Circuit class therapy intervention manual

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English C, Hillier S et al (2007) “Circuit class therapy versus individual therapy sessions during inpatient stroke rehabilitation. A controlled trial” *Archive of Physical Medicine and Rehabilitation* 88:955-63

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Preamble

This manual is intended as a guide to direct and support the provision of circuit class therapy (CCT) as a model of therapy delivery to people receiving hospital or centre-based rehabilitation. It was initially written as guide to therapists providing physiotherapy services to people after stroke and attending inpatient rehabilitation. However, the principles of CCT provision are the same, regardless of patient diagnosis and many of the exercises can be adapted for use for people with movement difficulties from other causes.

The aim of the manual is to provide:

1. A model or framework for CCT delivery
2. Guidance and practical ideas about the sorts of activities and exercises that can be included in circuit classes.

It is written with the experienced clinician in mind and should be used as an adjunct to clinical reasoning processes. It is not a 'recipe'. As long as the essential components and key principles (outlined below) are adhered to, therapists are free to adapt the activities or create their own. CCT employs the same key principles that are applied in any rehabilitation intervention; to tailor interventions to participants so that they experience some success and also some challenge, to continually progress the exercises and activities as their capacity improves and to aim for independence and maximizing functional outcomes.

General Guidelines

If CCT is to be provided as the sole method of physiotherapy service delivery

Duration - total of 3 hours per day. Usually this will be provided in two 90 minute sessions per day, but may also be provided in one 2-hour session and one 1-hour session.

Frequency – twice daily, 5 days a week (Monday to Friday).

Staff to participant ratio – this will depend on the level of dependency of participants, but generally CCT is provided on not more than 1:3 – i.e. no more than one staff member to three participants up to a maximum of six participants per staff member. A second staff member (physiotherapist, occupational therapist or therapy aide) may be present in addition to this, for part of each class to provide additional assistance in supervising more difficult activities. There may also be times that two staff members are working with the same participant for a period of time, for example during early walking activities or for challenging balance activities.

Staff qualifications – Circuit class therapy sessions should be overseen by a physiotherapist (or occupational therapist for the upper limb components). Therapy assistants can assist in the provision of circuit class therapy under the direction of a qualified therapist. Therapy aides may, on occasion, be the sole person running a circuit class, as long as the treating qualified therapist has provided sufficient detailed instructions. Therapy students should be encouraged to assist in planning and conducting CCT sessions under the supervision of clinical educators.

Participant mix – Participants with a variety of diagnoses or movement difficulties can be included in the same class. They may be following a different exercise program; as each participant is following their own individualised program, it does not matter if participants are doing different activities and exercises within the same class.

CCT can also be used in addition to individual therapy sessions. In this case, the same principles apply, but the frequency and duration may be adjusted to suit.

Key Principles

1. Maximise participant activity levels

The aim of CCT is for participants to be engaged in meaningful, therapeutic physical activity for the majority of CCT sessions. Naturally, rest times are required, but the aim should be to keep participants as active as possible. As the therapist, your role will be to assist (verbally and/or physically) participants to safely complete activities when required, identify meaningful activities that participants can practice independently (or with distant supervision) and progress activities as appropriate as well as provide timely and specific feedback about performance.

2. Exercises and activities should be as task-specific as possible

The key principles of task-specific exercises are:

- Exercises as closely resembling the task you are wishing to retrain as possible (e.g. activities to strengthen hip abductors to increase stability in stance phase should be closed chain exercises done in a weight-bearing position).
- Use everyday items as much as possible.
- Vary the items used and the context in which tasks are practiced (e.g. STS from various types of chairs, reach and grasp with various types of cups).
- Provide concrete goals for each task (e.g. if active pronation/supination is the task, grasping a ruler that is then tapped from side to side provides the participant with instant feedback).

