

Effects of a pilot randomized trial of a 20-week Tai Chi program on pain and other health outcomes in elders with cognitive impairment and osteoarthritic knee

Pao-Feng Tsai, RN, PhD

Associate Professor

Alice An-Loh Sun Endowed Professorship in Geriatric Nursing

College of Nursing

University of Arkansas for Medical Sciences

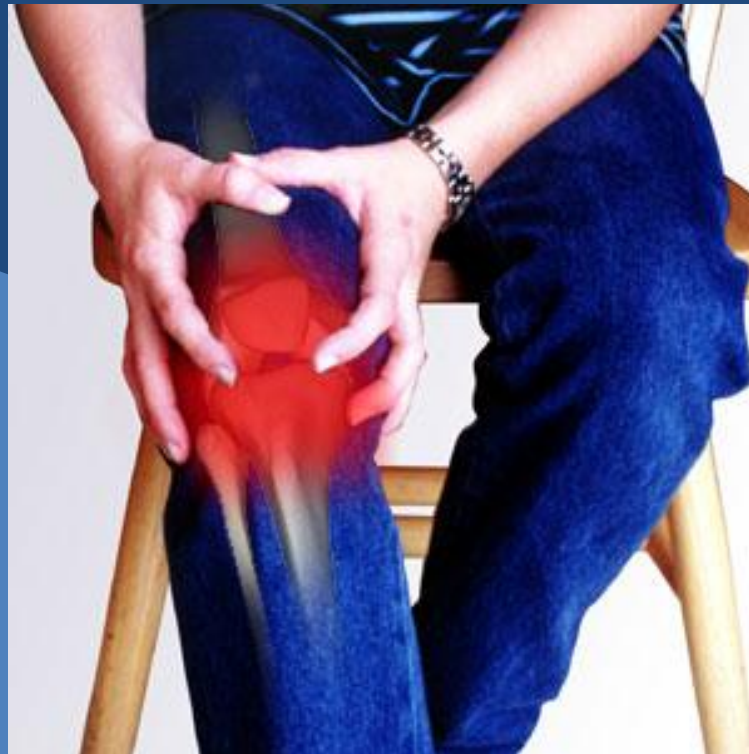
Collaborators

- Co-I:
 - Jason Chang, PhD, UAMS
 - Cornelia Beck, RN, PhD, UAMS
 - Yong-Fang Kuo, PhD, University of Texas Medical Branch
- Consultant:
 - Francis Keefe, PhD, Duke University
 - Karl Rosengren, PhD, Northwestern University

Supported by the National Institute of Nursing Research
and Alzheimer's Arkansas

Background

- The prevalence of knee osteoarthritis (OA) in elders with cognitive impairment (CI) is comparable to that in elders without CI.



- Pharmacological interventions for knee OA pain have shown limited efficacy and produce severe side effects.



Pain

```
graph TD; Pain[Pain] --> Avoid[Avoid activities & exercise]; Avoid --> Stiffness[Stiffness]; Stiffness --> Pain;
```

Stiffness

↓ **Physical functioning**

↓ **Cognitive functioning?**

**Avoid activities
& exercise**

Tai Chi, a non-pharmacological adjunct and low-impact aerobic exercise, has shown promise in reducing pain in elders without CI.



If Tai Chi can reduce knee OA pain in elders with CI, perhaps these elders will be able to perform activities of daily living longer and this can delay or prevent their institutionalization.



- However, elders with CI have been excluded from Tai Chi studies
- Without including elders with CI in trials of Tai Chi, the intervention cannot be tailored to their specific needs.



Aim

To test the efficacy of a 20-week Sun-style Tai Chi (TC) program in improving pain and other health outcomes in 55 community-dwelling elders with knee OA and CI.

Method

- Design: 20-week cluster-randomized clinical trial with two arms (Tai Chi and attention control).
- Setting: 8 study residential or community sites.

Sample

Inclusion Criteria

- age \geq 60 years
- a MMSE score of 18-28
- self-report of knee OA pain
- diagnosis of knee OA
- ability to speak English
- physician's/APN's permission to participate
- no regular exercise program in the past month
- ambulation without assistance from staff or a walking device for 50 meters; and
- ability to stand and maintain balance for 1 minute without a walking device

Exclusion Criteria

- uncorrectable moderate or severe hearing or vision deficits
- Parkinson's disease
- cancer pain
- chronic pain conditions, such as rheumatoid arthritis, fibromyalgia, or severe low back pain
- diabetic neuropathy
- arthroscopic surgery or total knee- or hip-replacement surgery in the past 6 months
- fractures in the past 6 months
- major psychiatric disorder or positive screen for depressive symptoms (GDS-15 score ≥ 5) without taking medication
- history of falls in the past 3 months; or
- vertigo in the past month.

Outcome measures

- Health outcomes:
 - WOMAC pain
 - WOMAC physical
 - WOMAC stiffness
 - Get Up and Go
 - Sit To Stand
 - Mini Mental State Exam

Intervention

Tai Chi

- Sun style
- 3 times/week for 20 weeks
- 20-40 min/session + 5 min break
- Modifications

Control

- Same length of time as Tai Chi group
- Medical topics
- Cultural topics
- Other activities

