

In older adults, there is insufficient statistical evidence to support or refute that physical activity combined with a simultaneous secondary task will improve mobility to a greater extent than physical activity alone.

Prepared by: Marjorie Berry
Date: March 2008
Review date: March 2009

CLINICAL SCENARIO: Older adults have been shown to mobilize less well under dual task conditions however to safely negotiate at home and in the community, an individual must be able to do so. (Schrodt & Mercer, 2000) Successful mobility in the community requires an individual to be able to maintain their balance not only when distracted but also when the environment requires a postural change to enable them to negotiate curbs and obstacles. When an individual is not successful in adapting to these challenges falls occur. The elderly are more prone to falls when distracted or fatigued (Lundin-Olsson & Nyberg, 1997) and they are slower to react to hazards when their attention is divided. (Chen et al., 1996) Postural stability is negatively affected in the geriatric population when a task requires increased attention as compared to a younger population. (Shumway-Cook & Woollacott, 2000)

FOCUSSED CLINICAL QUESTION: Does a Geriatric population show a more significant change in their mobility when they participate in a training program which includes a physical activity with or without an activity which requires them to divide their attention.

Summary of Search, 'Best' Evidence' appraised, and Key Findings:

- Five studies matched the inclusion criteria, 1 case study and 4 RCT's.
- One study used a blinded RCT (Yang et al., 2007). This study provided the best level of evidence and utilized the best methodology and consequently will be discussed in greater depth in this CAP.

CLINICAL BOTTOM LINE: Providing distraction in the form of a dual task to an elderly client during activity makes sense despite the lack of statistical evidence from the five studies reviewed.

Limitation of this CAP: This critically appraised paper has not been peer-reviewed by one other independent person/a lecturer.

SEARCH STRATEGY:

Terms used to guide Search Strategy:

- Patient/Client Group: Adults aged 65 years or older.
- Intervention (or Assessment): Physical activity which may include balance or strengthening exercises or walking
- Comparison: Physical activity alone and physical activity with a simultaneous second task (attention or distraction exercises)
- Outcome(s): Mobility outcomes which are relevant for a geriatric population

Databases and sites searched	Search Terms	Limits used
PEDro CINAHL MEDLINE EMBASE OVID (Including Cochrane Library, ACP Journal Club and DARE). Google Scholar Theses and dissertations	Physical activit* or exercis* or walk or balance AND Physiotherapy or physical therapy AND Geriatric* or elderly or senior* AND Dual or attention or cognition Author search Physiotherapy or physical therapy AND Physical activity or exercise or walk or balance	No limits for date Medline limited to Dual (not attention or cognition)

Systematic Review

- **Inclusion Criteria:**
 - ❖ Random design or experimental design
 - ❖ Age 65 or older
 - ❖ Any medical diagnosis
 - ❖ Community based
 - ❖ Mobility based outcome measure
 - ❖ Comparison of two tasks (physical activity and physical activity with a simultaneous second activity)
- **Exclusion Criteria:**
 - ❖ Inpatient
 - ❖ Dependent mobility

RESULTS OF SEARCH

Five relevant studies were located and categorised as shown in Table 1 (based on Levels of Evidence, Centre for Evidence Based Medicine, 1998)

Table 1: Summary of Study Designs of Articles retrieved

Study Design/ Methodology of Articles Retrieved	Level	Number Located	Author (Year)
Randomized control trial	1b/2b	1	McCulloch(2002)
Randomized control trial	1b/2b	1	Stemmler (2003)
Randomized control trial	1b/2b	1	Vaillant (2006)
Randomized control trial	1b/2b	1	Yang (2007)
Case study	4	1	Silsupudal (2006)

