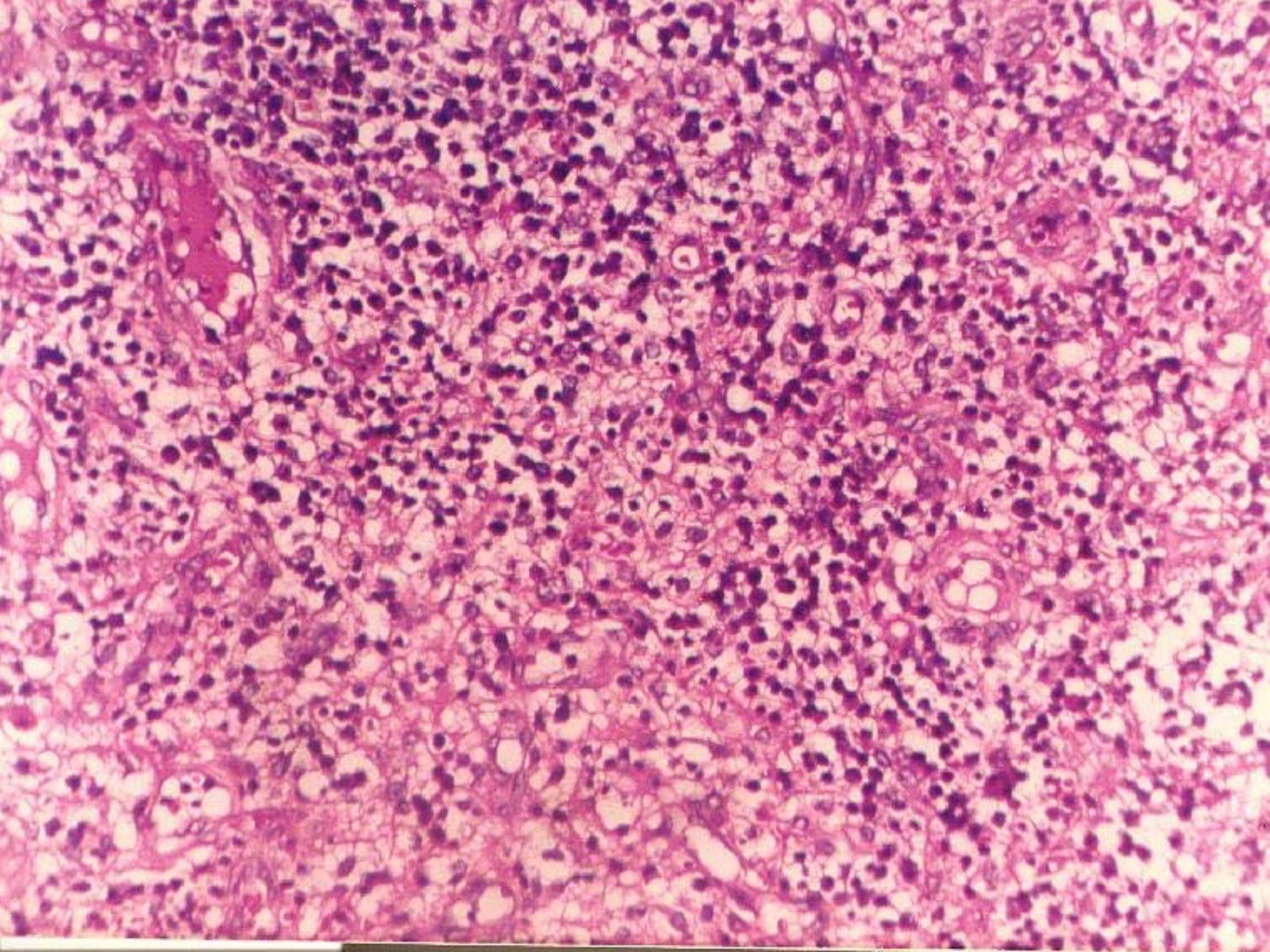
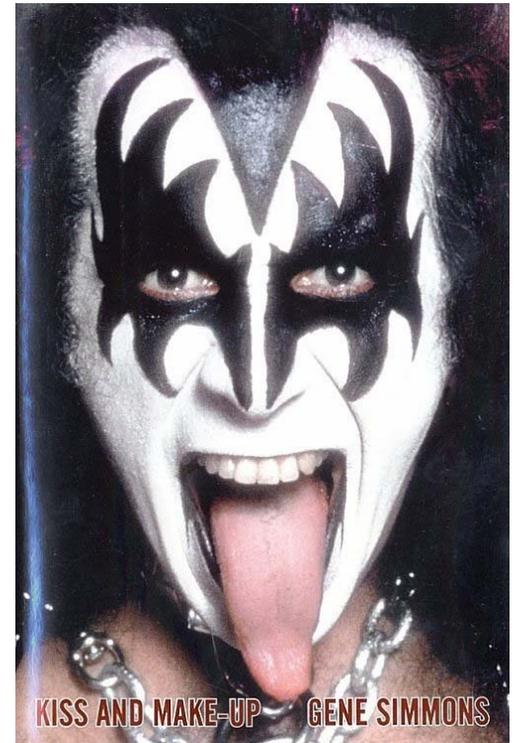