Descriptive results

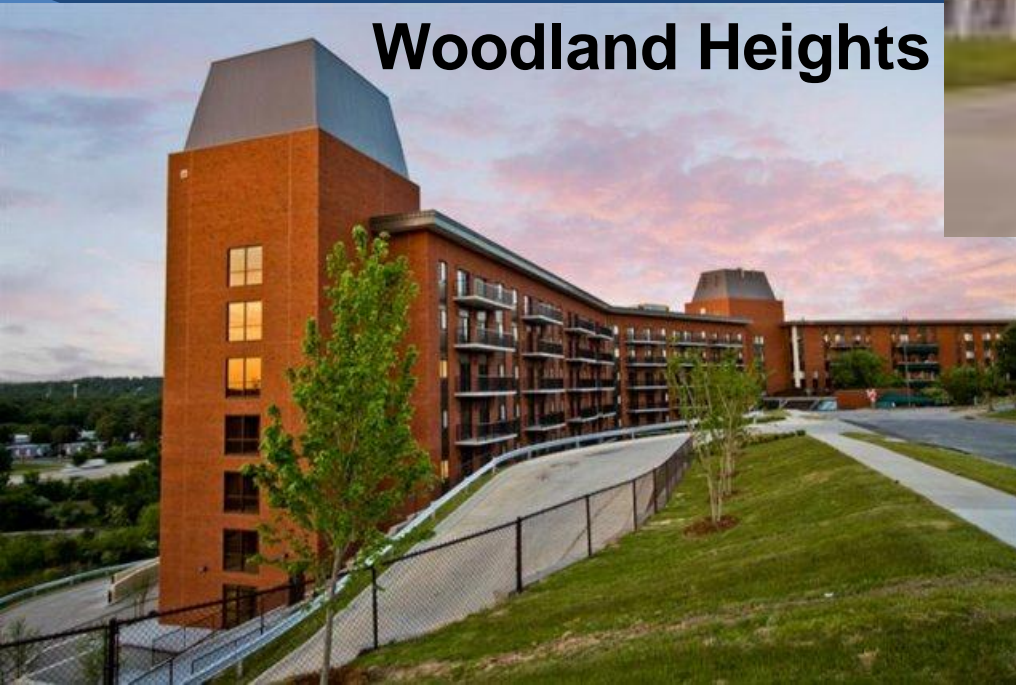
Hays Center



Parkway Village



Woodland Heights

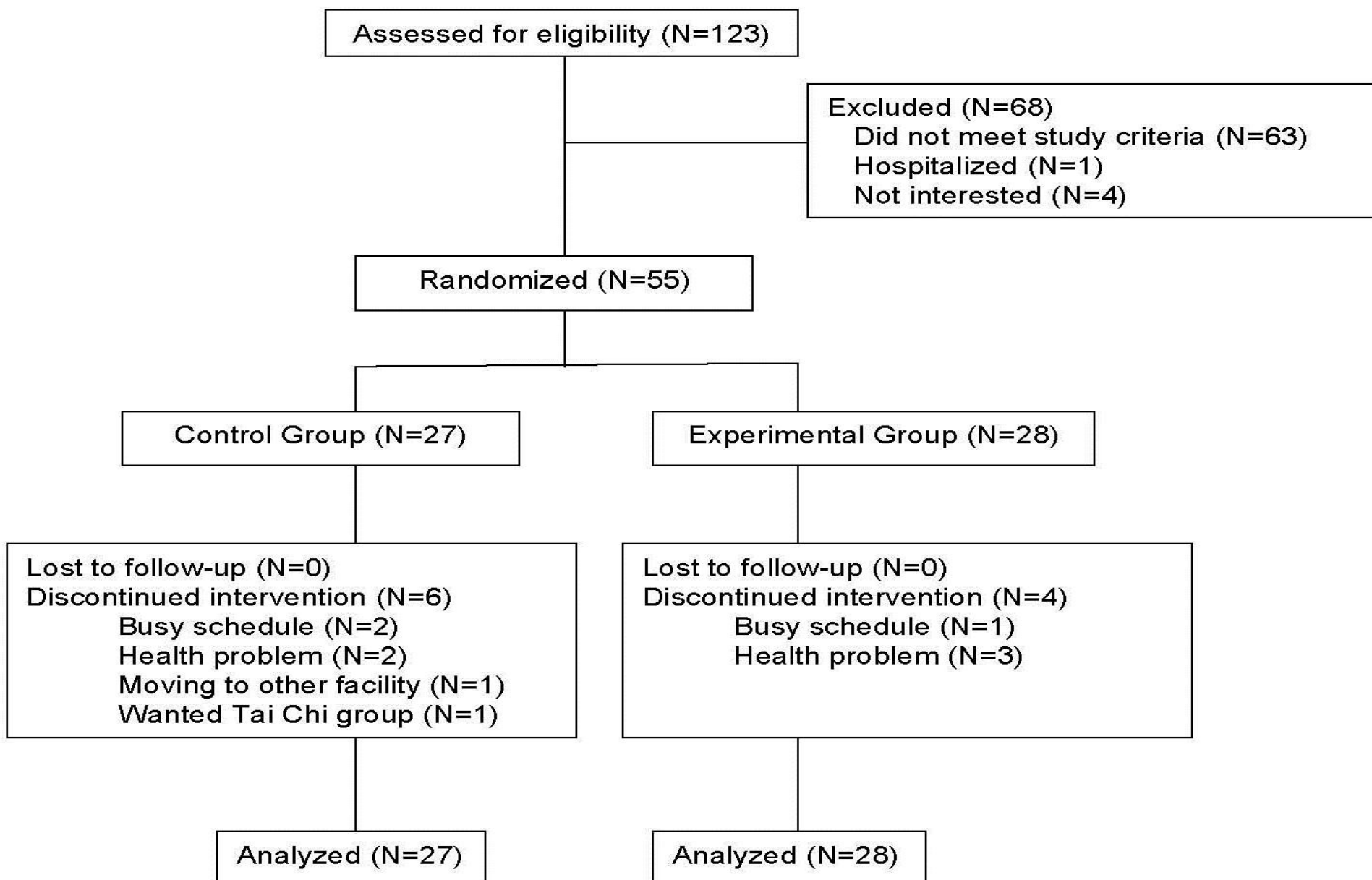


Recruiting results

* Indicates that the group was assigned to activity intervention

Sites	Contacted/ Screened	Eligible	Dropped before assignment
Presbyterian Village	27 / 11	5	1
Pleasant Hills*	61 / 19	9	0
Good Shepherd I	27 / 13	7	0
Good Shepherd II*	26 / 14	5	0
Woodland Heights	33 / 13	9	1
Parkway Village*	34 / 14	10	1
Hays Senior Center*	61 / 16	6	2
UAMS Senior Center	33 / 15	9	0
Bowker/Heritage	38 / 3	0	NA
Audubon Point	15 / 5	0	NA
Total	355 / 123	60	5

CONSORT flowchart: Patient flow through treatment



Demographics

Variable	Tai Chi group (N=28)	Activity group (N=27)	P value
Age	78.89 (6.91)	79.93 (8.30)	.99
Female	78.6%	66.7%	.38
Caucasian	92.9%	92.6%	1.00
Education (years)	14.82 (3.10)	14.30 (2.99)	.53

Baseline

Variable	Tai Chi group (N=28)	Activity group (N=27)	P
WOMAC-Pain	6.96 (3.26)	7.65 (3.21)	.43
WOMAC-Physical	26.43 (8.62)	26.74 (11.47)	.91
WOMAC-Stiff	3.25 (1.46)	2.85 (1.59)	.34
GUG	19.22 (5.69)	21.68 (7.63)	.18
STS	18.50 (8.09)	18.20 (5.36)	.87
MMSE-Cognition	26.04 (1.92)	24.85 (2.64)	.06

