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YOGA IMPROVES QUALITY OF LIFE AND FALL RISK-FACTORS IN A SAMPLE OF PEOPLE WITH CHRONIC PAIN AND TYPE 2 DIABETES

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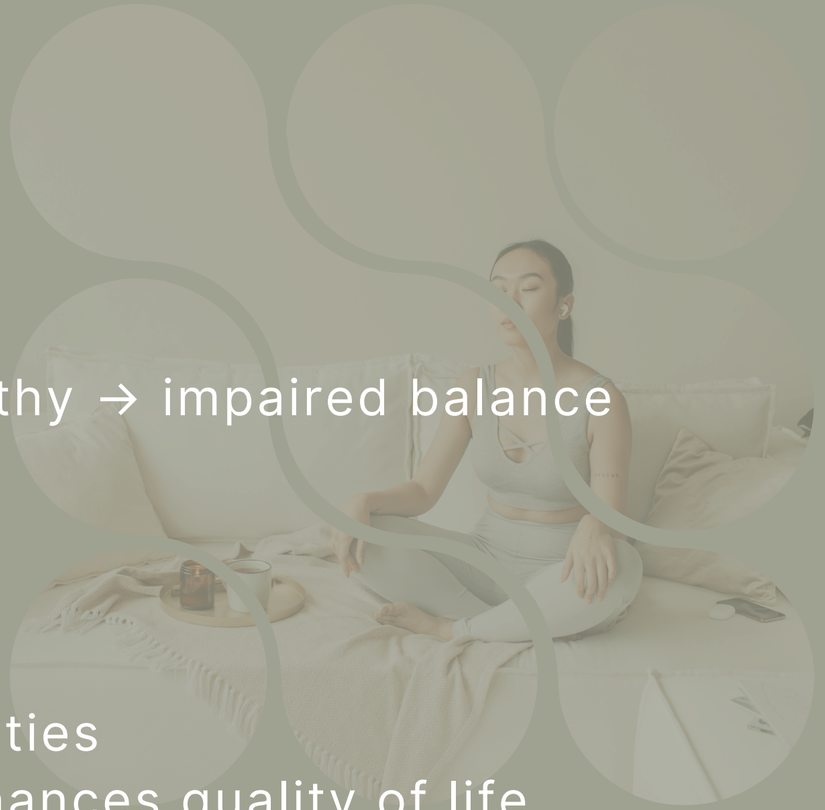
Type 2 Diabetes Mellitus (T2DM) and Fall Risk - The Need for Intervation

1. **T2DM – Definition & Global Burden**:
- Chronic metabolic disorder causing hyperglycemia
- 422 million affected worldwide; ~30 million in the U.S.
- Prevalence has quadrupled in the past 30 years
2. **Complications of T2DM**:
- Affects cognitive and physical function
- Can damage nearly all body systems
- Associated with lower extremity weakness and neuropathy → impaired balance
3. **Falls & T2DM**:
- People with T2DM are more likely to fall
- T2DM and its effects are key fall risk factors
4. **Role of Yoga**:
- Proven benefits for older adults and people with disabilities
- Improves: balance, strength, mobility, reduces pain, enhances quality of life
5. **Study Aim**:
- Compare outcomes of yoga intervention vs. usual care
- Outcomes measured: pain, balance, mobility, strength, quality of life



Methods

PARTICIPANTS AND RANDOMIZATION

Participants were recruited from a single interdisciplinary Pain Clinic. Brochures and flyers detailing the study and yoga intervention were displayed in the clinic's waiting area, allowing interested individuals to learn about the trial.

Inclusion Criteria:

- Adults (18+ years) with self-reported chronic pain lasting more than six months.
- Adequate English proficiency (at least at a sixth-grade reading level).
- Ability to attend one yoga session per week for eight weeks.

Exclusion Criteria:

- Pregnancy or planned surgery/hospitalization during the study period.
- Use of a spinal cord stimulator.
- Medical conditions that contraindicate yoga (e.g., unstable cardiac conditions, untreated psychosis, or uncontrolled seizures).

