

THERAPEUTIC DANCE INSTRUCTION FOR ENHANCING EXERCISE ADHERENCE AND IMPROVING MOBILITY IN PERSONS WITH MS

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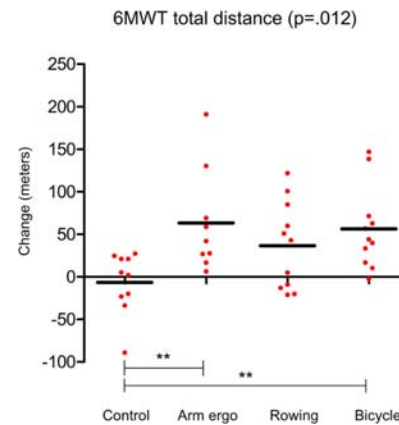
Why dance?

- How can we develop the habit of regular exercise for cardiopulmonary and neurological health
- Physical inactivity contributes to sedentary lifestyle that can **increase risk of morbidity and all-cause mortality**
- Low fitness is a better predictor of mortality than obesity or hypertension
- People with MS are at even greater risk
- Symptoms related to MS make participation in physical activity (PA) difficult (fatigue, difficulty with gait, balance issues)
- **64%** of people with MS did not meet international guidelines for regular physical activity vs **40%** of adults in US

Exercise as an disease course modifying intervention with generalized effects

- Adequate PA is one of the few **non-pharmacological interventions** available that can effectively reduce MS symptoms & improve quality of life, and is well-tolerated in people with MS
- **Physiological, psychological, neurological effects:**
 - Increase lower limb strength, step rate, walking speed
 - Decrease fatigue
 - Improving mood and balance
 - Improves cognition, relapse rate
- Benefits remain only if PA is **maintained over time**

Effects of standardized exercise therapy on walking ability in MS patients



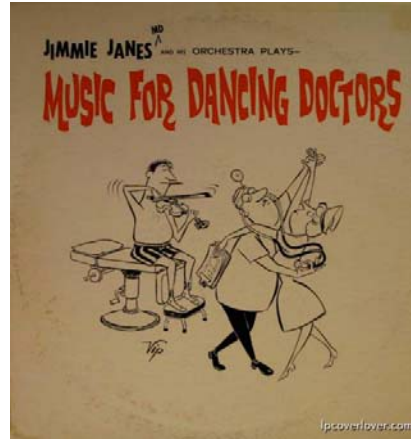
S Briken et al. Mult Scler 2013;20:382-390

Critical elements to increase habitual exercise?

- Experience with treadmill training suggests poor long term adherence
- Furthermore, although treadmills satisfies exercise needs, does not provide functional mobility training
- **Theories for self-motivation & behavior change:**
 - competence/self-efficacy
 - autonomy
 - meaningfulness to life goals
 - Enjoyment, group or social activity

Dance as Intervention

- Meets criteria for behavioral change
- Literature from other populations (elderly, PD, stroke, TBI) suggested high adherence
- May also have greater effects on mobility than just forward walking
- Dance as a “non-exercise” may make it more enjoyable



Neurological complexities of dance

- Motor learning, spatial integration, executive processing, appropriate response to external physical cues and social cues
- Tango, Waltz and Salsa are based on a set of structured steps which then can be arranged (choreographed) sequenced based on “real-time” needs
- Control of balance is dynamically applied
 - Forward, back, lateral, and turns
 - While responding to external perturbations
- Requires cognitive engagement and mastery of a motor skill, even more so than traditional gait training

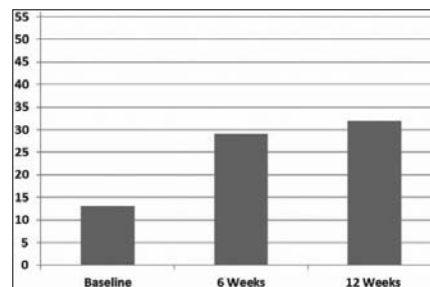
Why Salsa?

