

SUPPLEMENTARY DIGITAL MATERIAL 1

Supplementary Table I.—Main characteristics of the studies included in this systematic review.

Authors	Journal	Nation	Population (M/F)	Age (years)	H&Y	Intervention	Control	Outcome	Main Findings
Allen NE <i>et al.</i> 2017 —	Park. Relat Disord.	Australia	Total: n=38; 23 /15	Total: N/A	≤V	Group 1: Participants performed exergames 3 times /week for 12 weeks. Two exergames focusing on coordinated movements of the arm and hand. Both games were played with one upper extremity at a time, and were played with either the whole arm or the	Group 2: Usual care continue with home activities	TMT-A; TMT-B; MOCA score (secondary outcomes in the study). Data were collected at T0 (baseline) and at T1 (12 weeks)	Group 1 improved their time compared to the group 2 for the Trail Making Test Part A (p = 0.07)
			Group 1 n=19; 12 /7	Group 1: 67.5 ± 7.3					
			Group 2: n= 19; 11/8	Group 2: 68.4 ± 8.5					

						hand. A full exergame session comprised of playing each game under six conditions, so that 12 games were played per session			
Alves MLM et 2018 al.	Percept. Mot. Ski.	Brazil	Total: n=27; 25 / 2	Total: 61 ± 10.7	≤III	Group 1: Nintendo Wii™ group performed 10 individual training games, Games were Rhythm Parade, Obstacle Course, Tightrope Walk, and Basic Step. Group 2: Xbox Kinect™ group performed 10 individual training games. Games were	Group 3: The control group received no training of any type during the 5-week game training period	Digit Span forward and backward; Verbal Fluency Test; BAI (secondary outcomes in the study). Data were collected T0 (baseline), T1 (5 weeks) and T2 (9 weeks)	Group 1 showed improved scores on Digit Span backward at T1, (p = 0.002), BAI scores at T1(p = 0.045), and T2 (p = 0.031)
			Group 1: n= 9; 9 /0	Group 1: 58.89 ± 11.16					
			Group 2: n=9;8 /1	Group 2: 62.67 ± 13.81					
			Group 3: n= 9; 8 /1	Group 3: 61.67 ± 10.74					

						Hurdles, River Rush, Reflex Ridge, and Light Race. The physical therapist gave manual and verbal cues to the patient to promote a correct posture and perform movements required to interact with the game and achieve its goals			
Bekkers EMJ <i>et al.</i> 2020	Neurorehabili. Neural Repair	Belgium	Total: n=121; N/A	Total: N/A	II-III	Group 1: Patients performed TT+VR 3 times per week for 6 weeks. Each session lasting 45 minutes. The training was performed on a	Group 2: Treadmill training, 3 times per week for 6 weeks. Each session lasting 45 minutes.	TMT-B. (secondary outcomes in the study). Data were collected at T0 (baseline), at T1 (6	A significant effect of time was found for TMT-B scores ($P < 0.001$), indicating that both
			Group 1: n= 62; 37 /25	Group 1: 71.06 ± 6.3					
			Group 2:	Group 2:					

			n= 59; 37/22	70.86 ± 6.0		treadmill with Virtual reality. Every week obstacle levels were increased in height and depth, visibility was reduced from daylight to darkness, distractors in the environment were increased from calm to busy and navigation signposts were reduced from many to none to stimulate memory functions	Gait speed and walking duration were progressively increased using predetermined levels and criteria for progression	weeks), and at T2 (24 weeks)	groups benefited equally from both training modes
	Eur. J. Phys.	Italy	Total: n=20; 13/7	Total: 68.0 ± 6.1	II-III	Group 1 : Patients performed	Group 2: Patients	FIM cognitive subscale	No significant

Fundarò C <i>et al.</i> 2019	Rehabil. Med.		Group 1: n= 10; 5/5	Group 1: 65.9 ± 6.6		RAGT+VR, 30- min daily sessions, 5 days/week for 4 weeks. The VR landscape featured an animal (target) that the patient had to reach and catch; the device translated the subject's movement according to the movement of the avatar in the virtual scenery, performing the task requested. This non- immersive virtual application was programmed to calculate a	underwent a training program assisted by a physiotherapis t without use of any technological device, 30- min daily sessions, 5 days/week for 4 weeks	(primary outcomes in the study). Data were collected at T0 (baseline), at T1 (4 weeks)	difference in cognitive assessment was found in both groups (p<0.005)
			Group 2: n= 10; 8 /2	Group 2: 70.2 ± 4.8					

						performance accomplishment score (catching performance score); for correct execution of the selected task, 60 points were added to the game score			
Maggio MG <i>et al.</i> 2018	J Geriatr Psychiatry Neurol	Italy	Total: n=20; 10/10	Total: 69.4 ± 8.2	<III	Group 1: Participants underwent a semi-immersive VR system (Nirvana, BTS), 3 sessions a week, 60 minutes each, for 8 weeks. The device is connected to a projector and a big screen, it reproduces an interactive series	Group 2: Usual Cognitive Rehabilitation program was performed, 3 sessions a week, 60 minutes each, for 8 weeks	ACE-R, ACE-R AO; ACE-R M; ACE-R F; ACE-R L; ACE-R VS; BDI; FAB; GDS; HRS-A; MMSE; WEIGL (primary outcomes in the study) Data were	Significant difference between groups were found in ACE-R (p < 0.0001), ACE-R AO (p = <0.001), ACE-R F (p < 0.01), ACE-R VS (p < 0.0001), FAB (p <
			Group 1: n= 10; 6/4	Group 1: 69.9 ± 6.3					
			Group 2: n= 10; 4/6	Group 2: 68.9 ± 10.0					

