

STRONG Medicine Unit
Report on 24 Months Activity
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Introduction

The **STRONG** medicine program commenced in 1999.

In the year 2001 our mission statement is:

“ To develop a Centre to be emulated nationally, integrating the use of exercise based medicine into healthcare for the elderly.

The STRONG therapy program will provide:

- 1. Exercise as a treatment for disease**
- 2. Education for health professionals in the identification of sarcopenia, its functional implications and treatment.**
- 3. Ongoing research into exercise as a medicine.”**

I am happy to report the outcomes achieved after 2 years of operation this report includes outcomes in five areas:

1. Overall summary, future aims and needs.
2. Utilisation and implementation data
3. Safety
4. Health outcomes
5. Impact on health care system
6. Educational outreach

Summary of first 24 months of STRONG.

The attached report outlines the evidence for the efficacy of the STRONG Therapy program. In short our major findings 24 months into the STRONG experiment are in a targeted group of diverse individuals and diseases. We have significantly improved physiology, self-reported and objective function, QOL, depression and sleep. ***These findings in a clinical treatment program for the elderly who have been selected for a wide variety of diseases, are previously undemonstrated.*** The continual strength gains are similar to highly controlled research settings. The addition of nutritional support to our model of care appears to be assisting our goals. We are now able to look at specific diseases and whether the program is having an effect. The program appears effective in depression, diabetes, Parkinson's Disease, stroke, osteoporosis, joint replacement and arthritis, prednisone or disease related muscle wasting, and frailty and functional impairment.

Subjects enjoy the high intensity program and see a major change in the presenting health problem. They rate our program at a high level. We have worked hard on appropriate training to exact physiological change in our patients. This appears to be giving us similar changes to research laboratory controlled trials of weight lifting. Despite this emphasis on high intensity we have a safe program with few adverse events. Both carers and general practitioners see an effect on the care of their patients and rate the program highly

The research and educational portions of our program have been extremely successful incorporating the teaching of our clinical principles in the medical curriculum at many levels as well as in exercise physiology. To have commenced two new research studies over this time ensuring an ongoing academic presence in the field of exercise and disease for several years.

Utilisation and implementation data

Period June 1999 to June 2001

Total numbers

- 385 patients assessed
- 100 clinics (50/year).
- 303 eligible (80%).

Of those eligible a 30% drop out at 3 months the majority in the first two weeks.

- 40% drop out by 6 months
- 70% dropout by 12 months
- 80% dropout by 24 months

Analysis of dropout's v completers suggests dropouts are significantly more depressed, take more medications, feel less vital and complain more of pain. They were not older or functionally different.

The figures include actively downloading subjects to other sites and therefore reflect those continuing to train at Balmain rather than true dropouts. Figures suggest with the current patterns that out of every 100 subjects who commence in the program we retain 50 at 6 months, 30 at 12 months and 20 at 24 months.

Frequency and duration of training

- Current activity is 8 hrs training/day three days a week
- One day intake clinic (4 new patients, 4 reviews)
- One day reassessments.
- Average group size 7/hr
- At any one time
 - 60% train twice a week
 - 30% train three times a week
 - 10% train once a week
- Currently 87 people training per week

Demographics of the group

Variable	mean+SD
Age (years) (40-91)	74.3+7.3
No. Chronic diseases	3.8+1.7
No. Medications	4.3+2.7
Education (no. years)	10+4
Female	58%
MMSE	28+2
Time from referral to assessment (days)	57.8+78.9
Veterans	36%
Married	42%

Reasons for referral

Gait, balance and mobility problems	40%
Depression	25%
Deconditioning	18%

Referral base

- 146 individual general practitioners have referred patients to the program
- Average time from referral to clinic appointment 59+78 days

Disease frequency in the group

Arthritis	68%
Cancer	14%
Cardiac failure	7%
Chronic lung disease	7%
Dementia	9%
Depression	30%
Diabetes	15%
Falls in last year	35%
Insomnia	13%
Joint replacement	10%
Obesity	10%
Osteoporosis with fracture	15%
Stroke	16%
Incontinence	10%
Parkinson's	10%
Hypertension	45%
Angina	8%

Summary

We have been able to recruit and screen 385 subjects in two years from over 146 General Practitioners. Of all subjects prescribed STRONG therapy, 80% completed their prescription in the first three months. Our population is typical in demographics and disease frequency with the 70-80 yo in large epidemiological studies. This is a positive aspect in generalising our results. No recruited patients were weight training prior to commencing STRONG therapy highlighting the lack of availability and use of this treatment. Patients were appropriately targeted for inclusion by disease with the majority of referrals for mobility problems. The cognitive ability of our group is high. We currently have 87 people training per week and a waiting list of over 4months for new referrals.