- Wanted a dance form that could be performed **partnered** or **single**
- Dance style that is current, making actual use accessible
- Desired some potential choreography and mind-body planning
- Combination of structured steps, torso, and UE movements, requiring integration of attention and rehearsal of physical movement
- Step count happened to be nearly identical to the highest speed on the Lokomat

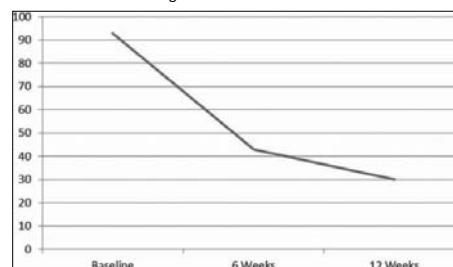
ID#	Salsa Steps (# Steps/Min)	HR (Beats/Min)	Walk Steps at 3.5 km/hr (#Steps/Min)	HR (Beats/Min)
P1	106	120	107	90
P2	112	77	110	77
P3	170	95	110	84

Why Salsa for MS?

- Limited studies looking at therapeutic effects of salsa in different pop.
- **Abreu et al. 2013:** case study on 83 y.o. with Alzheimer's
 - 24 one-hour salsa sessions over 12 weeks
 - Improved strength, balance, gait and functional activity
- **Granacher et al. 2012:** RCT with 28 older adults
 - 16 one-hour salsa sessions over 8 week vs no treatment
 - Conclusion: Salsa is a safe, feasible, and highly enjoyable PA program with high adherence rate



Changes in BBS. Abreu et al. 2013



Changes in TUG Test (time in seconds). Abreu et al. 2013

Dance in MS

- Almost nothing is known about dance intervention in MS, except for one Brazilian case study by Salgado & de P Vasconcelos 2010.
 - 1hr and 40-min session of salsa, twice a week for 5 month

Scale	Initial score	Meaning	Final score	Meaning
EDSS (Expanded Disability Status)	3	Medium incapacity of 1 FS (1 FS score 3 or little incapacity of 3 or 4 FS (1 FS score 2, others score 0 or 1) FS: Functional Systems	2	Little incapacity of 1 FS (1 FS score 2, others 0 or 1)
MRD (Minimal Record Disability)	6	Two supports are necessary during walking tests. The patient can walk 25 feet in 20 s	5	One support is necessary during walking tests. The patient can walk 25 feet in more than 20 s or bilateral supports are necessary and patient can walk 25 feet in 20 s at least.
NRS (Scripps Neurologic Rating Scale)	64	Max Score 100	71	Max Score 100

Pilot study of Salsa for MS : Method

- Pilot structured salsa dance intervention for people with MS
- 8 persons with MS
- 2.5 hours, 2x week for 4 weeks
 - Two 60-min classes + 30 min practice at home
- Reproducible dance protocol
- Outcomes measured:
 - Longitudinal effects on PA
 - Gait, balance, self-efficacy & tolerability

Participant Demographics

Subject	Age	Gender	MS Subtype	Disease Duration (yrs.)	PDDS ^a
02	56	F	RRMS ^b	22	1
03	32	F	RRMS	10	0
04	57	M	RRMS	2	3
06	63	F	RRMS	20	1
07	29	M	RRMS	1	1
08	51	F	RRMS	3	0
09	60	F	SPMS ^c	13	3
10	48	M	RRMS	2	0

^aPatient Determined Disease Steps
^bRelapsing-remitting multiple sclerosis
^cSecondary-progressive multiple sclerosis

Dance Protocol

- 1st lesson of each week:
 - Introduced a new step
 - Initially learned without music & without partner
 - Randomly paired and rotated between partners every few minutes
- 2nd lesson of each week:
 - reviewed and practiced steps learned cumulatively in prior lessons
- Some movements were slightly adapted or customized to participants' limitation
- Two mandatory breaks
 - # of breaks as indicator of intolerability

Progression of Dance Steps, 8 Classes over 4 Weeks

Classes	Bronze Level Syllabus
1-2	Frame-Posture-Balance, Leader/Follower Roles, Basic Step Forward and Side
3-4	Basic with Follower's Underarm Turn
5-6	Cross Over Breaks
7-8	Cross Body Lead

