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Outcomes of short-term participation in wheelchair dancing for individuals with spinal cord injuries – A pilot study

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PURPOSE

To investigate the therapeutic effectiveness of wheelchair-adapted Ballroom/Latin dancing in individuals with spinal cord injuries (SCI).

INTRODUCTION

- With advances in medicine, individuals with SCI are able to live longer, and people with SCI are faced not only with secondary medical complications following SCI but also conditions related to aging.
- Despite the many known benefits of exercise, individuals with SCI are significantly less physically active than the able-bodied population.
- There is a fundamental need to develop and offer novel programs that address the wide range of needs in SCI.
- The wheelchair-adapted Ballroom/Latin dance program chosen for this study allows participation of people with various abilities, both manual and power wheelchair users, who can maneuver their own chairs.

METHODS

PARTICIPANT DEMOGRAPHICS:

Fifteen individuals with chronic SCI

Mean age (yrs ± SD)	42.9 ± 12.1
Mean duration of injury (yrs ± SD)	14.0 ± 8.2
Paraplegia	5F/2M
Tetraplegia	6F/2M

PROTOCOL:

All participants were evaluated before and after participating in a six-week wheelchair ballroom/Latin dance program that consisted of two 2-hour lessons per week.

WHEELCHAIR DANCE PROGRAM:

- We used the Wheel One™ Wheelchair Ballroom and Latin Dance Curriculum developed by American DanceWheels Foundation (ADF).
- One seated dancer partners with one standing dancer to dance as a couple.
- The male dancers are taught to lead the female dancers, regardless of whether they are the seated dancer or the standing dancer and the female dancers are taught to follow the male dancers' leads.

- All dancers are taught basic steps that enable them to engage in social dance anywhere with appropriate modifications as needed.
- Participants in this study were taught three different dances: Rumba, Tango, and Salsa.

OUTCOME MEASURES: Participants were assessed with the following variables:

Physical & physiological outcomes	Functional outcomes	Psychosocial outcomes	Clinical outcomes
• Range of motion • Strength • Weight • Pain	• Balance • 6-min wheeling distance • Reaction time • Figure-of-eight wheelchair skills • Upper extremity coordination • Activity level	• Depression • Quality of life • Community reintegration	• Secondary conditions

We also monitored *attendance* as a measure of adherence.

ANALYSIS:

Before and after comparisons were made using paired t-tests and Wilcoxon signed tests.

To quantify upper extremity coordination, a **phase coordination index (PCI)** was calculated as the participants performed a tapping task (Plotnik et al. 2007). PCI is a value that reflects both *accuracy* and *consistency* of interlimb phase generation.

$$PCI = \Phi_{CV} + P\Phi_{ABS}$$

Φ : phase value of the left(L) UE using the right(R) UE as the reference
 $\Phi_{CV} = 360 \times \frac{(\Phi_{L, onset time} - \Phi_{R, onset time})}{TR_{L, onset time} - \Phi_{R, onset time}}$

Φ_{ABS} : coefficient of variation of the mean of Φ for each subject

$P\Phi_{ABS} = 100 \times (\Phi_{ABS}/180)$



Participants engaged in wheelchair dancing with a standing partner using manual and power wheelchairs