Safety and compliance

Adverse events

12,096 individual training sessions have been completed with one significant cardiac event. One patient with a previously repaired thoracic aneurysm developed a leak and it was surgically repaired. There were four falls with no injuries. Four patients developed abductor pollicis tendonitis, and 5 developed new rotator cuff tendonitis.

On 1440 individual testing sessions on muscle strength and performance tests: one person developed heart block on the 6min walk test. One patient sustained a minor muscle tear to the quadriceps while on the leg press. There were two falls.

Outside of the exercise sessions: Two patients developed UAP; Fractures - hip1, humerus 1, tib and fib 1; Surgery - hip replacement 2, decompressive back surgery 2, knee replacements 3; 1 suicide; two cancer deaths. Four patients were seeing physiotherapist prior to commencing in STRONG – there were 2 new referrals in this 2-year period.

We have completed a policy and procedures manual.

Compliance in the subjects:

- **0-3 months** **87%+16**
- **0-6 months** **77%**
- **0-9 months** **72%**
- **0-12 months** **77%**
- **0-24 months** **76%**

Summary

Enrolled subjects are questioned weekly regarding adverse events. In this frail aged population we had few intraexercise events demonstrating that this high intensity weight training and balance program is extremely safe. The high intensity weight training regimen and testing lead to some tendonitis, which we believe, was technique and machine related. Compliance was extremely high for a non-research setting. This suggests palatability of prescription intensity, frequency and setting. This clinical program appears to be safe and able to be done at high intensity.

Health outcomes

We have collected self-reported measures of function, quality of life, mood, self-efficacy, sleep, objective physical performance measures such as gait speed, chair rise time and physiological measures such as strength, balance and aerobic capacity every three months on all subjects over the 24 month period.

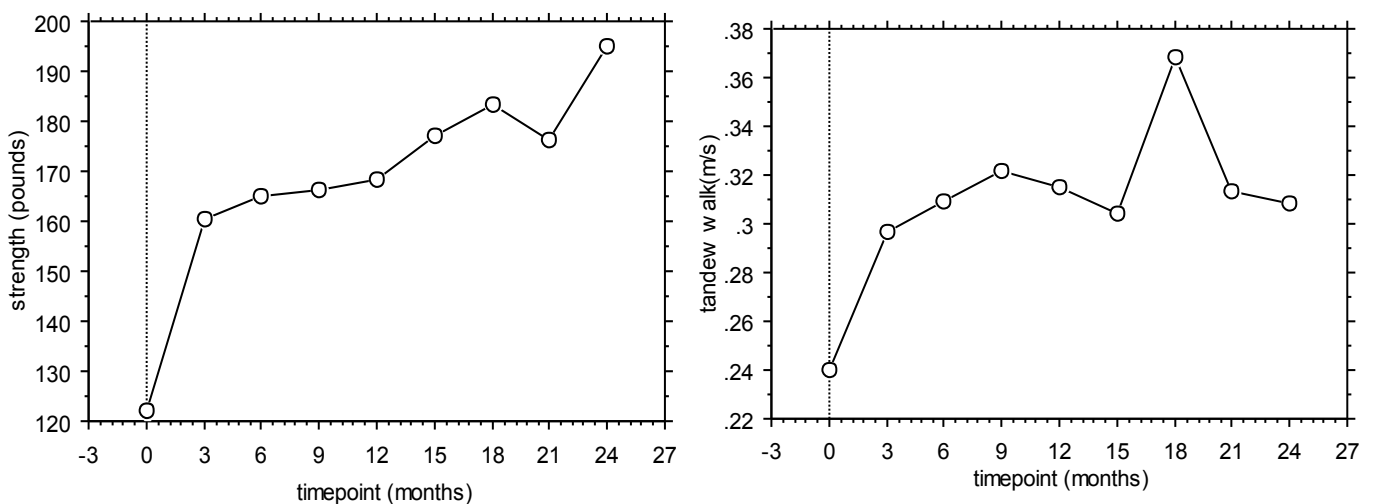
Results are presented for all timepoints cross-sectionally. We analysed the data longitudinally comparing subjects over time and found graphs were similar for all the above measures. Statistical analysis was completed with either a paired t test for continuous normally distributed data or a Wilcoxon sum rank test if not normally distributed. Groups at each time point are analysed as a whole. Results are reported as means \pm standard deviations. For all tables ns = $p > 0.05$. Subject numbers vary slightly depending on outcome but are roughly similar at baseline 240, 3 months 154, 6 months 77, 9 months 54, 12 months 45, 15 months 40, 18 months 40, 21 months 30, 24 months 18.

