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# An interdisciplinary approach to improving the quality of life in Postural Orthostatic Tachycardia Syndrome: A case study

Turner, C

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4 **An interdisciplinary approach to improving the quality of life in**

5 **Postural Orthostatic Tachycardia Syndrome: A case study**

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### 33 **Overview of POTS**

34 Postural Orthostatic Tachycardia Syndrome (POTS) is a condition that affects  
35 0.2% of the population, resulting from disturbances in the autonomic nervous system,  
36 presenting as a heterogeneous group of disorders with similar characteristics. The  
37 constellation of symptoms that arise as a result of this condition include blurred  
38 vision, brain fog, chest pain, headaches, severe fatigue and a rapid heart rate (HR)  
39 (Anderson, Lambert, Sari, Dawood, Esler et al., 2014; Raj, 2013). These symptoms  
40 make everyday living extremely challenging for POTS patients, with quality of life  
41 (QOL) severely impacted (Flack & Fulton, 2018; Moon, Kim, Byun, Sunwoo, Lim et  
42 al., 2016). Symptoms often occur when patients stand upright, resulting in inadequate  
43 vasoconstriction of blood vessels (particularly in the legs and core), due to muscle  
44 deconditioning and/or peripheral denervation. At present all medicines used to treat  
45 POTS have concerning side effects, some of which may exacerbate symptoms (Raj,  
46 2013). Research indicates that short-term exercise (Galbreath, Shibata, VanGundy,  
47 Okazaki, Fu et al., 2011) could alleviate symptoms, and cognitive behavioural  
48 therapies including goal setting (Kizilbash, Ahrens, Bruce, Chelimsky, Driscoll et al.,  
49 2014) would be specifically beneficial for managing POTS and improving QOL.

### 50 **Context and Research Team**

51 As part of a larger scale trial examining the benefits of exercise and Functional  
52 Imagery Training (FIT); an approach that aims to enhance self-efficacy and intrinsic  
53 motivation by exploring tangible goals, a potential participant was identified as  
54 having POTS. Due to the multitude of health-related complications including cardiac  
55 disorders and the research teams' prior lack of POTS knowledge, this participant  
56 (R.L.) did not meet the entry criteria because of her current health condition. The  
57 second author suggested the possibility of an adapted study, specific to R.L.'s needs if

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58 an interdisciplinary team could be formed and ethical clearance granted. The study  
59 aimed to investigate if FIT plus exercise improves the QOL in a patient diagnosed  
60 with POTS.

61 The project was promptly approved by the institutional ethics committee on  
62 the proviso that a first-aider be present during each exercise session. A case study  
63 project was then offered as an alternative to provide individual support necessary for  
64 POTS. Prior to the initial meeting a detailed information sheet and consent form  
65 explaining the protocols of the study was emailed to the subject. This also included a  
66 clear statement explaining FIT sessions would be audio recorded.

67 In the weeks pending ethical clearance, an interdisciplinary team of nine  
68 formed to devise and execute the treatment intervention. The team was brought  
69 together and managed by the second author, a chartered psychologist (British  
70 Psychological Society; Division of Academics, Teachers and Researchers) who  
71 directs a degree in sports rehabilitation and supervises final year projects. The second  
72 author will be referred to as 'the psychologist'. The psychologist has completed >500  
73 clinical hours of Motivational Interviewing (MI) training including fidelity checks  
74 and is a FIT practitioner. A trainee psychologist studying for a Ph.D in psychology  
75 and FIT practitioner was responsible for data collection and fidelity checks to add  
76 objectivity to the approach.

77 Two certified sports therapists (Sports Therapy Organisation) with a combined  
78 experience of 32 years, who own private practices, and are trained in special  
79 populations (e.g., cardiovascular disease) agreed to assist. The first author, one of the  
80 sports therapists, took responsibility for project logistics, such as timetables and  
81 general communication between all parties. Three conditioning coaches were  
82 undergraduate students supervised by a National Strength and Conditioning

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83 Association (NSCA) Coach, who is also lecturer in the subject. The medical doctor  
84 (National Health Service), a Consultant in Acute and General Medicine, acted as a  
85 sounding board and is a leading specialist in POTS.