3. Tailor the exercises and activities to each participant

The specific exercises and activities should be tailored to each individual participant and progressed to ensure they are working at their optimal level at all times. This should occur as part of a clinical reasoning process as per any physiotherapeutic intervention. This includes giving feedback (verbal, tactile, visual) about performance of activities.

At least at the initial assessment, and at intervals as needed thereafter, the CCT intervention algorithm (Appendix 1) should be followed to assist in planning the most appropriate activities to include for each participant. Use of the CCT planning sheets may assist in planning each class.

The tables of exercises are set out in levels of difficulty from A (easiest) to D (hardest). For brevity, a maximum of 4 variations are given – there may be other ways to vary and progress exercises.

Usual progression principles apply for example increasing weights (if aiming for strengthening) or repetitions (if aiming for coordination), increasing complexity (if aiming for skill) and changing environment and objects to increase transferability of skill. Incorporating dual tasking into activities (e.g. carrying a tray of cups while walking or STS) is another way of increasing the skill level.

4. Encourage autonomy and independent practice

Where possible (and safe) participants should be encouraged to take responsibility for their own practice sessions. This may mean giving participants their own practice sheets and encourage them to do them in whatever order they like and to ask for help when needed.

5. Encourage camaraderie and fun!

Healthy competition between participants and a sense of fun is important!

You can use partner work to monitor activities / give feedback, for example, checking for symmetry of activities, counting repetitions, timing activities.

General structure of circuit class

- For a 90 minute session, choose 8-10 activities for each participant to work through in the session and aim to spend 8-10 minutes on each activity.
- Those participants with UL issues should have 3-4 activities aimed at improving UL function in each session. If possible, make at least one of these a joint UL/balance task – e.g. pegging out washing on a line or reaching with the affected arm in standing.
- Each session should include at least 2 specific walking activities – with one of these being treadmill walking where possible to increase endurance.
- Each session should include at least one balance activity that is challenging enough to require the assistance of a therapist.
- Aim to include one group activity per day.
- Tip – sit to stand is often a good activity to start with as most participants will be able to do this safely with minimal instructions, so they can start with this while you are getting organized!

Hints for maximizing participant safety

- Sit between or next to parallel bars.

- Place back of (stable) chair next to participant.
- Sit next to wall with high plinth in front and another one to the side.
- Always have chair or plinth behind and something for UL support nearby.
- Use family members/students/assistants as appropriate.

Activities to achieve independence in sitting

1	A	B	C	D
	Sitting with the minimum physical support required.	Sitting with the minimum physical support required – incorporate limb and head movements. Reaching within arm's length.	Sitting edge of plinth reach beyond arm's length over affected leg. Reach to touch target or to pick up/move objects.	Perch on edge of high plinth with minimal thigh support and reach over affected leg.

Activities to achieve independent transfers from sit to stand

2	A	B	C	D
	Sitting edge of high plinth with scales or force platform under affected leg for feedback. Push through affected leg.	Sit to stand from perching with hand support.	Sit to stand from high chair with arm rests. Affected leg should be behind unaffected leg.	Sit to stand from lower chair / no arm rests. Increase distance unaffected leg is out in front.
				Sit to stand low chair, with unaffected foot on step. Cross hands over front of body.

Exercises for strength/control around the hip

3	A	B	C	D
	Supine on edge of plinth with affected leg on the floor. Knee in 90 flexion, hip neutral extension. Push down through foot to raise buttocks. Avoid using quads to straighten knee.	Standing, open chain hip extension.	Step backward onto low step OR walk up stairs backwards with handrail.	Step raise to front: With affected foot on low step in front, step up to lift unaffected foot off the ground. Can start by coming up onto unaffected toes, but careful not to just push up with unaffected foot.
		Standing, open chain hip abduction.	Step sideways onto low step OR walk up stairs sideways, leading with affected leg with handrail.	Step raise to side: With affected foot on low step to the side, step up to lift unaffected foot off the ground.
			Step unaffected leg forward onto step, use mirror or place a chair/rail/high plinth next to affected hip to give feedback about hip falling into ADduction.	