Self rating scales

Depression (GDS), self-efficacy (SE), Physical activity level (pase), arthritis pain (WOMAC) and sleep (PSQI), MOS quality of life, NHANES measures function.

	Score range	Score Interpretation
GDS	0-30	Higher scores indicate depression
SE	0-100	Higher scores indicate greater self efficacy
PASE	0-200	Higher scores indicate higher levels physical activity
Womac	0-100	Higher scores indicate less pain from arthritis
PSQI	0- 21	Higher scores indicate lower sleep quality
NHANES	Category 0-3 Disability 0-3	8 categories. Averaged for disability score. Higher scores indicate greater level of disability
MOS	Category 0-100	8 categories Higher scores indicate higher level of Quality of life

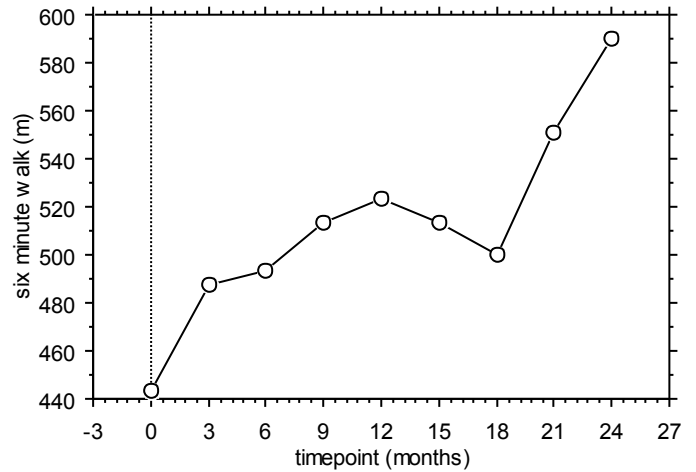
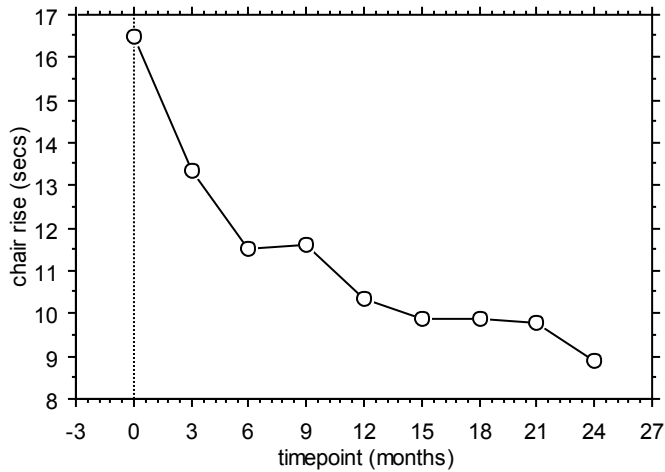
Physiology



Comment on physiological change

We have demonstrated marked and continued improvement in strength and balance over two years. The rate of our change mirrors the only highly controlled research data on PRT over two years in healthy elderly populations.