86 The collaborative team realised the potential for adopting an interdisciplinary  
87 approach and weekly meetings evolved to share information and practice, although  
88 not all members could always attend. Collectively, the team developed an evidenced-  
89 based intervention to improve health and psychological factors. General exercise has  
90 shown to benefit numerous health conditions such as: type 2 diabetes, depression,  
91 some cancers and heart disease (Agarwal, 2012; Pal, Radavelli-Bagatini, & Ho,  
92 2013), and specific studies (Fu, VanGundy, Shibata, Auchus, Williams et al., 2011;  
93 Shibata, Fu, Bivens, Hastings, Wang et al., 2012) provide guidance for working with  
94 POTS patients. For psychological support, goal-centred motivational imagery is  
95 beneficial for behavioural change and motivation to goal adherence (Andrade, Khalil,  
96 Dickson, May, & Kavanagh, 2016). As the psychology practitioners were trained in  
97 FIT, it was a natural starting point to explore motivation before focusing on tangible  
98 goals. It was therefore the aim to merge physiological and psychological interventions  
99 to create an interdisciplinary approach.

### 100 **Philosophical Application**

101 The interdisciplinary nature of this study involving an amalgamation of both  
102 psychological and physiological practices meant that we required a joint philosophical  
103 approach. Therefore, recognising there could be conflicting approaches, during the  
104 first team meeting the psychologist outlined the holistic stance; to assess the  
105 individual not the POTS diagnosis, which was accepted by all practitioners.  
106 Collectively, we accepted that there may be similarities between all POTS patients,  
107 however, we attempted to treat R.L. as a unique individual by assessing and treating

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108 based on findings alone, rather than making assumptions. Each finding drove our next  
109 step, and we conducted a weekly progress meeting to check practice and share  
110 information, which R.L. was invited to attend and provide input. Therefore, aligned  
111 with Rorty's (1991) philosophical suggestions, our findings developed with our  
112 contextual learning and treatment.

113 Individually, the psychologist adopted a humanistic cognitive approach, which  
114 gave R.L. the opportunity to learn imagery through cognitive methods after an initial  
115 interview. This approach could be seen as a paradoxical philosophy, but using person-  
116 centred FIT (Rhodes, May, Andrade, & Kavanagh, 2018; Solbrig, Whalley,  
117 Kavanagh, May, Parkin et al., 2019) gives the participant the autonomy to learn  
118 imagery to foster intrinsic motivation. The sports therapists, conditioning coaches and  
119 medical consultant were ultimately reductionist in their treatment due to the biological  
120 nature of their methods. Where possible R.L. was given the autonomy to make  
121 choices, therefore, we aimed to engage her in discussions about, for example, exercise  
122 selection. Collectively we were pragmatic (cf. Bhaskar, 2013) in nature,  
123 acknowledging that we are operating in different contexts.

### 124 **Case Overview**

125 R.L. is a 39-year-old, Caucasian female who works as a secondary school  
126 teacher and is a single mother of three teenage boys. During a routine exercise session  
127 at her gym in February 2018 she collapsed and was later diagnosed with POTS in  
128 March 2019. Prior to this event R.L had recently undergone surgery for carpal tunnel  
129 syndrome, however this condition was later found to be Hypermobile Ehlers-Danlos  
130 syndrome (HEDS) - synonymous with POTS. Before the condition developed, R.L.  
131 had previously led a very active lifestyle, attending exercise sessions four to five  
132 times per week, including high intensity group exercise and personal training



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### 158 **Measure**

159           Upon meeting R.L. the study design was recapped, and any questions  
160 answered. The WHOQOL-BREF (see Gholami, Jahromi, Zarei, & Dehghan, 2013)  
161 was then administered at baseline with score available in Table 2. The World Health  
162 Organisation (Whoqol Group, 1995, p. 1403), defines QOL as:

163           An individual's perception of their position in life in the context of the culture  
164           and value systems in which they live and in relation to their goals, expectations,  
165           standards and concerns.

