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Physical activity behavior up to one year post rehabilitation among adults with physical disabilities and/or chronic diseases: results of the prospective cohort study ReSpAct

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2
3 1 **Title:** Physical activity behavior up to one year post rehabilitation among adults with physical
4 2 disabilities and/or chronic diseases: results of the prospective cohort study ReSpAct

5 3 **Brief running head:** PA in adults with disabilities/chronic diseases

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3 26 **Background:** Little is known of physical activity (PA) behavior among adults with a disability
4
5 27 and/or chronic disease during and up to one year post rehabilitation. We aimed to explore 1)
6
7 28 dose characteristics of PA behavior among adults with physical disabilities and/or chronic
8
9 29 diseases during that period, and 2) the effects of personal characteristics and diagnosis on the
10
11 30 development of PA over time.

12
13 31 **Methods:** Adults with physical disabilities and/or chronic diseases (N=1256), enrolled in the
14
15 32 Rehabilitation, Sports and Active lifestyle (ReSpAct) study, were followed with a set of
16
17 33 questionnaires: 3-6 weeks before (T0) and 14 (T1), 33 (T2) and 52 (T3) weeks after discharge
18
19 34 from rehabilitation. PA was assessed with the Adapted-SQUASH. Dose characteristics of PA
20
21 35 were descriptively analyzed. Multilevel regression models were performed to assess PA over
22
23 36 time and the effect of personal and diagnosis characteristics on PA over time.

24
25 37 **Results:** Median total PA ranged from 1545 (IQR: 853 – 2453) at T0 to 1710 (IQR: 960 – 2730)
26
27 38 at T3 min/wk. Household (495 to 600 min/wk) and light-intensity (900 to 998 min/wk)
28
29 39 activities accrued the most minutes. Analyses showed a significant increase in total PA
30
31 40 moderate- to vigorous-intensity PA and work/commuting PA for all time points (T1-T3)
32
33 41 compared to baseline (T0). Diagnosis, age, sex and body mass index had a significant effect on
34
35 42 baseline total PA.

36
37 43 **Conclusion:** PA is highly diverse among adults with physical disabilities and/or chronic
38
39 44 diseases. Understanding this diversity in PA can help improving PA promotion activities.
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46 46 **Keywords:** Epidemiology, Rehabilitation medicine, Sports medicine, Public health
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Strengths and limitations of this study

- This is a largescale prospective cohort study that gives a detailed overview of the different dose characteristics of physical activity behavior in adults with physical disabilities and/or chronic diseases.
- We measured Physical activity with a self-reported questionnaire specifically designed for adults with disabilities giving detailed information on the different dose characteristics.
- We included a large heterogeneous group of adults with physical disabilities and/or chronic diseases, which makes it more applicable to the general rehabilitation setting and population.
- Potential sample selection bias may be present, since participants could only participate in the ReSpAct cohort study if they received physical activity counselling support during their rehabilitation treatment

61 Introduction

62 Regular physical activity (PA) has many benefits on cognitive, mental and physical health,
63 fitness, and quality of life, for both the general population as well as for adults with physical
64 disabilities and/or chronic diseases (further: adults with disabilities/chronic diseases).¹⁻⁴
65 Besides the direct health benefits for adults with disabilities/chronic diseases, being more
66 physically active is also considered a secondary (reducing or preventing long term effects of
67 an established health problem/disease) and tertiary (reduce impact of an established health
68 problem/disease by restoring function and reduce disease related complications) prevention
69 mechanism.^{5, 6} Yet, despite these benefits, PA behavior is suggested to be low among adults
70 with disabilities/chronic diseases.⁷⁻⁹

71 The recently updated World Health Organization (WHO) guidelines for PA recommend
72 that all adults, including those with physical disabilities and/or chronic diseases, should be
73 physically active for at least 150-300 minutes of moderate-intensity or 75-150 minutes of
74 vigorous-intensity per week or an equivalent combination, with the addition of muscle-
75 strengthening activities of at least moderate-intensity twice per week.^{10, 11} While these
76 recommendations are formulated for adults with disabilities/chronic diseases, the
77 development of the guidelines is mainly informed by evidence from studies in the general
78 population.¹¹ As highlighted by the WHO PA Guidelines Development Group and the
79 accompanying research agenda there is a clear need for more research on PA among adults
80 with disabilities/chronic diseases.^{12, 13}

81 The multicenter prospective cohort study “Rehabilitation, Sports and Active Lifestyle”
82 (ReSpAct) offers a great opportunity to start addressing this knowledge gap.^{14, 15} This study
83 was built around the implementation of a PA behavioral intervention in Dutch rehabilitation
84 care.^{14, 15} Uniquely, the ReSpAct study includes data on self-reported PA behavior and
85 potential determinants in a large, diverse population of adults with disabilities/chronic
86 diseases at four occasions: 3-6 weeks before discharge up to 1 year after discharge of
87 rehabilitation.^{14, 15}

88 Despite various calls for more research on PA in people with disabilities¹⁶⁻¹⁸, measuring
89 and understanding dose-response relationships of the construct of PA in the context of a
90 heterogeneous population with disabilities is not straightforward. PA is defined as “any bodily
91 movement produced by skeletal muscles that results in energy expenditure”.¹⁹ It is by
92 definition a multidimensional construct, with setting (e.g. PA during leisure time, work), mode

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3 93 (e.g. walking, bicycling), frequency (e.g. times per week), duration (e.g. in hours) and intensity
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5 94 (e.g. low, moderate or vigorous) as its crucial constituents.^{20, 21} These dimensions could also
6
7 95 be called the dose characteristics of PA, and are important to understand PA among different
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9 96 subgroups, as well as to study the dose-response relations of PA and health during and after
10
11 97 rehabilitation. Furthermore, it could be an important aspect in tailored PA counseling, as more
12
13 98 information on dose characteristics can lead to more focused PA recommendations. As only a
14
15 99 few cross-sectional, disease-specific studies described details on multiple dose characteristics
16
17 100 of PA in adults with disabilities/chronic diseases²²⁻²⁴, there is a need for prospective largescale
18
19 101 studies that take this multidimensionality of PA within and among adults with a diversity of
20
21 102 disabilities/chronic diseases into account.

22 103 An important step to enhance our understanding of PA is to explore the effect of
23
24 104 personal characteristics on the multidimensional construct PA behavior. Adults with
25
26 105 disabilities/chronic diseases are a heterogeneous group, both in PA behavior⁹ and personal
27
28 106 and disease characteristics.²⁵ Personal characteristics, such as age and sex, are determinants
29
30 107 for PA in the general population and specific diagnosis groups,²⁶⁻²⁹ yet it is largely unknown
31
32 108 how these characteristics influence the development of PA over time during and after a PA
33
34 109 promoting rehabilitation program. As such, it is important to understand which dimensions of
35
36 110 PA behavior contribute to the dose of PA and how this is perceived in the context of personal
37
38 111 characteristics or diagnoses. Such insights will help to understand PA behavior over time, and
39
40 112 will enable to individualize PA stimulation programs.

41 113 Therefore, the primary aim of this study was to explore the different dose
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43 114 characteristics of PA behavior (duration, setting, intensity, mode and frequency) among a
44
45 115 diverse group of adults with a physical disability and/or chronic disease at discharge from
46
47 116 rehabilitation up to one year post rehabilitation. The secondary aims were to explore the
48
49 117 development of PA behavior over time, and to analyze the effects of personal characteristics
50
51 118 and diagnosis on PA behavior and its development over time.

52 119

53 120 **Methods**

54 121 *Study overview*

55 122 This study is part of prospective cohort study ReSpAct to evaluate the nationwide
56
57 123 implemented Dutch rehabilitation program Rehabilitation, Sport and Exercise (RSE, Dutch:
58
59 124 "Revalidatie, Sport en Bewegen").^{14, 15} RSE is an evidence-based PA counseling program

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2
3 125 involving multiple counseling sessions based on motivational interviewing during and after
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5 126 rehabilitation to stimulate a physically active lifestyle in adults with disabilities/chronic
6
7 127 diseases.^{14, 15, 30, 31} Participants, recruited between May 2013 and August 2015, were followed
8
9 128 over time with a set of questionnaires: at baseline (T0: 3-6 weeks before discharge), and at 14
10
11 129 (T1), 33 (T2) and 52 (T3) weeks after discharge from rehabilitation.¹⁴ The study was approved
12
13 130 by the Ethical Committee of the Center for Human Movement Sciences of the University
14
15 131 Medical Center Groningen (reference: ECB/2013.02.28_1). All participants voluntarily
16
17 132 participated after signing an informed consent.

18 133

19 134 *Patient and public involvement*

20
21 135 Representatives of the Dutch community organizations Knowledge Centre for Sport
22
23 136 Netherlands and Stichting Special Heroes (former: Stichting Onbeperkt Sportief) were
24
25 137 involved as collaborators and consultants in the design and conduct of the ReSpAct study.^{14,}
26
27 138 ¹⁵ Rehabilitation professionals (counsellors, project leaders, physicians, managers) from the
28
29 139 participating rehabilitation centres and hospitals were involved as consultants in the design
30
31 140 and conduct of the ReSpAct study. We did not involve people with disabilities/chronic diseases
32
33 141 as consultants/advisors/collaborators in the study. The current paper reports results from the
34
35 142 primary outcome measure of the ReSpAct study (physical activity).

36 143

37 144 *Study population*

38
39 145 Inclusion criteria for this study were: 1) aged 18 years or older; 2) having a physical disability
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41 146 and/or chronic disease; 3) receiving inpatient, outpatient or consultancy rehabilitation
42
43 147 treatment at one of the participating rehabilitation departments or institutes; 4) participating
44
45 148 in the RSE program; 5) data available on diagnosis; and 6) valid data available of the adapted
46
47 149 version of the Short Questionnaire to ASsess Health enhancing physical activity (Adapted-
48
49 150 SQUASH) at baseline and at least one follow-up measurement.

50
51 151 Participants were excluded if they 1) were unable to complete questionnaires, even
52
53 152 with help; 2) participated in a PA program other than RSE.

54 153

55 154 *PA behavior*

56
57 155 Self-reported PA behavior was measured using the Adapted-SQUASH, a 19-item recall
58
59 156 questionnaire to assess PA among adults with disabilities based on an average week of the

1
2
3 157 past month.³² Participants had to fill out the number of days (frequency), average hours and
4
5 158 minutes per day (duration) and the perceived intensity (intensity: light, moderate, vigorous)
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7 159 of different types of activities (mode: e.g. walking, cycling, wheeling, gardening) that were pre-
8
9 160 structured in different settings: activities during commuting, activities at work and school,
10
11 161 household activities and leisure time activities. The Adapted-SQUASH has a good reliability
12
13 162 (ICC = .67 and .76, for total activity score and total minutes of activity per week respectively),
14
15 163 and a validity comparable to other PA questionnaires when using accelerometer derived PA
16
17 164 ($\rho = .40$ for total activity score and ICC = .22 for total minutes of activity per week).³²

18 165 Raw Adapted-SQUASH data were processed with a custom created syntax (SPSS
19
20 166 statistics 26, IBM). Minutes of activity per week were calculated by multiplying frequency by
21
22 167 duration. Intensity of activity was calculated by combining the perceived intensity of each
23
24 168 activity with a corresponding metabolic equivalent of task (MET) value based on the Ainsworth
25
26 169 compendium of physical activities³³ and a compendium of energy costs of the physical
27
28 170 activities for wheelchair dependent individuals³⁴ into light (<4 MET for people 18-65 years old,
29
30 171 <3 for people older than 65), moderate (4-6.5 for people 18-65 years old, MET 3-6 MET for
31
32 172 people older than 65) or vigorous intensity (>6.5 for people 18-65 years old, >6 MET for people
33
34 173 older than 65).^{32, 35} Primary outcomes were total minutes PA per week, minutes PA per setting,
35
36 174 minutes PA per intensity, and the frequency of PA modes.

37 175 Adapted-SQUASH data of a measurement occasion was deemed valid when no more
38
39 176 than one of the pre-structured settings was missing and the total minutes PA per week was
40
41 177 not higher than 6720 minutes (on average 16 hours/day).
42
43 178

43 179 *Personal characteristics*

45 180 Personal characteristics included age, sex, body mass index (BMI), marital status, current
46
47 181 smoking habit, current alcohol usage, education level and work status. Current smoking habit
48
49 182 was dichotomized into smoker and non-smoker. Current alcohol usage was categorized in no,
50
51 183 light (1-3 or 1-2 drinks per week for males and females respectively), moderate (4-20 or 3-13
52
53 184 drinks per week for males and females respectively) and excessive (≥ 21 or ≥ 14 drinks per
54
55 185 week for males and females respectively).⁸ Education level was dichotomized into high
56
57 186 (applied university and higher) and low, to make it internationally comparable. Work status
58
59 187 was categorized into school, employed, unemployed, retired, unable to work and other (e.g.
60

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3 188 voluntary work). Personal characteristics were self-reported by participants, with the
4
5 189 exception of age and sex, which were reported by the RSE counselor.
6

7 190

8
9 191 *Rehabilitation characteristics*

10 192 Rehabilitation characteristics included diagnosis, rehabilitation context (hospital or
11
12 193 rehabilitation center), rehabilitation form (inpatient-, outpatient, or consultancy
13
14 194 rehabilitation) and number of received counseling sessions from the RSE program (0 sessions,
15
16 195 1-3 sessions, 4 or more sessions).

17
18 196 Different diagnoses were grouped according to diagnosis groups of the Dutch
19
20 197 Diagnose-Treatment Combinations, a structure for the financial aspects of a hospital visit,
21
22 198 which has roots in the ICD-10 structure: amputation (both upper and lower extremities), brain
23
24 199 disease (e.g. stroke, congenital brain diseases), chronic pain, musculoskeletal disease (e.g.
25
26 200 rheumatic conditions, conditions of upper-, lower extremities and spine), neurologic disease
27
28 201 (e.g. Parkinson's disease, multiple sclerosis), organ disease (e.g. heart disease, chronic
29
30 202 obstructive pulmonary disease), spinal cord injury (SCI) and other (e.g. chronic fatigue
31
32 203 syndrome, medically unexplained symptoms).³⁶ Rehabilitation characteristics were reported
33
34 204 by the RSE counselor.

35 205

36 206 *Statistical analysis*

37
38 207 Descriptive information of the population and the dose characteristics of PA behavior are
39
40 208 shown in mean \pm SD or median (IQR) for continuous variables, and percentages for categorical
41
42 209 variables. Differences of baseline characteristics between included and excluded participants
43
44 210 were tested with independent t-test for continuous variables and Pearson χ^2 -test for
45
46 211 categorical variables.

47 212 To evaluate the development of PA behavior over time, we created six separate
48
49 213 multilevel regression models with total minutes of PA per week (model 1), minutes of PA per
50
51 214 week per setting (models 2-5) and minutes of moderate to vigorous PA (MVPA) per week
52
53 215 (model 6) as dependent variables, and measurement occasions (categorical) as independent
54
55 216 variable. Each model consisted of measurement occasion at level 1, participants at level 2
56
57 217 (random intercepts) and rehabilitation institutes as level 3 (random intercepts). Since we
58
59 218 expected variation among participants in their PA behavior over time, we added random
60

219 slopes for measurement occasion on the level of participants. However, this resulted in non-
220 converging (i.e. unreliable) models, and subsequently removed from the models.

221 To explore the effects of personal characteristics and diagnosis on the development of
222 PA behavior over time, multilevel regressions models were created with measurement
223 occasion, characteristic and an interaction term between measurement occasion and
224 characteristic for each of the six dependent variables and for each characteristic separately.
225 Evaluated characteristics were diagnosis (largest diagnosis in our data, i.e. brain disease, as
226 reference), age (continuous, in years), sex (male as reference), BMI (continuous, in kg/m²),
227 smoking (non-smoker as reference), alcohol use (no alcohol use as reference) and education
228 level (low as reference).²⁶⁻²⁹ Type III ANOVA tests were used to assess significance of the
229 overall interaction between measurement occasion and the characteristics. Since multilevel
230 regression analyses are robust against missing data, this was not addressed.³⁷ All analyses
231 were done with R and RStudio³⁸. The lmerTest package was used for multilevel regressions
232 analysis.³⁹ Significance level was set at 0.05.

233

234 **Results**

235 Study population

236 Table 1 shows descriptors of included and excluded participants per measurement occasion.
237 Of the 1719 participants in the ReSpAct cohort, 1256 participants were included in this study.
238 The largest diagnosis groups were: brain disease (27.1%, n=341), musculoskeletal disorders
239 (18.6%, n=234), chronic pain (15.8%, n=198) and neurologic disease (15.0%, n=188). Excluded
240 participants were younger (p<.001), more often a smoker (p=.04), and received less counseling
241 sessions (p<.001).

242

243 PA dose characteristics

244 Table 2 shows the PA dose characteristics (duration, setting, intensity, mode and frequency)
245 at the four different measurement occasions.

246 *Duration*

247 Total duration of PA (min/wk) varied over time and among participants, showing its lowest
248 median value at discharge from rehabilitation (T0: 1545); followed by increased levels of 1770,
249 1830 and 1710 min/wk at respectively T1, T2 and T3 (table 2).

250 *Setting*

1
2
3 251 Participants spent most PA time in household tasks (median range T0-T3: 495 to 600 min/wk),
4
5 252 followed by leisure time (median range T0-T3: 450 to 510 min/wk). A large proportion of
6
7 253 participants reported 0 min/wk PA in work (>50%; largest IQR 0 – 1080 min/wk) and
8
9 254 commuting (>70%; largest IQR commuting 0 – 40 min/wk) settings.

10 255 *Intensity*

11
12 256 Participants spent between 900 – 997.5 min/wk in light-intensity PA, 120 – 150 min/wk in
13
14 257 moderate-intensity and 100 – 120 min/wk in vigorous-intensity. In household tasks, most
15
16 258 minutes were spent in light intensity (480-540 min/wk) and little to none in moderate and
17
18 259 vigorous-intensity (82% 0 min/wk and 100% 0 min/wk, respectively). Leisure time activities
19
20 260 were predominantly in MVPA (40-60 min/wk light; 60-90 min/wk moderate; and 90-120
21
22 261 min/wk vigorous). Intensity of work activities were of light (median 0, IQR 0-165 to 0-420) or
23
24 262 moderate-intensity (median 0, IQR 0-0 to 0-60) and not of vigorous-intensity (100% 0 min/wk).
25
26 263 Commuting activities were mostly spent in vigorous (16-17% >0 min/wk), followed by light
27
28 264 (11-12% >0 min/wk) and moderate-intensity (5-7% >0 min/wk).

29 265 *Mode and frequency*

30
31 266 Walking is the most frequent mode of leisure time activities at all measurement occasions,
32
33 267 with an average frequency ranging from 3.3 ± 2.7 to 3.6 ± 2.7 times/wk. Bicycling is the second
34
35 268 most frequent mode, with an average frequency ranging from 1.6 ± 2.1 to 1.8 ± 2.2 times/wk.
36
37 269 Gardening, odd jobs and fitness are frequented around 0.6 times/wk (Table 2).
38
39 270

40 271 PA behavior over time

41
42 272 Figure 1 and appendix 1 show the results of the multilevel regression models for PA behavior
43
44 273 over time. Compared to baseline (T0), there is a significant increase ($p<.001$) in total minutes
45
46 274 of PA per week over time for each of the three follow-up measurement occasions (increase:
47
48 275 218.6, 242.2 and 153.8 min/wk at respectively T1, T2 and T3). Time spent in the settings work
49
50 276 and commuting significantly increased at follow-up occasions (all $p<.05$). With the exception
51
52 277 of one occasion, leisure time (T1, $p<.01$) and household tasks (T2, $p<.05$) remained stable
53
54 278 compared to baseline values (T0). Time spent in MVPA significantly increased at each
55
56 279 measurement occasion compared to T0 (increase: 105.0, 138.4 and 112.9 min/wk at
57
58 280 respectively T1, T2 and T3, all $p<.001$).

58 281

59 282 Effects of personal characteristics and diagnosis

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2
3 283 Figure 2 shows total PA per measurement occasion and distribution of PA in the 4 settings
4
5 284 separated for the different diagnoses. Appendix 2 provides a detailed description of PA
6
7 285 behavior per diagnosis.

8
9 286 Figure 3 shows the effect of each personal characteristic on total PA and MVPA. The
10
11 287 multilevel regression model analyses showed that at baseline, a significant effect on total PA
12
13 288 was found for diagnosis (musculoskeletal disease and other diseases more active than brain
14
15 289 disease), age (higher age less active), sex (females more active than males) and BMI (higher
16
17 290 BMI less active) (see also appendix 3). No interaction effects between these characteristics
18
19 291 and measurement occasion were found, i.e. the effect of these characteristics on PA remained
20
21 292 constant over time. There was one significant interaction effect for education on PA over time,
22
23 293 with people with high education increasing their levels of PA more over time than people with
24
25 294 low education.

26
27 295 Appendix 2 provides a detailed description of the effects of the diagnosis and personal
28
29 296 characteristics on baseline levels and the development over time of PA in each setting and
30
31 297 MVPA. In short, diagnosis had a significant baseline effect for MVPA and all settings of PA,
32
33 298 except for commuting, where we found an interaction effect of diagnosis. People with a higher
34
35 299 age were less active in work, household and commuting, but more active in leisure time and
36
37 300 MVPA. In the work setting, an older age led to increase in PA over time. Females were more
38
39 301 active in household tasks, but less active in MVPA and in both household and MVPA females
40
41 302 had less increase in PA over time. Smokers had less increase in MVPA over time than non-
42
43 303 smokers. Alcohol use had baseline effects on leisure time (moderate alcohol usage more
44
45 304 active, excessive alcohol usage less active) and on MVPA (moderate alcohol usage more
46
47 305 active) and interaction effect on MVPA (light and excessive alcohol usage had more
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49 306 improvement of MVPA over time).

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51 307

52 308 **Discussion**

53 309 We explored the PA dose characteristics in a broad population of adults with
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55 310 disabilities/chronic diseases from discharge up to one year after rehabilitation. We found a
56
57 311 significant increase in total minutes per week of PA over time. Almost two thirds of the total
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59 312 minutes was light intensity PA. Most PA were in household setting. Leisure time contributed
60
313 to the most minutes of MVPA. We found an on average active population, showing a

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3 314 considerable degree of variation in PA among this population and over time, in all dose
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5 315 characteristics and among personal and disease characteristics.
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7 316

8
9 317 PA dose characteristics

10 318 To the best of our knowledge, this is the first prospective cohort study that considers all dose
11 319 characteristics (duration, setting, intensity, mode and frequency) of PA in a large
12 320 heterogeneous population of adults with disabilities/chronic diseases. Compared to previous
13 321 studies (self-reported PA in specific disability groups and in a heterogeneous disability groups),
14 322 our participants were more active in total PA, MVPA and leisure time PA.^{8, 22, 24, 40-45}
15 323 Furthermore, the proportion of participants adhering to the aerobic component of the WHO
16 324 PA guideline (>150 min of moderate PA, >75 min of vigorous PA or combination of both) is
17 325 higher in our population compared to previous research (68-74% versus 35-60%).^{8, 46-48} This
18 326 suggests that the ReSpAct cohort is a potential positive selection regarding PA behavior. A
19 327 possible explanation of our active population may relate to the fact that all participants
20 328 voluntary engaged in the RSE program, and thus received PA counselling during and after
21 329 rehabilitation.
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32 330 Furthermore, we found a large amount of light-intensity PA. There are indications that
33 331 the curvilinear relationship between PA and health found in able-bodied individuals³, also
34 332 apply to adults with disabilities/chronic diseases.⁴⁹ This means that for inactive people, even
35 333 a small increase in PA (in any duration, intensity, mode and frequency), can lead to health
36 334 benefits, suggesting the potential importance of light-intensity PA. However, as light-intensity
37 335 activities might be harder to recall than MVPA, it is debatable how valid self-reported
38 336 instruments can measure light-intensity. Future research should focus on reliably measuring
39 337 light-intensity and the dose-response relationship between light-intensity PA and health
40 338 outcomes.
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51 340 PA behavior over time

52 341 In contrast to the common decline in PA after rehabilitation⁵⁰, we found a significant increase
53 342 in total minutes of PA and in MVPA after rehabilitation. The largest improvement was found
54 343 between just before discharge (T0) and 14 weeks after (T1) and remained more or less stable
55 344 till one year after rehabilitation. Between T0 and T1, participants received personalized PA
56 345 counseling (RSE program)^{14, 15, 31}, which may explain the increase in PA behavior in this period.

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3 346 The period just after rehabilitation is a critical window of opportunity for intervening and
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5 347 important to assist people from being a patient to a participant in lifelong PA.⁵¹ Our results
6
7 348 seem to confirm these notions. However, our data is limited to one year after rehabilitation,
8
9 349 and future research should investigate whether these counseling sessions are enough for
10
11 350 adherence to lifelong PA.

12 351

14 352 Effects of personal characteristics and diagnosis

16 353 We found a large diversity in individual PA behavior over time, as seen by the large
17
18 354 interquartile ranges for all dose characteristics of PA. Part of this diversity in PA can be
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20 355 explained by age, sex, BMI and diagnosis. The effects of age and sex on PA are also found in
21
22 356 the general population and in people with disabilities, with older people being less active and
23
24 357 males being more active than females.^{26, 27, 46, 48} In contrast, we found that females were more
25
26 358 active than males, which may be explained by the household PA as these were reported much
27
28 359 more by females than males. As household PA were mostly of light intensity, we also found
29
30 360 that males were more active than females in MVPA, which is in line with previous literature.^{26,}
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32 361 ⁴⁶

34 362 Interestingly, we found that older people were more active in MVPA than younger
35
36 363 people. One explanation could be that for people older than 55 years, MVPA is reached with
37
38 364 a lower MET-value.⁵² Because the Adapted-SQUASH has predefined MET-values for each
39
40 365 activity, it could be that the same activity is categorized as light intensity for people younger
41
42 366 than 55 years, but as moderate intensity for people older than 55 years.

44 367 Only education had a significant interaction effect on PA over time, with people with a
45
46 368 higher education increasing their PA behavior more than people with a lower education.
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48 369 Previous research also found that people with higher education were more active, but to the
49
50 370 best of our knowledge, the association between education and longitudinal change of PA
51
52 371 behavior was not studied before.^{26, 53}

54 372 Combining the knowledge about dose characteristics of PA behavior and the influence
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56 373 of personal characteristics on PA behavior could help health professionals and PA promoting
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58 374 programs to give more individually tailored recommendations. This could be beneficial for
59
60 375 getting adults with disabilities/chronic diseases more active, as it is known from goal setting
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62 376 literature that more specificity is better.⁵⁴

377

378 Study limitations

379 As the ReSpAct cohort is probably a positive sample regarding PA, results should be
380 generalized to the broader population of people with a physical disability and/or chronic
381 disease with caution.

382 PA was measured with a self-reported questionnaire. Questionnaires are prone to
383 recall bias and social desirability, and therefore lead to overestimation of PA.^{32, 55, 56} Intensity
384 outcomes of the Adapted-SQUASH are mostly based on MET-values from the Ainsworth
385 compendium of physical activities, based on a general population³³, which might not be as
386 valid for people with disabilities. However, as the test-retest reliability was high for the
387 Adapted-SQUASH, the increase of PA behavior found in this study is fairly robust.

388 Lastly, possible effects of characteristics (i.e., age, sex, BMI, smoking behavior, alcohol
389 use and education level) and diagnosis on PA were tested univariable and not multivariable.
390 It is possible that effects of characteristics are influenced by other characteristics.
391 Multivariable testing would correct for this. However, because our main aim was to explore
392 the dose characteristics and the studied characteristics were based on previous literature²⁶⁻²⁹,
393 we currently limited the study ambitions to univariate testing.

395 Future research

396 This study gives detailed information on the dose characteristics of PA behavior in adults with
397 disabilities/chronic diseases, which is a first step in the dose-response relationship of PA and
398 health. Due to lack of research on this relationship in adults with disabilities/chronic diseases,
399 evidence of the current WHO PA guidelines for this population is mostly derived from research
400 in non-disabled populations.¹¹ This makes it questionable how applicable these guidelines are,
401 and perhaps making disability specific guidelines more suitable.^{17, 57} However, the current PA
402 guidelines for people with disabilities do have its merits, as it exposed the lack of systematic
403 research on PA in this population⁵⁸, inspiring new studies, such as the current study, to bridge
404 this gap. Future research should now focus on the dose-response relationships between PA
405 and health.

406 Closely related to the need for more research on the dose-response relationship of PA
407 and health, is the need for more research on PA measurement instruments in adults with
408 disabilities/chronic diseases. Both self-reported and device-based instruments have

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2
3 409 limitations in this population, and future research should find out which types of instruments
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5 410 are most appropriate for dose/dose-response studies.