Main result

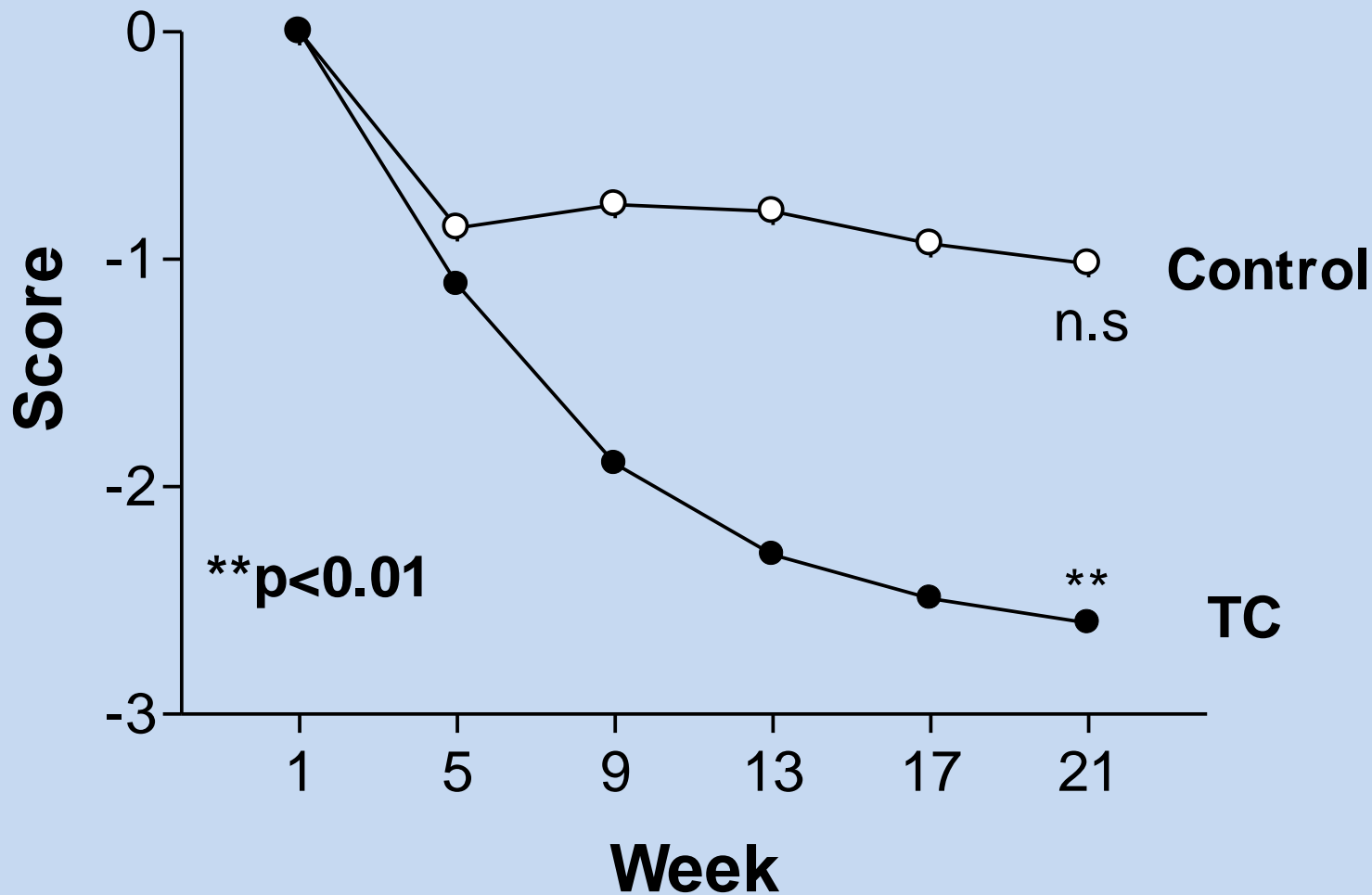


Outcome Variables by Time (Within-Group Effects) Controlling for Site Effect

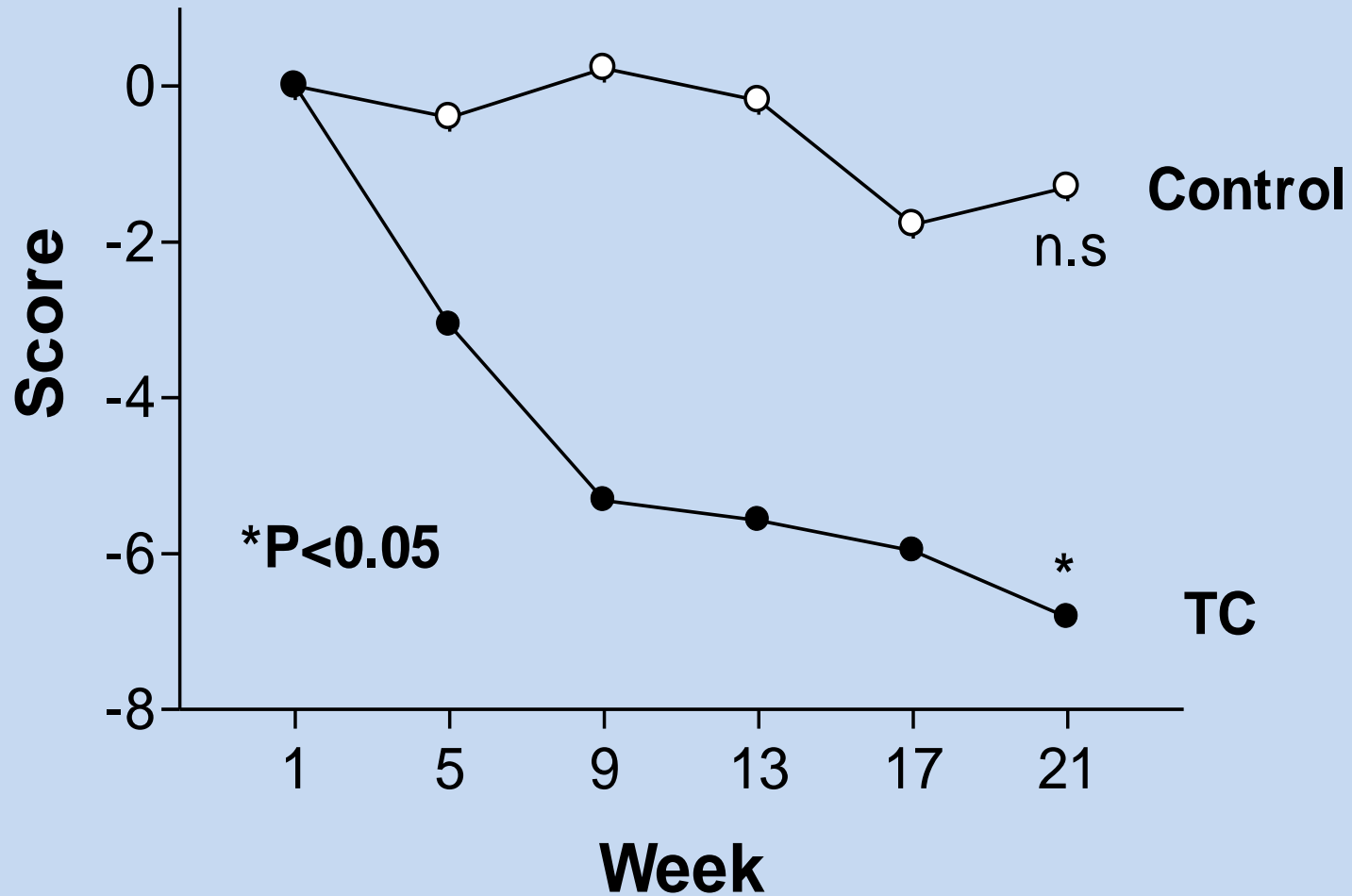
Variable	Tai Chi			Control		
	Estimate	SE	P	Estimate	SE	P
WOMAC Pain	-0.5020	0.1415	0.001**	-0.1525	0.0774	0.060
WOMAC Physical Function	-1.2296	0.4546	0.012*	-0.3143	0.2285	0.181
WOMAC Stiffness	-0.3643	0.0688	<0.000***	-0.0593	0.0477	0.225
GUG	-0.2099	0.0871	0.023*	-0.1165	0.1413	0.417
STS	-0.3792	0.1299	0.007**	-0.2059	0.1553	0.196
MMSE	0.1673	0.0798	0.046*	0.1196	0.0798	0.146