166   The WHOQOL-BREF questionnaire consisting of 26 self-report items was used to  
167   assess domain specific and two overall QOL items. Individual items are scored 1-5  
168   and each domain presents a range of 0-100; the raw scores have been transformed  
169   according to manual guidelines (World Health Organisation, 1997). The four  
170   domains: physical health, psychological health, social relationships and environment  
171   (World Health Organisation, 1997) factorially vary. Physical health questions seek to  
172   evaluate an individual's ability to perform daily tasks, energy levels and fatigue,  
173   mobility, pain and discomfort, sleep and rest, dependence on medicine and work  
174   capacity. Psychological health questions assess the level of positive feelings, negative  
175   feelings, self-esteem, ability to think and concentrate, personal beliefs, body image  
176   and appearance. Social relationship questions are in relation to personal relationships,  
177   social support and sexual activity. Finally, environment questions consider aspects  
178   such as: home environment, financial resources, access to health and social care and  
179   opportunities for recreation.

### 180 **FIT**

181           FIT is a person-centred methodology that utilises the skills from MI,  
182   integrating imagery to enhance self-efficacy and foster intrinsic motivation. MI is a

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183 client-centred counselling technique that aims to reduce resistance and resolve  
184 ambivalence towards change using specific systematic processes (cf. Miller &  
185 Rollnick, 2012). When compared to a control group, MI has been found to be  
186 significantly better for weight loss (Smith, Heckemeyer, Kratt, & Mason, 1997), but  
187 not as effective when compared to an imagery (FIT) group (Solbrig et al., 2019). Due  
188 to the complex motivational needs of POTS patients, FIT can be adapted to support  
189 change based on individual cases.

190         The fundamentals of FIT operate within the spirit of MI and the four processes  
191 of the interview must be adhered to; engage in conversation, focus on goals, evoke  
192 change, and plan for progress. Individuals are supported using skills such as  
193 affirmations when they discuss possible solutions to obstacles, further developing  
194 self-efficacy. Using Paivio's (1985) motivational and cognitive imagery approach,  
195 FIT explores goals by discussing intrinsic values and goals, potential obstacles,  
196 personal strengths and overcoming struggles, and future success. At each stage of  
197 discussion, the individual is taught how to use multisensory imagery by periodically  
198 layering each sense (see Williams, Cooley, & Cumming, 2013) to enhance the  
199 experiences and create feedback from discussion (Lang, 1979). Specifically, imagery  
200 focuses on the multisensory experience of goal achievement to foster self-efficacy,  
201 and immediate action-based implementations (Duckworth, Kirby, Gollwitzer, &  
202 Oettingen, 2013) which could be beneficial for managing POTS and adhering to  
203 exercise. Progressive interview questions like; "what would it be like in six months if  
204 you did not change your exercise routine", are later compared to; "imagine a future  
205 version of you in six months who did stick to the exercise program. What does that  
206 look like? How does it feel? What can you do right now to support a future you?".

### 207 **FIT Interview**

208           The initial FIT interview is both an assessment and intervention as it involves  
209 motivational imagery training. The meeting was audio recorded (and later fully  
210 transcribed) for potential client quotes. The audio was shown to other FIT  
211 practitioners for training purposes and to check fidelity, which was later reported as  
212 ‘high’. The transcription was highlighted to show the best fit from the answers given.  
213 All quotes were checked with R.L. to ensure meaning was accurate during later  
214 interpretation and brief quotes approved by R.L. for publication.

215           The psychologist began by asking open-ended questions about lifestyle to  
216 engage in conversation, progressing to focusing on goals, and then the difference  
217 between R.L.’s life now and what she expected it would be like at this point. As the  
218 interview continued, imagery was used to contrast between current self and future  
219 achievements. To train multisensory imagery, especially motivation specific  
220 achievement goals (Paivio, 1985), layered stimulus response training (LSRT;  
221 Williams, Cooley, & Cumming, 2013) was used to enhance vividness and  
222 controllability. Through the FIT process R.L. revealed how the opportunity to enrol  
223 on to a study which included exercise, physical therapy and psychological support  
224 was the “final roll of the dice”, and this was the “most important step in regaining her  
225 identity”.