Table 2

Summary of Quantitative Review

Criteria for study Review (<i>Evidence-based rehabilitation. A guide to practice.</i> 2002)	(Silsupadol et al., 2006)	(Vaillant et al., 2006)	(Yang et al., 2007)	(Stemmler et al., 2003)	(McCulloch et al., 2002)
Sample size justified	NO	NO	NO	NO	NO
Blinded	YES	NO	YES	?	?
Random Sample	Case study volunteers N=3	RCT by address N= 56	RCT community groups N=25	RCT No detail N=22	Pseudo-random retirement community N=16
Samples compared baseline	NO	NO	YES	NO	NO
Drop outs	1 from follow up	12(results not included)	zero	?	?
Contamination/Co-intervention	?	?	Co-intervention avoided	?	?
Informed Consent	yes	YES	YES	?	?
Results can be replicated	YES	NO	YES	YES	NO
Statistical tests	NO	YES	YES	YES	Statistics used

appropriate		Wilcoxon Mann-Whitney Spearman's coefficient.	t tests, Chi square MANOVA	ANOVA MANOVA	for significance tests not identified
RESULTS	Balance Improved	Results not significant TUG better with Dual task	Improved gait with dual task (increased speed).	Decreased fall risk (decreased velocity)	Results not significant
Outcomes	BERG, TUG, CDI, ABC	TUG,OLB	Gait analysis	POMA and gait	SWOC NEUROCOM sensory

KEY:

RCT= Randomized control study

?= reference did not mention this information.

BEST EVIDENCE

Yang et al., 2007 was identified as providing the 'best' evidence and selected for critical appraisal. Reasons for selecting this study were:

- Randomized controlled trial
- Blind
- Baseline comparison of groups showed no differences statistically

SUMMARY OF BEST EVIDENCE**Critically Appraised Paper (Yang , 2007)****Aim/Objective of the Study/Systematic Review:**

This study examined the effect of a dual task program on the gait pattern of stroke clients. Background literature was discussed both to justify the need for the study and to review the relevance of utilizing a dual task.

Study Design: This single blind randomized controlled trial (N=25) recruited participants from community groups, the N=12 (control) and N=13 (intervention). Medical and outcome based inclusion/exclusion criteria was reviewed. The sample size was not justified. Informed consent was received. No ethical considerations were discussed.

Participants:

Inclusions:

Chronic stroke (at least a year earlier)
 Able to walk 10m without a mobility device
 Not receiving any rehabilitation services
 Stable medically
 Ability to follow instructions

Exclusions:

Any co-morbidities which precludes gait training,
 Uncontrolled health condition(s) for which exercise is contraindicated,
 Any neurological or orthopaedic disease that might limit the study.

Mean age control 59.17 +/- 11.98

Mean age experiment 59.46 +/- 11.83

Control male 7/female 5

Intervention male 7/female 6

Hemiplegic side:

control group: 6 right sided hemiplegia, 6 left sided hemiplegia.

Intervention group: 10 right sided hemiplegia; 3 left-sided hemiplegia.

Baseline comparisons of the control and intervention group were completed. There were no significant differences with respect to age, type of stroke, onset, sex, hemiparetic side, or in selected outcome measures.

Intervention

Intervention occurred 3 times a week for 4 weeks. The training program included 1)walking while holding 1 or 2 balls in both hands, 2)walking while bouncing a ball 3)walking while kicking a ball. The control group practised walking.

Outcome Measures:

The Gait rite system (a computerized gait assessment tool) was used to analyse gait pre and post training. This was noted to be both a valid and reliable measure.

Measures included: speed (cm/s), cadence (step/min), stride time (s), stride length (cm).

The evaluator (a physiotherapist) was blinded to group assignment. The trial order was randomized to compensate for practice effects and fatigue and specific instructions given during training.

The evaluation would be easily replicated if the Gaitrite system was available to clinicians. The ball exercises themselves are reproducible.

Methodology:

No drop outs

Co-intervention avoided (were not included if they were receiving rehab)

Contamination not mentioned but reasonable to assume that with two distinct groups that contamination can be avoided.

Informed consent

Results can be replicated.

Pedro score: 7/10. Points were assigned for: blind assessor, baseline comparability, between group comparison, concealed allocation, random, validity and point estimates, and adequate follow up.

Main Findings:

- The intervention group demonstrated a significant increase of velocity, cadence, stride time and length. The significance level (p) for this change occurring between the intervention and control group varied from $< .001$ (speed), $<.001$ (cadence), $.,007$ (stride time) and $.003$ (stride length).
- A significance of $.05$ was set for all analysis.
- The authors concluded that a walking speed of 110 to 150 cm/s is necessary to function in the community. The intervention group attained this speed. (Mean 115.35 +/- 18.14.) (P.001)

Critical Appraisal Summary

Limitations and Implications

Although a power calculation was not completed, an appropriate statistical analysis was completed. Subjects volunteered to participate and consequently were highly motivated and perhaps biased to succeed. However, the study had good methodology and would be easy to implement, if the gait rite system was available for clinicians.