Applications of the preventative health care model to wound care

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Department of Physical Therapy
Winston-Salem State University



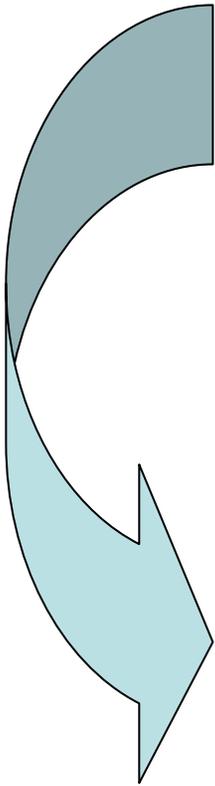




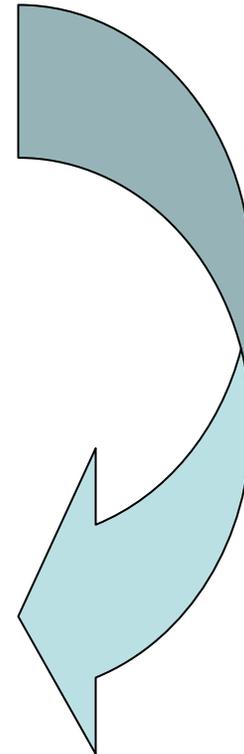


Causes of Diabetic Ulceration

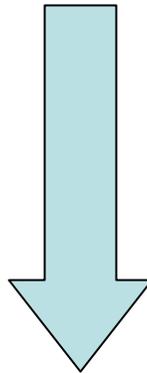
Ischemia

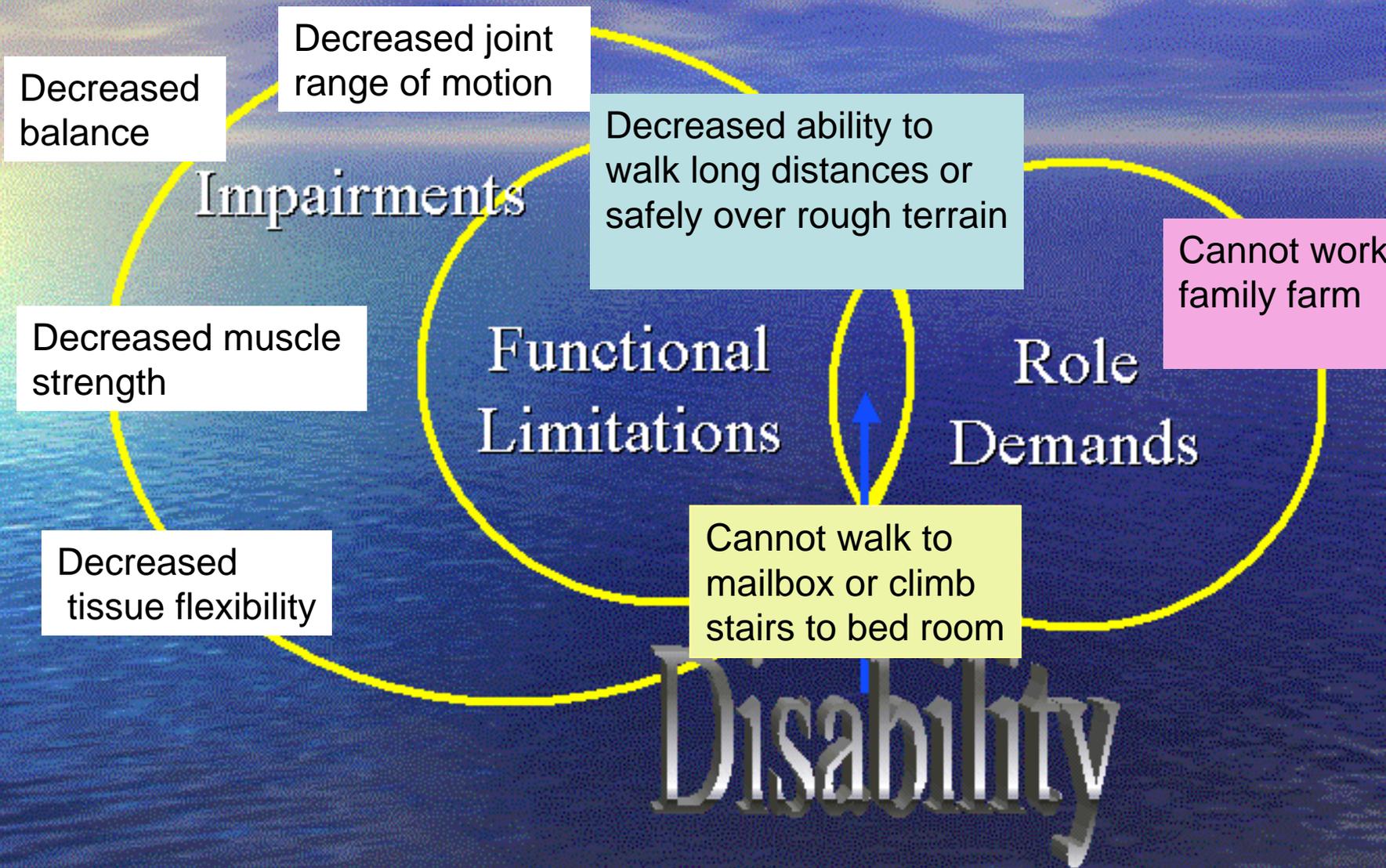


Mechanical Stresses



Neuropathy





Mobility Limitations in Adults > 40 Years of Age

- Lower extremity disease:
 - peripheral arterial disease (PAD)
 - peripheral neuropathy (PN)
- Diabetes
- Combination of LED & Diabetes (↑risk)

Mobility Limitation Among Persons Aged 40 Years With and Without Diagnosed Diabetes and Lower Extremity Disease—United States, 1999-2002
JAMA. 2006;295:29-30.

Peripheral Arterial Disease

- 8-10 million Americans affected
- Expected increase in prevalence to 12 million by 2020
- Marker for serious cardiovascular disease
- Claudication pain affects 2% of patients over 65 years
- 20-25% of older men & women seen in primary care have low ABIs



Relationship Between ABI & Leg Function

The Ankle Brachial Index Is Associated with Leg Function and Physical Activity: The Walking and Leg Circulation Study. *Annals of Internal Medicine* 2002 June 136(12):873-883.



ABI & Leg Function/Physical Activity

- Cross-sectional study
- 3 Chicago Area Medical Centers
- 740 men and women (460 with PVA)
- Clinical measures: Accelerometer-measured physical activity over 7 days, 6-minute walk, 4-m walking velocity, standing balance, and ABI

ABI and Walking

- Stronger association between ABI and function than leg symptoms and function
- < 40% of participants with ABI of 0.4 walked continuously for 6 minutes
- > 95% of participants with ABI of 1-1.5 walked continuously for 6 minutes
- With an ABI < 0.5
 - shorter distance walked in 6 minutes
 - less physical activity
 - slower 4-m walking velocity
 - decreased tandem stance (< 10 s)