226           R.L. described a desire and need to change, giving reasons such as: “I have to  
227 try. I feel guilty of not being able to go out with my children”, and a need to be fit and  
228 healthy to keep her job and provide for her family. The interview also revealed a loss  
229 of confidence in her physical appearance, lack of self-esteem, and an admission that  
230 “with POTS life would never be the same again” and was “pretty crap at present”. In  
231 spite of this, there was an underlying tone of defiance towards her condition, wanting

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232 to gain “some form of control” to improve her QOL. Towards the end of the session,  
233 R.L. set a goal: “I would like to jog continually for five minutes and maybe a long-  
234 term goal is to run for 5K” and suggested some lifestyle modifications such as  
235 “walking 10,000 steps” daily. Jogging was the primary goal, which was imagined  
236 through a set of controllable scenarios, and multisensory LSRT delivered to again  
237 enhance vividness and controllability. Using a scale from 0 (no image) to 5 (as vivid  
238 as having achieved the goal), R.L. was asked to rate her imagery at strategic points,  
239 scoring >3 at each. A cue was linked to a daily activity, in this case before taking the  
240 first sip of coffee, whereby imagery is activated throughout the day to imagine the  
241 feeling of success from jogging for five minutes followed by a small implementation  
242 strategy. Immediately after this session the physical assessment occurred.

### 243 **Physical Assessment**

244       The physical assessment determined areas which required improvement  
245 through corrective exercise and physical therapy. Assessments included: range of  
246 motion (RoM), flexibility, functional movement, muscle activation and special tests.  
247 The findings of the physical tests revealed: posterior pelvic tilt, weak: gastrocnemius,  
248 gluteus maximus, hamstrings, quadriceps and lower back, limited external rotation at  
249 the acetabular femoral joint, painful/stiff lumbar region and sacroiliac joint with  
250 hypermobility in the glenohumeral joint. The assessment lasted for 33 minutes, with  
251 no exercise occurring at baseline. The results from the assessment went on to develop  
252 the physiological intervention delivery. A retest of these assessments did not formally  
253 occur, but observations were made based on posture, balance and movement quality  
254 which then informed the exercise program.

255 **Developing and Delivering the Interventions**

256 It was not until after completion of the WHOQOL-BREF, FIT interview, and  
257 physical assessments at baseline that the interdisciplinary team had enough  
258 information to develop a plan for R.L.'s needs. We decided to run combined  
259 conditioning and physical therapy, and supportive imagery sessions for eight-weeks  
260 following similar exercise protocols (Richardson, Nordon-Craft, & Carrothers, 2017)  
261 and FIT delivery (Rhodes et al., 2018) timelines. At week eight the WHOQOL-BREF  
262 would be conducted a second time. At that point, the intervention stopped, and no  
263 support provided. Four-weeks later (12-weeks from the first exercise session) we  
264 asked the participant to complete the WHOQOL-BREF a final time.

265 The general plan was to deliver FIT booster sessions for the first 15-minutes,  
266 followed by aerobic conditioning for up to 30-minutes and corrective exercises lasting  
267 approximately 15-20 minutes. Although this time was set aside for delivery, we were  
268 pragmatic in our approach as there are many obstacles at play.

269 **Psychological Intervention**

270 From a psychological perspective exercise alone has been shown to decrease  
271 depression and anxiety, while enhancing body image and confidence (De Moor,  
272 Beem, Stubbe, Boomsma, & De Geus, 2006; Campbell & Hausenblas, 2009).  
273 Furthermore, exercise is beneficial in negating social withdrawal and low self-esteem  
274 whilst presenting opportunities for enhanced self-efficacy and social interactions  
275 (Sharma, Madaan, & Petty, 2006). Although there are many benefits associated with  
276 general exercise, individuals with POTS often lack motivation to start, with the  
277 primary concern of becoming unconscious during training (Kizilbash et al., 2014).  
278 Research (Tito & Hess, 2017) delivering exercise and assessing QOL has reported a  
279 decrease in both physical and psychological domains, but an increase in overall QOL.