PARTICIPANTS AND RANDOMIZATION

Interested patients were initially screened via telephone to confirm eligibility based on the inclusion and exclusion criteria. Once deemed eligible, they were scheduled for a baseline assessment. At that point, participants were randomized into either the yoga intervention group or the control group, ensuring similar baseline characteristics between groups. Approximately **50% of study participants were randomized to the control group and 50% were randomized to the yoga group**, this proportion was maintained for the 18 individuals with T2DM included in these secondary analyses.

Intervention vs. Control

Control Group: Received standard care via monthly self-management education sessions on pain.

Yoga Group: Attended 16 standardized, progressive yoga sessions (2 per week for 8 weeks), incorporating postures, breath work, mantras, and meditation tailored for pain management.

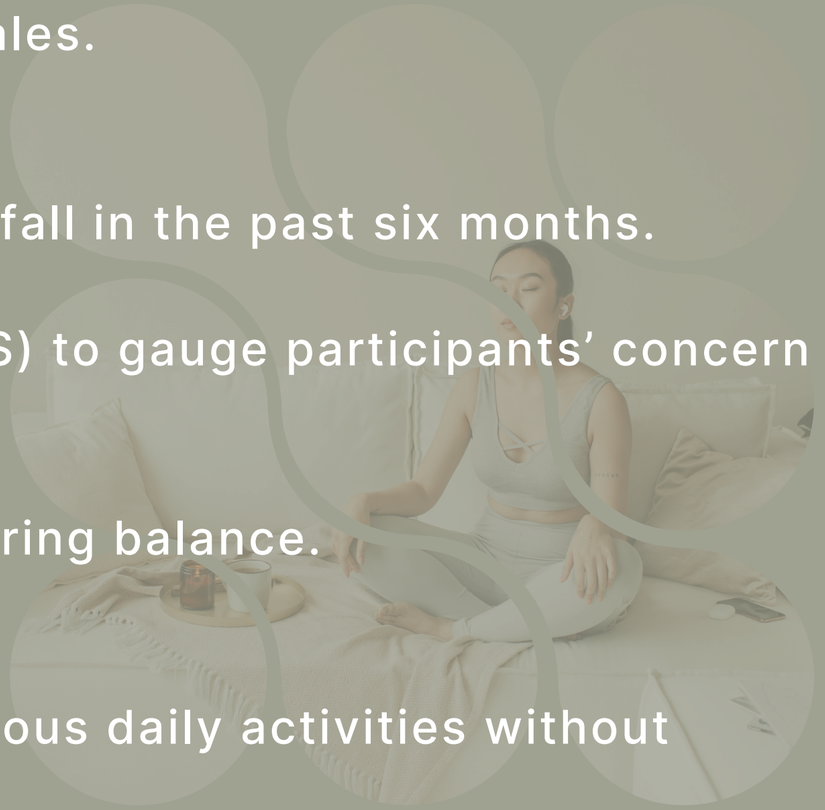
Data Collection

Measurements were taken both before and after the intervention, including demographics, pain (using the Brief Pain Inventory), fear of falling, balance (Berg Balance Scale and Balance Confidence Scale), and health-related quality of life.

OUTCOME MEASURES

1. Brief Pain Inventory (BPI)
   - Assesses pain intensity and interference on 0–10 scales.
   - Higher scores indicate greater pain or interference.
2. Self-Reported Falls
   - Participants indicated whether they had sustained a fall in the past six months.
3. Fear of Falling
   - A single item taken from the Falls Efficacy Scale (FES) to gauge participants' concern about falling.
4. Berg Balance Scale (BBS)
   - A 14-item scale (each scored 0–4, total 0–56) measuring balance.
   - Higher scores reflect better balance.
5. Activity-Specific Balance Confidence (ABC) Scale
   - Evaluates participants' confidence in performing various daily activities without losing balance.
6. RAND-36 Health Survey
   - Assesses health-related quality of life across 8 domains.
   - Total scores range from 36 to 148, with higher scores indicating better QoL.

Additionally, demographic information (e.g., age, gender) was collected via self-report.



DATA ANALYSIS

Data were analyzed using Statistical Package for the Social Sciences version 23. Double data entry was completed on 10% of the total study sample to ensure quality of data entry.