6
7 411 The effect of personal characteristics and diagnosis on PA behavior overall and over
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9 412 time found in this study, helps to inform readers to points of attention when promoting PA
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11 413 behavior. Although most characteristics examined in this study cannot be intervened at,
12
13 414 theoretical models underlying PA promotion, such as the Physical Activity for people with a
14
15 415 Disability (PAD) model⁵⁹, suggest personal factors (e.g. motivation, self-efficacy) and
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17 416 environmental factors (e.g. barriers and facilitators, social support) that can be intervened at,
18
19 417 also influence PA behavior. Future research should investigate how these modifiable factors
20
21 418 influence the development of PA behavior during and after rehabilitation. This could help
22
23 419 improve PA promotion interventions and gear them more to individualized therapy.

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25 420

421 **Conclusion**

26
27 422 Both PA level, and change of PA over time are highly variable among adults with
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29 423 disabilities/chronic diseases, in terms of different PA dimensions and in the context of
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31 424 personal and diagnosis characteristics. The findings of this study help to understand the
32
33 425 construct of PA behavior among a diverse population of persons with a physical disability
34
35 426 and/or chronic disease what potentially can be used to improve PA promotion activities
36
37 427 among this population during and after rehabilitation.

38 428

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18 453 PB conceptualized the current study, analyzed the data, interpreted the data and drafted the
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24 459

25 460 *Competing interests:*

26 461 The authors declare that they have no competing interests

27 462

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Table 1. Descriptive statistics of included participants at each measurement occasion (T0-T3) and excluded participants at T0.

	Included				Excluded
	T0	T1	T2	T3	
N	1256	1114	966	860	463
Age (years)	50.7 ± 13.4	51.1 ± 13.4	51.5 ± 13.0	51.6 ± 13.2	47.5 ± 14.3**
Sex (% male)	47.3	47.9	47.6	49.2	42.1
BMI (kg/m ²)	27.5 ± 8.6	27.5 ± 8.8	27.4 ± 9.1	27.4 ± 9.3	27.0 ± 5.9
Diagnosis					
% Brain disease	27.1	26.8	26.5	27.4	24.4
% Musculoskeletal disease	18.6	18.0	17.6	17.3	18.1
% Chronic pain	15.8	15.8	14.9	14.9	18.1
% Neurologic disease	15.0	15.5	16.1	16.9	12.5
% Organ disease	12.1	12.7	12.7	12.4	9.9
% Amputation	4.5	4.7	4.9	4.7	4.3
% Spinal cord injury	3.0	2.7	2.8	2.8	4.3
% Other diseases	3.8	3.8	4.5	3.6	3.2
Smoking					
% Yes	16.3	16.6	15.4	15.3	13.0
% No	71.3	73.5	74.9	75.2	39.7
Alcohol use					
% No	58.0	57.9	59.0	58.7	34.6
% Light	10.4	10.5	11.0	10.9	5.4
% Moderate	24.0	25.0	24.0	24.1	11.2
% Excessive	2.2	2.4	2.3	2.0	0.6
Marital status					
% Single	26.8	27.7	27.7	27.7	21.4
% Married/living with partner	62.9	63.9	63.9	63.9	39.3
Education level					
% Low	3.4	3.5	3.2	2.8	3.5
% Middle	63.6	64.3	65.0	66.7	44.1
% High	22.5	23.7	23.5	22.7	12.7
Work status					
% School	1.8	1.8	1.1	1.7	1.9
% Employed	31.2	32.3	31.9	32.1	20.1
% Unemployed	11.6	11.9	11.4	11.7	9.3
% Retired	15.4	16.4	16.0	16.9	7.6
% unable to work	21.7	21.8	22.3	21.5	14.9
% Other	7.7	7.5	9.0	8.1	6.3
Rehabilitation context					
% Rehabilitation center	71.6	71.6	72.3	72.8	75.4
% Hospital	28.4	28.4	27.7	27.2	24.6
Rehabilitation form					
% Inpatient	2.8	2.6	2.3	2.3	3.7
% Outpatient	89.8	90.3	89.8	90.5	90.1
% Consultancy	7.4	7.1	8.0	7.2	6.3

PA in adults with disabilities/chronic diseases

Number of counseling moments					**
% 0	11.4	11.0	10.8	10.0	21.0
% 1-3	56.4	55.8	56.3	57.0	55.3
% 4 or more	32.2	33.1	32.9	33.0	23.8

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

There was more missing data in the excluded group of participants compared to the included group of participants.

* and ** Significant difference between the included and excluded participants based on independent sample t-tests for continuous variables and based on Chi-square tests for categorical variables without unknown category between baseline participants and those excluded. (*p<0.05; **p<0.001).

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For peer review only

PA in adults with disabilities/chronic diseases

Table 2. Physical activity behavior of adults with disabilities/chronic diseases per measurement occasion as measured with the Adapted-SQUASH³²

	T0	T1	T2	T3
Total PA				
N	1256	1114	966	860
Total (min/week)	1545 (852.5 - 2453)	1770 (990 - 2780)	1830 (981 - 2730)	1710 (960 - 2730)
Light (min/week)	900 (360 - 1680)	997.5 (420 - 1920)	960 (409 - 1980)	900 (360 - 1800)
Moderate (min/week)	120 (0 - 480)	180 (15 - 596)	180 (0 - 690)	150 (0 - 630)
Vigorous (min/week)	100 (0 - 246.25)	120 (0 - 300)	120 (0 - 300)	120 (0 - 289)
Adherence to the aerobic WHO PA guidelines (%)	68.3	74.9	71.3	71.2
Leisure time				
N	1252	1098	955	843
Total (min/week)	450 (230 - 795)	510 (270 - 853)	480 (240 - 840)	465 (240 - 840)
% 0 min/week	3.6	2.4	4.1	4.4
Light (min/week)	60 (0 - 323)	60 (0 - 330)	60 (0 - 300)	40 (0 - 270)
% 0 min/week	43.6	44.4	44.6	46.9
Moderate (min/week)	75 (0 - 255)	90 (0 - 300)	60 (0 - 300)	70 (0 - 273)
% 0 min/week	37.6	32.1	36.8	38.0
Vigorous (min/week)	90 (0 - 213)	120 (0 - 268)	100 (0 - 240)	100 (0 - 240)
% 0 min/week	30.8	27.2	31.0	30.8
<i>Frequency of leisure time activities per week</i>				
<i>Walking</i>	3.6 ± 2.7	3.5 ± 2.6	3.3 ± 2.6	3.3 ± 2.7
<i>Bicycling</i>	1.8 ± 2.2	1.7 ± 2.1	1.6 ± 2.1	1.7 ± 2.1
<i>Wheelchair riding</i>	0.4 ± 1.5	0.4 ± 1.5	0.4 ± 1.5	0.4 ± 1.5
<i>Handcycling</i>	0.0 ± 0.4	0.1 ± 0.5	0.1 ± 0.5	0.1 ± 0.4
<i>Gardening</i>	0.7 ± 1.2	0.6 ± 1.1	0.5 ± 1	0.5 ± 1.1
<i>Odd jobs</i>	0.7 ± 1.4	0.5 ± 1.2	0.5 ± 1.1	0.5 ± 1.1
<i>Fitness</i>	0.6 ± 1.1	0.7 ± 1.1	0.5 ± 1	0.4 ± 0.9
<i>Swimming</i>	0.3 ± 0.7	0.3 ± 0.6	0.2 ± 0.5	0.2 ± 0.5
Household				
N	1234	1096	953	853
Total (min/week)	540 (180 - 960)	540 (210 - 1020)	600 (240 - 1020)	495 (210 - 930)
% 0 min/week	13.5	10.4	10.3	11.8
Light (min/week)	510 (180 - 960)	540 (210 - 960)	540 (210 - 960)	480 (185 - 900)
% 0 min/week	13.9	11.0	11.1	12.3
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.6	83.4	82.0	82.8
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100.0	100.0	100.0	100.0
Work				
N	1186	1093	943	844
Total (min/week)	0 (0 - 600)	0 (0 - 960)	0 (0 - 1080)	0 (0 - 1080)

PA in adults with disabilities/chronic diseases

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3	% 0 min/week	59.9	52.6	52.9	54.5
4	Light	0 (0 - 165)	0 (0 - 420)	0 (0 - 300)	0 (0 - 240)
5	% 0 min/week	72.9	67.9	70.2	71.1
6	Moderate (min/week)	0 (0 - 0)	0 (0 - 60)	0 (0 - 60)	0 (0 - 60)
7	% 0 min/week	80.8	72.9	71.8	73.5
8	Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
9	% 0 min/week	100.0	100.0	100.0	100.0
10					
11					
12					
13	Commuting				
14	N	1246	1108	959	847
15	Total (min/week)	0 (0 - 25)	0 (0 - 30)	0 (0 - 30)	0 (0 - 40)
16	% 0 min/week	72.5	71.3	71.3	70.4
17	Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
18	% 0 min/week	88.8	87.7	88.2	88.5
19	Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
20	% 0 min/week	95.5	93.4	93.8	94.5
21	Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
22	% 0 min/week	83.3	83.9	83.6	83.0
23					
24					
25					

Data presented as median (interquartile range), mean \pm SD or %

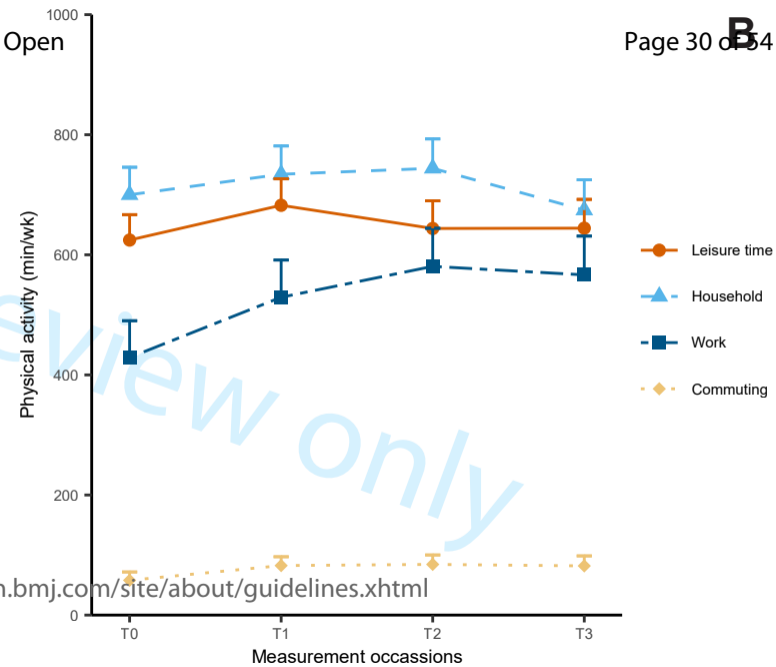
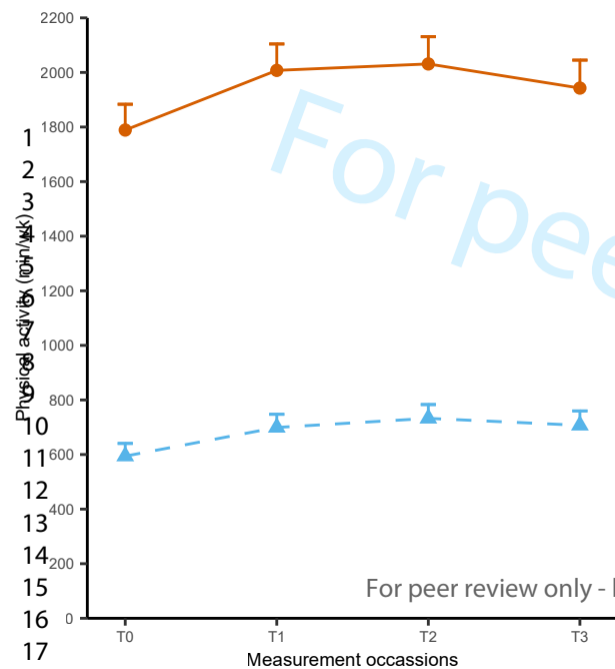
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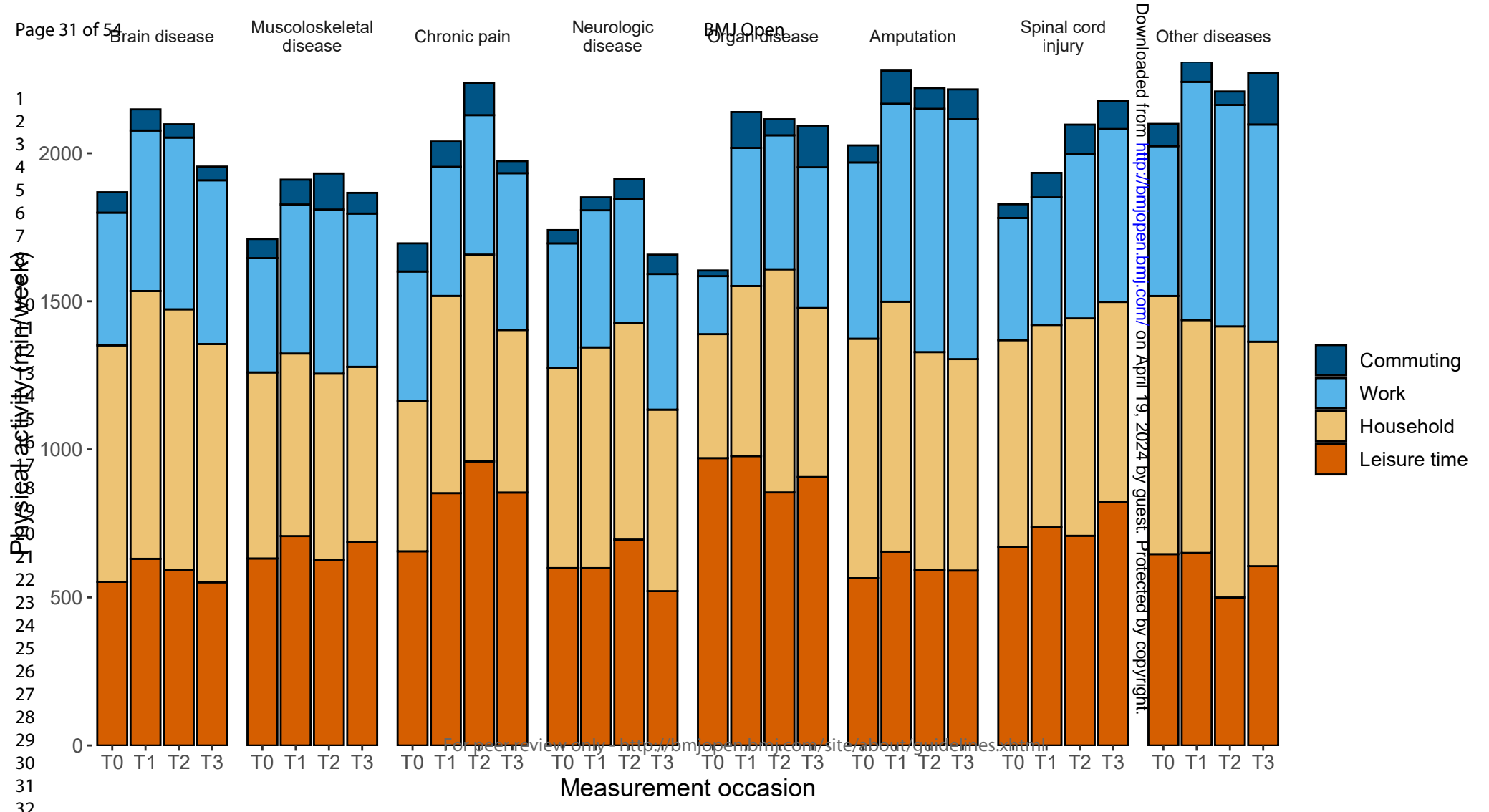
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3 633 Figure 1. Regression lines of the multilevel regressions models for A) minutes of total
4 634 physical activity (PA) per week and minutes of moderate to vigorous physical activity (MVPA)
5 635 and B) for minutes of physical activity per week per setting.
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10 637 Figure 2. Descriptive data of total physical activity behavior and the distribution in the four
11 638 settings per measurement occasion of each diagnosis.
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16 640 Figure 3. Effects of personal characteristics on baseline levels and development over time of
17 641 total PA and MVPA, based on the individual multilevel regression models with 95%
18 642 confidence interval. *significant difference between groups at baseline ($p < .05$). †significant
19 643 difference in development over time between groups (1 between light alcohol usages and no
20 644 alcohol usage, 2 between excessive alcohol usage and no alcohol usage) ($p < .05$).
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Physical activity (min/week)

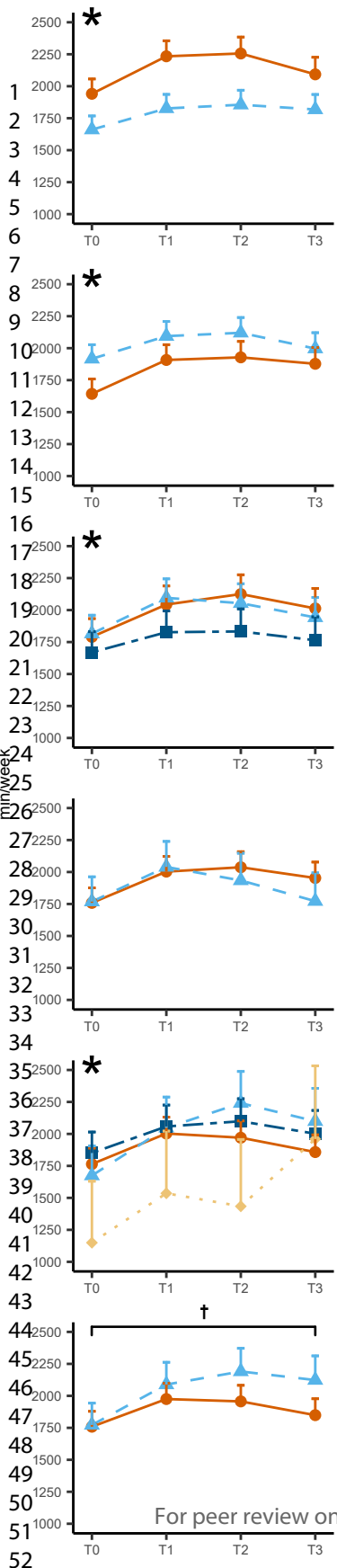


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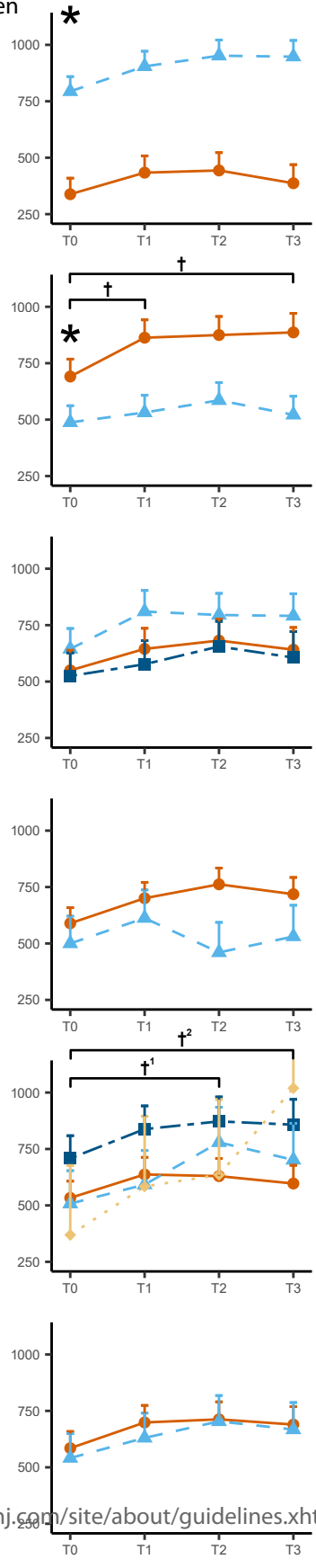
Total PA

BMJ Open

MVPA



- Age**
- <51 years
 - ≥ 51 years
- Sex**
- Male
 - Female
- BMI**
- <25 kg/m² [ref]
 - 25-30 kg/m²
 - >30 kg/m²
- Smoking habit**
- No
 - Yes
- Alcohol use**
- No [ref]
 - Light
 - Moderate
 - Excessive
- Education level**
- Low
 - High



- Age**
- <51 years
 - ≥ 51 years
- Sex**
- Male
 - Female
- BMI**
- <25 kg/m² [ref]
 - 25-30 kg/m²
 - >30 kg/m²
- Smoking habit**
- No
 - Yes
- Alcohol use**
- No [ref]
 - Light
 - Moderate
 - Excessive
- Education level**
- Low
 - High

Appendix 1. Results of longitudinal multilevel analysis of physical activity behavior over time in table

Appendix 1. Results of longitudinal multilevel analysis of physical activity behavior over time

	Baseline to T1			Baseline to T2			Baseline to T3					
	β	95% CI	p-value	β	95% CI	p-value	β	95% CI	p-value			
Total PA	218.6	142.9	294.3	<.001	242.2	162.6	321.7	<.001	153.8	70.9	236.6	<.001
Leisure Time	57.9	15.0	100.8	.008	19.3	-25.7	64.3	.400	19.8	-27.2	66.7	.409
Household	34.2	-6.7	75.0	.101	44.1	1.2	86.9	.044	-25.5	-70.1	19.0	.262
Work	100.3	59.2	141.4	<.001	151.7	108.5	195.0	<.001	137.6	92.6	182.5	<.001
Commuting	24.5	6.1	43.0	.009	26.5	7.2	45.8	.007	24.0	3.9	44.1	.019
MVPA	105.0	57.8	152.3	<.001	138.4	88.7	188.1	<.001	112.9	61.1	164.6	<.001

PA = Physical activity, MVPA = moderate to vigorous physical activity

Bold = statistically significant

Appendix 2. Descriptive statistics and PA behavior of each diagnosis groups separately.**Brain disease:****Appendix 1.1** Descriptive statistics of participants with a brain disease

	Population at T0	Population at T1	Population at T2	Population at T3
N	341	299	256	236
Age (years)	52.7 ± 12.3	53 ± 12.2	53.3 ± 11.8	53.5 ± 11.9
Sex (% male)	56.6	57.9	56.6	58.9
BMI (kg/m ²)	27 ± 10.7	27.1 ± 11.3	27 ± 11.9	27 ± 12
Smoking				
% Yes	12.6	12	10.2	11
% No	73.6	77.3	78.9	78
Alcohol use				
% No	51	54.2	52.3	53.8
% Light	12.9	13.4	14.5	14
% Moderate	20.5	19.7	20.7	19.5
% Excessive	1.5	1.7	1.2	1.3
Marital status				
% Single	23.8	25.1	25.1	25.1
% Married/living with partner	65.1	66.2	66.2	66.2
Education level				
% Low	65.1	66.2	66	66.9
% High	23.5	24.7	24.2	24.6
Work status				
% School	1.5	1.3	0.8	1.3
% Employed	36.1	37.5	35.9	37.7
% Unemployed	9.7	10.4	9	9.7
% Retired	17.3	18.7	18	18.6
% unable to work	15.8	15.7	17.2	15.7
% Other	7.3	7.4	9	8.1
Rehabilitation context				
% Rehabilitation center	76.2	75.6	78.1	78.8
% Hospital	23.8	24.4	21.9	21.2
Rehabilitation form				
% Inpatient	3.8	3.7	3.5	2.5
% Outpatient	89.7	90	88.7	90.3
% Consultancy	6.5	6.4	7.8	7.2
Number of counseling moments				
% 0	11.4	10.7	10.9	9.3
% 1-3	52.5	53.5	52.3	52.1
% 4 or more	36.1	35.8	36.7	38.6

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.2 Physical activity behavior of people with a brain disease per measurement occasion

	T0	T1	T2	T3
Total PA				
N	341	299	256	236
Total (min/week)	1410 (760 - 2400)	1620 (930 - 2685)	1568 (952 - 2604)	1680 (960 - 2604)
Light (min/week)	790 (240 - 1440)	840 (308 - 1650)	750 (243 - 1642)	780 (240 - 1538)
Moderate (min/week)	160 (0 - 540)	180 (30 - 615)	195 (1 - 788)	230 (3 - 750)
Vigorous (min/week)	120 (0 - 300)	150 (40 - 360)	140 (0 - 312)	120 (29 - 360)

Leisure time

N	341	295	256	232
Total (min/week)	450 (240 - 805)	520 (288 - 878)	510 (240 - 840)	480 (296 - 908)
% 0 min/week	3.2	3.4	4.7	3
Light (min/week)	30 (0 - 250)	30 (0 - 270)	0 (0 - 246)	0 (0 - 240)
% 0 min/week	49.9	49.2	51.2	51.3
Moderate (min/week)	120 (0 - 300)	120 (0 - 360)	120 (0 - 338)	120 (0 - 360)
% 0 min/week	33.1	28.1	31.2	32.3
Vigorous (min/week)	120 (0 - 270)	120 (42 - 300)	120 (0 - 289)	120 (30 - 300)
% 0 min/week	27	21	29.7	23.3
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3.6 \pm 2.7	3.3 \pm 2.5	3.3 \pm 2.5	3.2 \pm 2.6
Bycycling	1.8 \pm 2.2	1.9 \pm 2.3	1.7 \pm 2.2	1.9 \pm 2.2
wheelchair riding	0.2 \pm 1.2	0.3 \pm 1.2	0.2 \pm 1	0.2 \pm 1
Handbiking	0 \pm 0	0 \pm 0.2	0 \pm 0.5	0 \pm 0.3
Gardening	0.6 \pm 1.1	0.6 \pm 1.2	0.5 \pm 1.1	0.6 \pm 1.1
Odd jobs	0.7 \pm 1.4	0.6 \pm 1.2	0.6 \pm 1.2	0.5 \pm 0.9
Fitness	0.6 \pm 0.9	0.7 \pm 1.2	0.6 \pm 1.1	0.5 \pm 1.1
Swimming	0.3 \pm 0.7	0.3 \pm 0.7	0.1 \pm 0.5	0.1 \pm 0.4

Household

N	333	293	253	236
Total (min/week)	480 (140 - 855)	420 (150 - 960)	525 (180 - 870)	472 (148 - 878)
% 0 min/week	17.1	11.3	13	13.1
Light (min/week)	450 (120 - 840)	420 (150 - 900)	450 (180 - 840)	420 (135 - 840)
% 0 min/week	17.4	12.3	14.2	14.8
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.7	80.2	81	80.9
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	321	296	247	231
Total (min/week)	0 (0 - 480)	0 (0 - 900)	0 (0 - 1020)	0 (0 - 960)
% 0 min/week	62.9	51.4	51	55
Light	0 (0 - 0)	0 (0 - 300)	0 (0 - 120)	0 (0 - 0)
% 0 min/week	76.9	68.9	73.3	76.2
Moderate (min/week)	0 (0 - 0)	0 (0 - 60)	0 (0 - 120)	0 (0 - 90)
% 0 min/week	80.4	73	70.4	71.4
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	340	296	253	231
Total (min/week)	0 (0 - 36)	0 (0 - 30)	0 (0 - 50)	0 (0 - 60)
% 0 min/week	70.3	71.6	66.8	68.4
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	90.9	88.9	88.5	90.9
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	94.4	94.3	93.3	93.5
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	80.6	80.7	79.1	80.5

Data presented as median (interquartile range), mean \pm SD or %

Musculoskeletal disease

Appendix 1.3 Descriptive statistics of participants with a musculoskeletal disorder

	Population at T0	Population at T1	Population at T2	Population at T3
N	234	201	170	149
Age (years)	47 ± 14.9	47.5 ± 15	47.6 ± 14.8	46.4 ± 14.5
Sex (% male)	35.9	36.3	37.1	35.6
BMI (kg/m ²)	27.5 ± 6.1	27.2 ± 5.8	27.7 ± 6.4	27.7 ± 6.2
Smoking				
% Yes	20.5	21.9	20.6	22.1
% No	66.7	66.7	71.2	68.5
Alcohol use				
% No	52.6	52.7	56.5	57
% Light	10.7	10.4	11.2	11.4
% Moderate	22.6	24.4	22.9	21.5
% Excessive	1.3	1	1.2	0.7
Marital status				
% Single	26.5	25.9	25.9	25.9
% Married/living with partner	61.5	63.7	63.7	63.7
Education level				
% Low	64.1	64.7	66.5	69.1
% High	24.4	25.4	26.5	22.1
Work status				
% School	2.6	3	1.8	2
% Employed	31.2	32.3	31.2	33.6
% Unemployed	12.8	13.9	12.9	15.4
% Retired	12	13.4	12.4	12.1
% unable to work	19.7	18.4	21.8	18.1
% Other	10.7	9.5	12.4	10.7
Rehabilitation context				
% Rehabilitation center	65.4	65.2	67.6	63.8
% Hospital	34.6	34.8	32.4	36.2
Rehabilitation form				
% Inpatient	1.3	1.5	0.6	1.3
% Outpatient	87.2	89.1	88.2	88.6
% Consultancy	11.5	9.5	11.2	10.1
Number of counseling moments				
% 0	13.7	13.4	12.4	12.8
% 1-3	62	60.2	62.9	62.4
% 4 or more	24.4	26.4	24.7	24.8