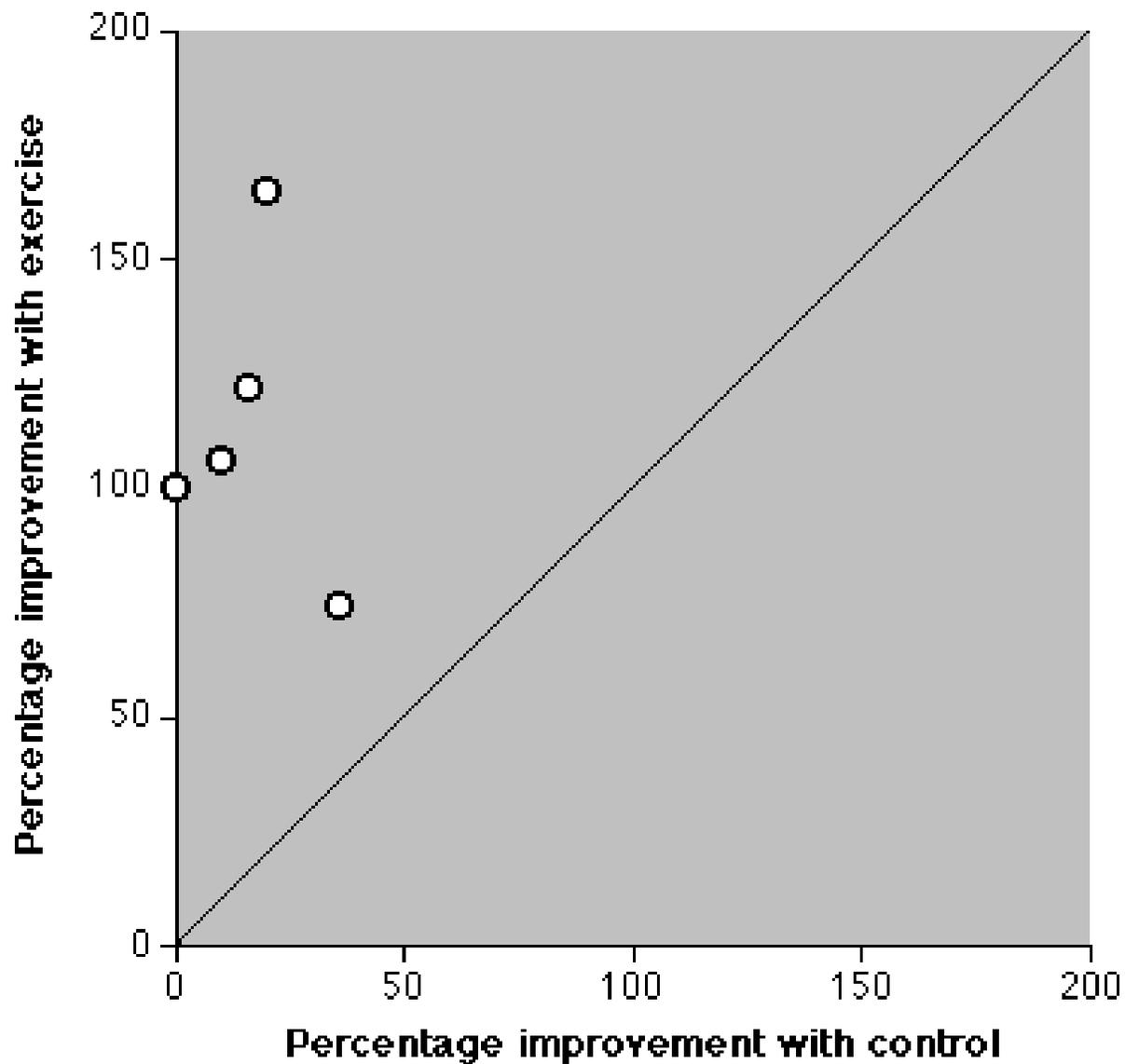
Review of the Literature

- JW Brandsma, BG Robeer, S van der Heuvel et al. The effect of exercises on walking distance of patients with intermittent claudication: A study of randomized clinical trials. *Physical Therapy* 1998 78: 278-88.
- AW Gardner, ET Poehlman. Exercise rehabilitation programs for the treatment of claudication pain: a meta-analysis. *JAMA* 1995 274: 975-80.