Exercises for strength/control around the knee

4	A	B	C	D
	Sitting, slide foot along floor to extend knee. Use target marks on the floor. Use slippery sam to reduce friction.	Sitting, open chain knee extension ± weights. *NB: close chain, WB exercises are preferable.*	Controlled knee bends: Standing feet shoulder width apart, feet take as much weight as possible through the affected leg, flex affected knee to about 20 degrees, then extend again without locking.	Step downs: Standing on low step, step down leading with non-affected foot. Aim for slow, controlled step.
			Walk with knees slightly bent.	Step downs no hand support. Place half foam cup on floor in front. Tap with unaffected foot without crushing.
	Sitting, flex knee past 90. Use target marks on the floor. Use slippery sam to reduce friction.	Hamstring curls in standing ± weights.		

Exercises for strength/control around the ankle

5	A	B	C	D
	Sitting, toe raises (active DF) ± weights.	Standing raise up onto toes, encourage even weight bearing.	Stand on small ramp, raise onto toes. Do in SLS.	Walk on toes.
	Sitting heel raises ± weights.			Walk on heels.

Exercises for improving control of lower limb

6	A	B	C	D
	Heel shin (in lying) Run heel of foot up and down the shin as smoothly as possible. Can also go one direction, lift off foot and place back to start.	Foot placement in sitting. In sitting, tap foot to marks on the ground aiming for control and accuracy.	Foot placement in standing. Progress by increasing speed.	Overground walking away from bars, placing feet on marks on floor.

Exercises for improving postural control in standing

Aim to include *at least 1 postural control activity that adequately challenges balance (and therefore requires therapist assistance) per class.* Aim to include another 1-2 activities that can be performed with distant supervision. Most of the tasks below can be adapted for people who require standby assist or even light assist to safely stand through to those more independent who require more challenging tasks. The BOS can be narrowed, the support surface altered and the distance reached or speed of activity increased.

7	A	B	C	D
	Standing next to bar with feet apart. Aim for steady stance and minimum UL support (ie intermittent support or fingertips only). Add in controlled movement of weight from side to side.	Stand in front of wall/room divider. Reach for marks on wall within BOS. Vary direction and height of marks. Can also trace picture / spiral on whiteboard.	Toe tap ups: Stand with minimum UL support. Tap one toe onto edge of step placed in front. Repeat with other foot.	Clock face: Standing with marks on the ground in front arranged in a clock face. Tap toe to each mark, then back to stance position.
	Stand next to bar, unaffected foot on step to side / in front.	Stand and reach for objects placed in varying positions and heights, eg low stool, high shelf, to the side.	Ankle strategies: Standing approx ½ m from wall with back to the wall. Slowly lean back, using ankle DF and arms to slow movement. Aim to touch wall without leaning against it	Stepping over objects forwards and sideways, increasing speed and size of objects.

		Stand and peg washing on a line. Stand and fold washing (or other meaningful task). Vary size and shape of washing.	Stepping strategies – practice stepping quickly in all directions	

Walking practice - simple

All participants should perform *at least 2 preferably more* walking activities per class. Aim to include some overground walking practice away from the parallel bars each session, even if this is with 2 people assisting. As soon as they are able to, participants should have one session on the treadmill per day (aim for 10 – 20 minutes on treadmill).

8	A	B	C	D
	Step forward to mark on floor in front. Step forward onto step in front. Lead with affected foot, then lead with unaffected foot.	Walk along parallel bars forwards. Walk sideways/backwards along bars. Focus on stride length and/or foot placement by using a marked walkway. Focus on speed by doing time trials.	Treadmill walking, lowest speed with 2 assist (may need one to assist affected LL swing or knee control in stance). Treadmill walking, reduce assistance, increase speed *as much as is safe to do so.*	Outdoor walking with assistance. Incorporate as many different surfaces as possible.