Outcomes measured

- Pre-post intervention, 3-, 6- month follow-up
- **Dance Tolerability:**
 - # of individual breaks per session
- **Gait:**
 - Timed 25-FT Walk Test
 - MS Walking Scale-12
- **Balance:**
 - Timed Up and Go
 - Dynamic Gait Index
 - Berg Balance Scale
- **Self-efficacy & motivation:**
 - MS Self-Efficacy Scale
 - Activities-specific Balance Confidence Scale
 - Motives for Physical Activity Measure-Revised
- **Physical Activity:**
 - Godin Leisure Time Exercise Questionnaire
 - Home journal
- **MS-related clinical symptoms**
 - MS Symptom Checklist
- **Patient Determined Disease Steps** (walking disability)

Outcome Measure	Pre-Intervention Median (IQR) ^a	Post-Intervention Median (IQR)	3- Month Follow-Up Median (IQR)
Gait Outcome Measures			
Timed 25 Foot Walk (sec) ^b	4.6 (4.3, 5.0)	4.8 (4.3, 4.9)	4.8 (4.1, 5.1)
MS Walking Scale-12 ^b	29.2 (1.0, 59.9)	29.2 (1.6, 46.4)	17.7 (1.6, 41.7) **
Balance Outcome Measures			
Timed Up & Go (sec) ^b	9.5 (8.6, 10.0)	8.5 (8.1, 8.9) **	8.3 (8.0, 8.9) **
Dynamic Gait Index ^c	22.5 (20.3, 23.8)	23.0 (23.0, 23.8) *	24.0 (22.3, 24.0) **
Berg Balance Scale ^c	55.0 (53.3, 56.0)	56.0 (56.0, 56.0)	55.0 (54.0, 55.8)
Statistical significance: * p < 0.10; ** p < 0.05.			
^a Interquartile Range			
^b Lower values indicate better performance.			
^c Higher values indicate better performance, the total number of minutes per week include dance sessions.			

Outcome Measure	Pre-Intervention Median (IQR) ^a	Post-Intervention Median (IQR)	3- Month Follow-Up Median (IQR)
Self-Efficacy and Motivation Outcome Measures			
MS Self Efficacy Scale ^c	56.5 (46.8, 71.5)	63.8 (47.3, 70.1)	62.3 (48.1, 64.8)
Activities-specific Balance Confidence Scale ^c	85.5 (68.0, 97.0)	88.8 (70.5, 97.2) *	87.8 (63.9, 98.4)
Motives for Physical Activity Measure-Revised^c:			
Competence Domain	6.2 (4.7, 6.7)	6.4 (5.7, 6.9)	5.9 (5.2, 6.7)
Interest/Enjoyment Domain	5.6 (4.8, 6.6)	6.1 (5.7, 6.5)	5.8 (5.1, 6.1)
Physical Activity Outcome Measures (Godin Leisure Time Exercise Questionnaire^c)			
Total minutes/week	250.0 (25.0, 447.5)	450.0 (305.0, 731.3) **	267.5 (25.0, 807.5) *
Vigorous Exercise (min)	0.0 (0.0, 0.0)	0.0 (0.0, 33.8)	20.0 (0, 126.3) *
Moderate Exercise (min)	70.0 (0.0, 338.8)	325.0 (240.0, 492.5)**	45.0 (0, 195.0)
Mild Exercise (min)	75.0 (0.0, 201.3)	75.0 (0.0, 246.3)	177.5 (0, 326.3)
Total Leisure Activity (METs ^d)	28.0 (4.5, 50.8)	43.0 (30.0, 67.5) **	20.5 (3.8, 66.5)
MS Symptoms/Disability			
Patient Determined Disease Steps ^b	1.0 (0.0, 2.5)	1.0 (0.0, 2.5)	1.0 (0.0, 2.5)
MS Symptom Checklist ^b	5.0 (2.0, 6.8)	5.5 (2.3, 8.5) **	2.0 (1.3, 9.0)
Statistical significance: * p < 0.10; ** p < 0.05.			
^a Interquartile Range			
^b Lower values indicate better performance.			
^c Higher values indicate better performance, the total number of minutes per week include dance sessions.			
^d Metabolic equivalent			