Study Methodology

- Medline and Nonmedline-based specialty searches
- 10 Randomized Clinical Trials
- 5 studies had a untreated control group
- 9/10 groups had a walking exercise group
- exercise programs varied in intensity, duration and content
- Outcome measures were max pain-free walking distance or time on a treadmill

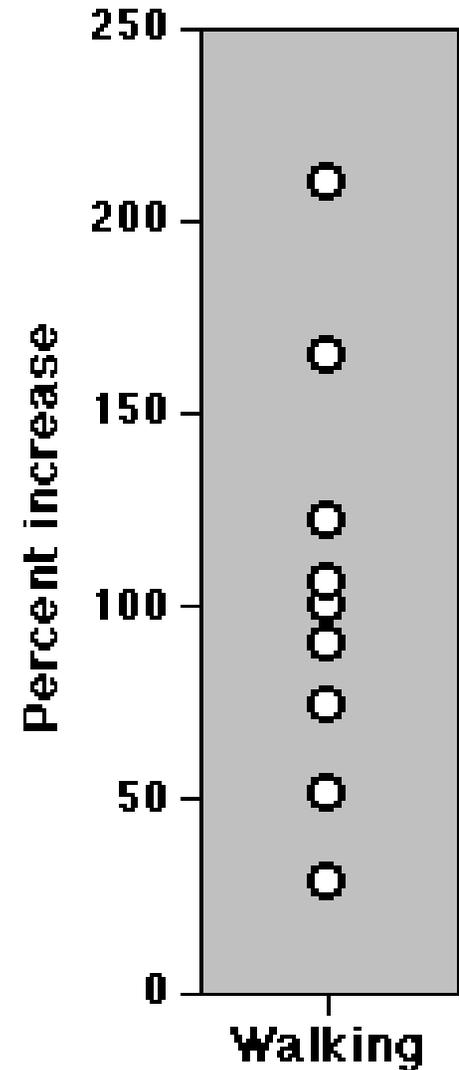
Effect of exercise on walking distance or time in patients with intermittent claudication



9 Study Groups

- Improved walking distance (28-210%)
- Smallest improvements seen with short duration or low intensity exercise

Effect of exercise
on walking distance
or time



Effects of Exercise on PAD

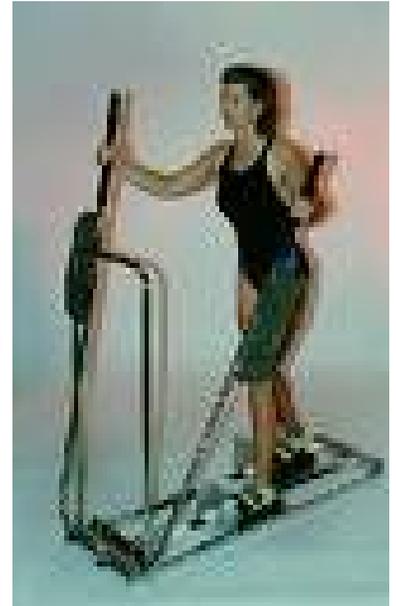
Examined 16 stage II PVD patients (8 received placebo therapy and 8 received exercise therapy)

- Increased the walking capacity
- Increased pain-free walking time
- Increased maximum walking time

Mannarino, Pasqualini, and Menna et al., *Angiology*
1989 Jan; 40(1):5-10.

Polestriding exercise for PAD

- 52 participants randomized into 4 test groups
- Test groups:
 - PoleStriding with vitamin E (N = 13)
 - PoleStriding with placebo (N= 14)
 - vitamin E without exercise (N= 13)
 - placebo without exercise (N = 12)
- Polestriding significantly improved exercise tolerance and perceived quality of life



Home versus Center-Based Exercise Training

- Center-based programs superior to Home
- Greater improvement with distance walked and time to claudication pain (up to 6 mo)
- Home-based study demonstrated a greater rate of adherence (68% compared to 38% to center-based at 2 years post)

H
O
M
E



G
R
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Conclusion

- 10 studies unequivocally demonstrated that a standardized exercise program improved pain-free walking distance or increased time to claudication pain in patients with PAD

References

- Cochrane Database Syst Rev. 2005 Jan 25;(1):CD004017
- <http://www.jr2.ox.ac.uk/bandolier/band52/b52-4.html>Correction: The Ankle Brachial Index Is Associated with Leg Functioning and Physical...*Ann Intern Med.*2003; 139: 306.