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.4 Physical activity behavior of participants with a musculoskeletal disorder

	T0	T1	T2	T3
Total PA				
N	234	201	170	149
Total (min/week)	1728 (1042 - 2918)	2055 (1200 - 3070)	1935 (1011 - 3270)	1898 (1085 - 3270)
Light (min/week)	1140 (450 - 2124)	1260 (600 - 2370)	1145 (600 - 2248)	1050 (555 - 2290)
Moderate (min/week)	120 (0 - 472)	150 (15 - 510)	128 (0 - 600)	120 (0 - 540)
Vigorous (min/week)	120 (0 - 268)	120 (0 - 310)	120 (0 - 300)	120 (0 - 300)

Leisure time

N	233	199	168	145
Total (min/week)	420 (243 - 770)	450 (252 - 765)	420 (204 - 750)	375 (185 - 660)
% 0 min/week	4.3	2	5.4	5.5
Light (min/week)	120 (0 - 360)	90 (0 - 352)	90 (0 - 278)	60 (0 - 271)
% 0 min/week	38.2	35.2	39.9	40
Moderate (min/week)	60 (0 - 195)	90 (0 - 220)	60 (0 - 214)	30 (0 - 180)
% 0 min/week	42.5	32.2	42.9	48.3
Vigorous (min/week)	100 (0 - 240)	120 (0 - 285)	110 (0 - 241)	105 (0 - 240)
% 0 min/week	27.9	28.1	29.2	36.6
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3.6 \pm 2.6	3.6 \pm 2.4	3.4 \pm 2.6	3.2 \pm 2.6
Bycycling	2.1 \pm 2.3	1.8 \pm 2.2	1.7 \pm 2.2	1.4 \pm 1.9
wheelchair riding	0.3 \pm 1.5	0.3 \pm 1.3	0.2 \pm 1.2	0.2 \pm 1.1
Handbiking	0.1 \pm 0.5	0.1 \pm 0.6	0.1 \pm 0.5	0 \pm 0.3
Gardening	0.5 \pm 1.1	0.4 \pm 0.7	0.4 \pm 0.8	0.3 \pm 0.6
Odd jobs	0.5 \pm 1.2	0.4 \pm 1.1	0.5 \pm 1.1	0.4 \pm 1
Fitness	0.7 \pm 1.1	0.6 \pm 1.1	0.5 \pm 1.1	0.3 \pm 0.8
Swimming	0.4 \pm 0.8	0.4 \pm 0.7	0.3 \pm 0.7	0.2 \pm 0.6

Household

N	232	199	166	147
Total (min/week)	630 (236 - 1099)	630 (300 - 1140)	600 (278 - 1012)	585 (248 - 900)
% 0 min/week	9.5	8	7.2	6.1
Light (min/week)	615 (210 - 1080)	600 (282 - 1140)	600 (270 - 960)	585 (240 - 900)
% 0 min/week	9.9	9	7.2	6.1
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	90.1	89.9	88	90.5
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	223	197	166	148
Total (min/week)	0 (0 - 960)	300 (0 - 1200)	390 (0 - 1440)	360 (0 - 1710)
% 0 min/week	50.7	44.2	41.6	42.6
Light	0 (0 - 600)	0 (0 - 840)	0 (0 - 1005)	0 (0 - 1200)
% 0 min/week	64.6	58.4	57.2	57.4
Moderate (min/week)	0 (0 - 0)	0 (0 - 180)	0 (0 - 285)	0 (0 - 120)
% 0 min/week	77.1	68.5	64.5	70.3
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	232	200	169	149
Total (min/week)	0 (0 - 52)	0 (0 - 82)	0 (0 - 30)	0 (0 - 60)
% 0 min/week	68.1	63.5	67.5	61.7
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.5	80	84	82.6
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	96.6	94.5	95.3	95.3
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	78.9	81	81.7	77.2

Data presented as median (interquartile range), mean \pm SD or %

Chronic pain

Appendix 1.5 Descriptive statistics of participants with chronic pain

	Population at T0	Population at T1	Population at T2	Population at T3
N	198	176	144	128
Age (years)	45.4 ± 11.6	45.8 ± 11.8	47.4 ± 10.8	46.6 ± 11.2
Sex (% male)	24.2	25.6	23.6	25
BMI (kg/m ²)	27.9 ± 6.1	28 ± 6.2	27.8 ± 5.7	27.6 ± 5.9
Smoking				
% Yes	16.2	17	16	14.8
% No	70.7	72.7	73.6	76.6
Alcohol use				
% No	51	51.1	52.8	54.7
% Light	8.6	9.1	7.6	9.4
% Moderate	24.7	26.7	25.7	25
% Excessive	2.5	2.8	3.5	2.3
Marital status				
% Single	28.3	30.7	30.7	30.7
% Married/living with partner	59.1	59.7	59.7	59.7
Education level				
% Low	72.2	73.3	74.3	76.6
% High	15.7	17.6	16.7	15.6
Work status				
% School	2	2.3	0.7	1.6
% Employed	30.3	32.4	32.6	33.6
% Unemployed	16.2	15.3	13.2	14.1
% Retired	3.5	4	3.5	2.3
% unable to work	25.3	26.7	28.5	27.3
% Other	10.1	9.7	12.5	12.5
Rehabilitation context				
% Rehabilitation center	63.1	63.6	62.5	64.1
% Hospital	36.9	36.4	37.5	35.9
Rehabilitation form				
% Inpatient	2.5	2.8	0.7	1.6
% Outpatient	92.4	92	94.4	94.5
% Consultancy	5.1	5.1	4.9	3.9
Number of counseling moments				
% 0	9.1	8.5	7.6	3.1
% 1-3	52.5	49.4	51.4	55.5
% 4 or more	38.4	42	41	41.4

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.6 Physical activity behavior of participants with chronic pain

	T0	T1	T2	T3
Total PA				
N	198	176	144	128
Total (min/week)	1710 (1051 - 2520)	1845 (972 - 2770)	1868 (1080 - 2771)	1598 (1080 - 2771)
Light (min/week)	1260 (652 - 2032)	1338 (630 - 2250)	1308 (606 - 2280)	1192 (770 - 1989)
Moderate (min/week)	60 (0 - 300)	112 (0 - 360)	94 (0 - 424)	112 (0 - 300)
Vigorous (min/week)	90 (2 - 210)	120 (0 - 240)	90 (0 - 240)	95 (0 - 240)

Leisure time

N	198	171	143	125
Total (min/week)	435 (240 - 735)	525 (282 - 792)	445 (240 - 752)	450 (210 - 710)
% 0 min/week	1.5	0.6	3.5	3.2
Light (min/week)	150 (30 - 420)	180 (0 - 480)	150 (0 - 360)	120 (0 - 360)
% 0 min/week	24.2	28.1	31.5	32.8
Moderate (min/week)	30 (0 - 180)	60 (0 - 210)	45 (0 - 188)	15 (0 - 180)
% 0 min/week	46.5	40.9	44.8	48
Vigorous (min/week)	60 (0 - 191)	120 (5 - 210)	90 (0 - 180)	90 (0 - 225)
% 0 min/week	26.3	25.1	30.1	25.6
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	4.5 \pm 2.5	4.3 \pm 2.5	4.1 \pm 2.6	4.1 \pm 2.6
Bycycling	2 \pm 2.2	1.9 \pm 2.2	1.7 \pm 2	2.1 \pm 2.2
wheelchair riding	0.2 \pm 1.2	0.2 \pm 0.8	0.2 \pm 1	0.2 \pm 1
Handbiking	0 \pm 0.5	0 \pm 0	0 \pm 0.2	0 \pm 0.3
Gardening	0.6 \pm 1.1	0.5 \pm 1.1	0.4 \pm 1.1	0.6 \pm 1.3
Odd jobs	0.8 \pm 1.6	0.5 \pm 1.1	0.5 \pm 1.1	0.3 \pm 0.8
Fitness	0.6 \pm 1.1	0.6 \pm 1.1	0.5 \pm 1	0.3 \pm 0.8
Swimming	0.3 \pm 0.6	0.2 \pm 0.4	0.2 \pm 0.5	0.2 \pm 0.5

Household

N	196	171	141	128
Total (min/week)	690 (270 - 1080)	720 (300 - 1245)	680 (315 - 1260)	702 (300 - 1059)
% 0 min/week	6.6	4.1	5	7
Light (min/week)	690 (270 - 1058)	660 (300 - 1245)	680 (300 - 1260)	702 (300 - 1050)
% 0 min/week	6.6	4.7	5.7	7
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	92.9	91.8	90.1	89.1
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	190	175	141	126
Total (min/week)	0 (0 - 720)	0 (0 - 900)	0 (0 - 960)	0 (0 - 930)
% 0 min/week	55.3	52.6	53.2	55.6
Light	0 (0 - 480)	0 (0 - 600)	0 (0 - 540)	0 (0 - 480)
% 0 min/week	62.6	60.6	63.1	63.5
Moderate (min/week)	0 (0 - 0)	0 (0 - 30)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	83.7	74.9	75.2	77
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	197	174	143	127
Total (min/week)	0 (0 - 50)	0 (0 - 40)	0 (0 - 14)	0 (0 - 8)
% 0 min/week	68.5	70.7	72.7	74
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	85.3	85.6	86	86.6
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	96.4	94.8	95.8	97.6
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	79.2	82.8	83.9	84.3

Data presented as median (interquartile range), mean \pm SD or %

Neurologic disease

Appendix 1.7 Descriptive statistics of participants with a neurologic disease

	Population at T0	Population at T1	Population at T2	Population at T3
N	188	173	156	145
Age (years)	49.6 ± 12	49.7 ± 12.1	50.2 ± 11.8	51.1 ± 11.5
Sex (% male)	43.6	42.8	42.9	46.9
BMI (kg/m ²)	27 ± 6.6	27 ± 6.7	26.4 ± 5.8	26.2 ± 5.3
Smoking				
% Yes	19.7	20.2	19.9	17.2
% No	67.6	68.8	69.9	72.4
Alcohol use				
% No	53.2	53.2	57.1	55.9
% Light	8	8.1	7.1	8.3
% Moderate	23.9	25.4	23.1	23.4
% Excessive	2.1	2.3	2.6	2.1
Marital status				
% Single	30.3	31.2	31.2	31.2
% Married/living with partner	59.6	60.1	60.1	60.1
Education level				
% Low	60.6	61.3	60.3	59.3
% High	29.3	30.1	30.8	31
Work status				
% School	0.5	0.6	0	0.7
% Employed	28.2	30.1	28.8	28.3
% Unemployed	11.7	12.7	11.5	11.7
% Retired	9	8.7	10.3	9.7
% unable to work	32.4	31.2	31.4	32.4
% Other	8	8.1	9	7.6
Rehabilitation context				
% Rehabilitation center	69.7	69.9	68.6	70.3
% Hospital	30.3	30.1	31.4	29.7
Rehabilitation form				
% Inpatient	1.1	1.2	1.3	0.7
% Outpatient	93.1	93.1	92.9	94.5
% Consultancy	5.9	5.8	5.8	4.8
Number of counseling moments				
% 0	13.3	13.9	13.5	13.1
% 1-3	59	59	57.1	60.7
% 4 or more	27.7	27.2	29.5	26.2

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.8 Physical activity behavior of participants with a neurologic disease

	T0	T1	T2	T3
Total PA				
N	188	173	156	145
Total (min/week)	1478 (709 - 2268)	1500 (900 - 2625)	1770 (840 - 2280)	1450 (735 - 2280)
Light (min/week)	870 (311 - 1669)	930 (420 - 1890)	952 (412 - 1744)	840 (360 - 1635)
Moderate (min/week)	120 (0 - 480)	155 (0 - 510)	120 (0 - 458)	95 (0 - 420)
Vigorous (min/week)	48 (0 - 210)	90 (0 - 210)	90 (0 - 281)	45 (0 - 210)

Leisure time

N	186	171	153	143
Total (min/week)	420 (200 - 686)	405 (219 - 690)	450 (218 - 840)	360 (178 - 600)
% 0 min/week	5.9	2.9	3.3	6.3
Light (min/week)	60 (0 - 225)	30 (0 - 270)	60 (0 - 330)	60 (0 - 270)
% 0 min/week	44.1	46.8	39.9	42
Moderate (min/week)	60 (0 - 210)	90 (0 - 240)	60 (0 - 225)	60 (0 - 140)
% 0 min/week	34.4	35.1	36.6	39.9
Vigorous (min/week)	45 (0 - 180)	75 (0 - 198)	90 (0 - 240)	45 (0 - 180)
% 0 min/week	40.9	33.3	30.7	44.1
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3 \pm 2.8	3.2 \pm 2.8	3 \pm 2.7	2.8 \pm 2.7
Bicycling	1.6 \pm 2.1	1.6 \pm 2.1	1.7 \pm 2.1	1.3 \pm 1.9
wheelchair riding	0.4 \pm 1.5	0.5 \pm 1.6	0.6 \pm 1.7	0.6 \pm 1.7
Handbiking	0 \pm 0.1	0.1 \pm 0.5	0 \pm 0.3	0.1 \pm 0.5
Gardening	0.8 \pm 1.5	0.6 \pm 1.2	0.4 \pm 1	0.5 \pm 1.1
Odd jobs	0.5 \pm 1.2	0.4 \pm 1	0.4 \pm 1	0.4 \pm 1.1
Fitness	0.7 \pm 1.1	0.7 \pm 1	0.7 \pm 1.2	0.5 \pm 0.8
Swimming	0.3 \pm 0.6	0.3 \pm 0.6	0.2 \pm 0.4	0.2 \pm 0.5

Household

N	186	171	155	143
Total (min/week)	570 (180 - 1020)	540 (240 - 1020)	540 (240 - 1065)	420 (180 - 988)
% 0 min/week	13.4	12.3	11	15.4
Light (min/week)	540 (180 - 956)	480 (232 - 960)	480 (232 - 1065)	420 (165 - 900)
% 0 min/week	13.4	12.3	11.6	15.4
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.1	87.1	83.9	90.2
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	175	167	153	145
Total (min/week)	0 (0 - 600)	0 (0 - 750)	0 (0 - 540)	0 (0 - 600)
% 0 min/week	66.3	61.7	62.1	62.8
Light	0 (0 - 0)	0 (0 - 150)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	78.9	73.7	77.1	76.6
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	85.1	79.6	77.8	79.3
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	186	173	155	144
Total (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 10)	0 (0 - 0)
% 0 min/week	80.6	80.3	74.2	75.7
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	90.9	90.8	89	88.9
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	95.7	96	94.2	95.1
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	90.3	90.2	88.4	88.9

Data presented as median (interquartile range), mean \pm SD or %

Organ disease

Appendix 1.9 Descriptive statistics of participants with an organ disease

	Population at T0	Population at T1	Population at T2	Population at T3
N	152	141	123	107
Age (years)	59.9 ± 10.3	60.4 ± 10.1	60 ± 10.5	61.1 ± 10.9
Sex (% male)	68.4	68.8	65.9	68.2
BMI (kg/m ²)	28.6 ± 4.9	28.5 ± 4.9	28.4 ± 4.8	28.1 ± 4.9
Smoking				
% Yes	13.2	13.5	13	12.1
% No	78.9	80.1	80.5	81.3
Alcohol use				
% No	48	48.9	49.6	46.7
% Light	11.2	9.9	12.2	11.2
% Moderate	30.3	31.9	29.3	33.6
% Excessive	2	2.1	1.6	0.9
Marital status				
% Single	25	26.2	26.2	26.2
% Married/living with partner	69.1	68.1	68.1	68.1
Education level				
% Low	76.3	76.6	75.6	76.6
% High	17.1	17	18.7	18.7
Work status				
% School	0.7	0.7	0.8	0.9
% Employed	28.3	27.7	28.5	26.2
% Unemployed	11.8	12.1	14.6	12.1
% Retired	34.2	35.5	35	41.1
% unable to work	17.1	17	13.8	13.1
% Other	2.6	2.1	3.3	1.9
Rehabilitation context				
% Rehabilitation center	82.2	83	84.6	86
% Hospital	17.8	17	15.4	14
Rehabilitation form				
% Inpatient	2	2.1	1.6	1.9
% Outpatient	90.1	90.1	88.6	89.7
% Consultancy	7.9	7.8	9.8	8.4
Number of counseling moments				
% 0	10.5	9.9	10.6	10.3
% 1-3	61.8	61.7	63.4	60.7
% 4 or more	27.6	28.4	26	29

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.10 Physical activity behavior of participants with an organ disease

	T0	T1	T2	T3
Total PA				
N	152	141	123	107
Total (min/week)	1500 (840 - 2370)	1560 (870 - 2775)	1950 (870 - 3112)	1740 (904 - 3112)
Light (min/week)	600 (180 - 1489)	600 (180 - 1260)	600 (211 - 1770)	600 (165 - 1260)
Moderate (min/week)	300 (0 - 795)	390 (90 - 1080)	420 (60 - 1150)	385 (60 - 1042)
Vigorous (min/week)	120 (0 - 270)	180 (0 - 360)	124 (0 - 360)	180 (0 - 385)

Leisure time

N	152	139	120	105
Total (min/week)	505 (224 - 848)	605 (300 - 990)	570 (326 - 960)	690 (360 - 990)
% 0 min/week	2	2.2	2.5	5.7
Light (min/week)	0 (0 - 120)	0 (0 - 45)	0 (0 - 120)	0 (0 - 0)
% 0 min/week	67.8	71.2	67.5	77.1
Moderate (min/week)	180 (0 - 450)	180 (20 - 480)	180 (0 - 480)	240 (30 - 615)
% 0 min/week	31.6	23.7	26.7	24.8
Vigorous (min/week)	120 (0 - 270)	140 (0 - 352)	120 (0 - 300)	180 (20 - 360)
% 0 min/week	27.6	26.6	30	24.8
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3.7 \pm 2.6	3.5 \pm 2.5	3.4 \pm 2.6	3.7 \pm 2.6
Bycycling	1.7 \pm 2.1	1.5 \pm 1.9	1.5 \pm 1.9	1.9 \pm 2.1
wheelchair riding	0.1 \pm 0.7	0.1 \pm 0.6	0.1 \pm 0.9	0.1 \pm 1
Handbiking	0 \pm 0.1	0 \pm 0	0 \pm 0	0 \pm 0
Gardening	0.9 \pm 1.4	0.7 \pm 1.4	0.7 \pm 1	0.7 \pm 1.2
Odd jobs	0.9 \pm 1.5	0.7 \pm 1.5	0.8 \pm 1.3	0.9 \pm 1.6
Fitness	0	0.7 \pm 1.1	0.4 \pm 0.8	0.4 \pm 1
Swimming	0.2 \pm 0.5	0.1 \pm 0.4	0.1 \pm 0.4	0.1 \pm 0.5

Household

N	147	138	121	106
Total (min/week)	455 (142 - 930)	540 (169 - 960)	525 (240 - 1080)	525 (180 - 1005)
% 0 min/week	15.6	14.5	12.4	15.1
Light (min/week)	420 (128 - 840)	465 (150 - 840)	420 (150 - 900)	435 (139 - 840)
% 0 min/week	17.7	15.2	14.9	15.1
Moderate (min/week)	0 (0 - 0)	0 (0 - 60)	0 (0 - 60)	0 (0 - 84)
% 0 min/week	75.5	63	63.6	59.4
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	142	137	120	102
Total (min/week)	0 (0 - 480)	0 (0 - 480)	0 (0 - 765)	0 (0 - 705)
% 0 min/week	65.5	59.9	60.8	61.8
Light	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	84.5	84.7	84.2	85.3
Moderate (min/week)	0 (0 - 0)	0 (0 - 300)	0 (0 - 120)	0 (0 - 120)
% 0 min/week	78.2	67.9	70	71.6
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	148	141	122	102
Total (min/week)	0 (0 - 0)	0 (0 - 8)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	78.4	74.5	78.7	75.5
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	93.2	94.3	94.3	94.1
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	94.6	89.4	91.8	92.2
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	85.8	85.8	86.9	86.3

Data presented as median (interquartile range), mean \pm SD or %

Amputation

Appendix 1.11 Descriptive statistics of participants with an amputation

	Population at T0	Population at T1	Population at T2	Population at T3
N	57	52	47	40
Age (years)	56.8 ± 12.6	56.6 ± 13	55.9 ± 13.3	57.4 ± 12.2
Sex (% male)	77.2	78.8	76.6	82.5
BMI (kg/m ²)	27.1 ± 5.9	26.7 ± 5.8	26.7 ± 5.8	27.3 ± 6.1
Smoking				
% Yes	22.8	21.2	19.1	25
% No	70.2	73.1	76.6	72.5
Alcohol use				
% No	59.6	59.6	59.6	62.5
% Light	5.3	5.8	6.4	2.5
% Moderate	21.1	21.2	23.4	25
% Excessive	7	7.7	6.4	7.5
Marital status				
% Single	31.6	32.7	32.7	32.7
% Married/living with partner	61.4	61.5	61.5	61.5
Education level				
% Low	77.2	76.9	80.9	82.5
% High	14	15.4	12.8	12.5
Work status				
% School	0	0	0	0
% Employed	19.3	19.2	23.4	20
% Unemployed	8.8	7.7	10.6	7.5
% Retired	31.6	30.8	29.8	30
% unable to work	28.1	30.8	25.5	32.5
% Other	3.5	3.8	4.3	5
Rehabilitation context				
% Rehabilitation center	71.9	71.2	68.1	70
% Hospital	28.1	28.8	31.9	30
Rehabilitation form				
% Inpatient	7	5.8	8.5	7.5
% Outpatient	87.7	88.5	85.1	85
% Consultancy	5.3	5.8	6.4	7.5
Number of counseling moments				
% 0	17.5	19.2	19.1	20
% 1-3	42.1	42.3	40.4	45
% 4 or more	40.4	38.5	40.4	35

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.12 Physical activity behavior of participants with an amputation

	T0	T1	T2	T3
Total PA				
N	57	52	47	40
Total (min/week)	1294 (615 - 2130)	1942 (1260 - 2565)	1920 (1276 - 2925)	1918 (1130 - 2925)
Light (min/week)	840 (360 - 1680)	1238 (702 - 1732)	1200 (420 - 2070)	840 (420 - 1680)
Moderate (min/week)	210 (0 - 420)	190 (60 - 600)	210 (19 - 840)	330 (60 - 855)
Vigorous (min/week)	30 (0 - 180)	30 (0 - 278)	45 (0 - 240)	60 (0 - 278)

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60**Leisure time**

N	56	51	47	39
Total (min/week)	745 (311 - 1215)	690 (415 - 1290)	585 (262 - 1200)	660 (420 - 1122)
% 0 min/week	7.1	3.9	10.6	2.6
Light (min/week)	88 (0 - 725)	180 (0 - 540)	60 (0 - 420)	90 (0 - 472)
% 0 min/week	48.2	35.3	44.7	43.6
Moderate (min/week)	139 (0 - 375)	180 (0 - 450)	120 (0 - 480)	90 (0 - 480)
% 0 min/week	39.3	27.5	34	30.8
Vigorous (min/week)	30 (0 - 184)	30 (0 - 255)	30 (0 - 240)	60 (0 - 270)
% 0 min/week	46.4	47.1	46.8	46.2
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	2.9 \pm 3.1	2.9 \pm 3	2.7 \pm 2.8	3 \pm 3
Bycycling	0.7 \pm 1.8	0.7 \pm 1.6	0.8 \pm 1.7	0.7 \pm 1.6
wheelchair riding	2.8 \pm 3.3	2.2 \pm 3.1	1.9 \pm 2.9	2.3 \pm 3.2
Handbiking	0.2 \pm 0.8	0.4 \pm 1.3	0.4 \pm 1.1	0.3 \pm 0.9
Gardening	0.5 \pm 1.3	0.5 \pm 0.9	0.5 \pm 1.1	0.7 \pm 1.4
Odd jobs	0.7 \pm 1.6	0.9 \pm 1.6	0.7 \pm 1.3	1.1 \pm 1.8
Fitness	0.8 \pm 1.2	0.8 \pm 1.4	0.5 \pm 1	0.5 \pm 0.9
Swimming	0.5 \pm 0.9	0.3 \pm 0.5	0.2 \pm 0.5	0.2 \pm 0.4

Household

N	54	52	47	40
Total (min/week)	225 (0 - 652)	485 (202 - 840)	650 (225 - 1050)	420 (105 - 840)
% 0 min/week	29.6	19.2	21.3	22.5
Light (min/week)	225 (0 - 630)	485 (188 - 840)	630 (225 - 1005)	390 (105 - 840)
% 0 min/week	29.6	19.2	21.3	22.5
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 1)	0 (0 - 0)
% 0 min/week	90.7	86.5	74.5	82.5
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	53	49	46	38
Total (min/week)	0 (0 - 0)	0 (0 - 540)	0 (0 - 315)	0 (0 - 660)
% 0 min/week	75.5	59.2	69.6	52.6
Light	0 (0 - 0)	0 (0 - 240)	0 (0 - 0)	0 (0 - 315)
% 0 min/week	84.9	73.5	82.6	73.7
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 150)
% 0 min/week	84.9	77.6	76.1	65.8
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	57	52	47	39
Total (min/week)	0 (0 - 0)	0 (0 - 1)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.7	75	85.1	76.9
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	91.2	90.4	89.4	89.7
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	96.5	86.5	95.7	87.2
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	96.2	93.6	92.3

Data presented as median (interquartile range), mean \pm SD or %

Spinal cord injury

Appendix 1.13 Descriptive statistics of participants with SCI

	Population at T0	Population at T1	Population at T2	Population at T3
N	38	30	27	24
Age (years)	48.2 ± 15.4	48.2 ± 15.6	49.4 ± 14.2	50 ± 16.2
Sex (% male)	42.1	36.7	44.4	45.8
BMI (kg/m ²)	31 ± 23.8	32.4 ± 26.3	31.8 ± 28.3	31.5 ± 29.6
Smoking				
% Yes	18.4	20	14.8	16.7
% No	68.4	73.3	74.1	75
Alcohol use				
% No	42.1	43.3	44.4	41.7
% Light	2.6	3.3	3.7	0
% Moderate	34.2	36.7	33.3	41.7
% Excessive	7.9	10	7.4	8.3
Marital status				
% Single	44.7	43.3	43.3	43.3
% Married/living with partner	50	53.3	53.3	53.3
Education level				
% Low	60.5	56.7	55.6	66.7
% High	34.2	40	37	29.2
Work status				
% School	5.3	3.3	3.7	8.3
% Employed	26.3	26.7	25.9	16.7
% Unemployed	10.5	10	11.1	8.3
% Retired	18.4	20	18.5	25
% unable to work	26.3	26.7	25.9	29.2
% Other	7.9	10	7.4	8.3
Rehabilitation context				
% Rehabilitation center	89.5	86.7	88.9	91.7
% Hospital	10.5	13.3	11.1	8.3
Rehabilitation form				
% Inpatient	13.2	6.7	11.1	16.7
% Outpatient	73.7	76.7	70.4	66.7
% Consultancy	13.2	16.7	18.5	16.7
Number of counseling moments				
% 0	2.6	0	0	4.2
% 1-3	71.1	73.3	70.4	66.7
% 4 or more	26.3	26.7	29.6	29.2

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.14 Physical activity behavior of participants with SCI

	T0	T1	T2	T3
Total PA				
N	38	30	27	24
Total (min/week)	1515 (885 - 2059)	2018 (915 - 3008)	2100 (924 - 2599)	1700 (1061 - 2599)
Light (min/week)	885 (555 - 1582)	1185 (555 - 1642)	1185 (720 - 2115)	1203 (390 - 1779)
Moderate (min/week)	52 (0 - 240)	142 (0 - 465)	30 (0 - 225)	150 (0 - 484)
Vigorous (min/week)	42 (0 - 195)	120 (0 - 377)	90 (0 - 270)	120 (0 - 210)