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280 To complement the physical exercise and mobility support intervention, a FIT booster  
281 session was delivered weekly which aimed to support motivation to exercise  
282 throughout the 8-weeks.

283 ***FIT Booster.*** The FIT booster sessions were conversational, focusing on  
284 vividness and controllability of images and were used to monitor goals, reporting  
285 findings back to the research group. In weeks 1 and 2, R.L. reported using imagery  
286 infrequently as her thoughts were on occasion negative, such as fainting during  
287 exercise. A thought parking strategy was implemented whereby R.L. recognises a  
288 negative thought and then changes the focus to feelings of accomplishment when she  
289 achieves her initial running goal. All imagery regardless of positive or negative  
290 outcomes were praised for use, supporting self-efficacy by following the imagery  
291 process. During week 3 imagery use was reported as more frequent and controllable,  
292 aligned with cue use, and the goal changed to a 10-minute run. By week 4 R.L. was  
293 using imagery multiple times daily with the original cue and adaptations such as “when  
294 walking the dog, I image running 5K with my son, and how that accomplishment  
295 would feel, and what he would say”. This goal and cue adaptation occurred for the  
296 remainder of the intervention, with the psychologist inputting very little towards the  
297 end, merely adding prompts to add a sensory layer where necessary.

### 298 **Physiological Intervention**

299 Exercise can be particularly beneficial as it has been shown to address many  
300 of the common issues that make POTS so debilitating. It is cost effective, simple to  
301 implement and has minimal side-effects (Fu & Levine, 2018). Exercise improves the  
302 body’s skeletal pump through strengthening the extremities and core, thus improving  
303 venous return. It has been found effective in increasing blood volume, ventricle size  
304 and baroreflex sensitivity. This can improve stroke volume, vasoconstriction and

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305 pulmonary circulation which are all critical to negating the symptoms of POTS  
306 (Conner, Sheikh, & Grubb, 2012; Galbreath et al., 2011; Fu & Levine, 2018). Winker,  
307 Barth, Bidmon, Ponocny, Weber et al. (2005) found that following a three-month  
308 running program involving Austrian soldiers, 10 out of 16 who had previously  
309 experienced dizziness with tachycardia upon standing had a complete recovery from  
310 orthostatic intolerance. The control group, who did not jog, reported a resolution of  
311 symptoms in just 1 out of 11 soldiers. Considering case studies, there have been  
312 projects (e.g., Richardson et al., 2017) which implement specific exercise protocols to  
313 treat POTS by monitoring HR and setting tangible targets that motivate exercise  
314 adherence, enabling participants to return to full work duties.

315 For replication purposes exercises were selected by R.L and the conditioning  
316 coach in unison from a battery of suggestions in Richardson et al. (2017) on the day  
317 of training. Table 1 outlines all completed exercises which include actual rate of  
318 perceived exertion (RPE; Borg, 1982), exercise selection, duration, rest and  
319 observational notes. Principles of training, in particular frequency and intensity were  
320 adopted from Fu et al. (2011), however in contrast we did not incorporate a semi-  
321 recumbent only approach at the start.

322 Table 1. Exercise Training Program including RPE and Observations

<b>Week 1</b>	<b>Duration (sets/reps/time)</b>	<b>Rest Interval</b>	<b>RPE</b>	<b>Observations</b>
Jog	3-mins		15	Speed 6.5 KMPH; comfortable.
Lower Trunk Rotation	2 x 12 reps	30s	10	
Bridge	2 x 15s	30s	14	Limited glute activation. Hamstrings dominant.
Abdominal Curl	2 x 8 reps	30s	15	
<b>Week 2</b>				
Jog	5-mins		15	Speed 6.5 KMPH. Felt faint; 15-mins recovery.

