Table 1. Patient Inclusion and Exclusion Criteria

Inclusion criteria	
Age	18 to 70 years
Diagnosis	LBP of mechanical origin with/ without radiation to the lower limb
Pain duration	chronic (≥ 3 months) or recurrent (≥ 3 episodes in previous year)
Language	English speaking and English literate
Contact status	Access to a telephone
Exclusion criteria	
Pathology	Suspected or confirmed serious spinal pathology (fracture, metastatic, inflammatory or infective diseases of the spine, cauda equina syndrome/widespread neurological disorder). Nerve root compromise (2 of strength, reflex or sensation affected for same nerve root)
Past medical history	Spinal surgery or History of systemic / inflammatory disease
Current medical status	Scheduled for major surgery during treatment
Treatment status	Currently or having received treatment for chronic low back pain within previous 3 months
Pregnancy	Suspected or confirmed pregnancy
Contraindications	Unstable angina / uncontrolled cardiac dysrhythmias / severe aortic stenosis / acute systemic infection

	accompanied by fever. No confounding conditions, such as a neurological disorder or an intellectual disorder

Table 2. Primary and Secondary Outcomes Measures

Outcome	Measure	Baseline	1st session	1	4	12	24
Primary Outcomes							
Home-based adherence	[24]			✔	✔	✔	✔
Clinic-based adherence	SIRAS [26]			✔	✔	✔	
Specific adherence to back exercises at home, patient report of % prescribed sessions completed/week	[3]			✔	✔	✔	✔
Physical activity (total METs)	IPAQ [25]	✔		✔	✔	✔	✔
Pain intensity	NRS [27]	✔			✔	✔	✔
Pain bothersomeness	[27]	✔			✔	✔	✔
Interference with work	[27]	✔			✔	✔	✔
Satisfaction with symptoms	[27]	✔			✔	✔	✔
Perception of recovery	[28]	✔			✔	✔	✔
Pain related function - disability	RMDQ [29, 30]	✔			✔	✔	✔
Pain related function – patient specific functional scale	PSFS [31]	✔			✔	✔	✔
Quality of life	EurQoL [32]	✔			✔	✔	✔
Secondary Outcomes							
Fear avoidance beliefs –physical activity subscale	FABQ [33]	✔			✔	✔	✔
Perceived competence to follow recommendations	[34]	✔	✔		✔	✔	✔
Autonomous motivation to follow recommendations	TSRQ [35]	✔	✔		✔	✔	✔
Controlled motivation to follow recommendations	TSRQ [35]	✔	✔		✔	✔	✔
Amotivation regarding recommendations	TSRQ [35]	✔	✔		✔	✔	✔

Note: 1st session = assessment conducted immediately following the first treatment session. MET = metabolic equivalent. SIRAS = Sports Injury Rehabilitation Adherence Scale. IPAQ = International Short Form Physical Activity Questionnaire. NRS = Numerical Rating Scale. RMDQ = Roland Morris Disability Questionnaire. PSFS = Patient Specific Functional Scale. EurQoL = European Quality of Life Questionnaire. FABQ = Fear Avoidance Beliefs Questionnaire. TSRQ = Treatment Self Regulation Questionnaire.