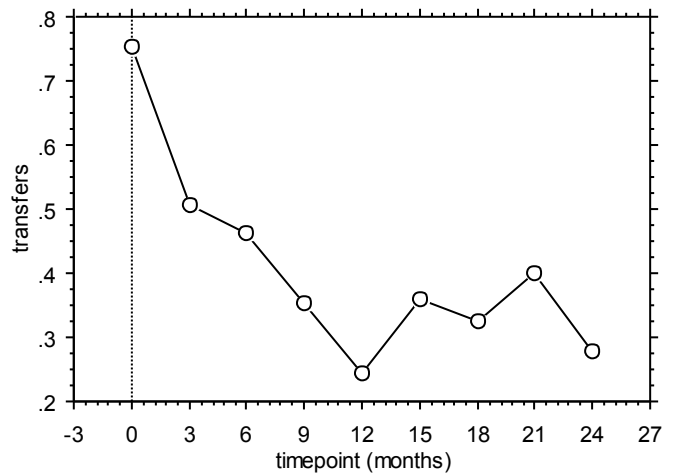
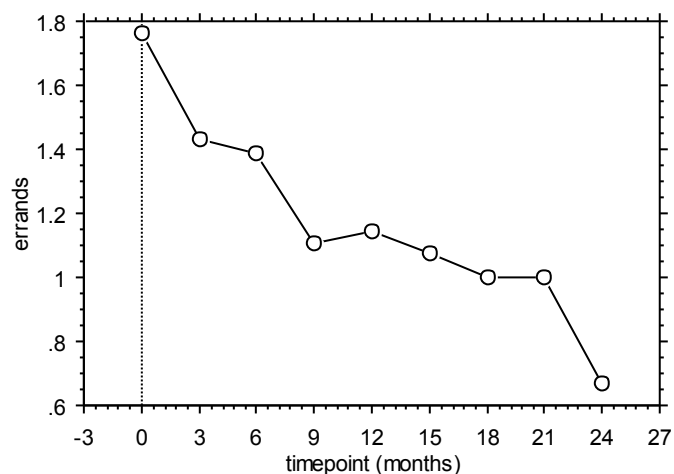
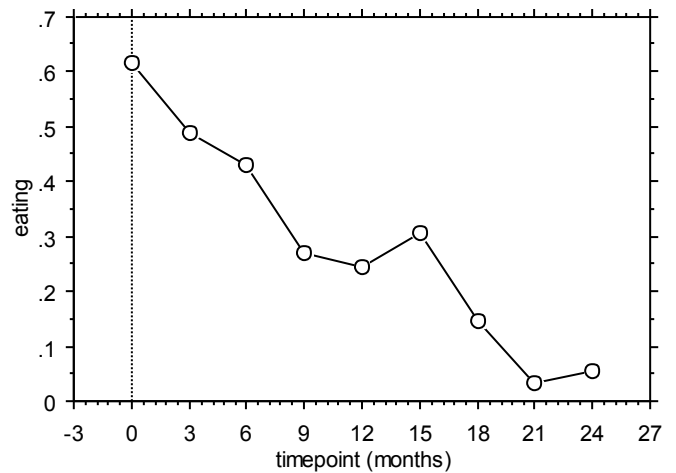
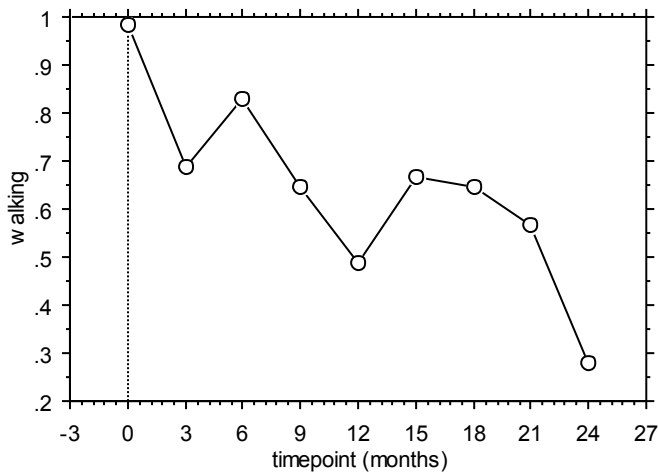
Performance Based Tests.