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

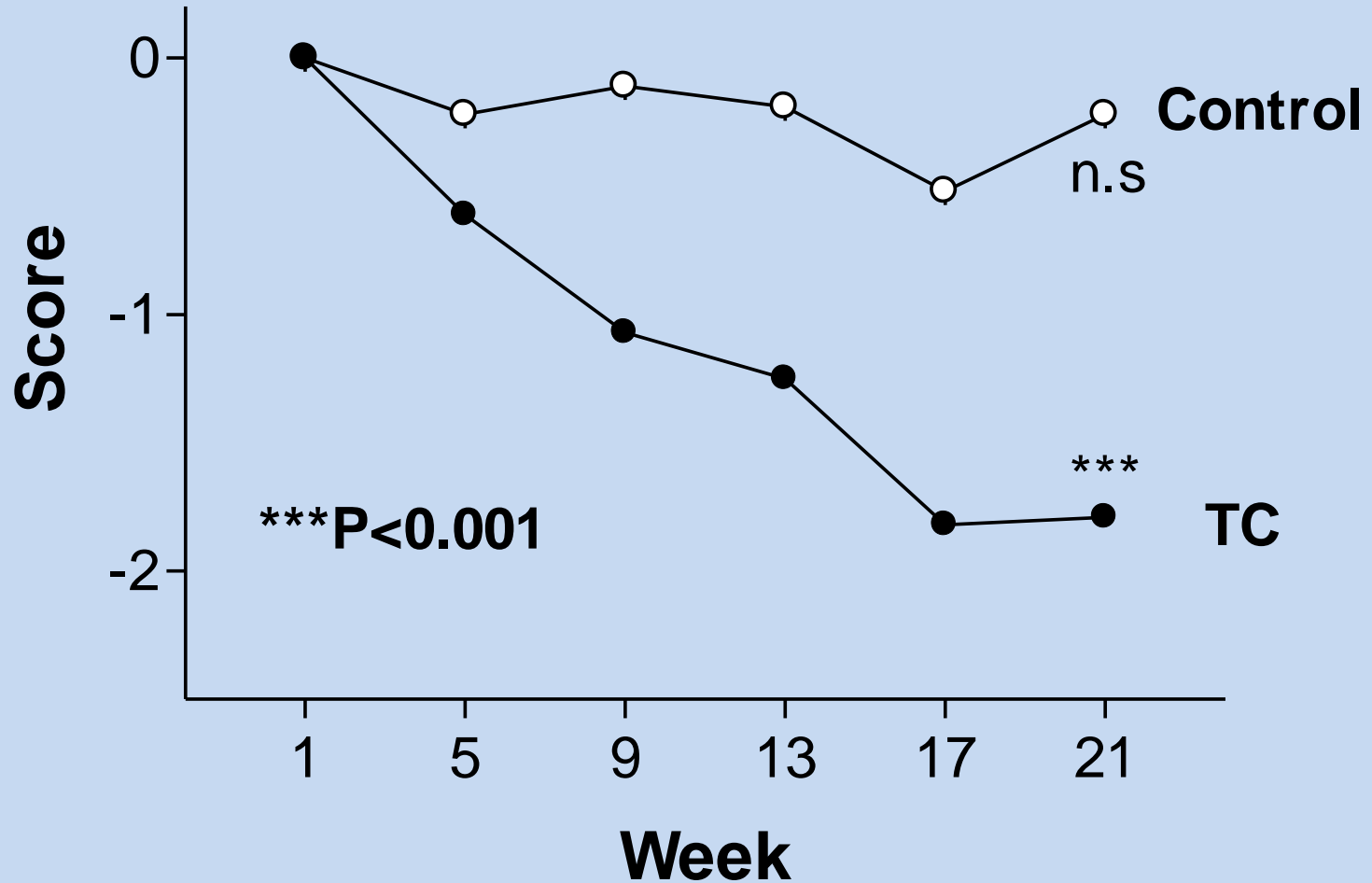
Change in WOMAC Pain (within group)



