAL WIDTH APART (NO MORE THAN A FOOT) AND WEIGHT SHOULD BE FELT ACROSS THE BALL OF THE FOOT.  As above REPLY: As above. | 2.WALK ACROSS THE ROOM WHILE TURNING YOUR HEAD LEFT AND RIGHT TO LOOK BACK AND FORTH BETWEEN TWO TARGETS PLACED APPROXIMATELY 1.5 METRES APART AT EYE LEVEL.  TURNING YOUR HEAD LEFT AND RIGHT: how many degrees? REPLY: Between 30-45 degrees in each direction. Can you please calculate to make sure of range?  Maximum distance of the targets should be fixed REPLY: Yes.  Lower speed for correctly performing the exercises? REPLY: Person dependent. However need to ensure that no matter how slow there is head as well as gait movement. | CONTINUE AS BEFORE GRADUALLY INCREASING THE SPEED AS THE EXERCISE BECOMES EASIER UNTIL YOU ARE ABLE TO PRACTSE AT A FAST SPEED AS ABOVE  Fast speed is fast walking speed or number of head turns while performing the exercise? REPLY: Both head and walking speed should increase at the same time. Target is at least 1.6 m/s for walking and head turns maximum 3 head turns left to right or vice versa per second. | WALK ACROSS THE ROOM WHILE TURNING YOUR HEAD AS FAR TO THE LEFT AND RIGHT SCANNING THE ROOM AS WHEN CROSSING THE ROAD  As far is 90 degrees?  Just one time to the left and one to the right?  REPLY: Yes, to 90 degrees. Repeated movements throughout the whole minute and the speed should increase (as before) as the exercise becomes easier.  Should we make a virtual crossroad? REPLY: Yes | CONTINUE AS BEFORE GRADUALLY INCREASING THE SPEED AS THE EXERCISE BECOMES EASIER UNTIL YOU ARE ABLE TO PRACTSE AT A FAST SPEED AS BEFORE.  Fast speed is fast walking speed or number of head turns while performing the exercise? REPLY: As before. Fast speed refers to both head movement and walking speed. Fast head movement speed should be 1 90 degree turn left and right per second. |
| HEAD &TRUNK SHOULD BE IN AN UPRIGHT POSITION, INITIAL STARTING POSITION WILL BE FEET NORMAL WIDTH APART (NO MORE THAN A FOOT) AND WEIGHT SHOULD BE FELT ACROSS THE BALL OF THE FOOT.  HEAD MOVEMENTS UP SHOULD BE NO MORE THAN 40 DEGREES IN THE UPWARD DIRECTION AND WHEN MOVING HEAD DOWN - CAN THIS BE MONITORED?  So from 0 to 40 degrees up and down? REPLY: Yes. | 3.WALK ACROSS THE ROOM MOVING YOUR HEAD UP TO LOOK AT THE CEILING AND DOWN TO LOOK AT THE GROUND  We need to measure:  Walking speed?  Number of times moving the head up and down? REPLY: Minimum desirable speed target 1.6 m/s. For head movement we wish to monitor that speed is increasing as the exercise becomes easier (Minimum is only the extension or flexion component of movement per second; maximum is no more than two full extension to flexion head movements (range 60 degrees extension and 90 degrees flexion) per second.)  Do we need virtual targets in the ceiling and floor or just the degrees are enough to assess up and down movements? REPLY: NO | CONTINUE AS BEFORE GRADUALLY INCREASING THE SPEED AS THE EXERCISE BECOMES EASIER UNTIL YOU ARE ABLE TO PRACTSE AT A FAST SPEED AS ABOVE  Fast speed is fast walking speed or number of head turns while performing the exercise?  REPLY: As before. | WALK ACROSS THE ROOM WHLE PRACTISING DIAGONAL HEAD MOVEMENTS  Diagonal? We need a definition  REPLY: V shaped movement – look up to the left, down centre and up to the right – can start in either direction. Will need to measure degrees | CONTINUE AS BEFORE GRADUALLY INCREASING THE SPEED AS THE EXERCISE BECOMES EASIER UNTIL YOU ARE ABLE TO PRACTSE AT A FAST SPEED AS ABOVE  Fast speed is fast walking speed or number of head turns while performing the exercise?  REPLY: As before. |