Table 3. Baseline characteristics

Participant characteristics	Control	Experimental
Age (years)	46.71 (13.48)	44.11 (12.96)
Female sex (%)	64/122 (52)	73/131 (56)
Irish birth (%)	80/93 (86)	87/101 (86)
Married or partner (%)	47/78 (60)	54/85 (64)
Weight (kg)	77.09 (15.48)	76.18 (17.47)
Height (cm)	167.52 (9.52)	167.73 (10.19)
Smoker (%)	27/87 (31)	25/102 (25)
Sick leave for low back pain (%)	50/91 (55)	41/97 (42)
Previous treatment (%)	38/93 (41)	46/100 (46)
Paid employment (%)	32/90 (36)	44/101 (44)
Participant Outcomes	**Control**	**Experimental**
Physical activity (total METs)	1849.06 (3525.31)	2356.84 (5650.21)
Pain intensity	5.84 (2.42)	5.53 (1.94)
Pain bothersomeness	3.31 (1.15)	3.28 (.99)
Interference	3.05 (1.14)	3.14 (1.15)
Satisfaction with symptoms	1.45 (.77)	1.63 (.95)
Perception of recovery	-.72 (2.17)	-.27 (2.20)
Pain related function (Roland-Morris Disability Questionnaire score)	12.44 (4.70)	11.51 (4.82)
Pain related function (Patient specific function)	3.85 (2.02)	4.03 (2.01)
Quality of life	.51 (.22)	.57 (.20)
Fear avoidance beliefs	16.95 (6.96)	17.39 (7.85)
Perceived competence to follow recommendations	6.67 (.57)	6.46 (.77)
Autonomous motivation to follow recommendations	6.64 (.54)	6.60 (.58)
Controlled motivation to follow recommendations	2.75 (1.29)	2.94 (1.45)
Amotivation	2.21 (.98)	2.27 (1.15)
Depression	9.07 (8.28)	7.32 (8.48)
Physiotherapist Characteristics	**Control**	**Experimental**
Female sex (%)	23/29 (79.31)	17/24 (70.83)
Age (years)	32.24 (5.26)	31.92 (4.70)
Clinical experience (years)	9.90 (5.16)	9.75 (4.33)
Autonomous orientation	100.10 (6.77)	94.05 (8.01)
Controlling orientation	57.21 (15.28)	58.61 (10.71)
Impersonal orientation	46.62 (9.03)	50.65 (12.03)

Note: MET = metabolic equivalent. Except where otherwise indicated, values represent group means with standard deviations listed in parentheses. Physiotherapist motivational orientation personality styles measured using the General Causality Orientations Scale [38].

Table 4. Effects of CONNECT intervention – between-arm differences in outcome variables over time

	Effects of intervention (Clinic cluster adjusted)				Effects of intervention (Therapist cluster adjusted)				Effects of intervention (not cluster adjusted)		
	Mean (95% CI)	*p*	ICC	*d*	Mean (95% CI)	*p*	ICC	*d*	Mean (95% CI)	*p*	*d*
Adherence Outcomes											
Home-based adherence											
Week 1	.46 (.15, .77)	.00		.32	.50 (.17, .82)	.00		.35	.46 (.16, .77)	.00	.32
Week 4	.43 (.14, .71)	.00		.30	.46 (.16, .76)	.00		.32	.43 (.15, .71)	.00	.30
Week 12	.39 (.04, .74)	.03		.27	.43 (.06, .81)	.02		.30	.39 (.04, .74)	.03	.27
Week 24	.35 (-.13, .83)	.15		.24	.40 (-.11, .91)	.12		.28	.36 (-.12, .83)	.14	.25
Overall	.41 (.10, .71)	.01	<.01	.28	.45 (.12, .78)	.01	<.01	.31	.41 (.10, .72)	.01	.28
Clinic-based adherence											
Week 1	.10 (-.14, .34)	.43		.15	.09 (-.16, .33)	.48		.13	.09 (-.16, .33)	.48	.13
Week 4	.09 (-.13, .31)	.44		.13	.08 (-.14, .30)	.48		.12	.08 (-.14, .30)	.48	.12
Week 12	.07 (-.19, .34)	.58		.10	.07 (-.19, .34)	.58		.10	.07 (-.19, .34)	.58	.10
Overall	.09 (-.13, .31)	.44	.08	.13	.08 (-.14, .30)	.48	.10	.12	.08 (-.14, .30)	.48	.12
Specific adherence to back exercises at home											
Week 1	4.44 (-1.72, 10.60)	.16		.03	4.71 (-1.39, 10.81)	.13		.04	4.47 (-1.70, 10.64)	10.64	.03
Week 4	3.82 (-1.02, 8.66)	.12		.04	4.54 (-.58, 9.66)	.08		.05	3.90 (-.95, 8.76)	8.76	.04
Week 12	3.20 (-2.77, 9.16)	.29		.05	4.37 (-2.09, 10.84)	.18		.07	3.34 (-2.64, 9.32)	9.32	.05
Week 24	2.57 (-6.05, 11.19)	.56		.06	4.20 (-4.96, 13.36)	.37		.08	2.77 (-5.87, 11.42)	11.42	.06
Overall	3.51 (-1.61, 8.62)	.18	<.01	.05	4.46 (-1.09, 10.00)	.11	<.01	.06	3.62 (-1.51, 8.75)	8.75	.05