Leisure time

N	38	30	26	23
Total (min/week)	435 (188 - 825)	604 (398 - 1155)	540 (375 - 862)	495 (370 - 955)
% 0 min/week	5.3	3.3	3.8	8.7
Light (min/week)	135 (0 - 442)	240 (0 - 555)	195 (1 - 465)	60 (0 - 375)
% 0 min/week	36.8	36.7	26.9	39.1
Moderate (min/week)	52 (0 - 240)	128 (0 - 285)	0 (0 - 232)	90 (0 - 321)
% 0 min/week	34.2	33.3	53.8	39.1
Vigorous (min/week)	42 (0 - 195)	120 (0 - 311)	75 (0 - 225)	120 (0 - 210)
% 0 min/week	44.7	33.3	30.8	30.4
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	2.1 \pm 2.6	2.2 \pm 2.6	1.5 \pm 2.1	2 \pm 2.5
Bycycling	1.2 \pm 2.1	1.6 \pm 2.4	0.8 \pm 1.8	1.6 \pm 2.6
wheelchair riding	1.6 \pm 2.6	1.7 \pm 2.9	2.6 \pm 3.4	2.5 \pm 3.3
Handbiking	0.3 \pm 1.3	0.3 \pm 0.9	0.7 \pm 1.4	0.4 \pm 1.2
Gardening	0.4 \pm 0.9	0.2 \pm 0.5	0.2 \pm 0.5	0.3 \pm 0.7
Odd jobs	0.8 \pm 1.6	0.4 \pm 1	0.3 \pm 0.6	0.7 \pm 1.3
Fitness	0	0.7 \pm 0.8	0.5 \pm 0.9	0.6 \pm 1
Swimming	0.5 \pm 0.8	0.4 \pm 0.8	0.2 \pm 0.5	0.2 \pm 0.5

Household

N	38	30	27	22
Total (min/week)	450 (38 - 840)	510 (135 - 998)	360 (180 - 1125)	322 (120 - 630)
% 0 min/week	21.1	13.3	11.1	13.6
Light (min/week)	450 (38 - 840)	510 (135 - 998)	360 (180 - 880)	278 (120 - 604)
% 0 min/week	21.1	13.3	11.1	13.6
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	97.4	86.7	92.6	86.4
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	36	30	27	23
Total (min/week)	0 (0 - 495)	0 (0 - 720)	180 (0 - 930)	0 (0 - 1110)
% 0 min/week	61.1	53.3	48.1	56.5
Light	0 (0 - 300)	0 (0 - 360)	0 (0 - 810)	0 (0 - 840)
% 0 min/week	69.4	70	55.6	65.2
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	86.1	83.3	88.9	82.6
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	38	30	27	24
Total (min/week)	0 (0 - 90)	0 (0 - 71)	0 (0 - 52)	0 (0 - 0)
% 0 min/week	63.2	70	66.7	79.2
Light (min/week)	0 (0 - 22)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	73.7	86.7	92.6	91.7
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	92.1	90	81.5	100
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	94.7	90	85.2	87.5

Data presented as median (interquartile range), mean \pm SD or %

Other diseases

Appendix 1.15 Descriptive statistics of participants with other diseases

	Population at T0	Population at T1	Population at T2	Population at T3
N	48	42	43	31
Age (years)	46.4 ± 13.8	47.4 ± 14.1	46.4 ± 13.9	46.9 ± 14.9
Sex (% male)	47.9	47.6	51.2	45.2
BMI (kg/m ²)	26 ± 4.6	25.7 ± 4.4	26.1 ± 4.6	26.8 ± 5
Smoking				
% Yes	10.4	9.5	11.6	6.5
% No	72.9	81	72.1	77.4
Alcohol use				
% No	35.4	40.5	34.9	35.5
% Light	18.8	19	20.9	22.6
% Moderate	27.1	28.6	25.6	22.6
% Excessive	2.1	2.4	2.3	3.2
Marital status				
% Single	14.6	16.7	16.7	16.7
% Married/living with partner	75	78.6	78.6	78.6
Education level				
% Low	62.5	64.3	69.8	71
% High	25	28.6	20.9	22.6
Work status				
% School	6.2	7.1	7	9.7
% Employed	39.6	40.5	41.9	41.9
% Unemployed	4.2	2.4	4.7	6.5
% Retired	12.5	14.3	11.6	12.9
% unable to work	20.8	23.8	18.6	16.1
% Other	6.2	7.1	7	6.5
Rehabilitation context				
% Rehabilitation center	62.5	66.7	60.5	61.3
% Hospital	37.5	33.3	39.5	38.7
Rehabilitation form				
% Inpatient	0	0	0	0
% Outpatient	93.8	92.9	95.3	93.5
% Consultancy	6.2	7.1	4.7	6.5
Number of counseling moments				
% 0	4.2	2.4	2.3	6.5
% 1-3	52.1	50	55.8	51.6
% 4 or more	43.8	47.6	41.9	41.9

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.16 Physical activity behavior of participants with other diseases

	T0	T1	T2	T3
Total PA				
N	48	42	43	31
Total (min/week)	1996 (1282 - 2535)	1715 (1402 - 3205)	2050 (1380 - 2960)	2135 (1560 - 2960)
Light (min/week)	1305 (652 - 2018)	1260 (562 - 2205)	1265 (731 - 2160)	1320 (530 - 2075)
Moderate (min/week)	132 (0 - 615)	172 (8 - 788)	240 (0 - 690)	180 (68 - 780)
Vigorous (min/week)	60 (0 - 188)	125 (40 - 251)	60 (0 - 205)	100 (60 - 240)

Leisure time

N	48	42	42	31
Total (min/week)	415 (216 - 735)	405 (285 - 889)	412 (259 - 630)	450 (312 - 810)
% 0 min/week	2.1	2.4	2.4	3.2
Light (min/week)	120 (0 - 315)	90 (0 - 288)	120 (0 - 348)	120 (0 - 300)
% 0 min/week	27.1	38.1	31	32.3
Moderate (min/week)	60 (0 - 225)	30 (0 - 285)	60 (0 - 202)	105 (0 - 352)
% 0 min/week	41.7	42.9	40.5	35.5
Vigorous (min/week)	60 (0 - 180)	120 (40 - 232)	60 (0 - 172)	75 (22 - 150)
% 0 min/week	33.3	23.8	35.7	22.6
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3.9 \pm 2.6	3.9 \pm 2.7	3.7 \pm 2.6	3.9 \pm 2.7
Bycycling	1.8 \pm 2	1.7 \pm 1.8	1.2 \pm 1.9	1.6 \pm 1.7
wheelchair riding	0 \pm 0	0 \pm 0.3	0.1 \pm 0.8	0 \pm 0
Handbiking	0 \pm 0.1	0 \pm 0	0 \pm 0	0 \pm 0
Gardening	1 \pm 1.5	0.8 \pm 1.5	0.5 \pm 0.8	1.3 \pm 1.9
Odd jobs	0.7 \pm 1.4	0.6 \pm 1.1	0.4 \pm 0.8	0.7 \pm 1.3

Household

N	48	42	43	31
Total (min/week)	740 (349 - 1060)	515 (188 - 982)	802 (480 - 1050)	720 (390 - 915)
% 0 min/week	6.2	7.1	2.3	6.5
Light (min/week)	660 (349 - 1028)	510 (188 - 945)	742 (420 - 960)	720 (360 - 915)
% 0 min/week	6.2	7.1	2.3	6.5
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	81.2	85.7	83.7	77.4
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	46	42	43	31
Total (min/week)	240 (0 - 810)	660 (0 - 1245)	480 (0 - 1440)	360 (0 - 1440)
% 0 min/week	43.5	33.3	37.2	41.9
Light	0 (0 - 450)	120 (0 - 900)	0 (0 - 690)	0 (0 - 840)
% 0 min/week	58.7	50	58.1	58.1
Moderate (min/week)	0 (0 - 105)	0 (0 - 285)	0 (0 - 450)	0 (0 - 150)
% 0 min/week	71.7	61.9	65.1	71
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	48	42	43	31
Total (min/week)	0 (0 - 45)	0 (0 - 79)	0 (0 - 60)	0 (0 - 110)
% 0 min/week	64.6	57.1	65.1	54.8
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	83.3	88.1	86	83.9
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	97.9	90.5	95.3	93.5
Vigorous (min/week)	0 (0 - 0)	0 (0 - 22)	0 (0 - 0)	0 (0 - 25)
% 0 min/week	77.1	73.8	79.1	71

Data presented as median (interquartile range), mean \pm SD or %

Appendix 3. Effect modification of personal characteristics and diagnosis on the development of physical activity behavior

			Total PA			Leisure time			Household			Work			Commuting			MVPA		
			β	SE	P-value	β	SE	P-value	β	SE	P-value	β	SE	P-value	β	SE	P-value	β	SE	P-value
8	Diagnosis	(Intercept)	1676.4	76.2	>.001	63.3	37.2	>.001	626.7	37.7	>.001	373.9	43.3	>.001	64.5	13.5	>.001	654.7	44.9	>.001
9	Brain disease (ref)	t1	223.9	74.2	.003	67.6	41.9	.107	-6.3	4.2	.876	144.5	4.4	>.001	17.5	18.0	.332	132.7	46.4	.004
10		t2	211.7	78.3	.007	-23.7	44.0	.590	7.4	42.2	.861	172.2	42.2	>.001	59.8	18.9	.002	147.5	49.0	.003
11		t3	144.1	80.6	.074	29.9	45.5	.512	-29.2	43.2	.500	128.7	43.3	.003	7.5	19.5	.701	105.0	5.4	.037
12		Musculoskeletal disorder	307.5	109.6	.005	-62.1	55.9	.267	181.4	58.9	.002	20.4	67.7	.003	-7.1	21.2	.736	-54.6	7.4	.438
13		Chronic pain	164.6	114.8	.152	-79.4	58.6	.176	169.0	61.9	.006	75.6	7.7	.285	4.3	22.3	.845	-246.1	74.1	.001
14		Neurologic disease	12.9	117.0	.913	-29.8	59.9	.618	45.5	63.0	.470	36.8	72.2	.611	-19.7	22.7	.385	-104.7	75.4	.165
15		Organ disease	129.3	128.1	.313	43.7	64.9	.501	73.3	68.0	.281	38.2	77.7	.622	-19.0	24.5	.438	127.1	8.9	.116
16		Amputation	-122.4	184.0	.506	344.3	94.5	>.001	-205.0	10.4	.041	-201.0	114.4	.078	-45.6	35.6	.201	-137.5	118.7	.247
17		Spinal cord injury	27.8	219.6	.899	19.5	112.2	.862	-118.7	118.1	.315	67.9	135.5	.617	3.6	42.6	.472	-165.4	141.9	.244
18		Other diseases	392.7	197.8	.047	15.9	101.1	.875	244.9	106.5	.021	106.7	121.1	.382	1.6	38.4	.783	-2.6	127.9	.984
19		t1 * Musculoskeletal disorder	38.1	116.8	.744	15.4	66.0	.815	35.0	62.9	.578	-54.5	63.3	.388	4.2	28.3	.157	-39.0	73.0	.593
20		t2 * Musculoskeletal disorder	36.5	123.6	.768	5.4	69.6	.470	-32.2	66.6	.629	66.7	67.7	.321	-44.5	29.8	.136	-6.6	77.3	.433
21		t3 * Musculoskeletal disorder	70.5	128.6	.584	27.9	72.8	.702	-63.0	69.1	.362	71.6	69.9	.302	4.6	3.9	.189	-3.5	8.4	.965
22		t1 * Chronic pain	6.6	122.0	.957	-1.1	69.2	.987	114.3	66.0	.084	-69.0	65.0	.293	-15.0	29.7	.613	-6.7	76.2	.426
23		t2 * Chronic pain	-20.1	130.1	.877	66.7	73.2	.363	72.7	7.2	.300	-71.1	7.7	.314	-81.0	31.4	.010	-8.2	81.4	.919
24		t3 * Chronic pain	-118.9	135.0	.379	-43.8	76.4	.566	17.3	72.4	.811	-52.6	73.3	.471	-28.4	32.5	.383	-21.9	84.4	.796
25		t1 * Neurologic disease	-114.5	123.1	.352	-73.0	69.7	.295	66.7	66.3	.315	-99.8	66.2	.136	-18.0	29.9	.548	-12.9	76.9	.116
26		t2 * Neurologic disease	-11.6	128.4	.928	121.0	72.6	.096	35.0	69.0	.612	-141.7	69.8	.043	-36.8	31.1	.236	-4.5	8.3	.614
27		t3 * Neurologic disease	-176.5	131.8	.181	-105.8	74.6	.156	-2.4	7.8	.973	-75.6	71.1	.290	13.2	31.9	.679	-8.7	82.4	.327
28		t1 * Organ disease	-94.0	131.9	.476	5.0	74.6	.947	-3.8	71.6	.957	-134.6	71.1	.061	2.7	32.1	.520	28.7	82.4	.728
29		t2 * Organ disease	76.0	138.5	.583	49.4	78.3	.528	24.3	74.9	.745	-9.6	75.5	.899	-5.8	33.6	.862	111.6	86.5	.197
30	t3 * Organ disease	181.2	144.4	.209	96.5	81.6	.237	2.6	77.8	.792	5.5	78.8	.522	38.2	35.3	.279	154.0	9.3	.088	
31	t1 * Amputation	365.9	193.8	.059	-36.5	11.3	.741	162.9	105.2	.122	16.4	107.7	.134	85.2	47.0	.070	84.4	121.1	.486	
32	t2 * Amputation	317.9	201.1	.114	-129.2	113.6	.255	319.9	108.7	.003	121.6	109.9	.268	-2.6	48.6	.671	44.6	125.7	.722	
33	t3 * Amputation	359.5	211.7	.090	-114.4	12.5	.343	203.2	114.4	.076	165.1	115.5	.154	115.8	51.3	.024	156.8	132.4	.236	

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1																				
2																				
3																				
4		t1 * Spinal cord injury	-18.7	242.1	.938	86.9	136.3	.524	99.0	129.4	.445	-197.9	129.	.128	-22.0	58.4	.706	-26.9	151.3	.859
5		t2 * Spinal cord injury	271.2	252.1	.282	304.2	143.4	.034	171.0	134.8	.205	-152.5	136.	.264	-44.9	6.5	.458	-74.2	157.7	.638
6		t3 * Spinal cord injury	113.3	262.6	.666	142.8	149.6	.340	126.4	144.5	.382	2.7	143.	.985	-62.1	62.8	.323	49.2	164.3	.765
7		t1 * Spinal cord injury	10.7	211.3	.960	-67.1	119.0	.573	-86.2	112.9	.446	179.4	113.	.114	-17.6	51.1	.731	32.1	132.0	.808
8		t2 * Spinal cord injury	-83.8	211.5	.692	-113.2	119.8	.345	67.9	113.0	.548	45.8	113.	.687	-88.1	51.2	.085	-122.4	132.1	.354
9		t3 * Spinal cord injury	96.1	234.1	.681	-44.0	131.5	.738	-54.1	125.0	.665	91.6	125.	.465	97.4	56.2	.083	-73.8	146.4	.614
10		Type III ANOVA Diagnosis			.001			>.001			>.001			.001			.311			>.001
11		Type III ANOVA Time *																		
12		Diagnosis			.612			.263			.493			.105			.041			.860
13																				
14	Age	(Intercept)	2429.2	142.5	>.001	446.2	73.9	>.001	846.2	77.6	>.001	1006.4	87.	>.001	115.2	27.7	>.001	-96.0	91.7	.296
15		t1	436.5	152.0	.004	84.4	86.4	.329	85.6	81.7	.295	258.6	81.	.002	66.1	37.0	.074	21.9	95.0	.818
16		t2	589.1	164.0	>.001	69.4	93.0	.455	104.4	88.1	.236	428.8	88.	>.001	23.1	39.7	.560	78.2	102.6	.446
17		t3	416.5	169.0	.014	-16.7	96.5	.863	4.1	9.8	.964	441.2	91.	>.001	34.8	4.9	.395	-2.2	105.7	.983
18		Age	-12.7	2.7	>.001	3.5	1.4	.012	-2.9	1.5	.049	-11.4	1.	>.001	-1.1	.5	.033	13.5	1.7	>.001
19		t1 * Age	-4.2	2.9	.143	-.5	1.6	.750	-1.0	1.6	.529	-3.1	1.	.046	-0.8	.7	.250	1.6	1.8	.372
20		t2 * Age	-6.7	3.1	.031	-1.0	1.8	.567	-1.1	1.7	.492	-5.4	1.	.001	0.1	.8	.919	1.1	1.9	.556
21		t3 * Age	-5.1	3.2	.113	0.7	1.8	.708	-0.6	1.7	.728	-5.9	1.	.001	-0.2	.8	.797	2.2	2.0	.271
22		Type III ANOVA Time * Age			.145			.839			.894			.002			.618			.696
23																				
24																				
25	Sex	(Intercept)	1642.7	59.1	>.001	619.5	25.7	>.001	461.8	27.6	>.001	453.3	39.	>.001	54.7	1.3	>.001	69.9	39.4	>.001
26		t1	265.0	55.9	>.001	61.9	25.6	.016	48.9	3.2	.105	113.8	3.	>.001	36.5	13.6	.007	172.0	34.8	>.001
27	Male (ref)	t2	285.5	58.8	>.001	29.6	26.7	.268	93.6	31.7	.003	147.8	32.	>.001	4.1	14.3	.005	183.8	36.7	>.001
28		t3	235.0	60.5	>.001	4.8	27.8	.142	32.5	32.5	.318	138.9	32.	>.001	51.1	14.7	.001	195.5	37.8	>.001
29		Female	273.9	73.0	>.001	-22.4	51.6	.665	45.4	37.9	>.001	-45.7	45.	.314	6.2	14.2	.664	-203.1	46.9	>.001
30		t1 * Female	-87.6	77.3	.257	17.0	6.0	.776	-24.6	41.7	.555	-25.9	42.	.537	-22.8	18.8	.225	-128.3	48.2	.008
31		t2 * Female	-81.9	81.2	.313	-8.0	63.9	.901	-93.6	43.7	.032	7.7	44.	.862	-25.9	19.7	.189	-86.1	5.7	.089
32		t3 * Female	-155.2	84.5	.066	-78.5	66.9	.241	-107.9	45.4	.018	-2.7	45.	.953	-53.0	2.5	.010	-161.9	52.7	.002
33		Type III ANOVA Time * Sex			.314			.633			.045			.887			.080			.009
34																				
35																				
36	BMI	(Intercept)	2008.8	135.0	>.001	668.2	68.1	>.001	768.1	71.9	>.001	553.0	81.	>.001	5.2	24.2	.038	643.7	86.8	>.001
37		t1	346.7	133.3	.009	101.3	75.6	.180	55.3	71.9	.442	155.6	7.	.028	31.1	31.4	.322	131.2	82.7	.113
38		t2	204.6	137.1	.136	87.2	77.5	.260	-72.7	74.0	.326	139.3	73.	.058	54.8	32.2	.089	116.8	85.1	.170
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2																				
3		t3	62.4	140.5	.657	96.6	79.5	.224	-173.9	75.8	.022	146.5	74.4	.051	12.7	33.0	.700	72.3	87.2	.407
4		BMI	-8.8	4.5	.049	-1.9	2.3	.403	-2.4	2.4	.331	-4.8	2.2	.079	0.2	.8	.816	-2.5	2.9	.398
5		t1 * BMI	-4.0	4.6	.384	-1.4	2.6	.605	-0.8	2.5	.760	-1.6	2.2	.518	-0.4	1.1	.742	-0.8	2.9	.771
6		t2 * BMI	1.9	4.7	.692	-2.1	2.7	.441	4.3	2.6	.093	0.4	2.2	.861	-1.1	1.1	.338	0.8	2.9	.791
7		t3 * BMI	3.4	4.9	.490	-2.5	2.7	.356	5.4	2.6	.038	-0.4	2.2	.875	0.2	1.1	.859	1.4	3.0	.651
8		Type III ANOVA Time * BMI			.457			.800			.042			.870			.703			.898
9																				
10																				
11	Smoking behavior	(Intercept)	1758.6	59.7	>.001	619.5	25.7	>.001	689.0	27.3	>.001	422.9	33.2	>.001	55.3	8.2	>.001	589.3	35.3	>.001
12	No (ref)	t1	244.3	44.9	>.001	61.9	25.6	.016	38.9	24.2	.107	114.5	24.2	>.001	21.3	1.7	.047	111.1	28.0	>.001
13		t2	278.6	46.8	>.001	29.6	26.7	.268	47.4	25.2	.060	162.3	25.2	>.001	3.0	11.1	.007	172.7	29.2	>.001
14		t3	194.5	48.6	>.001	4.8	27.8	.142	-14.8	26.1	.570	143.8	26.1	>.001	19.6	11.6	.091	129.1	3.4	>.001
15		Yes	9.9	99.4	.921	-22.4	51.6	.665	42.8	54.2	.430	-14.2	61.1	.817	2.4	18.8	.898	-89.4	64.1	.163
16		t1 * Yes	26.7	104.3	.798	17.0	6.0	.776	41.5	56.3	.461	-21.9	56.3	.699	2.4	24.9	.925	1.4	65.1	.983
17		t2 * Yes	-113.2	111.8	.311	-8.0	63.9	.901	25.1	6.2	.677	-87.0	6.2	.150	-3.5	26.5	.250	-212.3	69.8	.002
18		t3 * Yes	-190.8	116.6	.102	-78.5	66.9	.241	-21.9	62.8	.728	-53.6	63.2	.398	-9.5	27.6	.730	-98.2	72.8	.178
19		Type III ANOVA Time * Smoking behavior			.231			.546			.759			.516			.621			.008
20																				
21																				
22																				
23	Alcohol use	(Intercept)	1764.2	63.9	>.001	594.5	28.8	>.001	727.2	31.2	>.001	409.9	37.1	>.001	58.6	9.6	>.001	533.2	37.8	>.001
24	No (ref)	t1	239.0	53.1	>.001	56.5	3.4	.063	53.1	28.6	.064	9.8	28.6	.002	29.7	12.7	.019	103.9	33.2	.002
25		t2	206.2	55.5	>.001	18.7	31.7	.555	37.8	29.9	.206	13.0	3.0	>.001	1.6	13.2	.423	96.5	34.6	.005
26		t3	93.8	57.6	.103	-12.4	33.0	.706	-24.3	3.9	.433	105.6	31.2	.001	19.2	13.7	.161	63.8	36.0	.076
27		Light	-89.9	122.9	.465	-3.0	63.5	.962	-138.1	66.8	.039	59.2	76.1	.441	-23.7	23.5	.312	-25.4	79.1	.748
28		Moderate	86.8	89.8	.334	107.4	46.5	.021	-39.9	48.9	.415	33.6	55.2	.547	0.2	17.0	.992	175.0	57.8	.002
29		Excessive	-614.7	247.9	.013	-291.6	128.0	.023	-85.4	136.1	.530	-244.3	155.2	.116	-13.3	47.6	.780	-164.1	159.4	.304
30		t1 * Light	134.5	129.4	.299	11.0	73.9	.882	88.1	69.6	.206	81.5	7.1	.247	-24.9	31.0	.422	-19.6	8.7	.808
31		t2 * Light	360.2	134.1	.007	124.6	76.6	.104	82.9	72.4	.252	105.5	73.2	.149	82.3	32.0	.010	174.9	83.7	.037
32		t3 * Light	331.1	139.7	.018	202.3	8.5	.012	49.0	75.0	.514	128.5	76.1	.095	18.2	33.4	.586	13.0	87.2	.136
33		t1 * Moderate	-31.8	93.5	.734	14.9	53.7	.781	-65.7	5.5	.193	33.8	5.2	.505	-11.1	22.4	.619	25.9	58.4	.658
34		t2 * Moderate	42.0	99.0	.671	-21.7	56.6	.701	25.7	53.2	.629	4.9	53.2	.928	17.3	23.5	.462	67.5	61.8	.275
35		t3 * Moderate	56.8	102.9	.581	34.8	58.7	.553	-9.7	55.3	.861	32.4	55.2	.562	-12.5	24.5	.608	85.6	64.2	.183
36		t1 * Excessive	147.2	254.5	.563	119.4	145.1	.411	0.4	137.7	.998	84.2	141.1	.551	-62.3	61.4	.310	11.9	158.8	.485
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3		t2 * Excessive	78.4	272.9	.774	68.6	155.2	.658	-116.3	148.7	.434	202.6	149.6	.175	-0.8	65.9	.990	169.6	17.4	.319
4		t3 * Excessive	716.7	298.2	.016	347.4	169.3	.040	121.5	163.3	.457	311.3	167.0	.064	6.6	71.9	.927	586.4	186.2	.002
5		Type III ANOVA Alcohol use			.064			.001			.308			.112			.847			>.001
6		Type III ANOVA Time * Alcohol use			.074			.157			.514			.586			.145			.040
7																				
8																				
9	Education level	(Intercept)	1758.9	61.4	>.001	634.4	27.4	>.001	723.4	27.9	>.001	373.2	34.2	>.001	55.3	8.2	>.001	584.8	37.8	>.001
10	Low (ref)	t1	216.2	46.9	>.001	63.5	26.6	.017	35.2	25.3	.164	95.3	25.2	>.001	22.5	1.9	.038	114.0	29.1	>.001
11		t2	197.8	49.1	>.001	16.8	27.8	.546	34.8	26.5	.190	13.4	26.0	>.001	16.5	11.3	.147	127.8	3.6	>.001
12		t3	90.2	50.8	.076	6.0	28.9	.834	-36.6	27.3	.181	112.1	27.0	>.001	14.0	11.7	.234	104.7	31.6	.001
13		High	13.4	88.3	.879	-77.9	45.7	.088	-94.2	48.2	.051	187.1	54.0	.001	1.3	16.4	.935	-43.7	57.3	.446
14		t1 * High	100.0	92.6	.280	-1.1	52.6	.984	24.1	5.0	.629	66.9	49.0	.180	-4.7	21.5	.826	-24.7	57.6	.668
15		t2 * High	220.5	97.3	.024	55.1	55.2	.318	46.7	52.4	.374	78.9	52.0	.134	23.4	22.4	.297	34.6	6.6	.568
16		t3 * High	260.9	102.1	.011	84.1	58.0	.147	53.1	55.0	.335	94.9	55.0	.085	15.6	23.5	.506	21.7	63.5	.733
17		Type III ANOVA Time * Education level			.038			.375			.749			.284			.581			.791
18																				
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STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	1 & 2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4&5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5&6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (b) For matched studies, give matching criteria and number of exposed and unexposed	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-9
Bias	9	Describe any efforts to address potential sources of bias	-
Study size	10	Explain how the study size was arrived at	6-9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, explain how loss to follow-up was addressed (e) Describe any sensitivity analyses	8-9
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	9 + table 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	9 + table 1
Outcome data	15*	Report numbers of outcome events or summary measures over time	9&10 + table 2

1	Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-11 + table 2, 3, figures 1 and 3 and appendix 2
2			(b) Report category boundaries when continuous variables were categorized	
3			(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
4	Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10 & 11, Figure 3, appendix 2
5	Discussion			
6	Key results	18	Summarise key results with reference to study objectives	11
7	Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13&14
8	Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-15
9	Generalisability	21	Discuss the generalisability (external validity) of the study results	13
10	Other information			
11	Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at <http://www.strobe-statement.org>.

BMJ Open

Physical activity behavior up to one year post rehabilitation among adults with physical disabilities and/or chronic diseases: results of the prospective cohort study ReSpAct

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PA in adults with physical disabilities/chronic diseases

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2
3 1 **Title:** Physical activity behavior up to one year post rehabilitation among adults with physical
4 2 disabilities and/or chronic diseases: results of the prospective cohort study ReSpAct

5 3 **Brief running head:** PA in adults with physical disabilities/chronic diseases

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1
2
3 26 **Background:** Little is known of physical activity behavior among adults with a disability and/or
4
5 27 chronic disease during and up to one year post rehabilitation. We aimed to explore 1) dose
6
7 28 characteristics of physical activity behavior among adults with physical disabilities and/or
8
9 29 chronic diseases during that period, and 2) the effects of personal characteristics and diagnosis
10
11 30 on the development of physical activity over time.

12 31 **Methods:** Adults with physical disabilities and/or chronic diseases (N=1256), enrolled in the
13
14 32 Rehabilitation, Sports and Active lifestyle (ReSpAct) study, were followed with questionnaires:
15
16 33 3-6 weeks before (T0) and 14 (T1), 33 (T2) and 52 (T3) weeks after discharge from
17
18 34 rehabilitation. Physical activity was assessed with the Adapted-SQUASH. Dose characteristics
19
20 35 of physical activity were descriptively analyzed. Multilevel regression models were performed
21
22 36 to assess physical activity over time and the effect of personal and diagnosis characteristics
23
24 37 on PA over time.