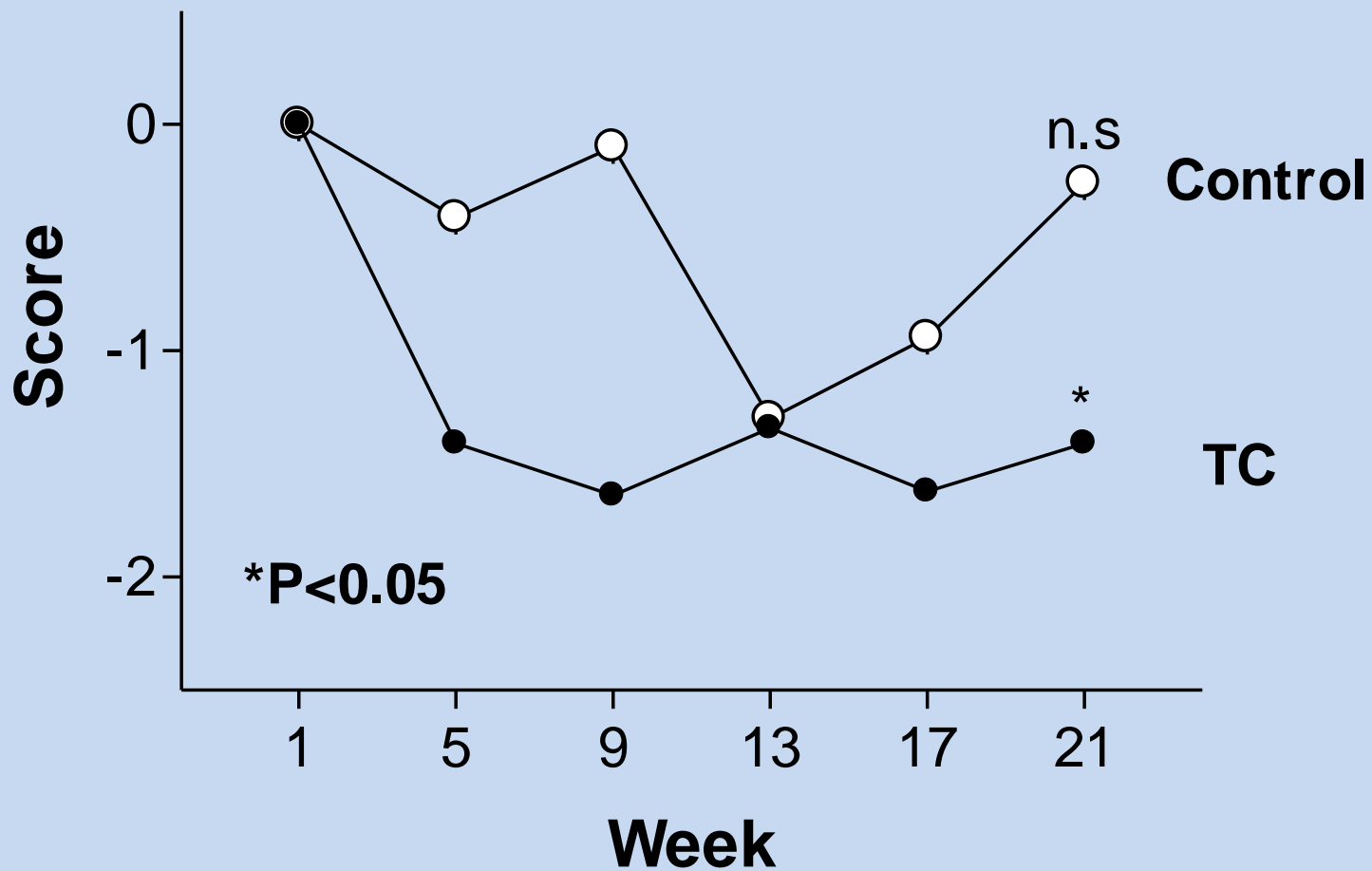
Change in WOMAC Physical (within group)



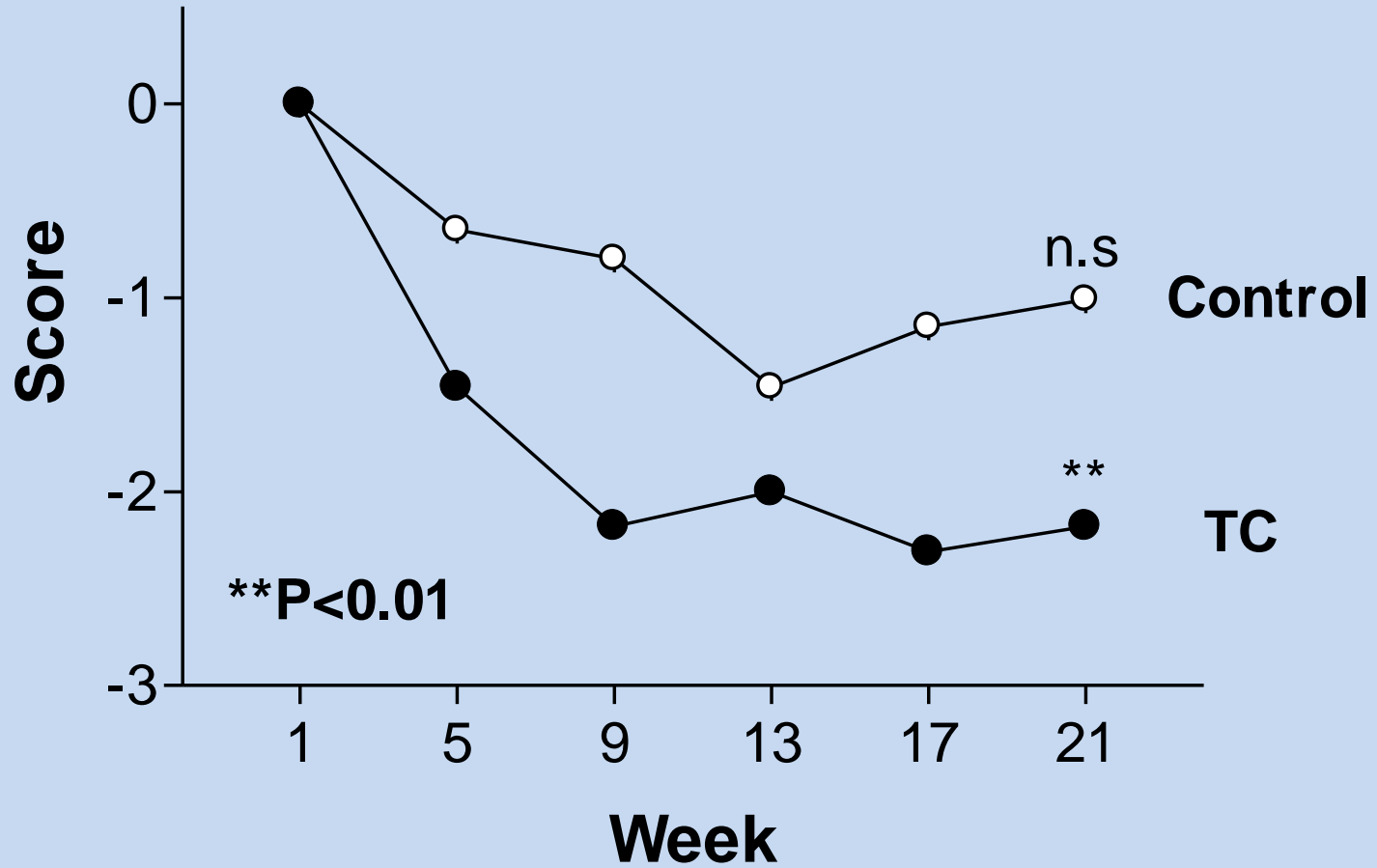
Change in WOMAC Stiffness (within group)