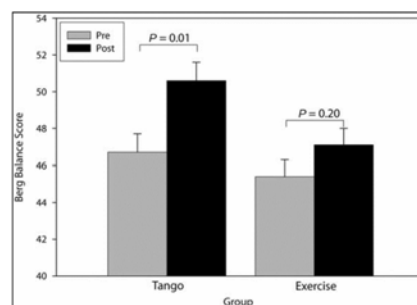
Results of 4 weeks of progressive salsa dance

- Increased **engagement in PA** during the intervention period
- Improvements in **gait and balance** immediately post-intervention and at 3-month follow-up compared to baseline
- At 3-month:
 - Increases in **vigorous and mild exercise**, but not stat sig
 - Stat sig improvements in **TUG, DGI, and MSWS-12** compared to baseline

Other literature on Dance

Parkinson's disease (PD)

- Hackney et al (2007):
2x/week, 10-week tango
 - Sig improvements on the BBS & TUG for tango group
 - No improvement for traditional exercise group



Berg Balance Scores for the tango and exercise groups before (gray) and after (black) intervention. Values plotted are means \pm SEM. The tango group demonstrated significant improvement while the exercise group did not.



Tolerability

- Well-tolerated (no one took an elective break during salsa sessions)
- Post-study interviews:
 - additional 30 min would be possible
 - a study longer than 4 weeks would be welcomed without fatigue



Limitations

- Small sample size (n=8)
- No control group
- Safety screening = people with motor deficits at milder range
- Some participants already engaged with regular exercise = less apparent to see pre-post difference in PA for some participants
- Short study duration = less likely to affect long-term behavioral changes
- Potential ceiling effects on clinical measures, especially the Berg Balance Scale



Summary and conclusions

- Safe and Tolerable
- No reported issues with fatigue
- Recruiting for a larger RCT (60-70)
- Tend to attract those already fairly active
- Intimidation factor for dance
- Participants like the “safety” of dancing with others with MS
- As with pharmacological agents, will not be for everyone



Thank you



What is salsa dance?

- A dance style that blended several Caribbean musical styles together.
 - The term “salsa” was created in New York City in the 1970s.
- Usually dance to music with a 4/4 beat per measure.
 - Basic dance rhythm consists of taking 3 steps every 4 beats of P1 music
 - A standard salsa step sequence is danced in 8 beats, or 2 measures.
- Basic steps include front-to-back and side-to-side
- Dance tempo generally ranges from 140 bpm to 220 bpm
- Open and closed frames

Different styles of Salsa

- There are many different types of salsa dance styles that emphasizes accenting different beats and movements.
- **Los Angeles:** danced “on 1” (first beat), emphasizes theatricality such as salsa shines (solos), very “showy”
- **Colombian:** emphasizes side-to-center footsteps and back-to-center (instead of forward-and-backward)
- **Cuban:** emphasizes the 4th and 8th beats and circular movements as opposed to linear movements
- **New York:** dance “on 2” (second beat), emphasizes shines, very linear
- **Puerto Rican:** can be danced on 1st or 2nd beats, emphasizes solo footwork and incorporates lots of shoulder shimmies

Different types of salsa



Salsa styles examples



Our choice: structured “American” style

- Why did we choose our style? Is it more new york or LA style?
- Our bpm? AI told me that it's around 114?



Videos of Rosalind teaching steps

- To be added



Salsa and other Dances

- Merengue
- Bachata
- Yen to add info for the dances above, but why didn't we choose other dance styles? Is there a reason besides the fact that salsa is currently the most popular dance style for people in the age range of being diagnosed with MS?

Salsa vs Merengue vs Bachata



-
- Tango
 - Waltz
 - Yen to add

Yesenia Peralta



- Internationally-renown salsa instructor, performer, and dancer
- Diagnosed with MS in August 2010 and mostly retired from salsa due to symptoms
- Started dancing and teaching salsa again in 2013

Yesenia in Berlin, 2005