	Effects of intervention (Clinic cluster adjusted)				Effects of intervention (Therapist cluster adjusted)				Effects of intervention (not cluster adjusted)		
	Mean (95% CI)	*p*	ICC	*d*	Mean (95% CI)	*p*	ICC	*d*	Mean (95% CI)	*p*	*d*
Physical activity (METS/total)											
Week 1	-711.67 (-2135.22, 711.88)	.33		-.20	-680.43 (-2187.02, 826.16)	.37		-.19	-735.22 (-2166.30, 695.85)	.31	-.21
Week 4	-709.64 (-2016.55, 597.28)	.29		-.20	-687.88 (-2070.55, 694.79)	.33		-.20	-729.57 (-2043.57, 584.42)	.28	-.21
Week 12	-707.60 (-1967.17, 551.98)	.27		-.20	-695.33 (-2029.48, 638.81)	.31		-.20	-723.93 (-1989.77, 541.91)	.26	-.21
Week 24	-705.56 (-1994.75, 583.63)	.28		-.20	-702.79 (-2071.85, 666.27)	.31		-.20	-718.28 (-2012.61, 576.05)	.28	-.20
Overall	-708.62 (-1982.45, 565.22)	.28	.02	-.20	-691.61 (-2039.79, 656.57)	.31	<.01	-.20	-726.75 (-2007.31, 553.80)	.27	-.21
Pain, Function, Quality of Life											
Pain intensity											
Week 4	-.38 (-1.16, .40)	.34		-.16	-.31 (-1.14, -.65)	.46		-.13	-.38 (-1.16, .40)	.34	-.16
Week 12	-.10 (-.71, .51)	.75		-.04	-.01 (-.65, .64)	.98		.00	-.10 (-.71, .51)	.75	-.04
Week 24	.18 (-.48, .83)	.60		.07	.30 (-.38, .98)	.38		.13	.18 (-.48, .83)	.60	.07
Overall	-.10 (-.71, .51)	.75	.03	-.04	-.01 (-.65, .64)	.98	<.01	.00	-.10 (-.71, .51)	.75	-.04
Pain bothersomeness											
Week 4	-.09 (-.48, .30)	.64		-.08	-.20 (-.61, .21)	.35		-.17	-.11 (-.50, .28)	.58	-.10
Week 12	-.07 (-.40, .24)	.65		-.06	-.16 (-.50, .19)	.37		-.14	-.09 (-.42, .23)	.58	-.08
Week 24	-.05 (-.39, .29)	.76		-.05	-.11 (-.47, .25)	.54		-.10	-.07 (-.41, .27)	.68	-.06
Overall	-.07 (-.40, .25)	.65	.01	-.06	-.16 (-.50, .19)	.37	.01	-.14	-.09 (-.42, .23)	.58	-.08
Interference with work											
Week 4	-.43 (-.83, -.04)	.03		-.38	-.45 (-.87, -.04)	.03		-.40	-.43 (-.83, -.04)	.03	-.38
Week 12	-.31 (-.65, .02)	.07		-.28	-.28 (-.63, .07)	.12		-.25	-.31 (-.65, .02)	.07	-.28
Week 24	-.19 (-.56, .18)	.30		-.17	-.11 (-.49, .27)	.58		-.10	-.19 (-.56, .18)	.30	-.17
Overall	-.31 (-.65, .02)	.07	.01	-.28	-.28 (-.63, .07)	.12	.02	-.25	-.31 (-.65, .02)	.07	-.28