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Lower Trunk Rotation	3 x 12 reps	30s	10	
Bridge	3 x 15s	30s	14-15	Improved glute firing.
Abdominal Curl	3 x 8 reps	30s	15	
<b>Weeks 3-4</b>				
Jog	10-mins		15-16	Speed 6.5 KMPH. Felt steady was able to talk throughout.
Bridge	3 x 12 reps	30s	14	
Side Plank	3 x 15s	30s	15	
Hip Abduction	3 x 8 reps	30s	13-14	Pain in left hip; stretched in adduction to resolve.
Plank on Elbows	2 x 20s	30s	15-16	
Abdominal Curl	3 x 10 reps	30s	15	Fatigued in last set.
<b>Weeks 5-6</b>				
Jog (week 5)	15-mins		15	Speed 6.5 KMPH continuous.
Jog (week 6)	20-mins		15-16	5-mins at 7.8 KMPH, followed by 15-mins at 6.5 KMPH.
Stationary Bike	5-mins		16-17	Interval; 10s at 100+ RPM followed by 20s at 60 RPM; repeat until time elapsed.
Sit to Stand	3 x 12 reps	30s	14-15	
Seated Shoulder Press	3 x 12 reps	30s	14-15	Using 3KG dumbbells.
Dumbbell Bench Press	3 x 12 reps	30s	13-14	Using 4KG dumbbells.
Bridge	3 x 12 reps	30s	14-15	
Side Plank	3 x 20 secs	30s	14	
Abdominal Curl	3 x 12 reps	30s	15	
<b>Weeks 7-8</b>				
Jog	20-mins		15-16	5-mins at 7.8 KMPH, followed by 15-mins at 6.5 KMPH.
Stationary Bike	5-mins		16-17	Interval - 10s at 100+ RPM followed by 20s at 60 RPM. Repeat until time elapsed.
Sit to Stand	3 x 8 reps	30s	15-16	Holding 5KG kettlebell in both hands.
Hip Abduction	3 x 8 reps	30s	14-15	With resistance band.
Seated Shoulder Press	3 x 8 reps	30s	15-16	Using 5KG dumbbells.
Arm Curls	3 x 8 reps	30s	15-16	Using 4KG dumbbells.
Dumbbell Bench Press	3 x 8 reps	30s	15	Using 6KG dumbbells.
Reverse Dip	3 x 30s	30s	15-16	

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Bridge	3 x 12 reps	30s	15
Abdominal Curl	3 x 12 reps	30s	15

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323 *Note.* reps = repetitions; s = seconds; mins = minutes; KMPH = kilometres per hour;  
324 RPM = revolutions per minute; KG = kilograms.

325           In conjunction with supervised exercise sessions, a home-based program  
326 consisting of two sessions per week, with at least 48 hours rest between sessions. The  
327 aim of these exercises was to develop core, shoulder and lower extremity strength,  
328 thus enhancing the body's skeletal pump efficiency. The home exercises were  
329 reviewed each week to monitor adherence and to discuss progressions and  
330 adaptations. We were pragmatic, and if this amount was not achievable, we decreased  
331 the progressions or home exercise frequency.

332           As sessions progressed, goals were modified to: increase strength (in  
333 particular legs and core), develop cardiovascular fitness, improve RoM in the hips,  
334 resolve lower back pain, and enhance stability in the shoulder girdle. There were also  
335 challenges that needed to be overcome related to time management, fatigue, and  
336 monitoring POTS symptoms before, during and after exercise. To help during  
337 exercise, the medical consultant prescribed vasoconstriction medication which was  
338 taken before exercise.

### 339 **Evaluating the Intervention**

340           The WHOQOL-BREF was administered at baseline (week 0), week 8 at the  
341 end of the combined intervention, and week 12. We also documented exercise  
342 adherence. Table 2 shows the domain scores for the WHOQOL-BREF, plus the two  
343 general life and health satisfaction questions similar to the format reported by Tito  
344 and Hess (2017). Furthermore, we have included change as percentage from baseline  
345 to week 12.

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346 Table 2. WHOQOL-BREF scores by domain and time point.

