



Pietsch, B., Weisser, B., Hanewinkel, R., Gray, C., Hunt, K., Wyke, S. and Morgenstern, M. (2019) Short term effects of a weight loss and healthy lifestyle programme for overweight and obese men delivered by German football clubs. *European Journal of Sport Science*, (doi: [10.1080/17461391.2019.1660809](https://doi.org/10.1080/17461391.2019.1660809))

There may be differences between this version and the published version. You are advised to consult the publisher's version if you wish to cite from it.

<http://eprints.gla.ac.uk/193491/>

Deposited on 20 August 2019

Enlighten – Research publications by members of the University of Glasgow
<http://eprints.gla.ac.uk>

1 Title

2 Short term effects of a weight loss and healthy lifestyle programme for
3 overweight and obese men delivered by German football clubs

4

5 Authors

6 Benjamin Pietsch (corresponding author)¹, Prof. Burkhard Weisser², Prof.

7 Reiner Hanewinkel¹, Dr. Cindy Gray³, Prof. Kate Hunt⁴, Prof. Sally Wyke³, Prof.

8 Matthis Morgenstern¹

9

10 1 Institute for Therapy and Health Research, Harmsstr. 2, 24114, Kiel, DE

11 2 Christian-Albrechts-University, Department of Sports Medicine, Kiel, DE

12 3 University of Glasgow, Institute of Health & Wellbeing, Glasgow, UK

13 4 University of Stirling, Institute for Social Marketing, Stirling, UK

14 Keywords

15 Weight loss

16 Health

17 Obesity

18 Male

19 Behavior

20 Gender

21 Abstract

22 Numbers of obese and overweight people continue to grow in Germany as they
23 do worldwide. Men are affected more often but do less about it and few weight
24 loss services attract men in particular. To evaluate the effectiveness of a men-
25 only weight loss program, Football Fans in Training (FFIT), delivered by football
26 clubs in the German Bundesliga, we did a non-randomized trial with a waiting
27 list control group. Participants' data were collected between January 2017 and
28 July 2018. FFIT is a 12-week, group-based, weight loss program and was
29 delivered in stadia and facilities of 15 professional German Bundesliga clubs.
30 Inclusion criteria were age 35-65 years, BMI ≥ 28 and waist circumference ≥ 100
31 cm.. Clubs recruited participants through Social Media, E-Mail and match day
32 advertisement. 477 German male football fans were allocated to the
33 intervention group by order of registration date at their respective clubs. 84
34 participants on waiting list were allocated to the control group. Primary outcome
35 was mean difference in weight loss with treatment condition over time as
36 independent variable. We performed a multilevel mixed-effects linear regression
37 analysis. Results were based on Intention-to-treat (ITT) analysis with Multiple
38 Imputation.. After 12 weeks, the mean weight loss of the intervention group
39 adjusted for club, course and participants' age was 6.24 kg (95 % CI 5.82 to
40 6.66) against 0.50 kg (-0.47 to 1.49) in the comparison group ($p < 0.001$). The

41 results indicate that Football Fans in Training effectively helped German men to
42 reduce their weight and waist circumference.
43

44 Background

45 In 2014, more than half of the adult population in Europe was defined as
46 overweight (BMI ≥ 25 kg/m²), and a quarter classified as obese (BMI ≥ 30
47 kg/m²).^{1, 2} In Germany, the last nationwide survey (2008-2011) that used
48 objective measurement showed similar numbers for obesity and that 53% of
49 adult women and 67% of adult men were overweight.³ While about average in
50 Europe for women the number for overweight men is significantly larger than
51 Europe-wide and also significantly larger than for German women.

52 Overweight and obesity contribute to increased risk of ill-health and premature
53 mortality. For example, in Germany, between 2002 and 2008, the numbers
54 were elevated by 31 % for excess weight related deaths and 37 % for years of
55 life and quality adjusted life years lost.⁴ The Global Burden of Disease (GBD)
56 Obesity Collaborators reported four million deaths and 120 million disability
57 adjusted life years for 2015 globally.⁵ Overweight and Obesity also cause
58 increased costs for both individuals and health systems. A study conducted in
59 collaboration with one of Germany's biggest health insurance companies
60 estimated the direct and indirect costs of overweight and obesity to the public
61 health system at 63 billion € in 2015.⁶

62 Compared with women, overweight men face a disproportionately higher health
63 risk. A meta-analysis published in 2016 and including 3.9 million people showed