25 38 **Results:** Median total physical activity ranged from 1545 (IQR: 853 – 2453) at T0 to 1710 (IQR:
26
27 39 960 – 2730) at T3 min/wk. Household (495 to 600 min/wk) and light-intensity (900 to 998
28
29 40 min/wk) activities accrued the most minutes. Analyses showed a significant increase in total
30
31 41 physical activity moderate- to vigorous-intensity physical activity and work/commuting
32
33 42 physical activity for all time points (T1-T3) compared to baseline (T0). Diagnosis, age, sex and
34
35 43 body mass index had a significant effect on baseline total physical activity.

36 44 **Conclusion:** Physical activity is highly diverse among adults with physical disabilities and/or
37
38 45 chronic diseases. Understanding this diversity in physical activity can help improving physical
39
40 46 activity promotion activities.

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42 47
43 48 **Keywords:** Epidemiology, Rehabilitation medicine, Sports medicine, Public health
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PA in adults with physical disabilities/chronic diseases

49 **Strengths and limitations of this study**

- 50 • This is a largescale prospective cohort study that gives a detailed overview of the
51 different dose characteristics of physical activity behavior in adults with physical
52 disabilities and/or chronic diseases.
- 53 • We measured physical activity with a self-reported questionnaire specifically
54 designed for adults with disabilities giving detailed information on the different dose
55 characteristics.
- 56 • We included a large heterogeneous group of adults with physical disabilities and/or
57 chronic diseases, which makes it more applicable to the general rehabilitation setting
58 and population.
- 59 • Potential sample selection bias may be present, since participants could only
60 participate in the ReSpAct cohort study if they received physical activity counselling
61 support during their rehabilitation treatment
- 62

63 Introduction

64 Regular physical activity (PA) has many benefits on cognitive, mental and physical health,
65 fitness, and quality of life, for both the general population as well as for adults with physical
66 disabilities and/or chronic diseases.¹⁻⁴ Besides the direct health benefits for adults with
67 physical disabilities/chronic diseases, being more physically active is also considered a
68 secondary (reducing or preventing long term effects of an established health
69 problem/disease) and tertiary (reduce impact of an established health problem/disease by
70 restoring function and reduce disease related complications) prevention mechanism.^{5, 6}
71 Despite these benefits, PA behavior is suggested to be low among adults with physical
72 disabilities/chronic diseases.⁷⁻⁹

73 The recently updated World Health Organization (WHO) guidelines for PA recommend
74 that all adults, including those with physical disabilities and/or chronic diseases, should be
75 physically active for at least 150-300 minutes of moderate-intensity or 75-150 minutes of
76 vigorous-intensity per week or an equivalent combination, with the addition of muscle-
77 strengthening activities of at least moderate-intensity twice per week.^{10, 11} While these
78 recommendations are formulated for adults with physical disabilities/chronic diseases, the
79 development of the guidelines is mainly informed by evidence from studies in the general
80 population.¹¹ As highlighted by the WHO PA Guidelines Development Group and the
81 accompanying research agenda there is a clear need for more research on PA among adults
82 with physical disabilities/chronic diseases.^{12, 13}

83 Despite various calls for more research on PA in people with disabilities¹⁴⁻¹⁶, measuring
84 and understanding dose-response relationships of the construct of PA in the context of a
85 heterogeneous population with disabilities is not straightforward. PA is defined as “any bodily
86 movement produced by skeletal muscles that results in energy expenditure”.¹⁷ It is by
87 definition a multidimensional construct, with setting (e.g. PA during leisure time, work), mode
88 (e.g. walking, bicycling), frequency (e.g. times per week), duration (e.g. in hours) and intensity
89 (e.g. low, moderate or vigorous) as its crucial constituents.^{18, 19} These dimensions could also
90 be called the dose characteristics of PA, and are important to understand PA among different
91 subgroups, as well as to study the dose-response relations of PA and health during and after
92 rehabilitation. Furthermore, it could be an important aspect in tailored PA counseling, as more
93 information on dose characteristics can lead to more focused PA recommendations. Only a
94 few studies described details on multiple dose characteristics of PA in adults with physical

PA in adults with physical disabilities/chronic diseases

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2
3 95 disabilities/chronic diseases²⁰⁻²². These studies either mainly concern validation of
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5 96 instruments that measure multiple dose characteristics, and not focused on describing the
6
7 97 dose characteristics itself^{20, 22} or are of a cross sectional nature in small diagnosis specific
8
9 98 populations²¹. Consequently, there is a need for largescale prospective studies that take this
10
11 99 multidimensionality of PA within and among adults with a diversity of disabilities/chronic
12
13 100 diseases into account.

14 101 An important step to enhance our understanding of PA is to explore the effect of
15
16 102 personal characteristics on the multidimensional construct PA behavior. Adults with physical
17
18 103 disabilities/chronic diseases are a heterogeneous group, both in PA behavior⁹ and personal
19
20 104 and disease characteristics.²³ Personal characteristics, such as age and sex, are determinants
21
22 105 for PA in the general population and specific diagnosis groups,²⁴⁻²⁷ yet it is largely unknown
23
24 106 how these characteristics influence the development of PA over time during and after a PA
25
26 107 promoting rehabilitation program. As such, it is important to understand which dimensions of
27
28 108 PA behavior contribute to the dose of PA and how this is perceived in the context of personal
29
30 109 characteristics or diagnoses. Such insights will help to understand PA behavior over time, and
31
32 110 will enable to individualize PA stimulation programs.

33 111 The multicenter prospective cohort study “Rehabilitation, Sports and Active Lifestyle”
34
35 112 (ReSpAct) offers a great opportunity to start addressing these knowledge gaps.^{28, 29} This study
36
37 113 was built around the implementation of a PA behavioral intervention in Dutch rehabilitation
38
39 114 care.^{28, 29} Uniquely, the ReSpAct study includes data on self-reported PA behavior and
40
41 115 potential determinants in a large, diverse population of adults with physical
42
43 116 disabilities/chronic diseases at four occasions: 3-6 weeks before discharge up to 1 year after
44
45 117 discharge of rehabilitation.^{28, 29}

46 118 Using data from the ReSpAct study, the primary aim of this study was to explore the
47
48 119 different dose characteristics of PA behavior (duration, setting, intensity, mode and
49
50 120 frequency) among a diverse group of adults with a physical disability and/or chronic disease
51
52 121 at discharge from rehabilitation up to one year post rehabilitation. The secondary aims were
53
54 122 to explore the development of PA behavior over time, and to analyze the effects of personal
55
56 123 characteristics and diagnosis on PA behavior and its development over time.

57 124

58 125 **Methods**

59 126 *Study overview*

1
2
3 127 This study is part of prospective cohort study ReSpAct to evaluate the nationwide
4
5 128 implemented Dutch rehabilitation program Rehabilitation, Sport and Exercise (RSE, Dutch:
6
7 129 “Revalidatie, Sport en Bewegen”).^{28, 29} RSE is an evidence-based PA counseling program
8
9 130 involving multiple counseling sessions based on motivational interviewing during and after
10
11 131 rehabilitation to stimulate a physically active lifestyle in adults with physical
12
13 132 disabilities/chronic diseases.²⁸⁻³¹ Participants, recruited between May 2013 and August 2015,
14
15 133 were followed over time with a set of questionnaires: at baseline (T0: 3-6 weeks before
16
17 134 discharge), and at 14 (T1), 33 (T2) and 52 (T3) weeks after discharge from rehabilitation.²⁸ The
18
19 135 study was approved by the Ethical Committee of the Center for Human Movement Sciences
20
21 136 of the University Medical Center Groningen (reference: ECB/2013.02.28_1). All participants
22
23 137 voluntarily participated after signing an informed consent.

23 138

25 139 *Patient and public involvement*

26
27 140 Representatives of the Dutch community organizations Knowledge Centre for Sport
28
29 141 Netherlands and Stichting Special Heroes (former: Stichting Onbeperkt Sportief) were
30
31 142 involved as collaborators and consultants in the design and conduct of the ReSpAct study.^{28,}
32
33 143 ²⁹ Rehabilitation professionals (counsellors, project leaders, physicians, managers) from the
34
35 144 participating rehabilitation centres and hospitals were involved as consultants in the design
36
37 145 and conduct of the ReSpAct study. We did not involve people with disabilities/chronic diseases
38
39 146 as consultants/advisors/collaborators in the study. The current paper reports results from the
40
41 147 primary outcome measure of the ReSpAct study (physical activity).

43 149 *Study population*

44
45 150 Inclusion criteria for this study were: 1) aged 18 years or older; 2) having a physical disability
46
47 151 and/or chronic disease; 3) receiving inpatient, outpatient or consultancy rehabilitation
48
49 152 treatment at one of the participating rehabilitation departments or institutes; 4) participating
50
51 153 in the RSE program; 5) data available on diagnosis; and 6) valid data available of the adapted
52
53 154 version of the Short Questionnaire to ASsess Health enhancing physical activity (Adapted-
54
55 155 SQUASH) at baseline and at least one follow-up measurement.

56 156 Participants were excluded if they 1) were unable to complete questionnaires, even
57
58 157 with help; 2) participated in a PA program other than RSE.

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60 158

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159 *PA behavior*

160 Self-reported PA behavior was measured using the Adapted-SQUASH, a 19-item recall
161 questionnaire to assess PA among adults with disabilities based on an average week of the
162 past month.³² Participants had to fill out the number of days (frequency), average hours and
163 minutes per day (duration) and the perceived intensity (intensity: light, moderate, vigorous)
164 of different types of activities (mode: e.g. walking, cycling, wheeling, gardening) that were pre-
165 structured in different settings: activities during commuting, activities at work and school,
166 household activities and leisure time activities. The Adapted-SQUASH has a good reliability
167 (ICC = .67 and .76, for total activity score and total minutes of activity per week respectively),
168 and a validity comparable to other PA questionnaires when using accelerometer derived PA
169 ($\rho = .40$ for total activity score and ICC = .22 for total minutes of activity per week).³²

170 Raw Adapted-SQUASH data were processed with a custom created syntax (SPSS
171 statistics 26, IBM). Minutes of activity per week were calculated by multiplying frequency by
172 duration. Intensity of activity was calculated by combining the perceived intensity of each
173 activity with a corresponding metabolic equivalent of task (MET) value based on the Ainsworth
174 compendium of physical activities³³ and a compendium of energy costs of the physical
175 activities for wheelchair dependent individuals³⁴ into light (<4 MET for people 18-65 years old,
176 <3 for people older than 65), moderate (4-6.5 for people 18-65 years old, MET 3-6 MET for
177 people older than 65) or vigorous intensity (>6.5 for people 18-65 years old, >6 MET for people
178 older than 65).^{32, 35} Primary outcomes were total minutes PA per week, minutes PA per setting,
179 minutes PA per intensity, and the frequency of PA modes.

180 Adapted-SQUASH data of a measurement occasion was deemed valid when no more
181 than one of the pre-structured settings was missing and the total minutes PA per week was
182 not higher than 6720 minutes (on average 16 hours/day).

184 *Personal characteristics*

185 Personal characteristics included age, sex, body mass index (BMI), marital status, current
186 smoking habit, current alcohol usage, education level and work status. Current smoking habit
187 was dichotomized into smoker and non-smoker. Current alcohol usage was categorized in no,
188 light (1-3 or 1-2 drinks per week for males and females respectively), moderate (4-20 or 3-13
189 drinks per week for males and females respectively) and excessive (≥ 21 or ≥ 14 drinks per
190 week for males and females respectively).⁸ Education level was dichotomized into high

1
2
3 191 (applied university and higher) and low, to make it internationally comparable. Work status
4
5 192 was categorized into school, employed, unemployed, retired, unable to work and other (e.g.
6
7 193 voluntary work). Personal characteristics were self-reported by participants, with the
8
9 194 exception of age and sex, which were reported by the RSE counselor.

10 195

11 196 *Rehabilitation characteristics*

12 197 Rehabilitation characteristics included diagnosis, rehabilitation context (hospital or
13
14 198 rehabilitation center), rehabilitation form (inpatient-, outpatient, or consultancy
15
16 199 rehabilitation) and number of received counseling sessions from the RSE program (0 sessions,
17
18 200 1-3 sessions, 4 or more sessions).

21 201 Different diagnoses were grouped according to diagnosis groups of the Dutch
22
23 202 Diagnose-Treatment Combinations, a structure for the financial aspects of a hospital visit,
24
25 203 which has roots in the ICD-10 structure: amputation (both upper and lower extremities), brain
26
27 204 disease (e.g. stroke, congenital brain diseases), chronic pain, musculoskeletal disease (e.g.
28
29 205 rheumatic conditions, conditions of upper-, lower extremities and spine), neurologic disease
30
31 206 (e.g. Parkinson's disease, multiple sclerosis), organ disease (e.g. heart disease, chronic
32
33 207 obstructive pulmonary disease), spinal cord injury (SCI) and other (e.g. chronic fatigue
34
35 208 syndrome, medically unexplained symptoms).³⁶ Rehabilitation characteristics were reported
36
37 209 by the RSE counselor.

38 210

39 211 *Statistical analysis*

41 212 Descriptive information of the population and the dose characteristics of PA behavior are
42
43 213 shown in mean \pm SD or median (IQR) for continuous variables, and percentages for categorical
44
45 214 variables. Differences of baseline characteristics between included and excluded participants
46
47 215 were tested with independent t-test for continuous variables and Pearson χ^2 -test for
48
49 216 categorical variables.

51 217 To evaluate the development of PA behavior over time, we created six separate
52
53 218 multilevel regression models with total minutes of PA per week (model 1), minutes of PA per
54
55 219 week per setting (models 2-5) and minutes of moderate to vigorous PA (MVPA) per week
56
57 220 (model 6) as dependent variables, and measurement occasions (categorical) as independent
58
59 221 variable. Each model consisted of measurement occasion at level 1, participants at level 2
60
222 (random intercepts) and rehabilitation institutes as level 3 (random intercepts). Since we

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223 expected variation among participants in their PA behavior over time, we added random
224 slopes for measurement occasion on the level of participants. However, this resulted in non-
225 converging (i.e. unreliable) models, and subsequently removed from the models.

226 To explore the effects of personal characteristics and diagnosis on the development of
227 PA behavior over time, multilevel regressions models were created with measurement
228 occasion, characteristic and an interaction term between measurement occasion and
229 characteristic for each of the six dependent variables and for each characteristic separately.
230 Evaluated characteristics were diagnosis (largest diagnosis in our data, i.e. brain disease, as
231 reference), age (continuous, in years), sex (male as reference), BMI (continuous, in kg/m²),
232 smoking (non-smoker as reference), alcohol use (no alcohol use as reference) and education
233 level (low as reference).²⁴⁻²⁷ Type III ANOVA tests were used to assess significance of the
234 overall interaction between measurement occasion and the characteristics. Since multilevel
235 regression analyses are robust against missing data, this was not addressed.³⁷ All analyses
236 were done with R and RStudio³⁸. The lmerTest package was used for multilevel regressions
237 analysis.³⁹ Significance level was set at 0.05.

238

239 Results

240 Study population

241 Table 1 shows descriptors of included and excluded participants per measurement occasion.
242 Of the 1719 participants in the ReSpAct cohort, 1256 participants were included in this study.
243 The largest diagnosis groups were: brain disease (27.1%, n=341), musculoskeletal disorders
244 (18.6%, n=234), chronic pain (15.8%, n=198) and neurologic disease (15.0%, n=188). Excluded
245 participants were younger (p<.001), more often a smoker (p=.04), and received less counseling
246 sessions (p<.001).

247

248 PA dose characteristics

249 Table 2 shows the PA dose characteristics (duration, setting, intensity, mode and frequency)
250 at the four different measurement occasions.

251 *Duration*

252 Total duration of PA (min/wk) varied over time and among participants, showing its lowest
253 median value at discharge from rehabilitation (T0: 1545); followed by increased levels of 1770,
254 1830 and 1710 min/wk at respectively T1, T2 and T3 (table 2).

255 *Setting*

256 Participants spent most PA time in household tasks (median range T0-T3: 495 to 600 min/wk),
257 followed by leisure time (median range T0-T3: 450 to 510 min/wk). A large proportion of
258 participants reported 0 min/wk PA in work (range T0-T3: 52.6-59.9%; largest IQR 0 – 1080
259 min/wk) and commuting (range T0-T3: 70.4-72.5%; largest IQR commuting 0 – 40 min/wk)
260 settings.

261 *Intensity*

262 Participants spent between T0 and T4 a median of 900 – 997.5 min/wk in light-intensity PA,
263 120 – 150 min/wk in moderate-intensity and 100 – 120 min/wk in vigorous-intensity. In
264 household tasks, most minutes were spent in light intensity (median range T0-T4: 480-540
265 min/wk) and little to none in moderate and vigorous-intensity (range T0-T4: 82-87.6% 0
266 min/wk and 100-100% 0 min/wk, respectively). Leisure time activities were predominantly in
267 MVPA (median range T0-T4: 40-60 min/wk light; 60-90 min/wk moderate; and 90-120 min/wk
268 vigorous). Intensity of work activities were of light (range T0-T4: median 0-0, IQR 0-165 to 0-
269 420) or moderate-intensity (range T0-T4: median 0-0, IQR 0-0 to 0-60) and not of vigorous-
270 intensity (100% 0 min/wk at all measurement occasions). Commuting activities were mostly
271 spent in vigorous (range T0-T4: 16-17% >0 min/wk), followed by light (range T0-T4: 11-12% >0
272 min/wk) and moderate-intensity (range T0-T4: 5-7% >0 min/wk).

273 *Mode and frequency*

274 Walking is the most frequent mode of leisure time activities at all measurement occasions,
275 with an average frequency ranging from 3.3 ± 2.7 to 3.6 ± 2.7 times/wk. Bicycling is the second
276 most frequent mode, with an average frequency ranging from 1.6 ± 2.1 to 1.8 ± 2.2 times/wk.
277 Gardening, odd jobs and fitness are frequented around 0.6 times/wk (Table 2).

279 PA behavior over time

280 Figure 1 and appendix 1 show the results of the multilevel regression models for PA behavior
281 over time. Compared to baseline (T0), there is a significant increase ($p < .001$) in total minutes
282 of PA per week over time for each of the three follow-up measurement occasions (increase:
283 218.6 [CI 142.9 – 294.3], 242.2 [CI 162.6 – 321.7] and 153.8 [CI 70.9 – 236.6] min/wk at
284 respectively T1, T2 and T3). Time spent in the settings work and commuting significantly
285 increased at follow-up occasions (all $p < .05$). With the exception of one occasion, leisure time
286 (T1, $p < .01$) and household tasks (T2, $p < .05$) remained stable compared to baseline values (T0).

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287 Time spent in MVPA significantly increased at each measurement occasion compared to T0
288 (increase: 105.0 [CI 57.6 – 152.2], 138.4 [CI 88.7 – 188.1] and 112.9 [CI 61.1 – 164.6] min/wk
289 at respectively T1, T2 and T3, all $p < .001$).

290

291 Effects of personal characteristics and diagnosis

292 Figure 2 shows total PA per measurement occasion and distribution of PA in the 4 settings
293 separated for the different diagnoses. Appendix 2 provides a detailed description of PA
294 behavior per diagnosis.

295 Figure 3 shows the effect of each personal characteristic on total PA and MVPA. The
296 multilevel regression model analyses showed that at baseline, a significant effect on total PA
297 was found for diagnosis (musculoskeletal disease, $\beta = 307.5$ [CI 92.7 – 522.2], and other
298 diseases, $\beta = 392.7$ [CI 5.0 – 780.3] more active than brain disease), age (higher age less active,
299 $\beta = -12.7$ [CI -18.0 – -7.4]), sex (females more active than males, $\beta = 273.9$ [CI 130.9 – 417.0])
300 and BMI (higher BMI less active, $\beta = -8.8$ [CI -17.6 – -0.03]) (see also appendix 3). No interaction
301 effects between these characteristics and measurement occasion were found, i.e. the effect
302 of these characteristics on PA remained constant over time. There was one significant
303 interaction effect for education on PA over time, with people with high education increasing
304 their levels of PA more over time than people with low education ($p < .05$).

305 Appendix 3 provides a detailed description of the effects of the diagnosis and personal
306 characteristics on baseline levels and the development over time of PA in each setting and
307 MVPA. In short, diagnosis had a significant baseline effect for MVPA and all settings of PA,
308 except for commuting, where we found an interaction effect of diagnosis. People with a higher
309 age were less active in work, household and commuting, but more active in leisure time and
310 MVPA. In the work setting, an older age led to increase in PA over time. Females were more
311 active in household tasks, but less active in MVPA and in both household and MVPA females
312 had less increase in PA over time. Smokers had less increase in MVPA over time than non-
313 smokers. Alcohol use had baseline effects on leisure time (moderate alcohol usage more
314 active, excessive alcohol usage less active) and on MVPA (moderate alcohol usage more
315 active) and interaction effect on MVPA (light and excessive alcohol usage had more
316 improvement of MVPA over time).

317

318 **Discussion**

1
2
3 319 We explored the PA dose characteristics in a broad population of adults with
4
5 320 disabilities/chronic diseases from discharge up to one year after rehabilitation. We found a
6
7 321 significant increase in total minutes per week of PA between baseline and all follow-ups. The
8
9 322 largest increase in PA was found between baseline and 14 weeks after rehabilitation, and then
10
11 323 more or less stabilized. Almost two thirds of the total minutes was light intensity PA. Most PA
12
13 324 were in household setting. Leisure time contributed to the most minutes of MVPA. We found
14
15 325 an on average active population, showing a considerable degree of variation in PA among this
16
17 326 population and over time, in all dose characteristics and among personal and disease
18
19 327 characteristics.
20

21 328

22 329 PA dose characteristics

23 330 To the best of our knowledge, this is the first prospective cohort study that considers all dose
24
25 331 characteristics (duration, setting, intensity, mode and frequency) of PA in a large
26
27 332 heterogeneous population of adults with physical disabilities/chronic diseases. Compared to
28
29 333 previous studies (self-reported PA in specific disability groups and in a heterogeneous
30
31 334 disability groups), our participants were more active in total PA, MVPA and leisure time PA.⁸
32
33 335 ^{20, 22, 40-45} Furthermore, the proportion of participants adhering to the aerobic component of
34
35 336 the WHO PA guideline (>150 min of moderate PA, >75 min of vigorous PA or combination of
36
37 337 both) is higher in our population compared to previous research (68-74% versus 35-60%).⁸
38
39 338 ⁴⁶⁻⁴⁸ This suggests that the ReSpAct cohort is a potential positive selection regarding PA
40
41 339 behavior. A possible explanation of our active population may relate to the fact that all
42
43 340 participants voluntarily engaged in the RSE program, and thus received PA counselling during
44
45 341 and after rehabilitation.

46 342 Participants completed a large amount of light intensity PA. There are indications that
47
48 343 the curvilinear relationship between PA and health found in able-bodied individuals³, also
49
50 344 apply to adults with physical disabilities/chronic diseases.⁴⁹ This means that for inactive
51
52 345 people, even a small increase in PA (in any duration, intensity, mode and frequency), can lead
53
54 346 to health benefits. Indeed, breaking up sedentary time into light intensity PA does have
55
56 347 positive effects on PA in able-bodied individuals.⁵⁰ Also, a study in people with mobility
57
58 348 limitations suggested a decrease in all-cause mortality by engaging in light intensity PA.⁵¹ All
59
60 349 this suggests the potential importance of light-intensity PA. However, as light-intensity
350 350 activities might be harder to recall than MVPA, it is debatable how valid self-reported

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1
2
3 351 instruments can measure light-intensity. Future research should focus on reliably measuring
4
5 352 light-intensity and the dose-response relationship between light-intensity PA and health
6
7 353 outcomes.

8
9 35410 355 PA behavior over time

11
12 356 In contrast to the common decline in PA after rehabilitation⁵², we found a significant increase
13
14 357 in total minutes of PA and in MVPA after rehabilitation. The largest improvement was found
15
16 358 between just before discharge (T0) and 14 weeks after (T1) and remained more or less stable
17
18 359 till one year after rehabilitation. We found a decrease in PA from 33 weeks (T2) to one year
19
20 360 after rehabilitation (T3), but PA at T3 was still significantly higher compared to PA at T0. The
21
22 361 improvement in PA aligns with the period that participants received personalized PA
23
24 362 counseling (RSE program).^{28, 29, 31} As a previous RCT already showed the effectiveness of
25
26 363 counseling after rehabilitation in improving PA behavior^{31, 53}, this may explain the increase in
27
28 364 PA behavior between T0 and T1. Since the period just after rehabilitation is a critical window
29
30 365 of opportunity for intervening and important to assist people from being a patient to a
31
32 366 participant in lifelong PA⁵⁴, a broader implementation of PA counseling not just in the
33
34 367 Netherlands⁵⁵ but internationally seems a promising approach. However, our data and that of
35
36 368 the RCT³¹ is limited to one year after rehabilitation, and future research should investigate
37
38 369 whether these counseling sessions are enough for adherence to lifelong PA.

38 370

39 371 Effects of personal characteristics and diagnosis

40
41 372 We found a large diversity in individual PA behavior over time, as seen by the large
42
43 373 interquartile ranges for all dose characteristics of PA. Part of this diversity in PA can be
44
45 374 explained by age, sex, BMI and diagnosis. The effects of age and sex on PA are also found in
46
47 375 the general population and in people with disabilities, with older people being less active and
48
49 376 males being more active than females.^{24, 25, 46, 48} In contrast, we found that females were more
50
51 377 active than males, which may be explained by the household PA as these were reported much
52
53 378 more by females than males. As household PA were mostly of light intensity, we also found
54
55 379 that males were more active than females in MVPA, which is in line with previous literature.^{24,}

56 380 ⁴⁶

57
58 381 Interestingly, we found that older people were more active in MVPA than younger
59
60 382 people. One explanation could be that for people older than 55 years, MVPA is reached with

1
2
3 383 a lower MET-value.⁵⁶ Because the Adapted-SQUASH has predefined MET-values for each
4
5 384 activity, it could be that the same activity is categorized as light intensity for people younger
6
7 385 than 55 years, but as moderate intensity for people older than 55 years.

8
9 386 Only education had a significant interaction effect on PA over time, with people with a
10
11 387 higher education increasing their PA behavior more than people with a lower education.
12
13 388 Previous research also found that people with higher education were more active, but to the
14
15 389 best of our knowledge, the association between education and longitudinal change of PA
16
17 390 behavior was not studied before.^{24, 57}

18 391 Combining the knowledge about dose characteristics of PA behavior and the influence
19
20 392 of personal characteristics on PA behavior could help health professionals and PA promoting
21
22 393 programs to give more individually tailored recommendations. This could be beneficial for
23
24 394 getting adults with physical disabilities/chronic diseases more active, as it is known from goal
25
26 395 setting literature that more specificity is better.⁵⁸

27 396

28 397 Strengths and limitations

29
30 398 A strength of the current study is that we study people with a broad range of physical
31
32 399 disabilities/chronic diseases, who underwent rehabilitation in different rehabilitation centers
33
34 400 and hospitals departments across the Netherlands. This, together with the pragmatic
35
36 401 measurement setting, improves generalizability of the results. However, as the ReSpAct
37
38 402 cohort is probably a positive sample regarding PA, results should also be generalized with
39
40 403 some caution.

41
42 404 This study used an observational study design, in which all participants received
43
44 405 personalized PA counseling as part of the RSE program. Without a control group, we cannot
45
46 406 study the effectiveness of the RSE program. As such, we do not know whether participating in
47
48 407 the RSE program contributed to the increased levels of PA after rehabilitation. However, the
49
50 408 primary aim of this study was to explore the dose characteristics of PA in adults with physical
51
52 409 disabilities/chronic diseases up to one year after rehabilitation, for which an observational
53
54 410 study lends it design. Furthermore, the RSE program was developed based on the results of
55
56 411 an RCT that showed the effectiveness of counseling during and after rehabilitation in
57
58 412 increasing overall PA behavior.^{31, 53}

59
60 413 PA was measured with a self-reported questionnaire. Questionnaires are prone to
414 recall bias and social desirability, and therefore lead to overestimation of PA.^{32, 59, 60} Intensity

PA in adults with physical disabilities/chronic diseases

1
2
3 415 outcomes of the Adapted-SQUASH are mostly based on MET-values from the Ainsworth
4
5 416 compendium of physical activities, based on a general population³³, which might not be as
6
7 417 valid for people with disabilities. However, as the test-retest reliability was high for the
8
9 418 Adapted-SQUASH, the increase of PA behavior found in this study is fairly robust.

10 419 Lastly, possible effects of characteristics (i.e., age, sex, BMI, smoking behavior, alcohol
11
12 420 use and education level) and diagnosis on PA were tested univariable and not multivariable.
13
14 421 It is possible that effects of characteristics are influenced by other characteristics.
15
16 422 Multivariable testing would correct for this. However, because our main aim was to explore
17
18 423 the dose characteristics and the studied characteristics were based on previous literature²⁴⁻²⁷,
19
20 424 we currently limited the study ambitions to univariate testing.