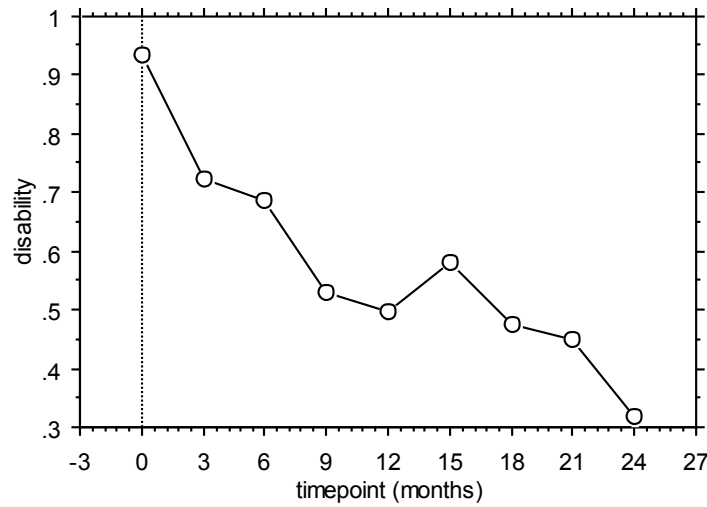
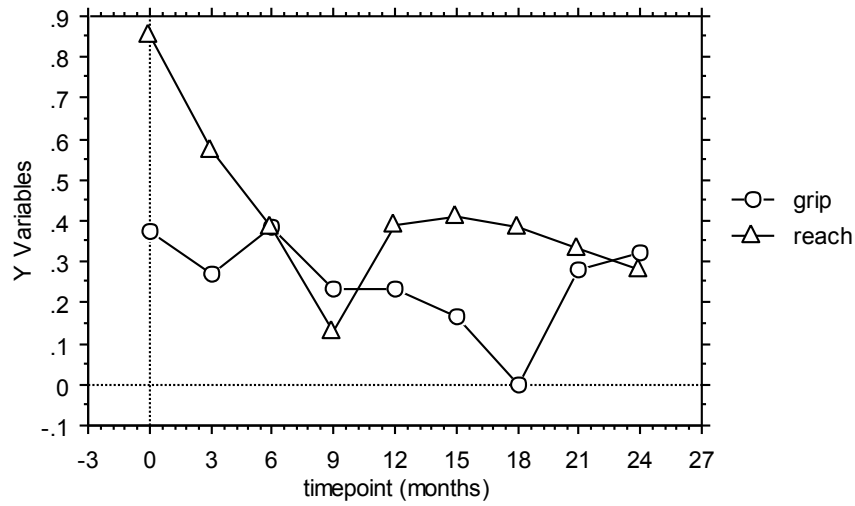


Comment on performance based tests

Our previously described changes in physiology are correlated highly with improved walking speed, measured ability to rise from a chair five times and distance covered in 6 minutes walking, a good proxy measure of aerobic fitness. These measures have all been well established in large epidemiological studies to predict institutionalisation and mortality. Improvements of this magnitude and duration may well lower institutionalisation and service use in the long-term.

Self reported Function

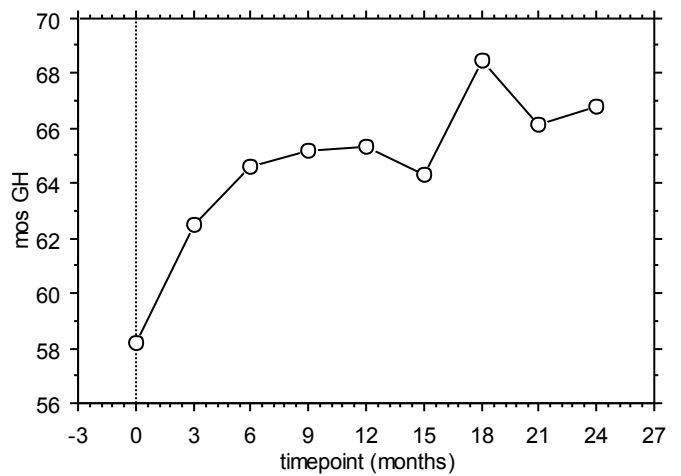
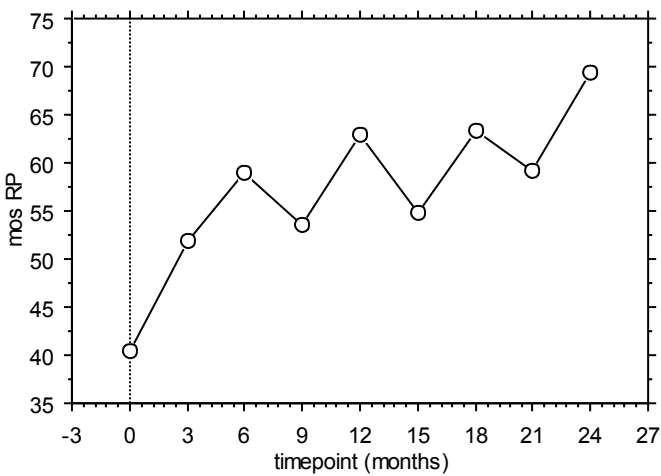
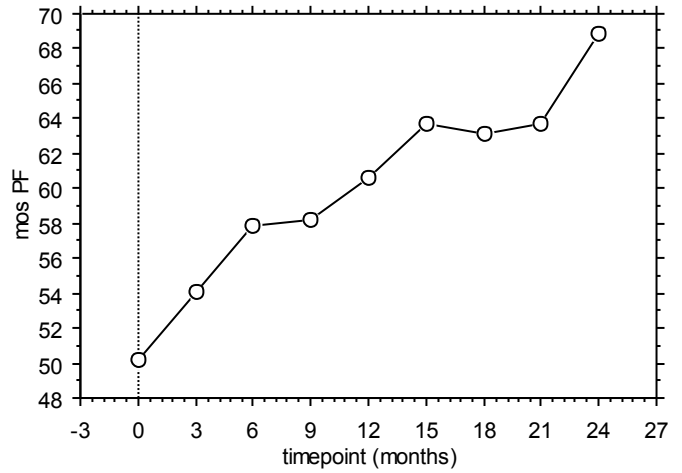
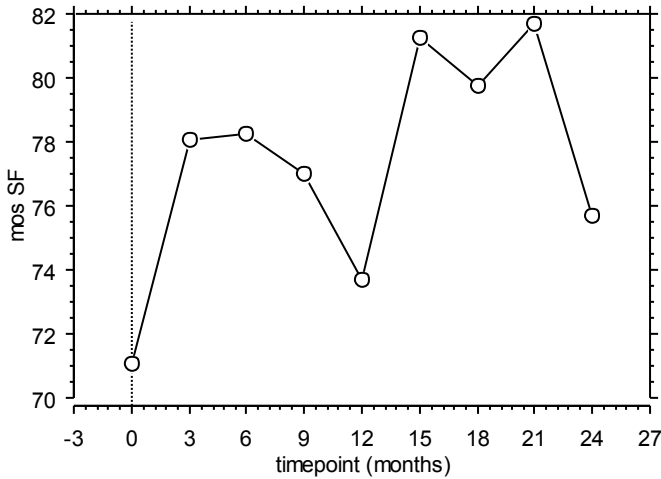