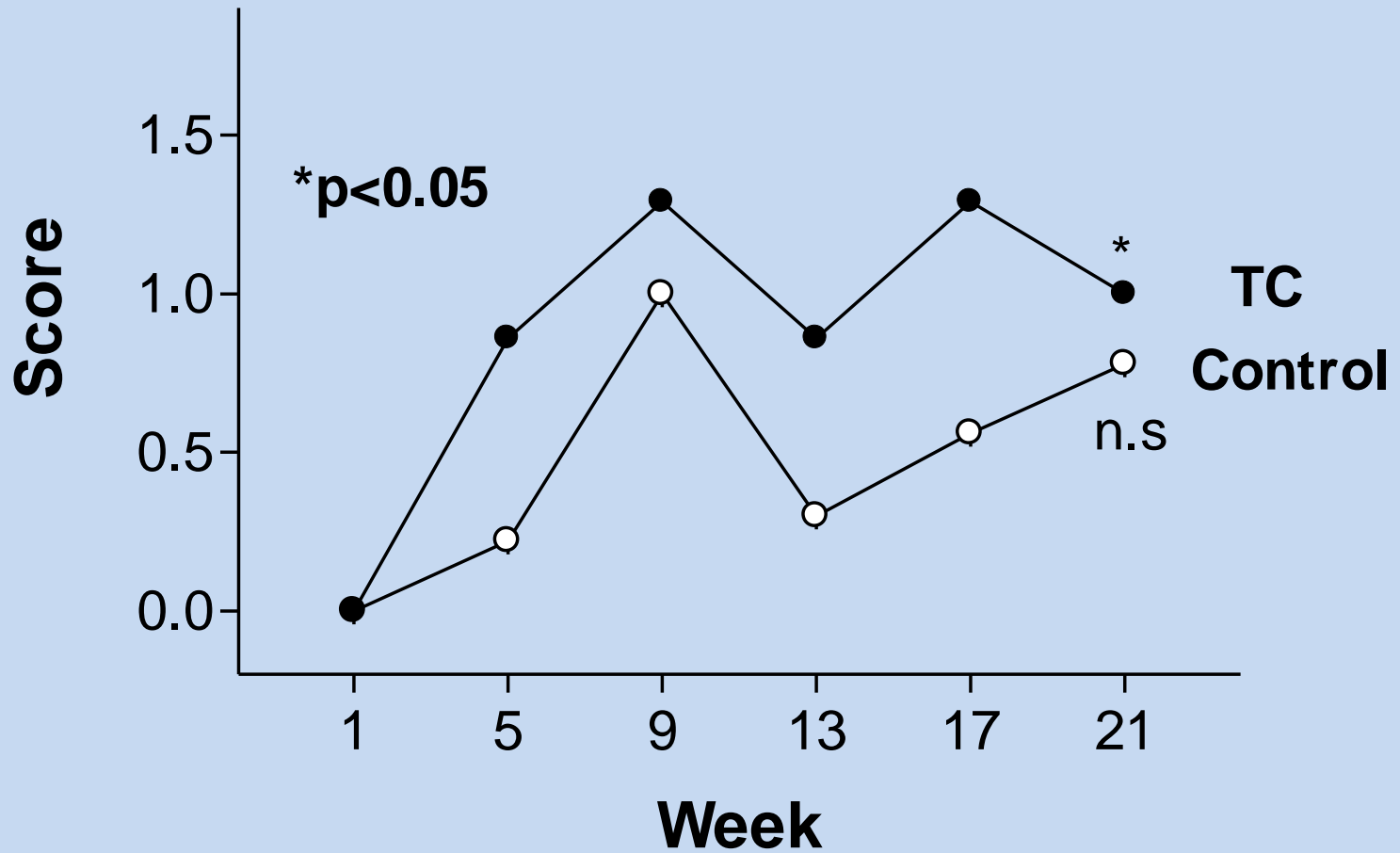
Change in Get-Up-Go (within group)



Change in Sit-To-Stand (within group)



Change in MMSE (within group)



**What if we do a “between-group”
comparison?**

Main Effect and Interactions, Controlling for Site Effect

Variable		Estimate	SE	t value	P value
WOMAC Pain	Group	-0.8502	0.7944	-1.07	0.286
	Time	-0.1525	0.1162	-1.31	0.195
	Group x Time	-0.3495	0.1629	-2.15	0.033*
WOMAC Physical	Group	-2.2677	2.9413	-0.77	0.442
	Time	-0.3143	0.3670	-0.86	0.396
	Group x Time	-0.9153	0.5144	-1.78	0.077
WOMAC Stiffness	Group	0.1277	0.4643	0.27	0.784
	Time	-0.0593	0.0601	-0.99	0.329
	Group x Time	-0.3050	0.0843	-3.62	0.000***
GUG	Group	-2.8590	2.2448	-1.27	0.204
	Time	-0.1165	0.1175	-0.99	0.326
	Group x Time	-0.0934	0.1647	-0.57	0.571
STS	Group	-0.2394	2.7568	-0.09	0.931
	Time	-0.2059	0.1441	-1.43	0.159
	Group x Time	-0.1733	0.2019	-0.86	0.392
MMSE	Group	1.4701	0.6199	2.37	0.019*
	Time	0.1196	0.0806	1.48	0.144
	Group x Time	0.0478	0.1129	0.42	0.673