	Effects of intervention (Clinic cluster adjusted)				Effects of intervention (Therapist cluster adjusted)				Effects of intervention (not cluster adjusted)		
	Mean (95% CI)	*p*	ICC	*d*	Mean (95% CI)	*p*	ICC	*d*	Mean (95% CI)	*p*	*d*
Satisfaction with current symptoms											
Week 4	-.18 (-.62, .26)	.41		-.56	-.07 (-.53, .39)	.76		-.09	-.17 (-.61, .27)	.46	-.22
Week 12	-.12 (-.44, .20)	.48		-.41	-.05 (-.38, .29)	.79		-.06	-.10 (-.42, .22)	.55	-.13
Week 24	-.05 (-.38, .28)	.77		-.25	-.02 (-.37, .33)	.91		-.03	-.03 (-.37, .31)	.87	-.04
Overall	-.12 (-.44, .20)	.48	<.01	-.41	-.05 (-.38, .29)	.79	.01	-.06	-.10 (-.42, .22)	.55	-.13
Treatment satisfaction											
Week 4	.10 (-.18, .39)	.47		-.22	.18 (-.13, .49)	.25		.22	.10 (-.20, .41)	.51	.12
Week 12	.05 (-.15, .26)	.62		-.14	.13 (-.10, .36)	.26		.15	.05 (-.17, .28)	.65	.06
Week 24	.00 (-.24, .24)	1.00		-.06	.08 (-.18, .33)	.55		.09	.00 (-.25, .25)	1.00	.00
Overall	.05 (-.15, .26)	.62	.002	-.14	.13 (-.10, .36)	.26	.01	.15	.05 (-.17, .28)	.65	.06
Perception of recovery											
Week 4	.58 (-.03, 1.20)	.06		.27	.50 (-.14, 1.13)	.13		.23	.60 (-.02, 1.21)	.06	.27
Week 12	.51 (-.01, 1.02)	.05		.23	.44 (-.10, .98)	.11		.20	.52 (.01, 1.04)	.05	.24
Week 24	.44 (-.19, 1.07)	.17		.20	.38 (-.27, 1.03)	.25		.17	.45 (-.18, 1.08)	.16	.21
Overall	.51 (-.01, 1.02)	.05	.03	.23	.44 (-.10, .98)	.11	.03	.20	.52 (.01, 1.04)	.05	.24
Pain related function (Roland-Morris Disability Questionnaire score)											
Week 4	-.80 (-1.38, .77)	.32		-.17	-.82 (-2.48, .85)	.34		-.17	-.94 (-2.53, .65)	.25	-.20
Week 12	-.36 (-1.68, .96)	.60		-.08	-.50 (-1.90, .90)	.48		-.11	-.49 (-1.83, .85)	.47	-.11
Week 24	.09 (-1.43, 1.60)	.91		.02	-.19 (-1.78, 1.41)	.82		-.04	-.05 (-1.58, 1.49)	.95	-.01
Overall	-.36 (-1.68, .96)	.60	.01	-.08	-.50 (-1.90, .90)	.48	.02	-.11	-.49 (-1.83, .85)	.47	-.11
Pain related function (Patient specific function)											
Week 4	.33 (-.28, .93)	.29		.16	.44 (-.21, 1.08)	.18		.22	.40 (-.22, 1.01)	.21	.20
Week 12	.38 (-.20, .95)	.20		.19	.44 (-.18, 1.06)	.16		.22	.45 (-.14, 1.04)	.14	.22
Week 24	.43 (-.34, 1.20)	.27		.21	.44 (-.37, 1.25)	.28		.22	.50 (-.28, 1.28)	.21	.25
Overall	.38 (-.20, .95)	.20	.07	.19	.44 (-.18, 1.06)	.16	.16	.22	.45 (-.14, 1.04)	.14	.22