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| NEW: BASELINE STRETCHING EXERCISES SITTING OR STANDIG FOR PERSONS WITH STROKE OR MCI | | | | |
| **INSTRUCTIONS HOLOGRAM WILL VERBALLY EXPLAIN AND VISUALLY DEMONSTRATE** | **EXERCISE** | **PROGRESSION 1** | **PROGRESSIONS 2** | **PROGRESSION 3** |
| Start by sitting near the edge of your seat.  *EXERCISE: hip external rotator stretch*  *As appropriate for persons with stroke or MCI* | Cross one ankle over your opposite knee. Gently lean forward until you feel a stretch in the hip and buttock area. The more you lean forward, the more you’ll feel the stretch in your hip. Hold for 15-20 seconds, then repeat for the other side. Repeat twice for each leg. |  |  |  |
| Sit with feet firm on the ground, back straight and head in an upright position.  *EXERCISE: lateral trunk flexion.*  *As appropriate for persons with stroke or MCI* | While seated, tilt your right shoulder down towards your right hip. Use your hand to reach down the side of the chair. Hold for 5 seconds. Then, return to midline and repeat on the other side. Alternate sides for a total of 10 repetitions. |  |  |  |
| STANDING Start by standing on a step or ledge, holding onto a railing or other sturdy surface for support.  *EXERCISE: Calf stretch*  *As appropriate for persons with stroke or MCI* | Keeping the knee straight, step one heel off the ledge and put your weight onto it until you feel a stretch along the back of your leg. Hold for 20 seconds and repeat both sides. Repeat 3 repetitions for each leg. |  |  |  |

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| NEW SITTING EXERCISES FOR PERSONS WITH STROKE, MCI, VESTIBULAR AND/OR LONG COVID | | | | |
| **INSTRUCTIONS HOLOGRAM WILL VERBALLY EXPLAIN AND VISUALLY DEMONSTRATE** | **EXERCISE** | **PROGRESSION 1** | **PROGRESSIONS 2** | **PROGRESSION 3** |
| Sit with feet hip width apart, placed firmly on the ground, back straight and head in an upright position.  *EXERCISE: Trunk rotation*  *As appropriate for patients with stroke or MCI* | While seated, move your upper body clockwise in circular motions. Focus on engaging your core muscles and feel free to use your hands for additional support. Start with small circles at a slow speed.  Repeat 10 times in each direction, clockwise and counterclockwise. | Practise the same exercises with larger circles at a slow speed.  Repeat 10 times in each direction, clockwise and counterclockwise. | Practise the same exercise with a small circle but at a faster speed. Continue to increase the speed as the exercise becomes easier until you are able to maintain your balance while practicing at a fast speed.  Repeat 10 times in each direction, clockwise and counterclockwise. | Practise the same exercise with a larger circle but at a faster speed. Continue to increase the speed as the exercise becomes easier until you are able to maintain your balance while practicing at a fast speed.  Repeat 10 times in each direction, clockwise and counterclockwise. |
| Start from a seated position.  *EXERCISE: Assisted toe raises*  *ONLY FOR PATIENTS WITH STROKE WITH FOOT DROP* | Place your unaffected foot underneath your affected foot. Then, use your foot to assist your affected foot up. Then release back down. Perform a total of 15 repetitions for affected leg only. | Progress to practising without assistance from the healthy foot. Perform a total of 15 repetitions for affected leg only. |  |  |
| Start from a seated position with your feet flat on the ground.  *EXERCISE: Heel raises*  *ONLY FOR PATIENTS WITH STROKE WITH FOOT DROP* | Point your toes and lift your heels off the ground. Then place your feet back down flat on the floor and repeat. You should feel this in your calf muscles.  Do 15 repetitions, making sure to keep your weight equal through both feet. | Increase the challenge by doing this same exercise in standing while holding on to a sturdy surface with both hands for additional support if required.  Do 15 repetitions, making sure to keep your weight equal through both feet. |  |  |
| Sit with back straight and feet placed hip width apart, flat on the ground Be mindful of maintaining controlled movement.  *EXERCISE: Seated marching on the spot*  *As appropriate, for all patient groups* | Start by lifting your affected leg up into your chest, and then place it back down onto the floor. Then repeat on the other leg, alternating back and forth. Do a total of 20 to 30 repetitions for each leg. | Practise the same exercises but pause at the top for a second or two.  Practise 20 repetitions for each leg. | Practise the initial exercise but also add arm swings (opposite arm, opposite leg) like you’re walking in place on the chair.  Practise 20 repetitions for each leg. |  |
| Sit with back straight, head in an upright position with feet hip width apart and placed firmly on the ground.  *EXERCISE: Sit to stand*  *As appropriate for all patient groups* | 1. Move toward the front edge of a sturdy chair with armrests. 2. Place your feet underneath your hips. 3. Place your hands lightly on each side of the seat. 4. Breathe in slowly. Lean forward and bring nose over knees 5. Breathe out as you slowly stand up. 6. As you move into a standing position, bring the weight to be felt across the ball of each foot. 7. Stand with feet flat on the ground and pause for a full breath in and out. 8. Breathe in as you sit down slowly. Tighten your core and abdominal muscles to control your lowering as much as possible. You should lower yourself back to the chair slowly, not just drop back into the seat.   Practise 5 repetitions, once a daily. | Practise sit to stand with the support of one hand. Practise 5 repetitions, once a day. | Practise sit to stand without using the armrests for support. | Practise sit to stand without arm support. Gradually increase the speed as the exercise becomes easier. |