First, normality of distribution was assessed. Given that many variables were non-normally distributed, non-parametric tests were primarily used:

- Within-group changes: Evaluated with the Wilcoxon signed-rank test
- Between-group comparisons: Conducted using the Mann-Whitney U test for continuous variables and Fisher's exact test (or chi-square test when appropriate) for categorical variables
- Effect Sizes: Calculated to determine the magnitude of differences between groups.

Additionally, percent change from baseline to post-intervention was computed for each measure to assess improvement over time.

Results

PARTICIPANT CHARACTERISTICS

- Total number of participants in the RCT: 84 people
- The number of individuals who self-reported a diagnosis of T2DM and were included in these analyses is: 18 (21%)
- Yoga group: 9 people
- Control group: 9 people

PATIENT CHARACTERISTICS

- Mean age: 54.94 ± 9.94 years
- 12 women
- 11 identified as Caucasian
- 11 individuals not in a couple
- 10 people with at least some college education
- There were no demographic differences between the yoga and usual care control groups

One individual in both the yoga and the control group **dropped out of the study** prior to the completion of the eight week assessments. Their data were carried forward from the baseline data.

On average, individuals randomized to the yoga group attended **10.3 ± 4.5** of the potential 16 sessions.

Demographics, compared between participants randomized to yoga or control groups.

Variable	All, N = 18	Yoga, n = 9	Control, n = 9	p =
Age	54.9 ± 9.94	56.6v±9.62	53.3 ± 11	.723
Gender (female)	12 (67%)	5 (56%)	7 (78%)	.620[a]
Race (Caucasian)	11 (60%)	4 (44%)	7 (78%)	.335[a]
Part of a couple (no)	11 (60%)	5 (56%)	6 (67%)	1.0[a]
Education (some college)	10 (56%)	4 (44%)	6 (67%)	.637[a]
Fall in the last 6 months (yes)	9 (50%)	5 (56%)	4 (45%)	1.0[a]

[a] Fisher's Exact Test.

SIGNIFICANT IMPROVEMENTS WERE FOUND IN:

- ↓ pain interference: 49 ± 15.00 vs. 41.25 ± 19.46, $p = 0.034$, 16%
- ↑ balance: 14.2 ± 14.07 vs. 20.4 ± 13.48, $p = 0.028$, 44%
- ↑ upper extremity strength: 7.7 ± 6.34 vs.10.8 ± 6.52, $p = 0.017$, 40%
- ↑ lower extremity strength: 4.1 ± 3.8 vs. 6.72 ± 4.78, $p = 0.018$, 64%
- ↑ QoL scores: 81.1 ± 7.66 vs. 91.9 ± 8.98, $p = 0.036$, 13%

Change in outcome measure scores between baseline and 8 weeks

Outcome measures	Yoga, n = 9				Control, n = 9			
	Baseline	8 weeks	p-value	% change	Baseline	8 weeks	p-value	% change
Pain intensity	27.9 ± 3.25	28.0 ± 4.6	.500	↑<1%%	27.25 ± 4.51	28.94 ± 8.31	.806	↑6%
Pain interference	49 ± 15.00,	41.25 ± 19.46	.034	↓16%	38.87 ± 14.96	41.27 ± 12.97	.379	↑6%
Balance	14.2 ± 14.07	20.4 ± 13.48	.028	↑44%	27.1 ± 9.92	21.7 ± 13.36	.012	↓20%
Gait speed, meters per second	.83 ± .567	1.0 ± .54	.176	↑20%	1.4 ± .76	1.5 ± .82	.116	↑7%
Endurance, number of feet	569.0 ± 551.40	680.9 ± 648.02	.499	↑20%	896.7 ± 383.71	908.2 ± 421.92	.889	↑1%
Upper extremity strength,	7.7 ± 6.34	10.8 ± 6.52	.017	↑40%	11.1 ± 5.18	12.8 ± 5.7	.072	↑15%
Lower extremity strength	4.1 ± 3.8	6.72 ± 4.78	.018	↑64%	5.8 ± 4.30	4.7 ± 4.8	.157	↓19%
Quality of life	81.1 ± 7.66	91.9 ± 8.98	.036	↑13%	84.5 ± 5.76	89.5 ± 8.7	.122	↑6%

There was a significant deterioration in balance in the control group, with a 20% decrease over eight weeks. Probably due to the loss of balance, the average intensity of pain and its impact on function increased, and lower limb strength decreased by 19% in participants in the control group.