	Effects of intervention (Clinic cluster adjusted)				Effects of intervention (Therapist cluster adjusted)				Effects of intervention (not cluster adjusted)		
	Mean (95% CI)	*p*	ICC	*d*	Mean (95% CI)	*p*	ICC	*d*	Mean (95% CI)	*p*	*d*
Quality of life											
Week 4	-.05 (-.12, .01)	.09		-.25	-.06 (-.13, .01)	.08		-.27	-.05 (-.12, .01)	.12	-.25
Week 12	-.04 (-.10, .01)	.13		-.19	-.04 (-.10, .02)	.19		-.17	-.04 (-.10, .01)	.13	-.19
Week 24	-.03 (-.09, .03)	.35		-.14	-.02 (-.08, .05)	.65		-.07	-.03 (-.09, .03)	.32	-.14
Overall	-.04 (-.10, .01)	.13	<.01	-.19	-.04 (-.10, .02)	.19	<.01	-.17	-.04 (-.10, 1.52)	.13	-.19
Motivational Outcomes											
Fear avoidance											
Week 4	-.99 (-3.40, 1.42)	.42		-.14	-.86 (-3.31, 1.60)	.50		-.12	-1.09 (-3.50, 1.32)	.38	-.16
Week 12	-.90 (-3.07, 1.28)	.42		-.13	-.77 (-3.04, 1.50)	.51		-.11	-1.01 (-3.20, 1.17)	.36	-.15
Week 24	-.81 (-3.73, 2.12)	.59		-.12	-.68 (-3.82, 2.46)	.67		-.10	-.94 (-3.87, 2.00)	.53	-.13
Overall	-.90 (-3.07, 1.28)	.42	<.01	-.13	-.77 (-3.04, 1.50)	.51	.01	-.11	-1.01 (-3.20, 1.17)	.36	-.15
Perceived competence to follow recommendations											
Immediately post-initial treatment	.21 (-.08, .50)	.15		.37	.27 (-.04, .57)	.08		.47	.21 (-.08, .49)	.16	.36
Week 4	.33 (.09, .56)	.01		.57	.38 (.13, .64)	.00		.67	.32 (.09, .56)	.01	.56
Week 12	.44 (.19, .69)	.00		.78	.50 (.23, .77)	.00		.87	.44 (.19, .69)	.00	.77
Week 24	.56 (.24, .88)	.00		.99	.61 (.28, .95)	.00		1.08	.55 (.23, .87)	.00	.97
Overall	.39 (.15, .62)	.00	<.01	.68	.44 (.19, .69)	.00	<.01	.77	.38 (.14, .61)	.00	.66
Autonomous motivation to follow recommendations											
Immediately post-initial treatment	.18 (-.04, .41)	.11		.34	.21 (-.02, .45)	.08		.39	.19 (-.04, .42)	.10	.35
Week 4	.09 (-.08, .26)	.28		.17	.12 (-.06, .30)	.18		.22	.10 (-.07, .27)	.26	.18
Week 12	.00 (-.13, .14)	.96		.01	.03 (-.11, .17)	.67		.06	.01 (-.13, .14)	.93	.01
Week 24	-.09 (-.23, .05)	.23		-.16	-.06 (-.21, .09)	.44		-.11	-.08 (-.23, .06)	.24	-.16
Overall	.05 (-.10, .20)	.53	<.01	.09	.08 (-.08, .23)	.34	<.01	.14	.05 (-.10, .20)	.50	.10

	Effects of intervention (Clinic cluster adjusted)				Effects of intervention (Therapist cluster adjusted)				Effects of intervention (not cluster adjusted)		
	Mean (95% CI)	*p*	ICC	*d*	Mean (95% CI)		ICC	*d*	Mean (95% CI)	*p*	*d*
Controlled motivation to follow recommendations											
Immediately post-initial treatment	-.10 (-.41, .21)	.53		-.08	-.19 (-.51, .13)	.24		-.15	-.10 (-.41, .21)	.52	-.08
Week 4	-.08 (-.38, .22)	.61		-.06	-.14 (-.46, .18)	.40		-.11	-.08 (-.39, .22)	.60	-.06
Week 12	-.06 (-.43, .31)	.76		-.05	-.08 (-.47, .31)	.68		-.06	-.06 (-.44, .31)	.73	-.05
Week 24	-.04 (-.52, .45)	.88		-.03	-.03 (-.54, .48)	.92		-.02	-.05 (-.53, .44)	.85	-.04
Overall	-.07 (-.40, .26)	.68	<.01	-.05	-.11 (-.46, .24)	.54	<.01	-.08	-.07 (-.40, .26)	.67	-.06
Amotivation											
Immediately post-initial treatment	-.25 (-.62, .12)	.19		-.25	-.23 (-.62, .16)	.25		-.23	-.25 (-.62, .12)	.19	-.25
Week 4	-.36 (-.67, -.05)	.02		-.37	-.34 (-.66, -.01)	.04		-.34	-.36 (-.67, -.05)	.02	-.37
Week 12	-.47 (-.81, -.12)	.01		-.48	-.44 (-.80, -.09)	.02		-.45	-.47 (-.81, -.12)	.01	-.48
Week 24	-.58 (-1.02, -.13)	.01		-.59	-.55 (-1.02, -1.02)	.02		-.56	-.58 (-1.02, -.13)	.01	-.59
Overall	-.41 (-.73, -.10)	.01	<.01	-.42	-.39 (-.72, -.06)	.02	.01	-.40	-.41 (-.73, -.10)	.01	-.42

Note: A positive value indicates that the experimental arm was higher on the outcome variable, compared with the controls. Standardized mean difference effect sizes (*d*) were calculated using baseline SD from control arm participants. Where baseline measures were not relevant (e.g., adherence variables), the control arm's SD at each time point was employed to calculate *d*.