<b>Domain</b>	<b>Baseline (week 0)</b>	<b>Week 8</b>	<b>Week 12</b>	<b>Change %</b>
1. Physical health*	19	44	44	57.14
2. Psychological*	44	56	56	18.18
3. Social relationships*	25	44	44	37.50
4. Environment*	44	69	56	18.18
Q1. How satisfied are you with your life?***	2	4	4	100.00
Q2. How satisfied are you with your health?***	2	2	2	0.00

347 \*range of scores for each domain is 0-100

348 \*\*\*range for each individual question is 1-5

349 The physical and environmental domains had the highest improvement from  
 350 baseline to week 8 with increases at 53.8% and 31.8% respectively. Exercise  
 351 adherence at week 8 was reported as a mean average of 83% based on three sessions  
 352 per week for eight-weeks which saw 20 out of 24 sessions completed.

353 Before exercise was completed at week 8, the psychologist interviewed R.L.  
 354 She discussed how the program had made her feel “less isolated...physically and  
 355 mentally healthier and stronger”. She went on to say: “before the intervention when I  
 356 passed out it would leave me feeling unwell for a week or more, but now I feel more  
 357 in control. If it does happen, I just dust myself off and get on with it”. When asked to  
 358 give feedback for future developments of the POTS program, R.L. said that the social  
 359 interaction and having a team that cared about her “specific needs” was motivating  
 360 alone. Beyond the intervention R.L. planned to continue exercising with a personal  
 361 trainer, with the new aim to independently run.

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362 Comparing week 8 to week 12, there was a 4.9% drop in total QOL with the  
363 environmental domain performing the worst at -13.8%, and the psychological domain  
364 the best with an increase of 5%. Overall, comparing total QOL baseline scores to  
365 week 12, there was a 27.9% increase. All domain scores: physical (46.2%),  
366 psychological (25%), social relationships (33.3%), and environmental (13.6),  
367 increased with specific questions showing no change for health (Q2), but a 100%  
368 increase for life satisfaction (Q1). The smaller variation between in the scores can  
369 also be associated by the test-retest reliability (von Steinbüchel, Lischetzke, Gurny, &  
370 Eid, 2006). At week 12, an exit interview was conducted, and R.L. stated that the  
371 intervention: “gave me the confidence to exercise”, but from week 10 there was a  
372 “decrease in using imagery because I felt back to my normal self”. Therefore, bi-  
373 weekly booster sessions could be of benefit.

374 Approximately 16-weeks after the study finished (28-weeks from week 1), we  
375 contacted R.L. and were informed that she is continuing to exercise, although less  
376 regularly than when under supervision, and hopes to get back in the gym post  
377 COVID-19. She informed us that she has decreased the use of medications including  
378 antidepressants but continues to have good and bad days, stating: “the bad days are  
379 now very few, and a great deal more manageable”. The current exercises conducted at  
380 home were from the study (or small adaptations), and small self-administered lifestyle  
381 modifications such as walking at least 10,000 steps daily were being completed 20-  
382 weeks post intervention.

### 383 **Reflections and Recommendations**

384 We tried to approach challenges with reactive solutions driven partly by R.L.  
385 We knew that the exercise program would have to be specific to the assessments, and  
386 the progression of the sessions could be generally planned but were required to be

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387 flexible due to the nature of POTS. The home exercise program was encouraged but  
388 again adapted to suit the reality of home training, including exercises that limited the  
389 potential for tachycardia and risk of falls. Additional challenges such as fatigue levels,  
390 loss of motivation, and time constraints, were overcome with positive dialogue,  
391 reinforcement of goals and a program that required just one weekly attendance for  
392 supervised sessions.

393         An initial issue occurred in week one. R.L wore a HR monitor during the  
394 session constantly checking her HR, which exacerbated exercise anxiety elevating her  
395 HR. Therefore, the psychologist and R.L. immediately left the laboratory and FIT was  
396 delivered through a brisk walk around the institution grounds. This became the initial  
397 method of delivery as it enabled the psychologist to review goals, help with imagery  
398 specific practice, and answer questions, whilst exercising and decreasing anxiety.  
399 However, this meant that no booster sessions were recorded in their entirety. A HR  
400 monitor was not worn again during exercise sessions, and although HR was often  
401 checked when using static equipment, most feedback was subjective through RPE.