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| NEW STANDING EXERCISES FOR PERSONS | | | | |
| **INSTRUCTIONS HOLOGRAM WILL VERBALLY EXPLAIN AND VISUALLY DEMONSTRATE** | **EXERCISE** | **PROGRESSION 1** | **PROGRESSIONS 2** | **PROGRESSION 3** |
| Stand with feet shoulder width apart. Weight should be felt across the ball of each foot with weight equally distributed on both feet. Head and upper body should be in an upright position, no leaning backwards or forwards. Knees should be “soft”, not “locked”  *EXERCISE: Lateral weight shifts*  *As appropriate, for all patient groups but particularly stroke and MCI* | Slowly shift your weight to your right foot and lift your left foot slightly off the ground. Hold for up to 30 seconds or as long as you can while maintaining good form. Try to keep tall posture and avoid leaning over. Then return to your starting position. Repeat 5 times on each side. | Gradually increase the speed of the weight shifts as the exercise becomes easier | Practise with feet hip width apart, at a slow speed | Practise with feet hip width apart gradually increasing the speed as the exercise becomes easier while maintaining good form. |
| Stand with feet hip width apart. Weight should be felt across the ball of each foot with weight equally distributed on both feet. Head and upper body should be in an upright position, no leaning backwards or forwards. Knees should be “soft”, not “locked”  *EXERCISE: limits of stability training anteroposterior direction*  *As appropriate, for all patient groups but particularly strok and MCI* | Sway forward from your ankles just until you feel pressure under your toes and change direction to sway backwards just until you feel pressure under your heels. Continue to sway forward and back as above for one minute, twice a day.  Heels and toes remain on the ground throughout the exercise. Practise | Practise the same exercise gradually increasing the speed as the exercise becomes easier until you are able to maintain your balance while practicing at a fast speed.  Practise for 30 seconds, twice a day. | Practise the same exercise at a slow to normal speed with feet close together.  Practise for 30 seconds, twice a day. | Practise the same exercise with feet hip width apart and eyes closed.  Practise for 30 seconds, twice a day. |
| Stand next to a wall but not touching with feet hip width apart. Weight should be felt across the ball of each foot with weight equally distributed on both feet. Head and upper body should be in an upright position, no leaning backwards or forwards. Knees should be “soft”, not “locked”  *EXERCISE: forward reach*  *As appropriate, for stroke and MCI* | Lift the arm nearest the wall to shoulder level (90 degrees if possible) Reach out in front of the body as if to pick up an object. Reach as far forward as you can without taking a step. Return to original position and repeat. Practice 10 repetitions, twice a day. | Continue the same exercise but gradually increase the speed as the exercise becomes easier until you are able to practise at a fast speed. |  |  |