21 425

22 426 Future research

23
24
25 427 This study gives detailed information on the dose characteristics of PA behavior in adults with
26
27 428 physical disabilities/chronic diseases, which is a first step in the dose-response relationship of
28
29 429 PA and health. Due to lack of research on this relationship in adults with physical
30
31 430 disabilities/chronic diseases, evidence of the current WHO PA guidelines for this population is
32
33 431 mostly derived from research in non-disabled populations.¹¹ This makes it questionable how
34
35 432 applicable these guidelines are, and perhaps making disability specific guidelines more
36
37 433 suitable.^{15, 61} However, the current PA guidelines for people with disabilities does have its
38
39 434 merits, as it exposed the lack of systematic research on PA in this population⁶², inspiring new
40
41 435 studies, such as the current study, to bridge this gap. Future research should now focus on the
42
43 436 dose-response relationships between PA and health.

43
44 437 Closely related to the need for more research on the dose-response relationship of PA
45
46 438 and health, is the need for more research on PA measurement instruments in adults with
47
48 439 physical disabilities/chronic diseases. Both self-reported and device-based instruments have
49
50 440 limitations in this population, and future research should find out which types of instruments
51
52 441 are most appropriate for dose/dose-response studies.

53 442 The effect of personal characteristics and diagnosis on PA behavior overall and over
54
55 443 time found in this study, helps to inform readers to points of attention when promoting PA
56
57 444 behavior. Although most characteristics examined in this study cannot be intervened at,
58
59 445 theoretical models underlying PA promotion, such as the Physical Activity for people with a
60 446 Disability (PAD) model⁶³, suggest personal factors (e.g. motivation, self-efficacy) and

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2
3 447 environmental factors (e.g. barriers and facilitators, social support) that can be intervened at,
4
5 448 also influence PA behavior. Future research should investigate how these modifiable factors
6
7 449 influence the development of PA behavior during and after rehabilitation. This could help
8
9 450 improve PA promotion interventions and gear them more to individualized therapy.

10 451

11 452 **Conclusion**

12 453 Both PA level, and change of PA over time are highly variable among adults with physical
13
14 454 disabilities/chronic diseases, in terms of different PA dimensions and in the context of
15
16 455 personal and diagnosis characteristics. The findings of this study help to understand the
17
18 456 construct of PA behavior among a diverse population of persons with a physical disability
19
20 457 and/or chronic disease what potentially can be used to improve PA promotion activities
21
22 458 among this population during and after rehabilitation.

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484 PB conceptualized the current study, analyzed the data, interpreted the data and drafted the
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491 *Competing interests:*

492 The authors declare that they have no competing interests

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494 *Data sharing*

495 Data are available upon reasonable request

496

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Table 1. Descriptive statistics of included participants at each measurement occasion (T0-T3) and excluded participants at T0.

	Included				Excluded
	T0	T1	T2	T3	
N	1256	1114	966	860	463
Age (years)	50.7 ± 13.4	51.1 ± 13.4	51.5 ± 13.0	51.6 ± 13.2	47.5 ± 14.3**
Sex (% male)	47.3	47.9	47.6	49.2	42.1
BMI (kg/m ²)	27.5 ± 8.6	27.5 ± 8.8	27.4 ± 9.1	27.4 ± 9.3	27.0 ± 5.9
Diagnosis					
% Brain disease	27.1	26.8	26.5	27.4	24.4
% Musculoskeletal disease	18.6	18.0	17.6	17.3	18.1
% Chronic pain	15.8	15.8	14.9	14.9	18.1
% Neurologic disease	15.0	15.5	16.1	16.9	12.5
% Organ disease	12.1	12.7	12.7	12.4	9.9
% Amputation	4.5	4.7	4.9	4.7	4.3
% Spinal cord injury	3.0	2.7	2.8	2.8	4.3
% Other diseases	3.8	3.8	4.5	3.6	3.2
Smoking					
% Yes	16.3	16.6	15.4	15.3	13.0
% No	71.3	73.5	74.9	75.2	39.7
Alcohol use					
% No	58.0	57.9	59.0	58.7	34.6
% Light	10.4	10.5	11.0	10.9	5.4
% Moderate	24.0	25.0	24.0	24.1	11.2
% Excessive	2.2	2.4	2.3	2.0	0.6
Marital status					
% Single	26.8	27.7	27.7	27.7	21.4
% Married/living with partner	62.9	63.9	63.9	63.9	39.3
Education level					
% Low	3.4	3.5	3.2	2.8	3.5
% Middle	63.6	64.3	65.0	66.7	44.1
% High	22.5	23.7	23.5	22.7	12.7
Work status					
% School	1.8	1.8	1.1	1.7	1.9
% Employed	31.2	32.3	31.9	32.1	20.1
% Unemployed	11.6	11.9	11.4	11.7	9.3
% Retired	15.4	16.4	16.0	16.9	7.6
% unable to work	21.7	21.8	22.3	21.5	14.9
% Other	7.7	7.5	9.0	8.1	6.3
Rehabilitation context					
% Rehabilitation center	71.6	71.6	72.3	72.8	75.4
% Hospital	28.4	28.4	27.7	27.2	24.6
Rehabilitation form					
% Inpatient	2.8	2.6	2.3	2.3	3.7
% Outpatient	89.8	90.3	89.8	90.5	90.1
% Consultancy	7.4	7.1	8.0	7.2	6.3

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Number of counseling moments					**
% 0	11.4	11.0	10.8	10.0	21.0
% 1-3	56.4	55.8	56.3	57.0	55.3
% 4 or more	32.2	33.1	32.9	33.0	23.8

Data presented as mean \pm SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

There was more missing data in the excluded group of participants compared to the included group of participants.

* and ** Significant difference between the included and excluded participants based on independent sample t-tests for continuous variables and based on Chi-square tests for categorical variables without unknown category between baseline participants and those excluded. (* p <0.05; ** p <0.001).

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Table 2. Physical activity behavior of adults with physical disabilities/chronic diseases per measurement occasion as measured with the Adapted-SQUASH³²

	T0	T1	T2	T3
Total PA				
N	1256	1114	966	860
Total (min/week)	1545 (852.5 - 2453)	1770 (990 - 2780)	1830 (981 - 2730)	1710 (960 - 2730)
Light (min/week)	900 (360 - 1680)	997.5 (420 - 1920)	960 (409 - 1980)	900 (360 - 1800)
Moderate (min/week)	120 (0 - 480)	180 (15 - 596)	180 (0 - 690)	150 (0 - 630)
Vigorous (min/week)	100 (0 - 246.25)	120 (0 - 300)	120 (0 - 300)	120 (0 - 289)
Adherence to the aerobic WHO PA guidelines (%)	68.3	74.9	71.3	71.2
Leisure time				
N	1252	1098	955	843
Total (min/week)	450 (230 - 795)	510 (270 - 853)	480 (240 - 840)	465 (240 - 840)
% 0 min/week	3.6	2.4	4.1	4.4
Light (min/week)	60 (0 - 323)	60 (0 - 330)	60 (0 - 300)	40 (0 - 270)
% 0 min/week	43.6	44.4	44.6	46.9
Moderate (min/week)	75 (0 - 255)	90 (0 - 300)	60 (0 - 300)	70 (0 - 273)
% 0 min/week	37.6	32.1	36.8	38.0
Vigorous (min/week)	90 (0 - 213)	120 (0 - 268)	100 (0 - 240)	100 (0 - 240)
% 0 min/week	30.8	27.2	31.0	30.8
<i>Frequency of leisure time activities per week*</i>				
Walking	3.6 ± 2.7	3.5 ± 2.6	3.3 ± 2.6	3.3 ± 2.7
Bicycling	1.8 ± 2.2	1.7 ± 2.1	1.6 ± 2.1	1.7 ± 2.1
Wheelchair riding	0.4 ± 1.5	0.4 ± 1.5	0.4 ± 1.5	0.4 ± 1.5
Handcycling	0.0 ± 0.4	0.1 ± 0.5	0.1 ± 0.5	0.1 ± 0.4
Gardening	0.7 ± 1.2	0.6 ± 1.1	0.5 ± 1	0.5 ± 1.1
Odd jobs	0.7 ± 1.4	0.5 ± 1.2	0.5 ± 1.1	0.5 ± 1.1
Fitness	0.6 ± 1.1	0.7 ± 1.1	0.5 ± 1	0.4 ± 0.9
Swimming	0.3 ± 0.7	0.3 ± 0.6	0.2 ± 0.5	0.2 ± 0.5
Household				
N	1234	1096	953	853
Total (min/week)	540 (180 - 960)	540 (210 - 1020)	600 (240 - 1020)	495 (210 - 930)
% 0 min/week	13.5	10.4	10.3	11.8
Light (min/week)	510 (180 - 960)	540 (210 - 960)	540 (210 - 960)	480 (185 - 900)
% 0 min/week	13.9	11.0	11.1	12.3
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.6	83.4	82.0	82.8
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100.0	100.0	100.0	100.0
Work				
N	1186	1093	943	844
Total (min/week)	0 (0 - 600)	0 (0 - 960)	0 (0 - 1080)	0 (0 - 1080)

PA in adults with physical disabilities/chronic diseases

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3	% 0 min/week	59.9	52.6	52.9	54.5
4	Light	0 (0 - 165)	0 (0 - 420)	0 (0 - 300)	0 (0 - 240)
5	% 0 min/week	72.9	67.9	70.2	71.1
6	Moderate (min/week)	0 (0 - 0)	0 (0 - 60)	0 (0 - 60)	0 (0 - 60)
7	% 0 min/week	80.8	72.9	71.8	73.5
8	Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
9	% 0 min/week	100.0	100.0	100.0	100.0
10					
11					
12					
13	Commuting				
14	N	1246	1108	959	847
15	Total (min/week)	0 (0 - 25)	0 (0 - 30)	0 (0 - 30)	0 (0 - 40)
16	% 0 min/week	72.5	71.3	71.3	70.4
17	Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
18	% 0 min/week	88.8	87.7	88.2	88.5
19	Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
20	% 0 min/week	95.5	93.4	93.8	94.5
21	Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
22	% 0 min/week	83.3	83.9	83.6	83.0
23					
24					
25					

*Frequencies of leisure time activities per week are presented in mean \pm SD. Other data is presented in median (interquartile range) or percentage.

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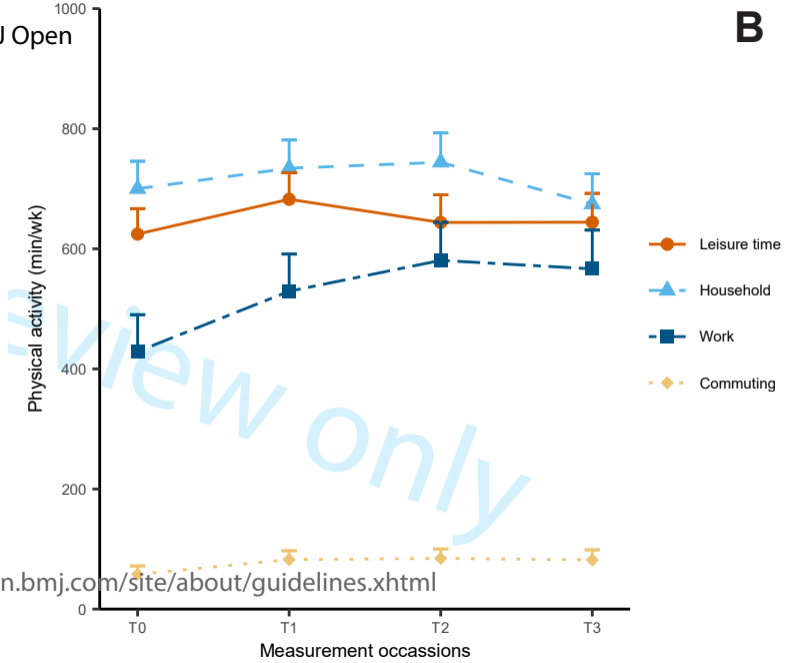
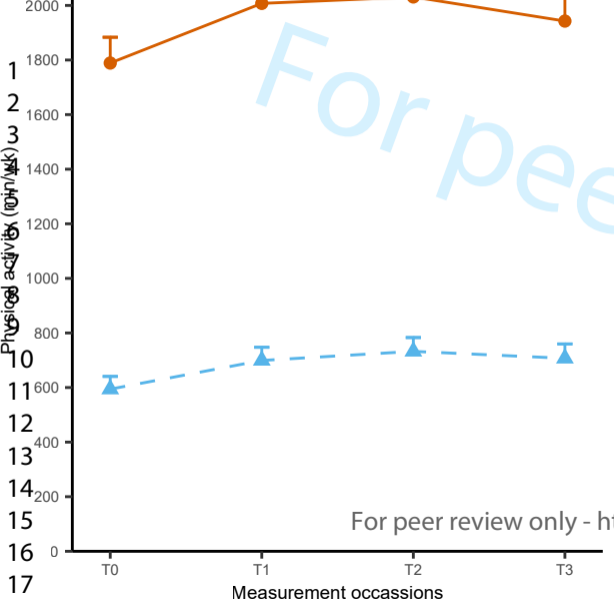
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PA in adults with physical disabilities/chronic diseases

1
2
3 674 Figure 1. Regression lines of the multilevel regressions models for A) minutes of total
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5 675 physical activity (PA) per week and minutes of moderate to vigorous physical activity (MVPA)
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7 676 and B) for minutes of physical activity per week per setting.
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9 677

10 678 Figure 2. Descriptive data of total physical activity behavior and the distribution in the four
11
12 679 settings per measurement occasion of each diagnosis.
13
14 680

15
16 681 Figure 3. Effects of personal characteristics on baseline levels and development over time of
17
18 682 total PA and MVPA, based on the individual multilevel regression models with 95%
19
20 683 confidence interval. *significant difference between groups at baseline ($p < .05$). †significant
21
22 684 difference in development over time between groups (1 between light alcohol usages and no
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24 685 alcohol usage, 2 between excessive alcohol usage and no alcohol usage) ($p < .05$).
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Brain disease

Musculoskeletal disease

Chronic pain

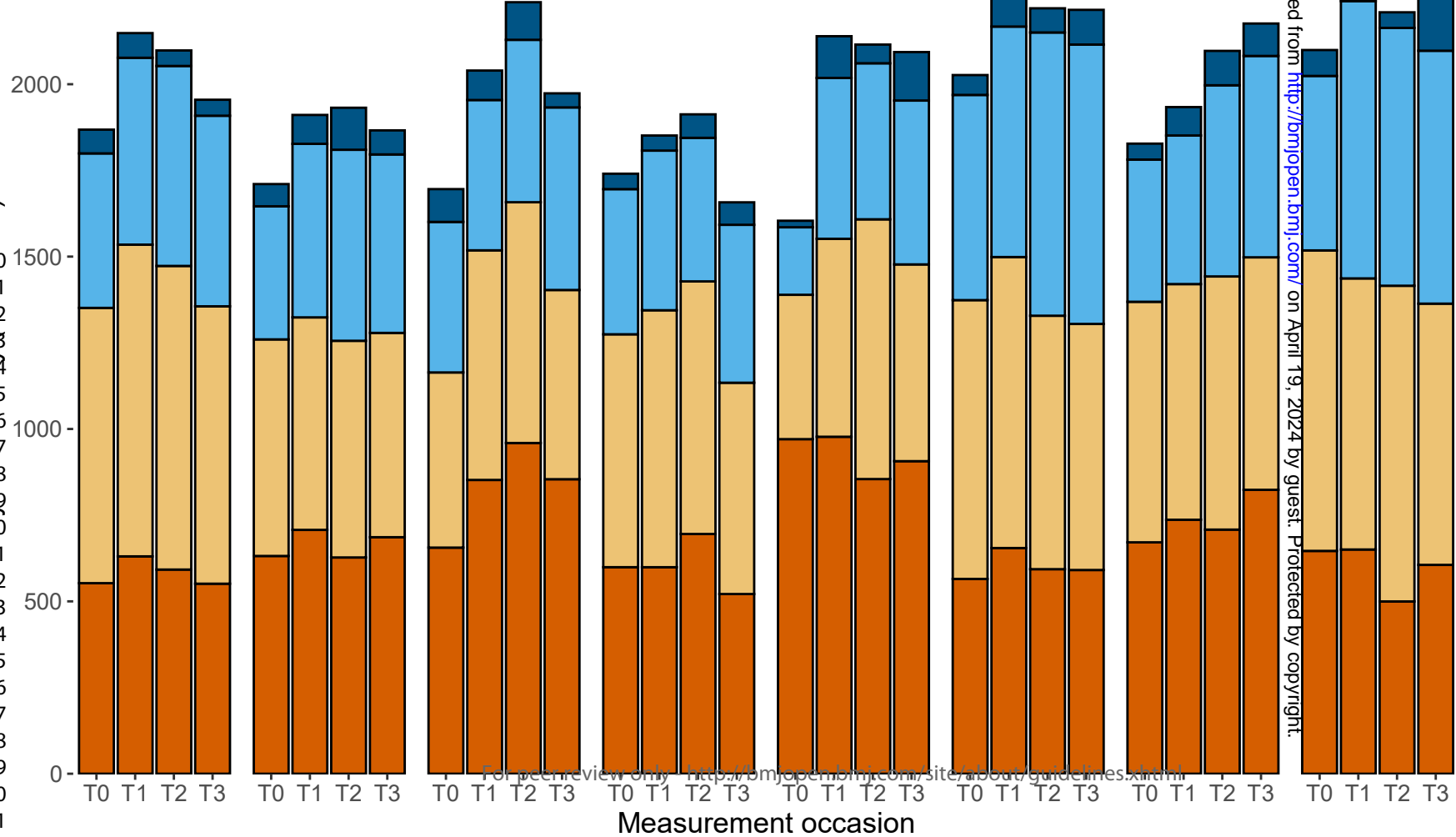
Neurologic disease

Organ disease

Amputation

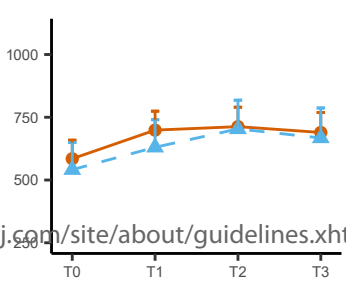
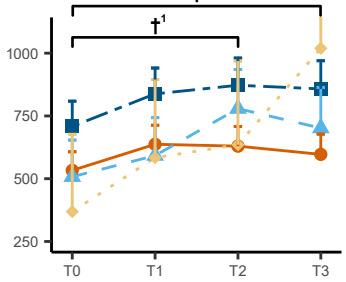
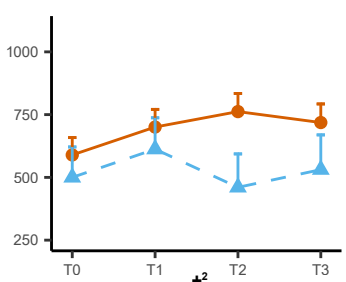
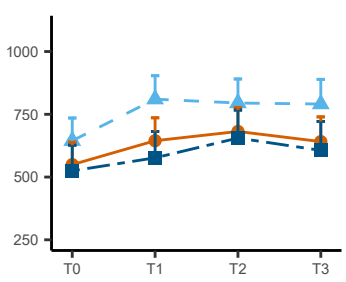
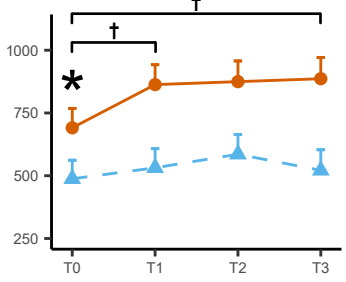
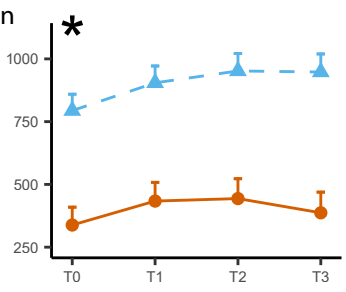
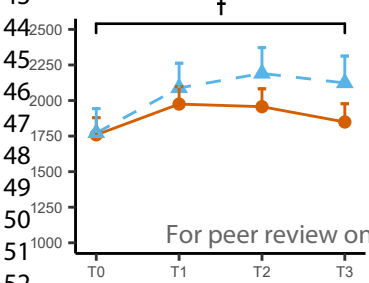
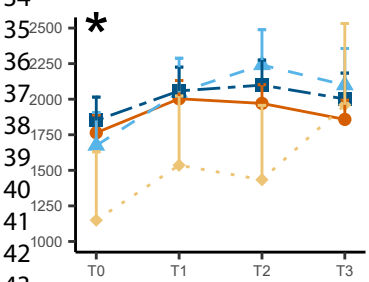
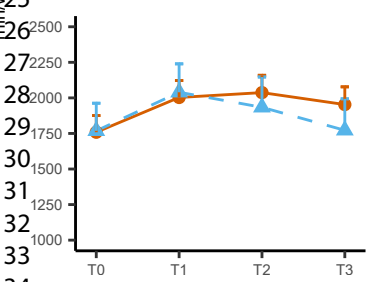
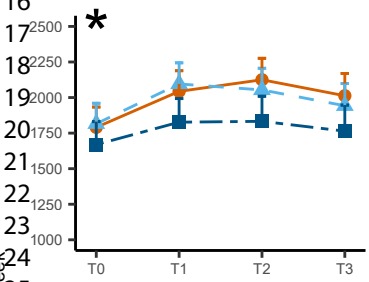
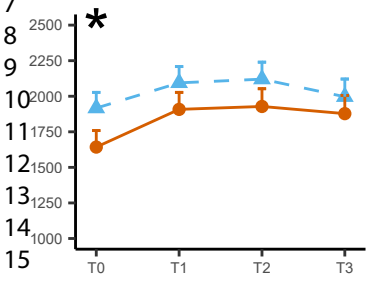
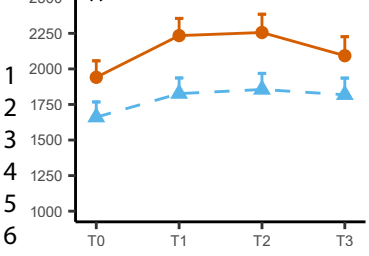
Spinal cord injury

Other diseases



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Appendix 1. Results of longitudinal multilevel analysis of physical activity behavior over time in table**Appendix 1.** Results of longitudinal multilevel analysis of physical activity behavior over time

	Baseline to T1			Baseline to T2			Baseline to T3					
	β	95% CI	p-value	β	95% CI	p-value	β	95% CI	p-value			
Total PA	218.6	142.9	294.3	<.001	242.2	162.6	321.7	<.001	153.8	70.9	236.6	<.001
Leisure Time	57.9	15.0	100.8	.008	19.3	-25.7	64.3	.400	19.8	-27.2	66.7	.409
Household	34.2	-6.7	75.0	.101	44.1	1.2	86.9	.044	-25.5	-70.1	19.0	.262
Work	100.3	59.2	141.4	<.001	151.7	108.5	195.0	<.001	137.6	92.6	182.5	<.001
Commuting	24.5	6.1	43.0	.009	26.5	7.2	45.8	.007	24.0	3.9	44.1	.019
MVPA	105.0	57.8	152.3	<.001	138.4	88.7	188.1	<.001	112.9	61.1	164.6	<.001

PA = Physical activity, MVPA = moderate to vigorous physical activity

Bold = statistically significant

Appendix 2. Descriptive statistics and PA behavior of each diagnosis groups separately.**Brain disease:****Appendix 1.1** Descriptive statistics of participants with a brain disease

	Population at T0	Population at T1	Population at T2	Population at T3
N	341	299	256	236
Age (years)	52.7 ± 12.3	53 ± 12.2	53.3 ± 11.8	53.5 ± 11.9
Sex (% male)	56.6	57.9	56.6	58.9
BMI (kg/m ²)	27 ± 10.7	27.1 ± 11.3	27 ± 11.9	27 ± 12
Smoking				
% Yes	12.6	12	10.2	11
% No	73.6	77.3	78.9	78
Alcohol use				
% No	51	54.2	52.3	53.8
% Light	12.9	13.4	14.5	14
% Moderate	20.5	19.7	20.7	19.5
% Excessive	1.5	1.7	1.2	1.3
Marital status				
% Single	23.8	25.1	25.1	25.1
% Married/living with partner	65.1	66.2	66.2	66.2
Education level				
% Low	65.1	66.2	66	66.9
% High	23.5	24.7	24.2	24.6
Work status				
% School	1.5	1.3	0.8	1.3
% Employed	36.1	37.5	35.9	37.7
% Unemployed	9.7	10.4	9	9.7
% Retired	17.3	18.7	18	18.6
% unable to work	15.8	15.7	17.2	15.7
% Other	7.3	7.4	9	8.1
Rehabilitation context				
% Rehabilitation center	76.2	75.6	78.1	78.8
% Hospital	23.8	24.4	21.9	21.2
Rehabilitation form				
% Inpatient	3.8	3.7	3.5	2.5
% Outpatient	89.7	90	88.7	90.3
% Consultancy	6.5	6.4	7.8	7.2
Number of counseling moments				
% 0	11.4	10.7	10.9	9.3
% 1-3	52.5	53.5	52.3	52.1
% 4 or more	36.1	35.8	36.7	38.6

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.2 Physical activity behavior of people with a brain disease per measurement occasion

	T0	T1	T2	T3
Total PA				
N	341	299	256	236
Total (min/week)	1410 (760 - 2400)	1620 (930 - 2685)	1568 (952 - 2604)	1680 (960 - 2604)
Light (min/week)	790 (240 - 1440)	840 (308 - 1650)	750 (243 - 1642)	780 (240 - 1538)
Moderate (min/week)	160 (0 - 540)	180 (30 - 615)	195 (1 - 788)	230 (3 - 750)
Vigorous (min/week)	120 (0 - 300)	150 (40 - 360)	140 (0 - 312)	120 (29 - 360)

Leisure time

N	341	295	256	232
Total (min/week)	450 (240 - 805)	520 (288 - 878)	510 (240 - 840)	480 (296 - 908)
% 0 min/week	3.2	3.4	4.7	3
Light (min/week)	30 (0 - 250)	30 (0 - 270)	0 (0 - 246)	0 (0 - 240)
% 0 min/week	49.9	49.2	51.2	51.3
Moderate (min/week)	120 (0 - 300)	120 (0 - 360)	120 (0 - 338)	120 (0 - 360)
% 0 min/week	33.1	28.1	31.2	32.3
Vigorous (min/week)	120 (0 - 270)	120 (42 - 300)	120 (0 - 289)	120 (30 - 300)
% 0 min/week	27	21	29.7	23.3
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3.6 \pm 2.7	3.3 \pm 2.5	3.3 \pm 2.5	3.2 \pm 2.6
Bicycling	1.8 \pm 2.2	1.9 \pm 2.3	1.7 \pm 2.2	1.9 \pm 2.2
wheelchair riding	0.2 \pm 1.2	0.3 \pm 1.2	0.2 \pm 1	0.2 \pm 1
Handbiking	0 \pm 0	0 \pm 0.2	0 \pm 0.5	0 \pm 0.3
Gardening	0.6 \pm 1.1	0.6 \pm 1.2	0.5 \pm 1.1	0.6 \pm 1.1
Odd jobs	0.7 \pm 1.4	0.6 \pm 1.2	0.6 \pm 1.2	0.5 \pm 0.9
Fitness	0.6 \pm 0.9	0.7 \pm 1.2	0.6 \pm 1.1	0.5 \pm 1.1
Swimming	0.3 \pm 0.7	0.3 \pm 0.7	0.1 \pm 0.5	0.1 \pm 0.4

Household

N	333	293	253	236
Total (min/week)	480 (140 - 855)	420 (150 - 960)	525 (180 - 870)	472 (148 - 878)
% 0 min/week	17.1	11.3	13	13.1
Light (min/week)	450 (120 - 840)	420 (150 - 900)	450 (180 - 840)	420 (135 - 840)
% 0 min/week	17.4	12.3	14.2	14.8
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.7	80.2	81	80.9
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	321	296	247	231
Total (min/week)	0 (0 - 480)	0 (0 - 900)	0 (0 - 1020)	0 (0 - 960)
% 0 min/week	62.9	51.4	51	55
Light	0 (0 - 0)	0 (0 - 300)	0 (0 - 120)	0 (0 - 0)
% 0 min/week	76.9	68.9	73.3	76.2
Moderate (min/week)	0 (0 - 0)	0 (0 - 60)	0 (0 - 120)	0 (0 - 90)
% 0 min/week	80.4	73	70.4	71.4
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	340	296	253	231
Total (min/week)	0 (0 - 36)	0 (0 - 30)	0 (0 - 50)	0 (0 - 60)
% 0 min/week	70.3	71.6	66.8	68.4
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	90.9	88.9	88.5	90.9
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	94.4	94.3	93.3	93.5
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	80.6	80.7	79.1	80.5