Walking practice – adaptive

9	A	B	C	D
	Indoor obstacle course – over obstacles, changes of direction, picking up objects from floor.	Walking on stairs, ramps, single steps	Outdoor walking with obstacle negotiations.	Dual tasking with simple walking. (eg walk and carry items, walk and mental arithmetic, walk and talk/turn head) Dual tasking with obstacle courses.

Upper limb and hand activities

This section presents some exercises using the matrix of difficulty as for lower limb activities, and other exercises in a list format as a grab bag of ideas from which to select the most appropriate for your patient. Usual concepts of progression apply – increasing repetitions, changing size and weight of object, increasing complexity of tasks. Active control exercises can often be done bilaterally to encourage use of ipsilateral pathways. Fine motor/skill based tasks (unless they are inherently bilateral tasks) should be done with the unaffected arm constrained in some way (behind back, mitt or sling).

Exercises for strength/control around the shoulder

10	A	B	C	D
	Sitting with arm supported on high plinth at 90 shoulder flexion. Active protraction to push small items of edge of plinth, or to hit target on a wall. Can use slippery sam or skateboard to reduce friction.	Sitting shoulder supported. Active protraction to push weighted object.	Active antigravity shoulder flexion in sitting or standing. Reach for target on wall.	Active shoulder flexion with weights/theraband. Reach for target on wall.

	Sitting with arm supported on high plinth at 90 shoulder flexion. Active horizontal AB and ADduction to hit target. Can use slippery sam or skateboard to reduce friction.	Auto assisted shoulder flexion – holding onto stick with both hands.	Active antigravity shoulder ABduction in sitting or standing. Reach for target on wall.	Active shoulder ABduction with weights/theraband. Reach for target on wall.
	Sidelying with arm supported in slings from overhead cage. Active shoulder protraction to reach for suspended targets.	Auto assisted shoulder abduction – holding onto stick with both hands.	Active antigravity shoulder rotations (IR/ER) in sidelying.	Resisted IR/ER exercises with weights (sidelying) or theraband (standing/sitting).

Exercises for strength/control around the elbow

11	A	B	C	D
	Sitting with arm supported on high plinth at 90 shoulder flexion. Active elbow flexion and extension. Use slippery sam/skateboard to reduce friction.	Active antigravity elbow flexion (sitting). Active antigravity elbow extension (lying supine). Where possible, provide targets to aim for.	Resisted elbow extension/flexion with free weights/theraband.	
	Place hand palm up on table. Turn over to palm down.	Active pronation/supination – hold or secure tendon hammer or ruler in the hand (palmar pockets are good for this). Tap hammer/ruler to table.		

Exercises for strength/control around the wrist

12	A	B	C	D
	Wrist flexion /ext with gravity eliminated (supported on table). Provide target to aim for.	Wrist flexion /ext antigravity (eg over edge of table.	Wrist flexion / ext with resistance.	
	Radial and ulnar deviation with gravity eliminated. Provide target to aim for.	Radial and ulnar deviation antigravity (eg over edge of table.	Radial and ulnar deviation with resistance.	

Exercises for strength/control around the fingers and thumb

13	A	B	C	D
	Finger flexion / ext with gravity eliminated (supported on table). Provide target to aim for.	Grasp and release objects of different sizes.	Use dynamometer or putty for resistance in practicing grip strength.	
	Spread fingers apart and close again with palm on table.		Use bull dog clips for resistance with fine pinch grip.	
	Place hand around object, try and squeeze object, then lift fingers/thumb away.			