Comment on self reported function

The results achieved are exciting and highly significant with improvements between 30-80% in functional impairment. These changes are in both upper and lower limb functional tasks and continue to show improvement out to 24 months. There appears to be a link between measured change in physiology and physical performance to self reported change in function in both upper and lower limbs.

Quality of life SF36
(Range 0-100 higher scores reflect higher quality of life)



Normal Aust women 70-74
N = 11,000

Normal USA >75yo
N=264

SF36

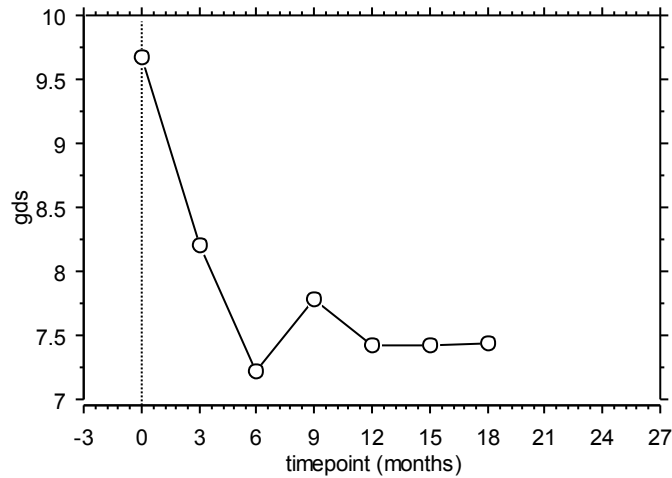
Physical functioning	63+25	53+30
Role physical	57+43	45+41
Bodily pain	65+27	60+26
General health	65+22	56+21
Vitality	60+20	50+23
Social functioning	81+25	73+28
Role emotional	75+38	63+42
Mental health	76+17	74+20

Comment on Quality of life changes

We have achieved significant improvements in physical performance, physical role, general health but not social function, vitality or bodily pain. I have included normal values for the age group in both Australia and USA as can be seen our group start equal or below the normal population but significantly exceed their quality of life by 3-6 months.