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

Clinically, stroke patients are not provided with a dual task during physical activity as part of a typical stroke rehabilitation program.

As a physiotherapist, this author has observed that clients who were able to talk while walking were more responsive to the challenges of negotiating a busy inpatient hospital hallway in a safe manner. The indicator, that a client stops walking when talking, may be used to note a higher risk for falls. (Lundin-Olsson & Nyberg, 1997) Although the author has distracted her clients during activities to challenge their balance reactions, she has not introduced a consistent distracting exercise.

The study with the strongest methodological quality (Yang et al., 2007) provided the best evidence supporting the benefits of using a dual task while exercising. The authors noted that to function well in the community, studies have shown that an individual must attain a walking speed of 110 to 150 cm/s. Subjects in the intervention group attained this speed.

These results are relevant for clinicians who treat high functioning stroke clients.

There were significant methodological concerns with 80% of the studies in this review. (Refer to Table 2) All references had sampling biases: 80% of the studies had samples which were not representative of the population and 100% had relatively small samples with no power

calculation. The study with the largest sample had numerous dropouts whose data was not included. In addition, results cannot be generalized between studies since subjects varied from those with self-reported balance difficulties, chronic stroke and osteoporosis and two groups that were not well identified.

In addition, even though there were no statistical benefits noted in two of the studies, client outcomes in these studies did improve post intervention which suggests that these exercise regimes may be beneficial clinically. (Silsupadol et al., 2006; Vaillant et al., 2006) The outcome measures used in these two studies were also more relevant to the clinical question than walking speed. Consequently, although, studies have not proven whether improved activity under a dual task condition translates into improved balance under novel conditions which could directly impact risk for falls, the author recommends continued use of dual task interventions with geriatric clients as client outcomes did improve.

Future research should focus on an inpatient geriatric rehabilitation population utilizing TUG as an outcome measure since this measure is used both as a mobility measure and as a predictor for falls in the elderly. (Shumway-Cook & Brauer, 2000)

REFERENCES

- Chen, H., Schultz, A., Ashton-Miller, J., Giordani, B., Alexander, N., & Guire, K. (1996). Stepping over obstacles: Dividing attention impairs performance of old more than young adults. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 51(3), 116-122.
- Lundin-Olsson, L., & Nyberg, L. (1997). 'Stops walking when talking' as a predictor of falls in elderly people. *Lancet*, 349(9052), 617.
- McCulloch, K. L., Guerra, L. D., Lee, C., & Taylor, K. M. (2002). Dual-task performance on the standardized walking obstacle course: Measurement of balance changes in older adults following a pilot intervention. *Journal of Geriatric Physical Therapy*, 25(3), 37.
- Schrodt, L., & Mercer, V. S. (2000). Dual-task performance of cognitive and balance tasks in older adults. *Issues on Aging*, 23(3), 3-6.
- Shumway-Cook, A., & Brauer, S. (2000). Predicting the probability for falls in community-dwelling older adults using the timed up & go test. *Physical therapy*, 80(9), 896-903.
- Silsupadol, P., Siu, K., Shumway-Cook, A., & Woollacott, M. H. (2006). Training of balance under single- and dual-task conditions in older adults with balance impairment. *Physical therapy*, 86(2), 269-281.
- Stemmler, K. E., Tournas, L. L., & Simpkins, S. D. (2003). Effects of dual task training on gait and balance in older adults. *Journal of Geriatric Physical Therapy*, 26(3), 47.
- Vaillant, J., Vuillerme, N., Martigné, P., Caillat-Miousse, J., Parisot, J., Nougier, V., et al. (2006). Balance, aging, and osteoporosis: Effects of cognitive exercises combined with physiotherapy. *Joint Bone Spine*, 73(4), 414-418.

Yang, Y., Wang, R., Chen, Y., & Kao, M. (2007). Dual-task exercise improves walking ability in chronic stroke: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, 88(10), 1236-1240.