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| NEW GAIT EXERCISES | | | | |
| **INSTRUCTIONS HOLOGRAM WILL VERBALLY EXPLAIN AND VISUALLY DEMONSTRATE** | **EXERCISE** | **PROGRESSION 1** | **PROGRESSIONS 2** | **PROGRESSION 3** |
| Stand with feet hip width apart. Weight should be felt across the ball of each foot with weight equally distributed on both feet. Head and upper body should be in an upright position, no leaning backwards or forwards. Knees should be “soft”, not “locked”  *EXERCISE: Side stepping*  *As appropriate, for stroke and MCI* | Stand in front of a wall or counter to hold onto for support. Step to the side with one leg then follow with the other. Repeat 5 steps, then change directions and repeat. Practise for one minute, twice a day. | Practise the same exercise but without holding onto an external object for support.  Practise for one minute, twice a day. | Practise the same exercise gradually increasing the speed as the exercise becomes easier.  Practise for one minute, twice a day |  |
| Stand with feet hip width apart. Weight should be felt across the ball of each foot with weight equally distributed on both feet. Head and upper body should be in an upright position, no leaning backwards or forwards. Knees should be “soft”, not “locked”  *EXERCISE: Walking with horizontal head movements scanning the room*  *As appropriate, for all patient groups* | Walk across the room while turning your head as far to the left and right as is comfortable scanning the room as when crossing the road.  Practise for one minute, twice a day – young patients under the age of 60 years old, no migraine history, no cervical issues  Practise for 30 seconds, twice a day: patients older than 60  Migraineurs will need to start with 10 seconds and gradually increase to 30 seconds in 5 second increments practicing once a day in WEEK 1 and twice a day from WEEK 2. | Continue the same exercise but gradually increase the head movement and walking speed as the exercise becomes easier. |  |  |

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| NEW OPTOKINETIC EXERCISES FOR PERSONS WITH VISUAL INDUCED DIZZINESS AND/OR VISUAL DEPENDENCY | | | | | | | | |
| **INSTRUCTIONS HOLOGRAM WILL VERBALLY EXPLAIN AND VISUALLY DEMONSTRATE** | **EXERCISE** | **PROGRESSION 1** | **PROGRESSIONS 2** | | **PROGRESSION 3** | | |
| Sit in front of the computer screen which should be placed at arm’s length.  The video starting point should be varied each time.  Potential videos may be found below. | The aim is to stare through the centre of the screen as the video is playing.  Begin with 10 seconds and gradually increase to 60 seconds in 5 second increments as the exercise becomes easier. Practise twice a day. (migraineurs will start with once a day in WEEK 1 and twice a day from WEEK 2)  Watch 2 of the videos each day, alternating between them. | The aim is to turn your head left and right to look from one side of the video image to the other as the video is playing. | Progress to practicing in standing with feet hip width apart, progressing to feet close together when this feels alright for full duration.  Begin with 10 seconds again (as under the Exercise heading) | | Stand with feet hip width apart. Turn your head left and right to look back and forth from one side of the video image to the other as the video is playing  Begin with 10 seconds again (as under the Exercise heading) | | |
| Stand with feet hip width apart. Weight should be felt across the ball of each foot with weight equally distributed on both feet. Head and upper body should be in an upright position, no leaning backwards or forwards. Knees should be “soft”, not “locked”  *EXERCISE: Walking with horizontal head movements scanning the room*  *As appropriate, for all patient groups* | Walk across the room while turning your head as far to the left and right as is comfortable scanning the room as when crossing the road.  Practise for one minute, twice a day – young patients under the age of 60 years old, no migraine history, no cervical issues  Practise for 30 seconds, twice a day: patients older than 60  Migraineurs will need to start with 10 seconds and gradually increase to 30 seconds in 5 second increments practicing once a day in WEEK 1 and twice a day from WEEK 2. | Continue the same exercise but gradually increase the head movement and walking speed as the exercise becomes easier. | |  | |  |

Videos:

<https://www.youtube.com/watch?v=YmuiflqFqM8&t=12s>

<https://www.youtube.com/watch?v=Z551ZJXawj0&t=16s>

<https://www.youtube.com/watch?v=C-OAFv5uGOw&t=31s>

<https://www.youtube.com/watch?v=u68EWmtKZw0&t=1097s>

<https://www.youtube.com/watch?v=hwgsrGRXxAo&t=10s>

For all exercises with head, body or eye movement

IN SITTING: Patients are asked at 10 seconds if they experience dizziness or blurry vision.

Questions to be asked: Do you feel dizzy, yes or no

If the patient responds YES, ask how dizzy? Mild, moderate, severe. If mild or moderate, continue at current. If severe, reduce and if unable to continue stop and go to the next exercise.

If the patients responds NO, then first ask patient to increase the speed of movement. The patient should report if feeling dizzy. If yes, continue at this speed if mild or moderate. If still too easy, continue to increase the speed. If maximum speed is reached without symptoms, stop and progress to next level at next session.

IN STANDING:

1. As above for dizziness; if no dizziness then focus on balance limits to decide progression.
2. For balance, this will be monitored by the hologram system. Ask patient at 10 seconds, how they feel. If they feel ok but postural sway is greater than normal continue to practice the exercise.
3. For standing exercises, speed should be started each day based on the day before with 10 second check for dizziness and balance.