402         The main challenge with the FIT intervention was initially reminding R.L. to  
403 use the cue as her activating process that commences imagery. Imagery use, precisely  
404 motivation general mastery (see Paivio, 1985) was slow to start. R.L. could imagine  
405 achieving her exercise goal, but verbally reported limited positive self-imagery. The  
406 booster sessions were mutually beneficial at disseminating imagery application and  
407 three topics arose during conversations; examine goals and cues, explore  
408 opportunities to solve problems and overcome negative thoughts, and feedback on  
409 how to optimise vividness and controllability. We suggest that FIT imagery booster  
410 sessions use these three topics as the minimum requirement as it promotes learning  
411 and motivational goals.

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412           Adjusting medication, work commitments and dietary patterns to fit into the  
413 intervention was challenging for R.L. The medical consultant prescribed the best  
414 medication to his knowledge to help with the incremental exercise program, and work  
415 was compassionate allowing flexible working hours. Eating habits were self-adapted  
416 to offset the increased energy expenditure resulting from exercise.

417           As an interdisciplinary team our main challenge was in meeting together,  
418 reviewing notes and developing a combined plan after week two. All nine members of  
419 the interdisciplinary team involved in the project met after the initial interview and  
420 assessments, then failed to meet together again. To maintain continuity weekly notes  
421 were circulated and generally all parties responded inputting into the following weeks  
422 program.

423           The aim of this study was to enhance the QOL through psychological and  
424 physiological interventions. To do this we collaboratively set out specific goals,  
425 which were modified based on achievement by R.L. and the research team. The initial  
426 goal of jogging five-minutes was completed in week three after a series of small  
427 setbacks and achievements, then goals evolved quickly which saw an observable  
428 change in R.L. She was more talkative, upbeat and seemed confident, setting more  
429 challenging goals such as jogging for 20-minutes. The overall increase in QOL due to  
430 the intervention at week eight, we feel, was due to the combination of psychological  
431 and physiological support, which assisted with the increase in confidence to exercise.  
432 Whilst it would be beneficial to complete larger studies comparing the combined or  
433 independent use of psychological and physiological interventions, there are clear  
434 benefits to using a holistic individualised approach. A key benefit is the consistency  
435 in scores from week 8 to 12 which demonstrate maintained QOL when support is

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436 removed. We recommend that future researchers include periodic FIT booster support  
437 sessions after the intervention to support motivation through imagery use.

### 438 **Conclusion**

439 Within our specific professions we are experienced in collaborative structures  
440 and because of our person-centred approach, we assumed little about R.L.'s condition  
441 before completing assessments. POTS is complex and the training program included  
442 is only a rough guide for practitioners. Generic exercise suggestions for POTS (Fu et  
443 al., 2011; Richardson et al., 2017) such as interval training would not have worked for  
444 R.L. in the first few weeks, so we suggest a collaborative approach that engages the  
445 specialists and client in mutual conversations that are focused on tangible goals.

446 We were very fortunate to have the expertise available and acted promptly to  
447 get the project underway. Applying neutrality, an essential skill for FIT, to this project  
448 was perhaps the most challenging part. We tried not to show emotion from R.L.'s  
449 highs and lows during setbacks and achievements, but we developed a connection as  
450 we learned from her. Motivational interventions such as MI and FIT focus on  
451 unambiguous goals, which as practitioners we fully engage in. These goals are client-  
452 centred, and team driven through mutual processes, resulting in behaviour change  
453 from us all. We recommend that practitioners who work with individuals that have  
454 low self-efficacy become trained in motivational goal setting. This creates a learning  
455 environment that cultivates empathy and autonomy, key factors for improving QOL.  
456 Overall, we supported R.L. by rekindling the enjoyment she once had whilst  
457 participating in health and exercise activities and were able to collaboratively support  
458 behavioural change by increasing intrinsic motivation.

459

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