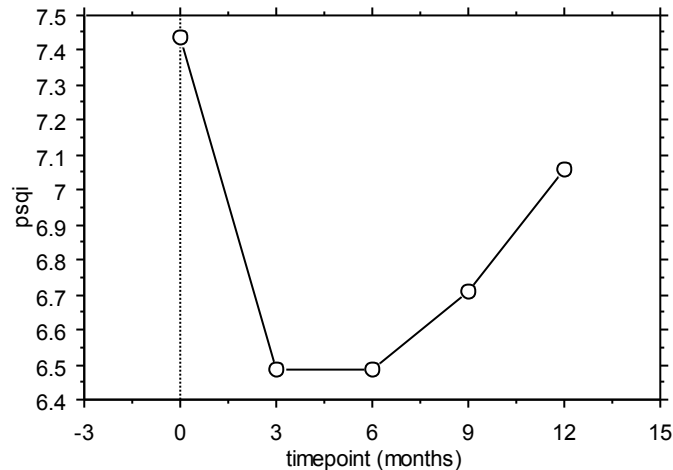
Geriatric Depression Scale (0-30)

(GDS higher scores more depressed, above 9 suggests significant depression)



Pittsburgh Sleep Quality Index

(PSQI higher scores reflect worse sleep)



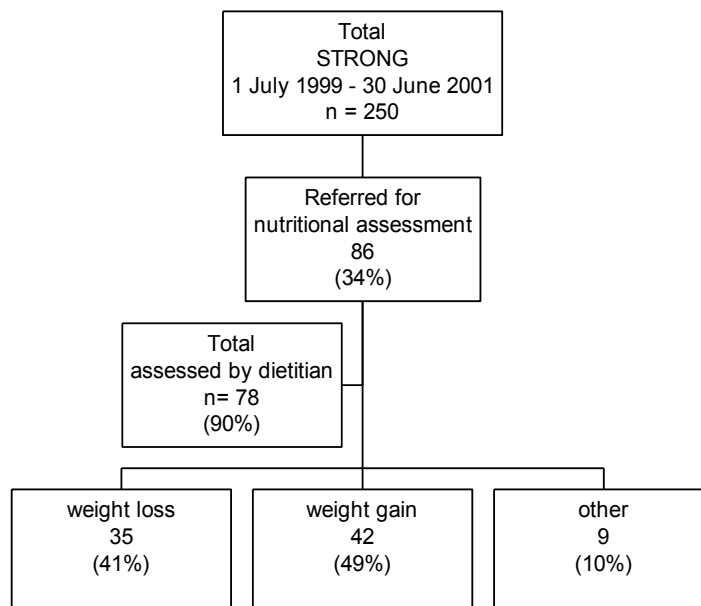
Comment on sleep and depression

We have documented significant improvements in both depression and sleep. We have analysed our groups in to both those with a diagnosis of depression and normals and the effect remains significant for both groups.

Other measures

No significant change in activity levels or self-efficacy measures were seen in the group as a whole.

Nutritional component Referral to Dietitian for weight gain or weight loss



1. Group with 3-month data

	Average weight		p value
	Baseline	3 months	
Whole group n=218	n=140 74.08±18.6	n=140 73.93±17.3	0.7292
No Nutritional referral n=135	n=85 75.72±13.5	n=85 75.51±13.1	0.5880
Referred for weight loss n=33	n=20 97.53±18.3	n=20 95.38±15.5	0.3191
Referred for weight gain n=41	n=28 53.99±10.3	n=28 55.87±9.9	<0.0001

2. Group with 6-month data

	Average weight			p value
	Baseline	3 months	6 months	
Whole group n=218	N=57 71.27±14.5	n=57 72.12±14.46	n=27 72.16±14.37	0-3 mo - 0.02 3-6 mo - 0.49
No Nutritional referral n=135	n=34 76.76±11.3	n=34 77.01±12.2	n=34 76.92±12.1	0-3 mo - 0.49 3-6 mo - 0.93
Referred for weight loss n=33	n=6 91.82±11.3	n=6 91.73±12.2	n=6 91.97±12.9	0-3 mo - 0.89 3-6 mo - 0.85
Referred for weight gain n=41	n=14 54.74±8.3	n=14 56.24±8.5	n=14 57.38±8.9	0-3 mo - 0.0042 3-6 mo - 0.064

Comment on nutritional component

Dietitian available to STRONG during 1/7/1999 – 30/6/2001

- 2 hours per week
- Mainly 1 off assessments – inadequate time for reviews
- Only able to see people for weight loss / gain – many others needing input for eg. Parkinson's, osteoporosis, diabetes

The added benefit of nutrition is seen in the significant effect in weight gain in the malnourished or sarcopenic subgroup. Our effect in weight loss is limited by the lack of follow-up due to only 2 hrs of dietary input per week.

Example of disease specific results

Parkinson's Disease

- Results in 10 Parkinson's patients over six months
- 72yo(60-82). 4.6 chronic diseases, medications 5.6, 30% had depression.