Summary

DISCUSSION ABOUT RESULTS

- In this sample of individuals with Type 2 Diabetes Mellitus (T2DM), yoga improved quality of life (QoL) and reduced fall risk factors.
- Most previous yoga studies in T2DM focused on glycemic control and metabolic outcomes.
- This is likely the first study targeting fall prevention in people with both chronic pain and T2DM.
- 50% of participants reported falling in the past 6 months – unusually high for an average age of ~55 years.
- For comparison:
  - Fall rate in people >65 years = 30%
  - Fall rate in people >80 years = 50%
- These findings underscore the urgent need for fall prevention strategies in adults with T2DM and chronic pain.

OUTCOME MEASURES & FALL RISK

No statistically significant between-group differences – sample size too small (n = 9 per group).

Despite this, the yoga group showed significant improvements in:

- Pain interference
- Balance (FAB scale ↑ 44%)
- Upper & lower extremity strength
- Quality of life (QoL)

FAB score <25 = fall risk

- Yoga group: improved from 14.2 → 20.4 (still at-risk)
- Control group: decreased from 27.1 → 21.7 (–20%)

Control group also had a 19% decrease in lower limb strength in just 8 weeks.

These results highlight the need for targeted interventions to improve fall-related outcomes in people with T2DM.

OUTCOME MEASURES

- **Pain interference** improved in the yoga group
- **Pain intensity** did **not** improve
  ➤ Likely due to varied pain types (e.g., migraines, neuropathy vs. back pain)
- **Mobility gains (Yoga group):**
- **Gait speed** ↑ by 0.17 m/s
  (MCID = 0.13 m/s — clinically meaningful)
- **6-Minute Walk** ↑ by 112 feet
  (MCID = 164 feet — close to threshold)
- **Quality of Life (QoL)**
- **Rand-36** score ↑ by 10.8 points
  (MCID = 3–5 points → significant improvement)

STUDY LIMITATIONS

- **Small sample size:**
  Only a subset of participants from a larger RCT, all self-reported T2DM.

- **Self-reported data:**
  T2DM diagnosis and other outcomes not clinically verified.

- **Single-site sample:**
  All participants were from one Pain Clinic in a small southwestern U.S. city.
  → Limited generalizability.

- **Sedentary baseline lifestyle:**
  Participants had little prior physical activity.
  → Improvements may reflect general activity effects, not yoga specifically.

STUDY LIMITATIONS

- **No active control group:**
  Cannot distinguish between yoga effects vs. social/group participation effects.

- **Measurement tools:**
  FAB and other physical tests were valid, but more objective tools (e.g., electronic balance, postural sway) are needed.

- **Pilot nature:**
  Intervention not tightly controlled; future studies should include:
  - **Active controls**
  - **Standardized environments**
  - **Matched instructor expertise**

FUTURE INTERVENTION STRATEGIES

Yoga improved QoL and fall risk factors, but may not be enough on its own.

In previous studies:

- Yoga helped people with neuropathy and post-stroke adults improve balance, mobility, and strength.
- However, some participants experienced increased falls due to overconfidence and lack of fall risk management awareness.

Fall prevention needs to address more than physical fitness — it must include:

- Risk education
- Cognitive and emotional awareness
- Neuropathy symptoms

Recommendation:

- Combine Yoga + Occupational Therapy + Self-Management Programs.
- Create multidimensional interventions for people with T2DM and chronic pain.

Bibliography

- Schmid AA, Atler KE, Malcolm MP, Grimm LA, Klinedinst TC, Marchant DR, Marchant TP, Portz JD. **Yoga improves quality of life and fall risk-factors in a sample of people with chronic pain and Type 2 Diabetes.** Complement Ther Clin Pract. 2018 May;31:369-373. doi: 10.1016/j.ctcp.2018.01.003. Epub 2018 Feb 15. PMID: 29526474.

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THANK YOU!