Data presented as median (interquartile range), mean \pm SD or %

Musculoskeletal disease

Appendix 1.3 Descriptive statistics of participants with a musculoskeletal disorder

	Population at T0	Population at T1	Population at T2	Population at T3
N	234	201	170	149
Age (years)	47 ± 14.9	47.5 ± 15	47.6 ± 14.8	46.4 ± 14.5
Sex (% male)	35.9	36.3	37.1	35.6
BMI (kg/m ²)	27.5 ± 6.1	27.2 ± 5.8	27.7 ± 6.4	27.7 ± 6.2
Smoking				
% Yes	20.5	21.9	20.6	22.1
% No	66.7	66.7	71.2	68.5
Alcohol use				
% No	52.6	52.7	56.5	57
% Light	10.7	10.4	11.2	11.4
% Moderate	22.6	24.4	22.9	21.5
% Excessive	1.3	1	1.2	0.7
Marital status				
% Single	26.5	25.9	25.9	25.9
% Married/living with partner	61.5	63.7	63.7	63.7
Education level				
% Low	64.1	64.7	66.5	69.1
% High	24.4	25.4	26.5	22.1
Work status				
% School	2.6	3	1.8	2
% Employed	31.2	32.3	31.2	33.6
% Unemployed	12.8	13.9	12.9	15.4
% Retired	12	13.4	12.4	12.1
% unable to work	19.7	18.4	21.8	18.1
% Other	10.7	9.5	12.4	10.7
Rehabilitation context				
% Rehabilitation center	65.4	65.2	67.6	63.8
% Hospital	34.6	34.8	32.4	36.2
Rehabilitation form				
% Inpatient	1.3	1.5	0.6	1.3
% Outpatient	87.2	89.1	88.2	88.6
% Consultancy	11.5	9.5	11.2	10.1
Number of counseling moments				
% 0	13.7	13.4	12.4	12.8
% 1-3	62	60.2	62.9	62.4
% 4 or more	24.4	26.4	24.7	24.8

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.4 Physical activity behavior of participants with a musculoskeletal disorder

	T0	T1	T2	T3
Total PA				
N	234	201	170	149
Total (min/week)	1728 (1042 - 2918)	2055 (1200 - 3070)	1935 (1011 - 3270)	1898 (1085 - 3270)
Light (min/week)	1140 (450 - 2124)	1260 (600 - 2370)	1145 (600 - 2248)	1050 (555 - 2290)
Moderate (min/week)	120 (0 - 472)	150 (15 - 510)	128 (0 - 600)	120 (0 - 540)
Vigorous (min/week)	120 (0 - 268)	120 (0 - 310)	120 (0 - 300)	120 (0 - 300)

Leisure time

N	233	199	168	145
Total (min/week)	420 (243 - 770)	450 (252 - 765)	420 (204 - 750)	375 (185 - 660)
% 0 min/week	4.3	2	5.4	5.5
Light (min/week)	120 (0 - 360)	90 (0 - 352)	90 (0 - 278)	60 (0 - 271)
% 0 min/week	38.2	35.2	39.9	40
Moderate (min/week)	60 (0 - 195)	90 (0 - 220)	60 (0 - 214)	30 (0 - 180)
% 0 min/week	42.5	32.2	42.9	48.3
Vigorous (min/week)	100 (0 - 240)	120 (0 - 285)	110 (0 - 241)	105 (0 - 240)
% 0 min/week	27.9	28.1	29.2	36.6
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3.6 \pm 2.6	3.6 \pm 2.4	3.4 \pm 2.6	3.2 \pm 2.6
Bycycling	2.1 \pm 2.3	1.8 \pm 2.2	1.7 \pm 2.2	1.4 \pm 1.9
wheelchair riding	0.3 \pm 1.5	0.3 \pm 1.3	0.2 \pm 1.2	0.2 \pm 1.1
Handbiking	0.1 \pm 0.5	0.1 \pm 0.6	0.1 \pm 0.5	0 \pm 0.3
Gardening	0.5 \pm 1.1	0.4 \pm 0.7	0.4 \pm 0.8	0.3 \pm 0.6
Odd jobs	0.5 \pm 1.2	0.4 \pm 1.1	0.5 \pm 1.1	0.4 \pm 1
Fitness	0.7 \pm 1.1	0.6 \pm 1.1	0.5 \pm 1.1	0.3 \pm 0.8
Swimming	0.4 \pm 0.8	0.4 \pm 0.7	0.3 \pm 0.7	0.2 \pm 0.6

Household

N	232	199	166	147
Total (min/week)	630 (236 - 1099)	630 (300 - 1140)	600 (278 - 1012)	585 (248 - 900)
% 0 min/week	9.5	8	7.2	6.1
Light (min/week)	615 (210 - 1080)	600 (282 - 1140)	600 (270 - 960)	585 (240 - 900)
% 0 min/week	9.9	9	7.2	6.1
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	90.1	89.9	88	90.5
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	223	197	166	148
Total (min/week)	0 (0 - 960)	300 (0 - 1200)	390 (0 - 1440)	360 (0 - 1710)
% 0 min/week	50.7	44.2	41.6	42.6
Light	0 (0 - 600)	0 (0 - 840)	0 (0 - 1005)	0 (0 - 1200)
% 0 min/week	64.6	58.4	57.2	57.4
Moderate (min/week)	0 (0 - 0)	0 (0 - 180)	0 (0 - 285)	0 (0 - 120)
% 0 min/week	77.1	68.5	64.5	70.3
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	232	200	169	149
Total (min/week)	0 (0 - 52)	0 (0 - 82)	0 (0 - 30)	0 (0 - 60)
% 0 min/week	68.1	63.5	67.5	61.7
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.5	80	84	82.6
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	96.6	94.5	95.3	95.3
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	78.9	81	81.7	77.2

Data presented as median (interquartile range), mean \pm SD or %

Chronic pain

Appendix 1.5 Descriptive statistics of participants with chronic pain

	Population at T0	Population at T1	Population at T2	Population at T3
N	198	176	144	128
Age (years)	45.4 ± 11.6	45.8 ± 11.8	47.4 ± 10.8	46.6 ± 11.2
Sex (% male)	24.2	25.6	23.6	25
BMI (kg/m ²)	27.9 ± 6.1	28 ± 6.2	27.8 ± 5.7	27.6 ± 5.9
Smoking				
% Yes	16.2	17	16	14.8
% No	70.7	72.7	73.6	76.6
Alcohol use				
% No	51	51.1	52.8	54.7
% Light	8.6	9.1	7.6	9.4
% Moderate	24.7	26.7	25.7	25
% Excessive	2.5	2.8	3.5	2.3
Marital status				
% Single	28.3	30.7	30.7	30.7
% Married/living with partner	59.1	59.7	59.7	59.7
Education level				
% Low	72.2	73.3	74.3	76.6
% High	15.7	17.6	16.7	15.6
Work status				
% School	2	2.3	0.7	1.6
% Employed	30.3	32.4	32.6	33.6
% Unemployed	16.2	15.3	13.2	14.1
% Retired	3.5	4	3.5	2.3
% unable to work	25.3	26.7	28.5	27.3
% Other	10.1	9.7	12.5	12.5
Rehabilitation context				
% Rehabilitation center	63.1	63.6	62.5	64.1
% Hospital	36.9	36.4	37.5	35.9
Rehabilitation form				
% Inpatient	2.5	2.8	0.7	1.6
% Outpatient	92.4	92	94.4	94.5
% Consultancy	5.1	5.1	4.9	3.9
Number of counseling moments				
% 0	9.1	8.5	7.6	3.1
% 1-3	52.5	49.4	51.4	55.5
% 4 or more	38.4	42	41	41.4

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.6 Physical activity behavior of participants with chronic pain

	T0	T1	T2	T3
Total PA				
N	198	176	144	128
Total (min/week)	1710 (1051 - 2520)	1845 (972 - 2770)	1868 (1080 - 2771)	1598 (1080 - 2771)
Light (min/week)	1260 (652 - 2032)	1338 (630 - 2250)	1308 (606 - 2280)	1192 (770 - 1989)
Moderate (min/week)	60 (0 - 300)	112 (0 - 360)	94 (0 - 424)	112 (0 - 300)
Vigorous (min/week)	90 (2 - 210)	120 (0 - 240)	90 (0 - 240)	95 (0 - 240)

Leisure time

N	198	171	143	125
Total (min/week)	435 (240 - 735)	525 (282 - 792)	445 (240 - 752)	450 (210 - 710)
% 0 min/week	1.5	0.6	3.5	3.2
Light (min/week)	150 (30 - 420)	180 (0 - 480)	150 (0 - 360)	120 (0 - 360)
% 0 min/week	24.2	28.1	31.5	32.8
Moderate (min/week)	30 (0 - 180)	60 (0 - 210)	45 (0 - 188)	15 (0 - 180)
% 0 min/week	46.5	40.9	44.8	48
Vigorous (min/week)	60 (0 - 191)	120 (5 - 210)	90 (0 - 180)	90 (0 - 225)
% 0 min/week	26.3	25.1	30.1	25.6
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	4.5 \pm 2.5	4.3 \pm 2.5	4.1 \pm 2.6	4.1 \pm 2.6
Bycycling	2 \pm 2.2	1.9 \pm 2.2	1.7 \pm 2	2.1 \pm 2.2
wheelchair riding	0.2 \pm 1.2	0.2 \pm 0.8	0.2 \pm 1	0.2 \pm 1
Handbiking	0 \pm 0.5	0 \pm 0	0 \pm 0.2	0 \pm 0.3
Gardening	0.6 \pm 1.1	0.5 \pm 1.1	0.4 \pm 1.1	0.6 \pm 1.3
Odd jobs	0.8 \pm 1.6	0.5 \pm 1.1	0.5 \pm 1.1	0.3 \pm 0.8
Fitness	0.6 \pm 1.1	0.6 \pm 1.1	0.5 \pm 1	0.3 \pm 0.8
Swimming	0.3 \pm 0.6	0.2 \pm 0.4	0.2 \pm 0.5	0.2 \pm 0.5

Household

N	196	171	141	128
Total (min/week)	690 (270 - 1080)	720 (300 - 1245)	680 (315 - 1260)	702 (300 - 1059)
% 0 min/week	6.6	4.1	5	7
Light (min/week)	690 (270 - 1058)	660 (300 - 1245)	680 (300 - 1260)	702 (300 - 1050)
% 0 min/week	6.6	4.7	5.7	7
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	92.9	91.8	90.1	89.1
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	190	175	141	126
Total (min/week)	0 (0 - 720)	0 (0 - 900)	0 (0 - 960)	0 (0 - 930)
% 0 min/week	55.3	52.6	53.2	55.6
Light	0 (0 - 480)	0 (0 - 600)	0 (0 - 540)	0 (0 - 480)
% 0 min/week	62.6	60.6	63.1	63.5
Moderate (min/week)	0 (0 - 0)	0 (0 - 30)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	83.7	74.9	75.2	77
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	197	174	143	127
Total (min/week)	0 (0 - 50)	0 (0 - 40)	0 (0 - 14)	0 (0 - 8)
% 0 min/week	68.5	70.7	72.7	74
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	85.3	85.6	86	86.6
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	96.4	94.8	95.8	97.6
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	79.2	82.8	83.9	84.3

Data presented as median (interquartile range), mean \pm SD or %

Neurologic disease

Appendix 1.7 Descriptive statistics of participants with a neurologic disease

	Population at T0	Population at T1	Population at T2	Population at T3
N	188	173	156	145
Age (years)	49.6 ± 12	49.7 ± 12.1	50.2 ± 11.8	51.1 ± 11.5
Sex (% male)	43.6	42.8	42.9	46.9
BMI (kg/m ²)	27 ± 6.6	27 ± 6.7	26.4 ± 5.8	26.2 ± 5.3
Smoking				
% Yes	19.7	20.2	19.9	17.2
% No	67.6	68.8	69.9	72.4
Alcohol use				
% No	53.2	53.2	57.1	55.9
% Light	8	8.1	7.1	8.3
% Moderate	23.9	25.4	23.1	23.4
% Excessive	2.1	2.3	2.6	2.1
Marital status				
% Single	30.3	31.2	31.2	31.2
% Married/living with partner	59.6	60.1	60.1	60.1
Education level				
% Low	60.6	61.3	60.3	59.3
% High	29.3	30.1	30.8	31
Work status				
% School	0.5	0.6	0	0.7
% Employed	28.2	30.1	28.8	28.3
% Unemployed	11.7	12.7	11.5	11.7
% Retired	9	8.7	10.3	9.7
% unable to work	32.4	31.2	31.4	32.4
% Other	8	8.1	9	7.6
Rehabilitation context				
% Rehabilitation center	69.7	69.9	68.6	70.3
% Hospital	30.3	30.1	31.4	29.7
Rehabilitation form				
% Inpatient	1.1	1.2	1.3	0.7
% Outpatient	93.1	93.1	92.9	94.5
% Consultancy	5.9	5.8	5.8	4.8
Number of counseling moments				
% 0	13.3	13.9	13.5	13.1
% 1-3	59	59	57.1	60.7
% 4 or more	27.7	27.2	29.5	26.2

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.8 Physical activity behavior of participants with a neurologic disease

	T0	T1	T2	T3
Total PA				
N	188	173	156	145
Total (min/week)	1478 (709 - 2268)	1500 (900 - 2625)	1770 (840 - 2280)	1450 (735 - 2280)
Light (min/week)	870 (311 - 1669)	930 (420 - 1890)	952 (412 - 1744)	840 (360 - 1635)
Moderate (min/week)	120 (0 - 480)	155 (0 - 510)	120 (0 - 458)	95 (0 - 420)
Vigorous (min/week)	48 (0 - 210)	90 (0 - 210)	90 (0 - 281)	45 (0 - 210)

Leisure time

N	186	171	153	143
Total (min/week)	420 (200 - 686)	405 (219 - 690)	450 (218 - 840)	360 (178 - 600)
% 0 min/week	5.9	2.9	3.3	6.3
Light (min/week)	60 (0 - 225)	30 (0 - 270)	60 (0 - 330)	60 (0 - 270)
% 0 min/week	44.1	46.8	39.9	42
Moderate (min/week)	60 (0 - 210)	90 (0 - 240)	60 (0 - 225)	60 (0 - 140)
% 0 min/week	34.4	35.1	36.6	39.9
Vigorous (min/week)	45 (0 - 180)	75 (0 - 198)	90 (0 - 240)	45 (0 - 180)
% 0 min/week	40.9	33.3	30.7	44.1
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3 \pm 2.8	3.2 \pm 2.8	3 \pm 2.7	2.8 \pm 2.7
Bicycling	1.6 \pm 2.1	1.6 \pm 2.1	1.7 \pm 2.1	1.3 \pm 1.9
wheelchair riding	0.4 \pm 1.5	0.5 \pm 1.6	0.6 \pm 1.7	0.6 \pm 1.7
Handbiking	0 \pm 0.1	0.1 \pm 0.5	0 \pm 0.3	0.1 \pm 0.5
Gardening	0.8 \pm 1.5	0.6 \pm 1.2	0.4 \pm 1	0.5 \pm 1.1
Odd jobs	0.5 \pm 1.2	0.4 \pm 1	0.4 \pm 1	0.4 \pm 1.1
Fitness	0.7 \pm 1.1	0.7 \pm 1	0.7 \pm 1.2	0.5 \pm 0.8
Swimming	0.3 \pm 0.6	0.3 \pm 0.6	0.2 \pm 0.4	0.2 \pm 0.5

Household

N	186	171	155	143
Total (min/week)	570 (180 - 1020)	540 (240 - 1020)	540 (240 - 1065)	420 (180 - 988)
% 0 min/week	13.4	12.3	11	15.4
Light (min/week)	540 (180 - 956)	480 (232 - 960)	480 (232 - 1065)	420 (165 - 900)
% 0 min/week	13.4	12.3	11.6	15.4
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.1	87.1	83.9	90.2
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	175	167	153	145
Total (min/week)	0 (0 - 600)	0 (0 - 750)	0 (0 - 540)	0 (0 - 600)
% 0 min/week	66.3	61.7	62.1	62.8
Light	0 (0 - 0)	0 (0 - 150)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	78.9	73.7	77.1	76.6
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	85.1	79.6	77.8	79.3
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	186	173	155	144
Total (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 10)	0 (0 - 0)
% 0 min/week	80.6	80.3	74.2	75.7
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	90.9	90.8	89	88.9
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	95.7	96	94.2	95.1
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	90.3	90.2	88.4	88.9

Data presented as median (interquartile range), mean \pm SD or %

Organ diseaseAppendix 1.9 Descriptive statistics of participants with an organ disease

	Population at T0	Population at T1	Population at T2	Population at T3
N	152	141	123	107
Age (years)	59.9 ± 10.3	60.4 ± 10.1	60 ± 10.5	61.1 ± 10.9
Sex (% male)	68.4	68.8	65.9	68.2
BMI (kg/m ²)	28.6 ± 4.9	28.5 ± 4.9	28.4 ± 4.8	28.1 ± 4.9
Smoking				
% Yes	13.2	13.5	13	12.1
% No	78.9	80.1	80.5	81.3
Alcohol use				
% No	48	48.9	49.6	46.7
% Light	11.2	9.9	12.2	11.2
% Moderate	30.3	31.9	29.3	33.6
% Excessive	2	2.1	1.6	0.9
Marital status				
% Single	25	26.2	26.2	26.2
% Married/living with partner	69.1	68.1	68.1	68.1
Education level				
% Low	76.3	76.6	75.6	76.6
% High	17.1	17	18.7	18.7
Work status				
% School	0.7	0.7	0.8	0.9
% Employed	28.3	27.7	28.5	26.2
% Unemployed	11.8	12.1	14.6	12.1
% Retired	34.2	35.5	35	41.1
% unable to work	17.1	17	13.8	13.1
% Other	2.6	2.1	3.3	1.9
Rehabilitation context				
% Rehabilitation center	82.2	83	84.6	86
% Hospital	17.8	17	15.4	14
Rehabilitation form				
% Inpatient	2	2.1	1.6	1.9
% Outpatient	90.1	90.1	88.6	89.7
% Consultancy	7.9	7.8	9.8	8.4
Number of counseling moments				
% 0	10.5	9.9	10.6	10.3
% 1-3	61.8	61.7	63.4	60.7
% 4 or more	27.6	28.4	26	29

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.10 Physical activity behavior of participants with an organ disease

	T0	T1	T2	T3
Total PA				
N	152	141	123	107
Total (min/week)	1500 (840 - 2370)	1560 (870 - 2775)	1950 (870 - 3112)	1740 (904 - 3112)
Light (min/week)	600 (180 - 1489)	600 (180 - 1260)	600 (211 - 1770)	600 (165 - 1260)
Moderate (min/week)	300 (0 - 795)	390 (90 - 1080)	420 (60 - 1150)	385 (60 - 1042)
Vigorous (min/week)	120 (0 - 270)	180 (0 - 360)	124 (0 - 360)	180 (0 - 385)

Leisure time

N	152	139	120	105
Total (min/week)	505 (224 - 848)	605 (300 - 990)	570 (326 - 960)	690 (360 - 990)
% 0 min/week	2	2.2	2.5	5.7
Light (min/week)	0 (0 - 120)	0 (0 - 45)	0 (0 - 120)	0 (0 - 0)
% 0 min/week	67.8	71.2	67.5	77.1
Moderate (min/week)	180 (0 - 450)	180 (20 - 480)	180 (0 - 480)	240 (30 - 615)
% 0 min/week	31.6	23.7	26.7	24.8
Vigorous (min/week)	120 (0 - 270)	140 (0 - 352)	120 (0 - 300)	180 (20 - 360)
% 0 min/week	27.6	26.6	30	24.8
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3.7 \pm 2.6	3.5 \pm 2.5	3.4 \pm 2.6	3.7 \pm 2.6
Bicycling	1.7 \pm 2.1	1.5 \pm 1.9	1.5 \pm 1.9	1.9 \pm 2.1
wheelchair riding	0.1 \pm 0.7	0.1 \pm 0.6	0.1 \pm 0.9	0.1 \pm 1
Handbiking	0 \pm 0.1	0 \pm 0	0 \pm 0	0 \pm 0
Gardening	0.9 \pm 1.4	0.7 \pm 1.4	0.7 \pm 1	0.7 \pm 1.2
Odd jobs	0.9 \pm 1.5	0.7 \pm 1.5	0.8 \pm 1.3	0.9 \pm 1.6
Fitness	0	0.7 \pm 1.1	0.4 \pm 0.8	0.4 \pm 1
Swimming	0.2 \pm 0.5	0.1 \pm 0.4	0.1 \pm 0.4	0.1 \pm 0.5

Household

N	147	138	121	106
Total (min/week)	455 (142 - 930)	540 (169 - 960)	525 (240 - 1080)	525 (180 - 1005)
% 0 min/week	15.6	14.5	12.4	15.1
Light (min/week)	420 (128 - 840)	465 (150 - 840)	420 (150 - 900)	435 (139 - 840)
% 0 min/week	17.7	15.2	14.9	15.1
Moderate (min/week)	0 (0 - 0)	0 (0 - 60)	0 (0 - 60)	0 (0 - 84)
% 0 min/week	75.5	63	63.6	59.4
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	142	137	120	102
Total (min/week)	0 (0 - 480)	0 (0 - 480)	0 (0 - 765)	0 (0 - 705)
% 0 min/week	65.5	59.9	60.8	61.8
Light	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	84.5	84.7	84.2	85.3
Moderate (min/week)	0 (0 - 0)	0 (0 - 300)	0 (0 - 120)	0 (0 - 120)
% 0 min/week	78.2	67.9	70	71.6
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	148	141	122	102
Total (min/week)	0 (0 - 0)	0 (0 - 8)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	78.4	74.5	78.7	75.5
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	93.2	94.3	94.3	94.1
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	94.6	89.4	91.8	92.2
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	85.8	85.8	86.9	86.3

Data presented as median (interquartile range), mean \pm SD or %

Amputation

Appendix 1.11 Descriptive statistics of participants with an amputation

	Population at T0	Population at T1	Population at T2	Population at T3
N	57	52	47	40
Age (years)	56.8 ± 12.6	56.6 ± 13	55.9 ± 13.3	57.4 ± 12.2
Sex (% male)	77.2	78.8	76.6	82.5
BMI (kg/m ²)	27.1 ± 5.9	26.7 ± 5.8	26.7 ± 5.8	27.3 ± 6.1
Smoking				
% Yes	22.8	21.2	19.1	25
% No	70.2	73.1	76.6	72.5
Alcohol use				
% No	59.6	59.6	59.6	62.5
% Light	5.3	5.8	6.4	2.5
% Moderate	21.1	21.2	23.4	25
% Excessive	7	7.7	6.4	7.5
Marital status				
% Single	31.6	32.7	32.7	32.7
% Married/living with partner	61.4	61.5	61.5	61.5
Education level				
% Low	77.2	76.9	80.9	82.5
% High	14	15.4	12.8	12.5
Work status				
% School	0	0	0	0
% Employed	19.3	19.2	23.4	20
% Unemployed	8.8	7.7	10.6	7.5
% Retired	31.6	30.8	29.8	30
% unable to work	28.1	30.8	25.5	32.5
% Other	3.5	3.8	4.3	5
Rehabilitation context				
% Rehabilitation center	71.9	71.2	68.1	70
% Hospital	28.1	28.8	31.9	30
Rehabilitation form				
% Inpatient	7	5.8	8.5	7.5
% Outpatient	87.7	88.5	85.1	85
% Consultancy	5.3	5.8	6.4	7.5
Number of counseling moments				
% 0	17.5	19.2	19.1	20
% 1-3	42.1	42.3	40.4	45
% 4 or more	40.4	38.5	40.4	35

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.12 Physical activity behavior of participants with an amputation

	T0	T1	T2	T3
Total PA				
N	57	52	47	40
Total (min/week)	1294 (615 - 2130)	1942 (1260 - 2565)	1920 (1276 - 2925)	1918 (1130 - 2925)
Light (min/week)	840 (360 - 1680)	1238 (702 - 1732)	1200 (420 - 2070)	840 (420 - 1680)
Moderate (min/week)	210 (0 - 420)	190 (60 - 600)	210 (19 - 840)	330 (60 - 855)
Vigorous (min/week)	30 (0 - 180)	30 (0 - 278)	45 (0 - 240)	60 (0 - 278)

Leisure time

N	56	51	47	39
Total (min/week)	745 (311 - 1215)	690 (415 - 1290)	585 (262 - 1200)	660 (420 - 1122)
% 0 min/week	7.1	3.9	10.6	2.6
Light (min/week)	88 (0 - 725)	180 (0 - 540)	60 (0 - 420)	90 (0 - 472)
% 0 min/week	48.2	35.3	44.7	43.6
Moderate (min/week)	139 (0 - 375)	180 (0 - 450)	120 (0 - 480)	90 (0 - 480)
% 0 min/week	39.3	27.5	34	30.8
Vigorous (min/week)	30 (0 - 184)	30 (0 - 255)	30 (0 - 240)	60 (0 - 270)
% 0 min/week	46.4	47.1	46.8	46.2
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	2.9 \pm 3.1	2.9 \pm 3	2.7 \pm 2.8	3 \pm 3
Bycycling	0.7 \pm 1.8	0.7 \pm 1.6	0.8 \pm 1.7	0.7 \pm 1.6
wheelchair riding	2.8 \pm 3.3	2.2 \pm 3.1	1.9 \pm 2.9	2.3 \pm 3.2
Handbiking	0.2 \pm 0.8	0.4 \pm 1.3	0.4 \pm 1.1	0.3 \pm 0.9
Gardening	0.5 \pm 1.3	0.5 \pm 0.9	0.5 \pm 1.1	0.7 \pm 1.4
Odd jobs	0.7 \pm 1.6	0.9 \pm 1.6	0.7 \pm 1.3	1.1 \pm 1.8
Fitness	0.8 \pm 1.2	0.8 \pm 1.4	0.5 \pm 1	0.5 \pm 0.9
Swimming	0.5 \pm 0.9	0.3 \pm 0.5	0.2 \pm 0.5	0.2 \pm 0.4

Household

N	54	52	47	40
Total (min/week)	225 (0 - 652)	485 (202 - 840)	650 (225 - 1050)	420 (105 - 840)
% 0 min/week	29.6	19.2	21.3	22.5
Light (min/week)	225 (0 - 630)	485 (188 - 840)	630 (225 - 1005)	390 (105 - 840)
% 0 min/week	29.6	19.2	21.3	22.5
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 1)	0 (0 - 0)
% 0 min/week	90.7	86.5	74.5	82.5
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	53	49	46	38
Total (min/week)	0 (0 - 0)	0 (0 - 540)	0 (0 - 315)	0 (0 - 660)
% 0 min/week	75.5	59.2	69.6	52.6
Light	0 (0 - 0)	0 (0 - 240)	0 (0 - 0)	0 (0 - 315)
% 0 min/week	84.9	73.5	82.6	73.7
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 150)
% 0 min/week	84.9	77.6	76.1	65.8
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	57	52	47	39
Total (min/week)	0 (0 - 0)	0 (0 - 1)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	87.7	75	85.1	76.9
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	91.2	90.4	89.4	89.7
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	96.5	86.5	95.7	87.2
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	96.2	93.6	92.3

Data presented as median (interquartile range), mean \pm SD or %

Spinal cord injuryAppendix 1.13 Descriptive statistics of participants with SCI

	Population at T0	Population at T1	Population at T2	Population at T3
N	38	30	27	24
Age (years)	48.2 ± 15.4	48.2 ± 15.6	49.4 ± 14.2	50 ± 16.2
Sex (% male)	42.1	36.7	44.4	45.8
BMI (kg/m ²)	31 ± 23.8	32.4 ± 26.3	31.8 ± 28.3	31.5 ± 29.6
Smoking				
% Yes	18.4	20	14.8	16.7
% No	68.4	73.3	74.1	75
Alcohol use				
% No	42.1	43.3	44.4	41.7
% Light	2.6	3.3	3.7	0
% Moderate	34.2	36.7	33.3	41.7
% Excessive	7.9	10	7.4	8.3
Marital status				
% Single	44.7	43.3	43.3	43.3
% Married/living with partner	50	53.3	53.3	53.3
Education level				
% Low	60.5	56.7	55.6	66.7
% High	34.2	40	37	29.2
Work status				
% School	5.3	3.3	3.7	8.3
% Employed	26.3	26.7	25.9	16.7
% Unemployed	10.5	10	11.1	8.3
% Retired	18.4	20	18.5	25
% unable to work	26.3	26.7	25.9	29.2
% Other	7.9	10	7.4	8.3
Rehabilitation context				
% Rehabilitation center	89.5	86.7	88.9	91.7
% Hospital	10.5	13.3	11.1	8.3
Rehabilitation form				
% Inpatient	13.2	6.7	11.1	16.7
% Outpatient	73.7	76.7	70.4	66.7
% Consultancy	13.2	16.7	18.5	16.7
Number of counseling moments				
% 0	2.6	0	0	4.2
% 1-3	71.1	73.3	70.4	66.7
% 4 or more	26.3	26.7	29.6	29.2