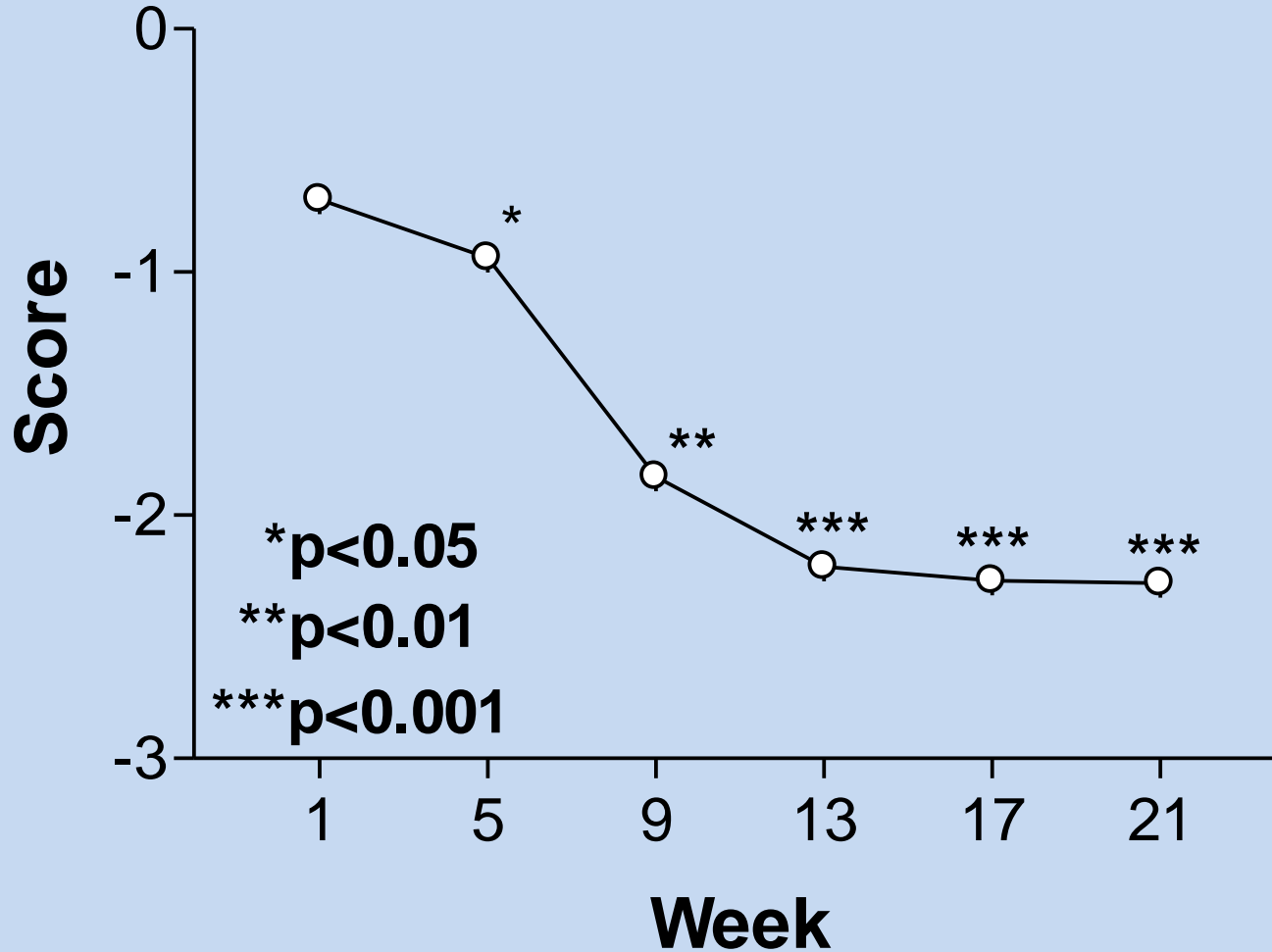
* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

General Linear Mixed Model Estimates for Changes in Outcomes Over Time in 2 Groups, Adjusting for Site Effect

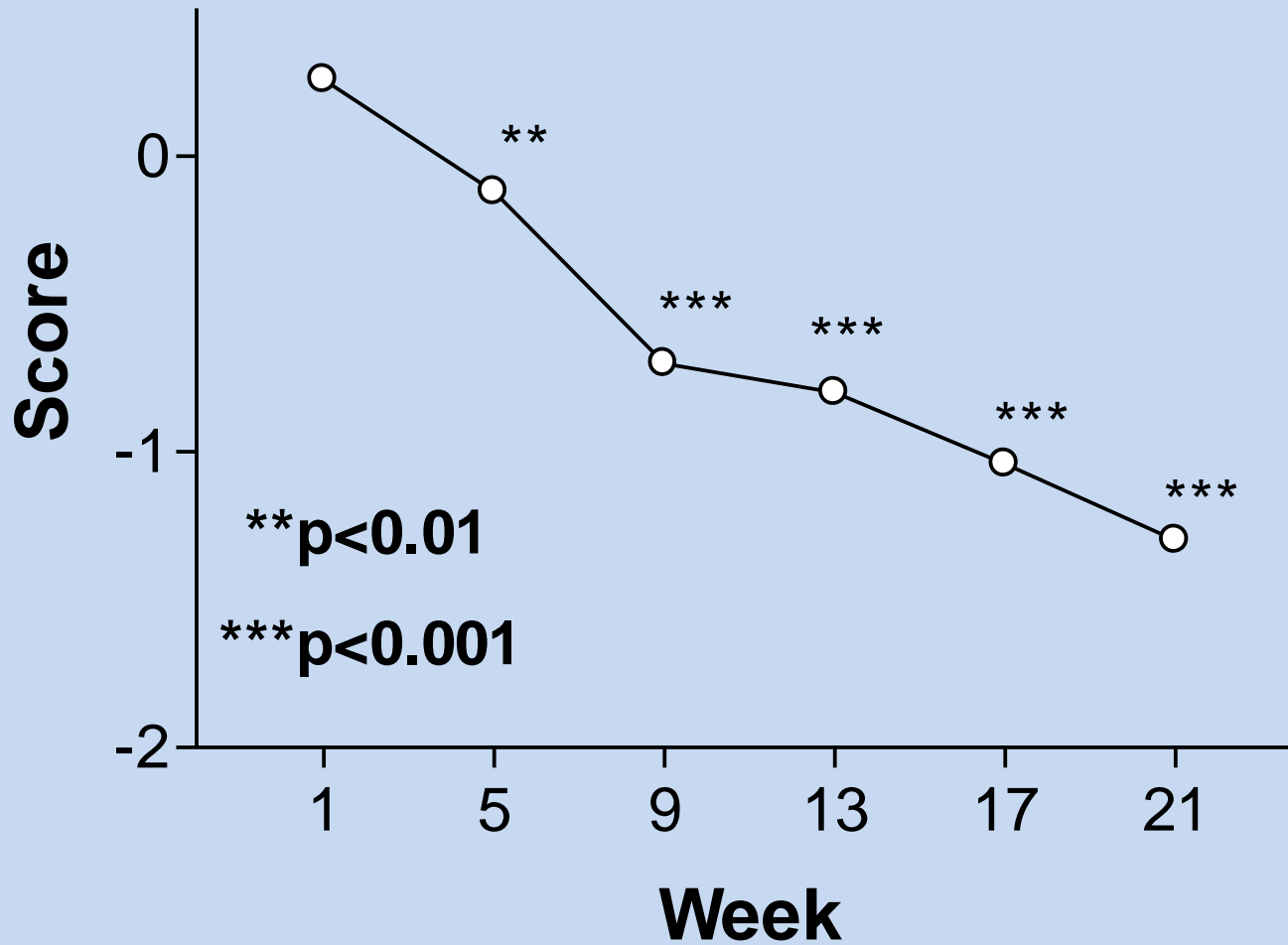
Variable		Estimates within Tai Chi group		
		Estimate	95% CI	P value
WOMAC Pain	Week 1	0.00		
	Week 5	-1.11	(-1.96 - -0.26)	0.012*
	Week 9	-1.90	(-3.08 - -0.72)	0.002**
	Week 13	-2.30	(-3.54 - -1.07)	0.000***
	Week 17	-2.49	(-3.87 - -1.12)	0.000***
	Week 21	-2.60	(-4.02 - -1.18)	0.000***
WOMAC Stiffness	Week 1	0.00		
	Week 5	-0.61	(-0.98 - -0.23)	0.002**
	Week 9	-1.07	(-1.60 - -0.54)	0.000***
	Week 13	-1.25	(-1.73 - -0.77)	0.000***
	Week 17	-1.82	(-2.43 - -1.21)	0.000***
	Week 21	-1.79	(-2.53 - -1.04)	0.000***