Diabetes and Physical Limitations

- 37% Higher proportion of physical limitations
- Decreased mobility
- Decreased lower extremity function
- Decreased ability to perform ADL's
- Females with diabetes greater disability than males

Orr et al., Diabetes Care. 2006 29:2120-2122

Bruce et al., Diabetes Care. 2005 28:2441-247

Ryerson et al., Diabetes Care. 2003 Jan; 26(1):206-10.

Volpato et al., Diabetes Care. 2003 26:70-75.

Peripheral Neuropathy & Physical Limitations

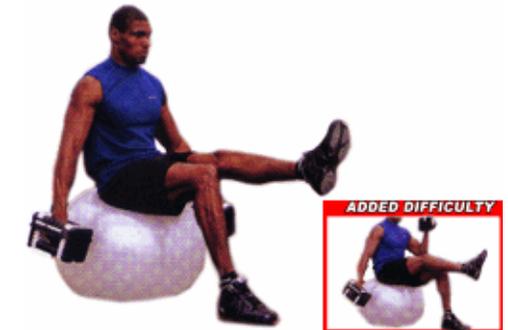
Level of peripheral neuropathy correlates with:

- impaired balance
- decrements in both usual and fast-paced walking speeds
- ability to walk long distances (quarter mile)
- climb steps without resting (10 steps)

Resnick, Vinik, Schwartz et al., Diabetes Care, Vol 23, Issue 11 1642-1647 (2000)

Preventing Progression from Impairment to Disability

- Slower muscle contraction velocity associated with gait and balance impairments (Orr et al., 2006)
- Suggested Intervention: resistance (power) training progressing to plyometric type exercises



Medicine & Science in Sports & Exercise. 31(1):38-45, January 1999.
FEIGENBAUM, MATTHEW S.; POLLOCK, MICHAEL L.

Women: Falls & Diabetes

- Diabetes increases the risk for fractures
- Aging women with diabetes are at higher risk for falling
- Women with diabetes are more likely to have multiple risk factors for falls
- Women with non-insulin-treated diabetes have a greater risk of falls

Fall Risk

- **Predictors of Falls in a Multiethnic Population of Older Rural Adults With Diabetes** *J. Gerontol. A Biol. Sci. Med. Sci.*, April 1, 2006; 61(4): 394 - 398.
- **Risk Factors for Falls in Older Disabled Women With Diabetes: The Women's Health and Aging Study** *J. Gerontol. A Biol. Sci. Med. Sci.*, December 1, 2005; 60(12): 1539 - 1545.

Causes of Diabetes-Related Falls

- Poor balance with increased body sway
- Higher prevalence of documented risk factors:
 - poor balance
 - decreased muscle strength
 - decreased flexibility/increased tissue stiffness
 - arthritis
 - cardiovascular disease
 - depression
 - poor vision
 - medications for insomnia & anxiety

Fall Prevention Strategies

- Education and skill building to increase knowledge about fall risk factors
- Exercise to improve strength and balance
- Home modifications to reduce fall hazards
- Medication assessment to minimize side effects
- Shoe wear that promotes stability
- Hip protectors to prevent fracture

Literature Supporting Exercise Intervention to Prevent Falls

- De Vos et al., Optimal loading for increasing muscle power during explosive resistance training in older adults. *J Geront.* 60:638-647, 2005
- Brandon et al., Effects of long-term resistive training on mobility and strength in older adults with diabetes. *J Geront.* 58:M740-745, 2003
- Orr et al., Power training improves balance in healthy older adults. *J Geront.* 61:78-85 (2006)
- Wolf et al., Reducing frailty and falls in older persons. *J American Geriatric Society* 44(5),489-506.

Taijiquan-As a Rehabilitation Technique

- 34 Studies (Mixed Clinical, NRCT, RCT)
- 11 RCT's
- 5 RCTs demonstrating positive effects on:
 - Balance
 - Cardiopulmonary endurance
 - Skin microcirculation
 - ROM
 - Immune function
 - Bone synthesis

Summary

- Individuals with Diabetes have a higher incidence of physical disabilities than their age-matched peers
- Ischemia and Peripheral Neuropathy are contributing factors to the development of these physical disabilities
- Exercise is an effective treatment and should be part of the wound providers comprehensive treatment plan