Exercises for reaching (focus on proximal control)

14	• Place palm on wall in front and hold position. Move trunk while keeping hand still. • Hang out washing or other overhead activities. • Draw on whiteboard – trace spiral and wipe clean again. • Wipe over high plinths, shelves. • Wiping walls/windows/whiteboard. • Move objects from lower surface (floor, low table) to higher surface (high plinth/shelf) • Reaching for objects on high shelves or to touch targets placed above shoulder height (+/- wrist weights). • Rolling pin pushing forward and backwards. • Push glass or other object to targets on table.

Exercises for reach and grasp

15	• Reach and grasp cups and various objects in sitting. Vary size and shape to encourage different grips. • Pick up glass/cups using spider grip from above. • Reach and grasp and move objects to and from different heights. • Take lids off jars/bottles. • Stack cups/large objects. • Bring objects from table to mouth. Vary size, weight. Add water.

	• Pour water from jug to cup. • Take objects in and out of toiletry bag. • Drop tennis ball from one hand and catch in another. Swap hands. • Mix with wooden spoon. • Pick up pencil, turn clockwise and place down again. Can mark out clockface on a table to give targets to aim for.

Exercises for object manipulation

16	• Use theraputty to make sausages, balls, pinch off small bits. • Scoop coins from edge of table into palm of other hand. Swap hands. • Take money in and out of purse. • Stack coins/checkers. • Use telephone to dial numbers. Use keyboard to type. • Pick up variety of small items and transfer cup to cup. • Spoon water cup to cup. • Use cutlery with theraputty. • Draw even lines / your name / dots within a circle / trace pattern. • Pour spilt peas/rice into hand. Swap hands. • Fold paper and place in envelope. Fold facewashers/hankies. Roll socks.

	• Tear paper. Cut paper with scissors. • Use a stopwatch to time activities. • Undo and do up buttons/zips. • Use plunger. Swap hands. • Play snap with partner. • Turn pages of book/magazine/newspaper. • Open snap lock bag.

Exercises for control of upper limb

17	• Finger nose movements – touch target on wall or partner's finger. Vary distance and speed. • Rapid alternating movements using pronation/supination on a table, clapping hands together, slapping thigh. • Touching targets of varying size and distance. Increase speed.

Exercises for flexibility of the upper limb

18	• Self stretch finger long flexors in sitting (prayer position) or by weight bearing on flat palm. • Thumb web space stretch around glass/cylinder. • Auto assisted stretch into shoulder flexion or abduction using stick. • Prolonged positioning in shoulder flexion or abduction or AB/ER

Exercises for improving awareness of sensation in the hand

19	• Retrieve objects from bucket of split peas/rice. Try and identify objects without looking. • Identify different textures (such as hairbrush sandpaper (coarse and fine), leather, glass, metal, newspaper, magazine, pinecone, sheepskin, hessian sacking, wool, corduroy, flannel, velvet, silk. • Identify numbers/letters/shapes traced on the arm by someone (can be done with buddy as partner work).

Group activities

Aim to include a group activity most days of the week to encourage camaraderie and peer support. Group games should still meet the criteria of being task specific and tailored to participants as much as possible. Activities can also be organized for pairs or smaller sub-groups of the class if more appropriate. Ideas for group/pair activities include:

- Relay races. This can vary from simple races to a cone and back again if all participants are of a similar level of walking ability, or can be more creative to match participant's abilities. E.g. can mix up activities such completing a set number of sit to stand repetitions, increasing difficulty of walking task (e.g. over obstacle course, heel toe walking, backwards walking) or even include some upper limb tasks
- Time trials – this can be for simple overground walking tasks, or for any variation. Can also do time trials of standing balance tasks, or upper limb tasks.
- Card games.
- Passing objects in sitting for UL function, particularly bilateral training.
- Passing objects in standing for standing balance.
- Treasure hunt around room. Hide objects (like cards) so that participants have to bend and look or move around obstacles to find items.
- Timing each other in activities.

Circuit class therapy planning sheet

Name of participant **Date**

Exercises planned	Completed (note progress such as reps, times,	Other exercises included
Morning class		
Afternoon class		