						of exercises, and it creates interactivity thanks to the infrared video camera analyzing the patient's movements.		collected at T0 (baseline), at T1 (8 weeks)	0.001) and MMSE (p = 0.014) in favor of VR
Maidan I <i>et al.</i> 2018	Neurorehabilit. Neural Repair	Israel/Net herland	Total: n= 64; 45/19	Total: N/A	II-III	Group 1: Participants performed 3 sessions/week for 6 weeks for 45 minutes in each session. Training consisted of walking on a treadmill with requesting to negotiate virtual obstacles presented to them on a screen in	Group 2: Participants practiced 3 sessions/week for 6 weeks for 45 minutes in each session. Training consisted of walking on a treadmill	GGeneral Cognitive Score (Mindstreams , NeuroTrax Corp, Israel) (primary outcomes in the study). Data were collected at T0 (baseline), at T1 (6 weeks)	Executive function scores increased after training in both groups (p = 0.032). Although no significant differences between training arms were found
			Group 1: n= 30; 22/8	Group 1: 70.1 ± 1.3					
			Group 2: n= 34; 23/11	Group 2: 73.1 ± 1.1					

						front of the treadmill			
Pazzaglia <i>C et al.</i> 2017	Physiotherapy	Italy	Total: n=51; 35 / 16	Total: N/A	≤V	Group 1: Participants underwent a semi-immersive VR system (Nirvana, BTS), 3 sessions/week, 40 minutes each, for 6 weeks. The device is connected to a projector and a big screen, it reproduces an interactive series of exercises, and it creates interactivity thanks to the infrared video camera analyzing the	Group 2: The conventional rehabilitation program was performed according to the national guidelines for physical therapy in patients with PD, 3 sessions a week, 40 minutes each, for 6 weeks	Short-form 36 mental composite score (secondary outcomes in the study). Data were collected at T0 (baseline), at T1 (6 weeks)	Significative improvements were observed only in VR group (p = 0.037)
			Group 1: n= 25; 18 / 7	Group 1: 72.0 ± 7.0 years					
			Group 2: n= 10; 17 / 9	Group 2: 70.0 ± 10.0 years					

						patient's movements			
Pompeu JUC <i>et al.</i> 2012	Physiotherapy	Brasil	Total: n=32; 17/15	Total: 67.4 ± 8.1	≤II	Group 1: Participants underwent global exercise + Nintendo Wii and Cognitive training, 2 times/week for 7 weeks (14 sessions). The cognitive demands of the games were attention to solve the tasks, working memory and performance management	Group 2: Participants underwent global exercise+balance exercise training 2 times/week for 7 weeks (14 sessions)	MOCA(secondary outcomes in the study). Data were collected at T0 (baseline), at T1 (7 weeks), and T2 (15 weeks)	Both groups showed a significant improvement on MOCA after training that was maintained at follow-up(p < 0.05), but no difference between the groups was found at any time (p > 0.05)
			Group 1: n= 16; NA	Group 1: 68.6 ± 8.0					
			Group 2: n= 16; NA	Group 2: 66.2 ± 8.3					
	Eur Neurol	Netherlands	Total: n= 41; NA	Total: N/A	≤III	Group 1: Participants	Group 2: Waiting list	Global MyCQ score	Global cognition

Van de Weijer <i>et al.</i> 2020			Group 1: 21; NA	Group 1: 64.65±7.4 0		performed an online cognitive game (AquaSnap™) at home using an internet browser for 3 sessions/week, 30 min each, for 12 weeks		(primary outcomes in the study) Data were collected at T0 (baseline), at T1 (12 weeks), at T2 (24 weeks)	scores improved in the group 1 after 24 weeks of training compared to group 2 (p = 0.049)
			Group 2: n= 20; NA	Group 2: 64.01±7.4 1					
Zimmermann <i>et al.</i> 2014	Neurology	Switzerland	Total: n= 39; 15/14	Total: N/A	≤V	Group 1: participants performed Cogniplus, 3 times/week for 4 weeks. CogniPlus is a specific cognitive exergame program. Each patient performed 4 different tasks for attention	Group 2: Participants performed Nintendo Wii training, 3 times/week for 4 weeks, for 10 minutes. In each session, the patients played 4 sports games:	Tests of Attentional Performance alertness, TM); the Block-Design Test, the California Verbal Learning Test (primary outcomes in the study).	There was a significant difference in attention after Wii training compared with CogniPlus (p = 0.019)
			Group 1: n= 19; 13/6	Group 1: 69.9 ± 6.3					
			Group 2: n= 20; 12/8	Group 2: 66.3 ± 9.7					

						memory and executive functions	Tennis, Swordplay, Archery, and Air Sports	Data were collected at T0 (baseline), at T1 (4 weeks)	
<p>Abbreviations: M: Male, F: Female; TMT-A: Trail making test part A; TMT-B: Trail Making test part B; MOCA: Montreal Cognitive Assessment; BAI: Beck Anxiety Inventory; TT: Treadmill; VR: Virtual reality; RAGT: Robot-Assisted Gait training; FIM: Functional Independence Measure; ACE-R; Addenbrooke Cognitive Examination–Revised; ACE-R AO; Attention and Orientation; ACE-R M: ACE-R Memory; ACE-R F: ACE- R Fluency; ACE-R L:ACE-R Language; ACE-R VS: ACE-R Visual-Spatial; FAB, Frontal Assessment Battery; GDS, Geriatric Depression Scale; HRS-A, Hamilton Rating Scale for Anxiety; MMSE, Mini-Mental State Examination; WEIGL, Weigl test.</p>									