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.14 Physical activity behavior of participants with SCI

	T0	T1	T2	T3
Total PA				
N	38	30	27	24
Total (min/week)	1515 (885 - 2059)	2018 (915 - 3008)	2100 (924 - 2599)	1700 (1061 - 2599)
Light (min/week)	885 (555 - 1582)	1185 (555 - 1642)	1185 (720 - 2115)	1203 (390 - 1779)
Moderate (min/week)	52 (0 - 240)	142 (0 - 465)	30 (0 - 225)	150 (0 - 484)
Vigorous (min/week)	42 (0 - 195)	120 (0 - 377)	90 (0 - 270)	120 (0 - 210)

Leisure time

N	38	30	26	23
Total (min/week)	435 (188 - 825)	604 (398 - 1155)	540 (375 - 862)	495 (370 - 955)
% 0 min/week	5.3	3.3	3.8	8.7
Light (min/week)	135 (0 - 442)	240 (0 - 555)	195 (1 - 465)	60 (0 - 375)
% 0 min/week	36.8	36.7	26.9	39.1
Moderate (min/week)	52 (0 - 240)	128 (0 - 285)	0 (0 - 232)	90 (0 - 321)
% 0 min/week	34.2	33.3	53.8	39.1
Vigorous (min/week)	42 (0 - 195)	120 (0 - 311)	75 (0 - 225)	120 (0 - 210)
% 0 min/week	44.7	33.3	30.8	30.4
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	2.1 \pm 2.6	2.2 \pm 2.6	1.5 \pm 2.1	2 \pm 2.5
Bycycling	1.2 \pm 2.1	1.6 \pm 2.4	0.8 \pm 1.8	1.6 \pm 2.6
wheelchair riding	1.6 \pm 2.6	1.7 \pm 2.9	2.6 \pm 3.4	2.5 \pm 3.3
Handbiking	0.3 \pm 1.3	0.3 \pm 0.9	0.7 \pm 1.4	0.4 \pm 1.2
Gardening	0.4 \pm 0.9	0.2 \pm 0.5	0.2 \pm 0.5	0.3 \pm 0.7
Odd jobs	0.8 \pm 1.6	0.4 \pm 1	0.3 \pm 0.6	0.7 \pm 1.3
Fitness	0	0.7 \pm 0.8	0.5 \pm 0.9	0.6 \pm 1
Swimming	0.5 \pm 0.8	0.4 \pm 0.8	0.2 \pm 0.5	0.2 \pm 0.5

Household

N	38	30	27	22
Total (min/week)	450 (38 - 840)	510 (135 - 998)	360 (180 - 1125)	322 (120 - 630)
% 0 min/week	21.1	13.3	11.1	13.6
Light (min/week)	450 (38 - 840)	510 (135 - 998)	360 (180 - 880)	278 (120 - 604)
% 0 min/week	21.1	13.3	11.1	13.6
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	97.4	86.7	92.6	86.4
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	36	30	27	23
Total (min/week)	0 (0 - 495)	0 (0 - 720)	180 (0 - 930)	0 (0 - 1110)
% 0 min/week	61.1	53.3	48.1	56.5
Light	0 (0 - 300)	0 (0 - 360)	0 (0 - 810)	0 (0 - 840)
% 0 min/week	69.4	70	55.6	65.2
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	86.1	83.3	88.9	82.6
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	38	30	27	24
Total (min/week)	0 (0 - 90)	0 (0 - 71)	0 (0 - 52)	0 (0 - 0)
% 0 min/week	63.2	70	66.7	79.2
Light (min/week)	0 (0 - 22)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	73.7	86.7	92.6	91.7
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	92.1	90	81.5	100
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	94.7	90	85.2	87.5

Data presented as median (interquartile range), mean \pm SD or %

Other diseases

Appendix 1.15 Descriptive statistics of participants with other diseases

	Population at T0	Population at T1	Population at T2	Population at T3
N	48	42	43	31
Age (years)	46.4 ± 13.8	47.4 ± 14.1	46.4 ± 13.9	46.9 ± 14.9
Sex (% male)	47.9	47.6	51.2	45.2
BMI (kg/m ²)	26 ± 4.6	25.7 ± 4.4	26.1 ± 4.6	26.8 ± 5
Smoking				
% Yes	10.4	9.5	11.6	6.5
% No	72.9	81	72.1	77.4
Alcohol use				
% No	35.4	40.5	34.9	35.5
% Light	18.8	19	20.9	22.6
% Moderate	27.1	28.6	25.6	22.6
% Excessive	2.1	2.4	2.3	3.2
Marital status				
% Single	14.6	16.7	16.7	16.7
% Married/living with partner	75	78.6	78.6	78.6
Education level				
% Low	62.5	64.3	69.8	71
% High	25	28.6	20.9	22.6
Work status				
% School	6.2	7.1	7	9.7
% Employed	39.6	40.5	41.9	41.9
% Unemployed	4.2	2.4	4.7	6.5
% Retired	12.5	14.3	11.6	12.9
% unable to work	20.8	23.8	18.6	16.1
% Other	6.2	7.1	7	6.5
Rehabilitation context				
% Rehabilitation center	62.5	66.7	60.5	61.3
% Hospital	37.5	33.3	39.5	38.7
Rehabilitation form				
% Inpatient	0	0	0	0
% Outpatient	93.8	92.9	95.3	93.5
% Consultancy	6.2	7.1	4.7	6.5
Number of counseling moments				
% 0	4.2	2.4	2.3	6.5
% 1-3	52.1	50	55.8	51.6
% 4 or more	43.8	47.6	41.9	41.9

Data presented as mean ± SD or %

Note: For some participants information was missing, leading to not all percentages adding up to a 100%.

Appendix 1.16 Physical activity behavior of participants with other diseases

	T0	T1	T2	T3
Total PA				
N	48	42	43	31
Total (min/week)	1996 (1282 - 2535)	1715 (1402 - 3205)	2050 (1380 - 2960)	2135 (1560 - 2960)
Light (min/week)	1305 (652 - 2018)	1260 (562 - 2205)	1265 (731 - 2160)	1320 (530 - 2075)
Moderate (min/week)	132 (0 - 615)	172 (8 - 788)	240 (0 - 690)	180 (68 - 780)
Vigorous (min/week)	60 (0 - 188)	125 (40 - 251)	60 (0 - 205)	100 (60 - 240)

Leisure time

N	48	42	42	31
Total (min/week)	415 (216 - 735)	405 (285 - 889)	412 (259 - 630)	450 (312 - 810)
% 0 min/week	2.1	2.4	2.4	3.2
Light (min/week)	120 (0 - 315)	90 (0 - 288)	120 (0 - 348)	120 (0 - 300)
% 0 min/week	27.1	38.1	31	32.3
Moderate (min/week)	60 (0 - 225)	30 (0 - 285)	60 (0 - 202)	105 (0 - 352)
% 0 min/week	41.7	42.9	40.5	35.5
Vigorous (min/week)	60 (0 - 180)	120 (40 - 232)	60 (0 - 172)	75 (22 - 150)
% 0 min/week	33.3	23.8	35.7	22.6
Frequency of leisure time activities (mean \pm sd days per week)				
Walking	3.9 \pm 2.6	3.9 \pm 2.7	3.7 \pm 2.6	3.9 \pm 2.7
Bycycling	1.8 \pm 2	1.7 \pm 1.8	1.2 \pm 1.9	1.6 \pm 1.7
wheelchair riding	0 \pm 0	0 \pm 0.3	0.1 \pm 0.8	0 \pm 0
Handbiking	0 \pm 0.1	0 \pm 0	0 \pm 0	0 \pm 0
Gardening	1 \pm 1.5	0.8 \pm 1.5	0.5 \pm 0.8	1.3 \pm 1.9
Odd jobs	0.7 \pm 1.4	0.6 \pm 1.1	0.4 \pm 0.8	0.7 \pm 1.3

Household

N	48	42	43	31
Total (min/week)	740 (349 - 1060)	515 (188 - 982)	802 (480 - 1050)	720 (390 - 915)
% 0 min/week	6.2	7.1	2.3	6.5
Light (min/week)	660 (349 - 1028)	510 (188 - 945)	742 (420 - 960)	720 (360 - 915)
% 0 min/week	6.2	7.1	2.3	6.5
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	81.2	85.7	83.7	77.4
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Work

N	46	42	43	31
Total (min/week)	240 (0 - 810)	660 (0 - 1245)	480 (0 - 1440)	360 (0 - 1440)
% 0 min/week	43.5	33.3	37.2	41.9
Light	0 (0 - 450)	120 (0 - 900)	0 (0 - 690)	0 (0 - 840)
% 0 min/week	58.7	50	58.1	58.1
Moderate (min/week)	0 (0 - 105)	0 (0 - 285)	0 (0 - 450)	0 (0 - 150)
% 0 min/week	71.7	61.9	65.1	71
Vigorous (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	100	100	100	100

Commuting

N	48	42	43	31
Total (min/week)	0 (0 - 45)	0 (0 - 79)	0 (0 - 60)	0 (0 - 110)
% 0 min/week	64.6	57.1	65.1	54.8
Light (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	83.3	88.1	86	83.9
Moderate (min/week)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
% 0 min/week	97.9	90.5	95.3	93.5
Vigorous (min/week)	0 (0 - 0)	0 (0 - 22)	0 (0 - 0)	0 (0 - 25)
% 0 min/week	77.1	73.8	79.1	71

Data presented as median (interquartile range), mean \pm SD or %

Appendix 3. Effect modification of personal characteristics and diagnosis on the development of physical activity behavior

			Total PA			Leisure time			Household			Work			Commuting			MVPA		
			β	SE	P-value	β	SE	P-value	β	SE	P-value	β	SE	P-value	β	SE	P-value	β	SE	P-value
8	Diagnosis	(Intercept)	1676.4	76.2	>.001	63.3	37.2	>.001	626.7	37.7	>.001	373.9	43.3	>.001	64.5	13.5	>.001	654.7	44.9	>.001
9	Brain disease (ref)	t1	223.9	74.2	.003	67.6	41.9	.107	-6.3	4.2	.876	144.5	4.4	>.001	17.5	18.0	.332	132.7	46.4	.004
10		t2	211.7	78.3	.007	-23.7	44.0	.590	7.4	42.2	.861	172.2	42.2	>.001	59.8	18.9	.002	147.5	49.0	.003
11		t3	144.1	80.6	.074	29.9	45.5	.512	-29.2	43.2	.500	128.7	43.3	.003	7.5	19.5	.701	105.0	5.4	.037
12		Musculoskeletal disorder	307.5	109.6	.005	-62.1	55.9	.267	181.4	58.9	.002	20.4	67.7	.003	-7.1	21.2	.736	-54.6	7.4	.438
13		Chronic pain	164.6	114.8	.152	-79.4	58.6	.176	169.0	61.9	.006	75.6	7.7	.285	4.3	22.3	.845	-246.1	74.1	.001
14		Neurologic disease	12.9	117.0	.913	-29.8	59.9	.618	45.5	63.0	.470	36.8	72.2	.611	-19.7	22.7	.385	-104.7	75.4	.165
15		Organ disease	129.3	128.1	.313	43.7	64.9	.501	73.3	68.0	.281	38.2	77.7	.622	-19.0	24.5	.438	127.1	8.9	.116
16		Amputation	-122.4	184.0	.506	344.3	94.5	>.001	-205.0	10.4	.041	-201.0	114.4	.078	-45.6	35.6	.201	-137.5	118.7	.247
17		Spinal cord injury	27.8	219.6	.899	19.5	112.2	.862	-118.7	118.1	.315	67.9	135.5	.617	3.6	42.6	.472	-165.4	141.9	.244
18		Other diseases	392.7	197.8	.047	15.9	101.1	.875	244.9	106.5	.021	106.7	121.1	.382	1.6	38.4	.783	-2.6	127.9	.984
19		t1 * Musculoskeletal disorder	38.1	116.8	.744	15.4	66.0	.815	35.0	62.9	.578	-54.5	63.3	.388	4.2	28.3	.157	-39.0	73.0	.593
20		t2 * Musculoskeletal disorder	36.5	123.6	.768	5.4	69.6	.470	-32.2	66.6	.629	66.7	67.7	.321	-44.5	29.8	.136	-6.6	77.3	.433
21		t3 * Musculoskeletal disorder	70.5	128.6	.584	27.9	72.8	.702	-63.0	69.1	.362	71.6	69.9	.302	4.6	3.9	.189	-3.5	8.4	.965
22		t1 * Chronic pain	6.6	122.0	.957	-1.1	69.2	.987	114.3	66.0	.084	-69.0	65.0	.293	-15.0	29.7	.613	-6.7	76.2	.426
23		t2 * Chronic pain	-20.1	130.1	.877	66.7	73.2	.363	72.7	7.2	.300	-71.1	7.7	.314	-81.0	31.4	.010	-8.2	81.4	.919
24		t3 * Chronic pain	-118.9	135.0	.379	-43.8	76.4	.566	17.3	72.4	.811	-52.6	73.0	.471	-28.4	32.5	.383	-21.9	84.4	.796
25		t1 * Neurologic disease	-114.5	123.1	.352	-73.0	69.7	.295	66.7	66.3	.315	-99.8	66.2	.136	-18.0	29.9	.548	-12.9	76.9	.116
26		t2 * Neurologic disease	-11.6	128.4	.928	121.0	72.6	.096	35.0	69.0	.612	-141.7	69.0	.043	-36.8	31.1	.236	-4.5	8.3	.614
27		t3 * Neurologic disease	-176.5	131.8	.181	-105.8	74.6	.156	-2.4	7.8	.973	-75.6	71.1	.290	13.2	31.9	.679	-8.7	82.4	.327
28		t1 * Organ disease	-94.0	131.9	.476	5.0	74.6	.947	-3.8	71.6	.957	-134.6	71.1	.061	2.7	32.1	.520	28.7	82.4	.728
29		t2 * Organ disease	76.0	138.5	.583	49.4	78.3	.528	24.3	74.9	.745	-9.6	75.5	.899	-5.8	33.6	.862	111.6	86.5	.197
30		t3 * Organ disease	181.2	144.4	.209	96.5	81.6	.237	2.6	77.8	.792	5.5	78.8	.522	38.2	35.3	.279	154.0	9.3	.088
31		t1 * Amputation	365.9	193.8	.059	-36.5	11.3	.741	162.9	105.2	.122	16.4	107.7	.134	85.2	47.0	.070	84.4	121.1	.486
32		t2 * Amputation	317.9	201.1	.114	-129.2	113.6	.255	319.9	108.7	.003	121.6	109.9	.268	-2.6	48.6	.671	44.6	125.7	.722
33		t3 * Amputation	359.5	211.7	.090	-114.4	12.5	.343	203.2	114.4	.076	165.1	115.5	.154	115.8	51.3	.024	156.8	132.4	.236

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1																				
2																				
3																				
4		t1 * Spinal cord injury	-18.7	242.1	.938	86.9	136.3	.524	99.0	129.4	.445	-197.9	129.	.128	-22.0	58.4	.706	-26.9	151.3	.859
5		t2 * Spinal cord injury	271.2	252.1	.282	304.2	143.4	.034	171.0	134.8	.205	-152.5	136.	.264	-44.9	6.5	.458	-74.2	157.7	.638
6		t3 * Spinal cord injury	113.3	262.6	.666	142.8	149.6	.340	126.4	144.5	.382	2.7	143.	.985	-62.1	62.8	.323	49.2	164.3	.765
7		t1 * Spinal cord injury	10.7	211.3	.960	-67.1	119.0	.573	-86.2	112.9	.446	179.4	113.	.114	-17.6	51.1	.731	32.1	132.0	.808
8		t2 * Spinal cord injury	-83.8	211.5	.692	-113.2	119.8	.345	67.9	113.0	.548	45.8	113.	.687	-88.1	51.2	.085	-122.4	132.1	.354
9		t3 * Spinal cord injury	96.1	234.1	.681	-44.0	131.5	.738	-54.1	125.0	.665	91.6	125.	.465	97.4	56.2	.083	-73.8	146.4	.614
10																				
11		Type III ANOVA Diagnosis			.001			>.001			>.001			.001			.311			>.001
12		Type III ANOVA Time *																		
13		Diagnosis			.612			.263			.493			.105			.041			.860
14	Age	(Intercept)	2429.2	142.5	>.001	446.2	73.9	>.001	846.2	77.6	>.001	1006.4	87.	>.001	115.2	27.7	>.001	-96.0	91.7	.296
15		t1	436.5	152.0	.004	84.4	86.4	.329	85.6	81.7	.295	258.6	81.	.002	66.1	37.0	.074	21.9	95.0	.818
16		t2	589.1	164.0	>.001	69.4	93.0	.455	104.4	88.1	.236	428.8	88.	>.001	23.1	39.7	.560	78.2	102.6	.446
17		t3	416.5	169.0	.014	-16.7	96.5	.863	4.1	9.8	.964	441.2	91.	>.001	34.8	4.9	.395	-2.2	105.7	.983
18		Age	-12.7	2.7	>.001	3.5	1.4	.012	-2.9	1.5	.049	-11.4	1.	>.001	-1.1	.5	.033	13.5	1.7	>.001
19		t1 * Age	-4.2	2.9	.143	-.5	1.6	.750	-1.0	1.6	.529	-3.1	1.	.046	-0.8	.7	.250	1.6	1.8	.372
20		t2 * Age	-6.7	3.1	.031	-1.0	1.8	.567	-1.1	1.7	.492	-5.4	1.	.001	0.1	.8	.919	1.1	1.9	.556
21		t3 * Age	-5.1	3.2	.113	0.7	1.8	.708	-0.6	1.7	.728	-5.9	1.	.001	-0.2	.8	.797	2.2	2.0	.271
22																				
23		Type III ANOVA Time * Age			.145			.839			.894			.002			.618			.696
24																				
25	Sex	(Intercept)	1642.7	59.1	>.001	619.5	25.7	>.001	461.8	27.6	>.001	453.3	39.	>.001	54.7	1.3	>.001	69.9	39.4	>.001
26		Male (ref)	265.0	55.9	>.001	61.9	25.6	.016	48.9	3.2	.105	113.8	3.	>.001	36.5	13.6	.007	172.0	34.8	>.001
27		t1	285.5	58.8	>.001	29.6	26.7	.268	93.6	31.7	.003	147.8	32.	>.001	4.1	14.3	.005	183.8	36.7	>.001
28		t2	235.0	60.5	>.001	4.8	27.8	.142	32.5	32.5	.318	138.9	32.	>.001	51.1	14.7	.001	195.5	37.8	>.001
29		t3	273.9	73.0	>.001	-22.4	51.6	.665	45.4	37.9	>.001	-45.7	45.	.314	6.2	14.2	.664	-203.1	46.9	>.001
30		Female	-87.6	77.3	.257	17.0	6.0	.776	-24.6	41.7	.555	-25.9	42.	.537	-22.8	18.8	.225	-128.3	48.2	.008
31		t1 * Female	-81.9	81.2	.313	-8.0	63.9	.901	-93.6	43.7	.032	7.7	44.	.862	-25.9	19.7	.189	-86.1	5.7	.089
32		t2 * Female	-155.2	84.5	.066	-78.5	66.9	.241	-107.9	45.4	.018	-2.7	45.	.953	-53.0	2.5	.010	-161.9	52.7	.002
33		t3 * Female																		
34		Type III ANOVA Time * Sex			.314			.633			.045			.887			.080			.009
35																				
36	BMI	(Intercept)	2008.8	135.0	>.001	668.2	68.1	>.001	768.1	71.9	>.001	553.0	81.	>.001	5.2	24.2	.038	643.7	86.8	>.001
37		t1	346.7	133.3	.009	101.3	75.6	.180	55.3	71.9	.442	155.6	7.	.028	31.1	31.4	.322	131.2	82.7	.113
38		t2	204.6	137.1	.136	87.2	77.5	.260	-72.7	74.0	.326	139.3	73.	.058	54.8	32.2	.089	116.8	85.1	.170
39																				
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3		t3	62.4	140.5	.657	96.6	79.5	.224	-173.9	75.8	.022	146.5	74.4	.051	12.7	33.0	.700	72.3	87.2	.407
4		BMI	-8.8	4.5	.049	-1.9	2.3	.403	-2.4	2.4	.331	-4.8	2.2	.079	0.2	.8	.816	-2.5	2.9	.398
5		t1 * BMI	-4.0	4.6	.384	-1.4	2.6	.605	-0.8	2.5	.760	-1.6	2.2	.518	-0.4	1.1	.742	-0.8	2.9	.771
6		t2 * BMI	1.9	4.7	.692	-2.1	2.7	.441	4.3	2.6	.093	0.4	2.2	.861	-1.1	1.1	.338	0.8	2.9	.791
7		t3 * BMI	3.4	4.9	.490	-2.5	2.7	.356	5.4	2.6	.038	-0.4	2.2	.875	0.2	1.1	.859	1.4	3.0	.651
8		Type III ANOVA Time * BMI			.457			.800			.042			.870			.703			.898
9																				
10																				
11	Smoking behavior	(Intercept)	1758.6	59.7	>.001	619.5	25.7	>.001	689.0	27.3	>.001	422.9	33.2	>.001	55.3	8.2	>.001	589.3	35.3	>.001
12	No (ref)	t1	244.3	44.9	>.001	61.9	25.6	.016	38.9	24.2	.107	114.5	24.2	>.001	21.3	1.7	.047	111.1	28.0	>.001
13		t2	278.6	46.8	>.001	29.6	26.7	.268	47.4	25.2	.060	162.3	25.2	>.001	3.0	11.1	.007	172.7	29.2	>.001
14		t3	194.5	48.6	>.001	4.8	27.8	.142	-14.8	26.1	.570	143.8	26.1	>.001	19.6	11.6	.091	129.1	3.4	>.001
15		Yes	9.9	99.4	.921	-22.4	51.6	.665	42.8	54.2	.430	-14.2	61.1	.817	2.4	18.8	.898	-89.4	64.1	.163
16		t1 * Yes	26.7	104.3	.798	17.0	6.0	.776	41.5	56.3	.461	-21.9	56.3	.699	2.4	24.9	.925	1.4	65.1	.983
17		t2 * Yes	-113.2	111.8	.311	-8.0	63.9	.901	25.1	6.2	.677	-87.0	6.2	.150	-3.5	26.5	.250	-212.3	69.8	.002
18		t3 * Yes	-190.8	116.6	.102	-78.5	66.9	.241	-21.9	62.8	.728	-53.6	63.2	.398	-9.5	27.6	.730	-98.2	72.8	.178
19		Type III ANOVA Time * Smoking behavior			.231			.546			.759			.516			.621			.008
20																				
21																				
22																				
23	Alcohol use	(Intercept)	1764.2	63.9	>.001	594.5	28.8	>.001	727.2	31.2	>.001	409.9	37.1	>.001	58.6	9.6	>.001	533.2	37.8	>.001
24	No (ref)	t1	239.0	53.1	>.001	56.5	3.4	.063	53.1	28.6	.064	9.8	28.6	.002	29.7	12.7	.019	103.9	33.2	.002
25		t2	206.2	55.5	>.001	18.7	31.7	.555	37.8	29.9	.206	13.0	3.0	>.001	1.6	13.2	.423	96.5	34.6	.005
26		t3	93.8	57.6	.103	-12.4	33.0	.706	-24.3	3.9	.433	105.6	31.2	.001	19.2	13.7	.161	63.8	36.0	.076
27		Light	-89.9	122.9	.465	-3.0	63.5	.962	-138.1	66.8	.039	59.2	76.1	.441	-23.7	23.5	.312	-25.4	79.1	.748
28		Moderate	86.8	89.8	.334	107.4	46.5	.021	-39.9	48.9	.415	33.6	55.2	.547	0.2	17.0	.992	175.0	57.8	.002
29		Excessive	-614.7	247.9	.013	-291.6	128.0	.023	-85.4	136.1	.530	-244.3	155.2	.116	-13.3	47.6	.780	-164.1	159.4	.304
30		t1 * Light	134.5	129.4	.299	11.0	73.9	.882	88.1	69.6	.206	81.5	7.1	.247	-24.9	31.0	.422	-19.6	8.7	.808
31		t2 * Light	360.2	134.1	.007	124.6	76.6	.104	82.9	72.4	.252	105.5	73.2	.149	82.3	32.0	.010	174.9	83.7	.037
32		t3 * Light	331.1	139.7	.018	202.3	8.5	.012	49.0	75.0	.514	128.5	76.1	.095	18.2	33.4	.586	13.0	87.2	.136
33		t1 * Moderate	-31.8	93.5	.734	14.9	53.7	.781	-65.7	5.5	.193	33.8	5.2	.505	-11.1	22.4	.619	25.9	58.4	.658
34		t2 * Moderate	42.0	99.0	.671	-21.7	56.6	.701	25.7	53.2	.629	4.9	53.2	.928	17.3	23.5	.462	67.5	61.8	.275
35		t3 * Moderate	56.8	102.9	.581	34.8	58.7	.553	-9.7	55.3	.861	32.4	55.2	.562	-12.5	24.5	.608	85.6	64.2	.183
36		t1 * Excessive	147.2	254.5	.563	119.4	145.1	.411	0.4	137.7	.998	84.2	141.1	.551	-62.3	61.4	.310	11.9	158.8	.485
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	t2 * Excessive	78.4	272.9	.774	68.6	155.2	.658	-116.3	148.7	.434	202.6	149.6	.175	-0.8	65.9	.990	169.6	17.4	.319
	t3 * Excessive	716.7	298.2	.016	347.4	169.3	.040	121.5	163.3	.457	311.3	167.0	.064	6.6	71.9	.927	586.4	186.2	.002
	Type III ANOVA Alcohol use			.064			.001			.308			.112			.847			>.001
	Type III ANOVA Time * Alcohol use			.074			.157			.514			.586			.145			.040
9	Education level (Intercept)	1758.9	61.4	>.001	634.4	27.4	>.001	723.4	27.9	>.001	373.2	34.2	>.001	55.3	8.2	>.001	584.8	37.8	>.001
10	Low (ref) t1	216.2	46.9	>.001	63.5	26.6	.017	35.2	25.3	.164	95.3	25.2	>.001	22.5	1.9	.038	114.0	29.1	>.001
11	t2	197.8	49.1	>.001	16.8	27.8	.546	34.8	26.5	.190	13.4	26.0	>.001	16.5	11.3	.147	127.8	3.6	>.001
12	t3	90.2	50.8	.076	6.0	28.9	.834	-36.6	27.3	.181	112.1	27.0	>.001	14.0	11.7	.234	104.7	31.6	.001
13	High	13.4	88.3	.879	-77.9	45.7	.088	-94.2	48.2	.051	187.1	54.0	.001	1.3	16.4	.935	-43.7	57.3	.446
14	t1 * High	100.0	92.6	.280	-1.1	52.6	.984	24.1	5.0	.629	66.9	49.0	.180	-4.7	21.5	.826	-24.7	57.6	.668
15	t2 * High	220.5	97.3	.024	55.1	55.2	.318	46.7	52.4	.374	78.9	52.0	.134	23.4	22.4	.297	34.6	6.6	.568
16	t3 * High	260.9	102.1	.011	84.1	58.0	.147	53.1	55.0	.335	94.9	55.0	.085	15.6	23.5	.506	21.7	63.5	.733
17	Type III ANOVA Time * Education level			.038			.375			.749			.284			.581			.791

STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	1 & 2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4&5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5&6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (b) For matched studies, give matching criteria and number of exposed and unexposed	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-9
Bias	9	Describe any efforts to address potential sources of bias	-
Study size	10	Explain how the study size was arrived at	6-9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, explain how loss to follow-up was addressed (e) Describe any sensitivity analyses	8-9
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	9 + table 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	9 + table 1
Outcome data	15*	Report numbers of outcome events or summary measures over time	9&10 + table 2

1 2 3 4 5 6 7 8 9 10 11 12	Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	9-11 + table 2, 3, figures 1 and 3 and appendix 2
13 14 15 16	Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10 & 11, Figure 3, appendix 2
17	Discussion			
18	Key results	18	Summarise key results with reference to study objectives	11
19 20 21	Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13&14
22 23 24	Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-15
25	Generalisability	21	Discuss the generalisability (external validity) of the study results	13
26	Other information			
27 28 29	Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at <http://www.strobe-statement.org>.