Physiology

- Strength increased by 36% at 3 months and 50% by 6 months.

Function	baseline	3 months	6 months	% change
Walking	1.33	0.4	0.2	85
Errands	2.3	1.8	1.4	40
Transfers	1.1	0.6	0.4	63
Dressing	0.44	0	0.2	50
Eating	1.4	1.8	1.2	14
Reach	0.8	0.2	0.4	50
Disability	1.3	0.87	0.77	40
Chair rise	13	10	8	40
Gait speed m/s	0.97	1.06	1.17	20
Distance m	470	527	576	22

- Activity levels improved by over 50%
- GDS or depression score was reduced by 66% (12 to 4)
- QOL, vitality, mental health, physical performance and general health were all improved.
- Compliance was 80%, no increase in falls and no major injuries.

Summary

Despite Parkinson's disease being a central neurotransmitter problem it appears appropriate exercise will improve abnormalities in weakness, gait and balance, functional performance and depression over optimal medication management.

Patient Satisfaction

Patient rating of their enjoyment and perceived improvement in the condition for which they joined the program on a Likert scale (1-5) with 5 being the maximal enjoyment or improvement imaginable

Satisfaction	3m	6m	9m	12m
Enjoyment	4.4+0.5	4.5+0.9	4.4+1.0	4.8+0.7
Helped problem	4.1+1.1	4.2+1.0	4.5+0.8	4.6+0.7
Kindness	5.0+0	4.9+0.3	5.0	5.0

37% drove themselves
11% driven by a family member
9% taxi
7% walked
33% public transport

88% of people surveyed at three months wished to continue. At six months 90% wished to continue. In nominating what they felt the program had improved 60% said, general health, strength, mobility or mood, 3% said nothing had improved. In response to what had gotten worse over this period 70% said nothing, 16% said some joint pain.

In response to where would they like to continue training 85% said the current setting, 6% said at home and 9% said a gym.

In response to how could we improve the program 82% said nothing, other suggestions included air conditioning, more space, aerobic equipment, abdominal exercises, a sauna etc.

Carer or Relative Satisfaction

84% of those surveyed noted a positive change in the patient since commencing in the clinic we have rating scales on the domains of health, mood and function which are as yet unanalysed.

General Practitioner Satisfaction.

100% of GPS surveyed received a letter from the clinic and found the information useful. 70% did not receive a follow-up letter, 90% felt the program benefited their patient and 100% would refer other patients.

Comment on satisfaction surveys

Patients see the benefits of our measured change in qol, health status and are happy with staff and the program, significant others and GPS also see the change.

Impact on health care system

146 different general practitioners have referred patients. The clinic now receives referrals from inpatients; outpatient clinics and a number of specialists have commenced referring patients such as the neurology and renal units on a small scale. The clinic has resulted in two patients being referred for physiotherapy and a small number of imaging procedures.

Education and Research

- Student attachments: Medical yr 5
- Advanced trainees in Geriatric medicine now attend
- Exercise physiology students yr3 at Sydney University do attachments for 4-8 weeks. We have had 10 students rotate all who we have surveyed and rate the experience highly.

The STRONG program staff is currently involved in two funded research projects.

1. The effect of PRT in diabetics, a randomised 12-month study in conjunction with the Department of exercise and sport science at Sydney University.
2. A multi centre observational study on hip fracture and the determinants of functional disability.

Publication output in the last 24 months from members of the unit include:

Book chapters

1. Depression in the older woman. Chapter 20 of Exercise, Nutrition and the Older Woman.
2. Sleep in the older woman. Chapter 24 of Exercise, Nutrition and the Older Woman.

Journal articles

1. Exercise its never too late; Modern medicine accepted
2. Insomnia in the elderly: Modern medicine accepted
3. The use of exercise in depression, Journal of clinical nutrition.
4. The long-term effectiveness of exercise in depression, accepted, Journal of gerontology.
5. The effects of low intensity versus high intensity progressive resistance weight training on shoulder function in the elderly. A randomised controlled. Abstract
6. The effective and appropriate intensity of progressive resistance training required to treat clinical depression in the elderly. A randomised controlled trial. Abstract

Summary

The educational outreach is now infiltrating into mainstream clinical practice on the wards to undergraduate curriculum in exercise physiology at the University and the clinical training program for doctors in geriatric medicine. The active productive involvement in research has advanced considerably as we continue to aim at fulfilling our mission statement.