RESULTS

Outcome measure		Pre (Mean ± SD)	Post (Mean ± SD)	p
Physical & physiological	ROM (deg)			
	R SH flexion	142.5 ± 14.3	151.6 ± 14.2	p=0.004
	R SH extension	70.5 ± 11.2	78.9 ± 10.5	p=0.003
	R SH IR	53.5 ± 15.4	77.1 ± 25.6	p=0.002
	R SH ER	92.8 ± 8.8	112 ± 11.8	p=0.002
	L SH flexion	147.3 ± 13.5	154.5 ± 10.8	p=0.011
	L SH abduction	130.1 ± 13.5	140.7 ± 13.1	p=0.002
	L SH extension	68.1 ± 9.2	79.9 ± 4.7	p=0.002
	L SH IR	54.1 ± 14.6	79.1 ± 22.3	p=0.002
	L SH ER	92.4 ± 12.3	113.4 ± 13.6	p=0.002
	Strength (kg)			
	R SH flexion	7.5 ± 3.6	9.7 ± 4.1	p=0.007
R SH abduction	6.9 ± 3.2	9.2 ± 4	p=0.003	
R SH IR	12.8 ± 7.3	18 ± 7.1	p=0.002	
R SH ER	9.3 ± 4.3	11.1 ± 4.9	p=0.003	
R ER ext	14.9 ± 6.1	18.6 ± 6.7	p=0.002	
R ER ext	9.4 ± 5.2	11.6 ± 6.2	p=0.005	
L SH flexion	7.3 ± 2.8	9.9 ± 4.4	p=0.002	
L SH abduction	7.5 ± 3.2	9.8 ± 4	p=0.002	
L SH IR	12.4 ± 5.8	16.3 ± 7.5	p=0.007	
L SH ER	10.1 ± 4.2	12.6 ± 5.5	p=0.002	
L ER ext	15.5 ± 5.8	17.9 ± 6.9	p=0.003	
L ER ext	9.9 ± 5.4	12.1 ± 6.7	p=0.007	
Trunk flexion	7.7 ± 3.6	8.6 ± 4	p=0.007	
Trunk R lateral	7.4 ± 3.1	8.5 ± 3.3	p=0.006	
Weight (kg)	148.7 ± 45.9	144.1 ± 45.5	p=0.002	
Resting gain	3.1 ± 4.5	3.1 ± 3.1	p=0.007	
6-min distance (m)	2095.9 ± 471.7	2155.1 ± 505.8	p=0.012	
Reaction time (sec)	100.1 ± 25.1	118.7 ± 21.5	p=0.012	
WC skill test	10 ± 3.5	9.4 ± 3.1	p=0.009	
UE coordination PCI	7.5 ± 3.2	5.7 ± 3.6	p=0.010	
Community reintegration	CRS - Intent of 35.1 ± 5.1	36.7 ± 3.7	p=0.004	

* Only significant changes are displayed in the table. No changes were noted in R SH abduction range, trunk L lateral or extension strength, sitting balance, activity level, depression, quality of life, and secondary conditions.

- Participants demonstrated **significant improvements** in **bilateral range of motion, strength, 6-min wheeling distance, reaction time, wheelchair skills, upper extremity coordination, and community participation.**

- Participants also demonstrated **significant reductions** in **weight and resting gain.**

- Adherence was very high** at 93.3 ± 7.8%.

Participant feedback:

- "Dancing got me out of bed. I feel more confident and beautiful. I am contacting people I have been avoiding."
- "Dancing made me feel complete."
- "Learned to maneuver my wheelchair in new ways that transferred over to daily life. I now feel like that my wheelchair is not just a hardware or a mode of transportation but a part of me. I liked that a person in a wheelchair not only had a role in decision making but can actually take lead in dancing."

- "I have been asked by 4 guys to dance at a club!"
- "Dancing has increased my trunk strength - I no longer need lateral supports."
- "Helped me get out of my apartment and live in reality. This has greatly influenced my spouse who first thought it was stupid but now wants to be involved in seeing this continue."
- "I have gotten closer to my husband."
- "Dancing motivated me to take better care of my body."
- "I have become more confident and found a way to enjoy life again. Improved self-esteem and I am much happier. I am also more understanding of my spouse engaging in leisure activities with opposite sex."
- "I feel more confident about getting back into the community. Dancing brought me out of my sweats and back into normal clothing. I was able to be around people without disabilities without fear. This should be part of rehabilitation."
- "Did not know that people in wheelchairs could really dance the real thing! This has helped me use muscles that I normally don't use and improve performance in other sports. I was sweating!"



CONCLUSIONS

- Our results suggest that wheelchair dancing may have multiple physical, physiological, functional, and psychosocial benefits.
- Based on these preliminary findings, a randomized, controlled study with long-term follow up is warranted.
- Such a study may provide a foundation for implementing novel dance-based therapeutic programs that are fun and thus encourage participation for individuals with SCI.

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