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

Difference in WOMAC pain (between group)



Difference in WOMAC Stiffness (between group)



Discussion

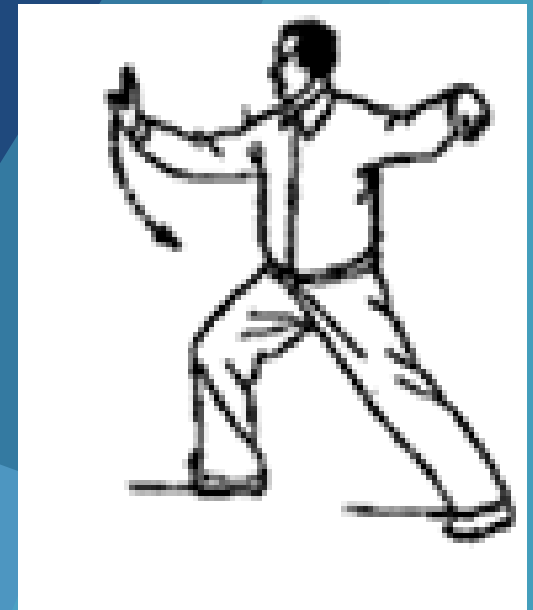
- Most sensitive variables- Pain and stiffness
- Physical function-
 - Power issue
 - May need longer time
 - May never reach the level that can be achieved by younger people
 - Selection of tools
- Cognitive function-
 - Power issue
 - May need longer time
 - Selection of tool

Conclusions

- Tai Chi may have effect on physical and cognitive function
- Tai Chi has beneficial effect on stiffness
- Tai Chi has beneficial effect on knee pain

Future Direction

1. What is the mechanism causing the changes in pain and other health outcomes?



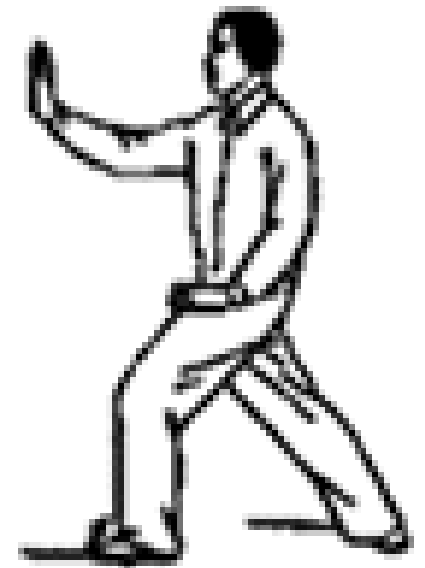
Future Direction

2. What is the dosage of Tai Chi needed to improve knee pain and other health outcomes?

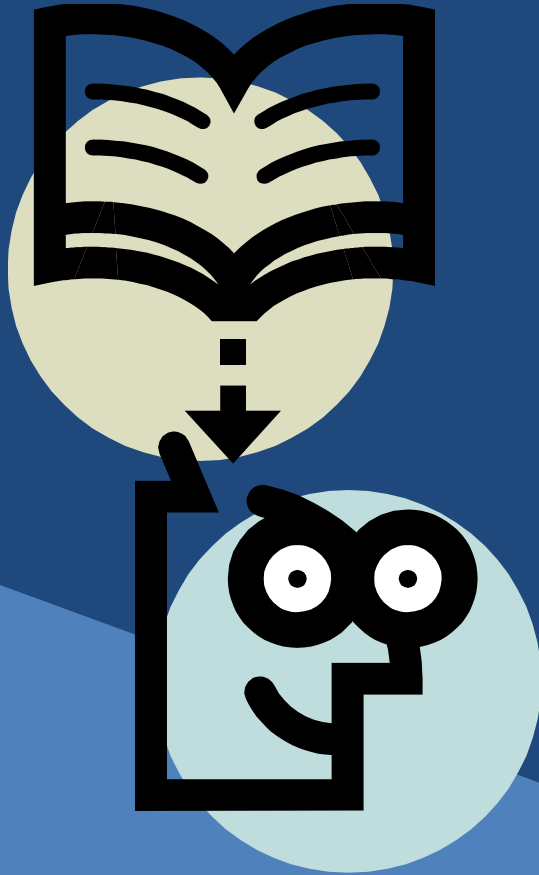


Future Direction

3. How long will the positive outcomes and pain reduction last?







Questions?