64 a significantly higher mortality risk in men with BMI higher than 25.⁷ But despite
65 this and the higher prevalence of overweight and obesity in men (67% vs 53%,
66 as mentioned above), German men of all ages are underrepresented in existing
67 health behavior change programs. Some of Germany's biggest commercial
68 weight reduction programs reported that female participants made up between
69 73.7 % and 78.0 % of all attendees.⁸⁻¹⁰ A review of 244 weight loss trials, mostly
70 conducted in the United States, similarly showed that 27.0 % of participants
71 were male and only five percent of all trials were men only (32.0 % women
72 only)¹¹ Furthermore, according to the 2017 report by Germany's union of health
73 insurance companies, of 1.7 million participants attending their preventive
74 health courses, 81.0 % were female.¹² There are several possible reasons for
75 men's low attendance rates. First is the subjective misperception of their BMI. In
76 a study testing differences in weight status perception after either self-reported
77 or objective BMI measurements, proportionally more men (42.7 % self-reported,
78 54.7 % objectively measured) than women (19.3 % self-reported, 30.9 %
79 objectively measured) had the tendency to estimate their weight as "about right"
80 when statistically being considered overweight (BMI = 25-30).¹³ Secondly, men
81 seem to have fewer concerns about health risks¹⁴ and about eating, body
82 weight, and physical appearance.¹⁵ Additionally men report barriers to seeking

83 help with health needs like socialization to conceal vulnerability¹⁶ and last, some
84 men view existing programs as unattractive and difficult to attend to.¹¹
85 However, it is well established that men who do attend weight loss programs
86 are often successful in losing weight.^{17, 18} Research shows that even 5 to 10
87 percent weight loss result in substantial health benefits and lowers future
88 risks.¹⁹ The “Football Fans in Training” program (FFIT), originating in Scotland,
89 has demonstrated the power of the professional football setting to attract men in
90 the UK to a men-only group-based weight management and healthy living
91 program.²⁰ The 12-week program was developed in 2010²¹, and evaluated in a
92 randomized controlled trial (in 2011-2012) which showed that FFIT was
93 effective and cost-effective, showing benefits in weight loss and other
94 secondary outcomes 12 months after baseline.²² Key to FFIT’s success is the
95 program’s alignment with the emotional attachment of fans to football and use
96 of what has been regarded, until recently at least, as a traditionally male
97 setting.^{21, 23} Building on FFIT’s success and popularity in Scotland, other
98 programs addressing men’s health, weight and physical inactivity have been
99 adapted for other professional sports club environments and for other countries,
100 including rugby and ice hockey, to attract men to lose weight, and improve other
101 health behaviors.

102 After translation and very minor adaptations, FFIT was successfully launched in
103 the German Bundesliga, the most attended football league worldwide, in 2016.
104 Previous research showed the feasibility of recruiting clubs to deliver the
105 program and fans to attend the program.²⁴ The current study aims to test the
106 effectiveness of the adapted German Football Fans in Training program with
107 German football fans.

108 Methods

109 **Intervention and Setting**

110 FFIT is a gender-sensitized weight loss program delivered free of charge at
111 professional football club facilities by trained club coaches, originally developed
112 by a team at the University of Glasgow.²¹ FFIT in Germany (Fußballfans im
113 Training) was adapted by translation into German and minor cultural
114 amendments as described below.

115 After an initial health check and baseline measurements, the participants
116 attended twelve weekly sessions of 90 minutes. All sessions included (1) a
117 classroom based session and (2) a group-based physical activity session. Each
118 weekly classroom-based discussion covered a topic related to weight loss or
119 behavior change. This included: developing a healthier diet by enhancing
120 knowledge about nutrition and alcohol, interpreting food labels and choosing

121 healthier take-out food. Participants were taught to use behavior change
122 techniques including self-monitoring, goal-setting and getting support from other
123 group members, family and friends. Goals were reviewed weekly and through
124 discussion men learnt from one another about how to make changes. A detailed
125 description of the programme and mapping of all behavior change techniques
126 can be found in Gray et al. (2013). The classroom based session also included
127 an incremental walking program designed to increase fitness over time through
128 goals setting and self-monitoring of steps²⁵. The physical activity session was
129 light to moderate physical activity, of increasing duration and intensity as the
130 twelve weeks progressed. Club coaches, who had been trained to deliver FFIT,
131 were instructed to include basic workout principles like warm-up and cool-down
132 as well as endurance, muscle, flexibility and coordination training. Football
133 training exercises were also recommended.

134 Some minor adaptations to the original program materials were made to make
135 them appropriate for use in Germany. Examples of foods used in the healthy
136 diet sessions were replaced by more popular choices in Germany.

137 Measurement units were assimilated to German standards (e.g. liters instead of
138 pints). Additional content was also added to explain the link between obesity
139 and cancer, especially colon cancer, in men.²⁶ A more detailed description of
140 the adaptation process can be found elsewhere.²⁴

141 **Study Design and participants**

142 We conducted a pragmatic non-randomized trial with a waiting list comparison
143 group. Data for both intervention group and comparison group were collected
144 between January 2017 and July 2018. During this time period men were
145 recruited to 29 12-week deliveries of FFIT in 15 clubs. Clubs chose their own
146 recruitment methods (e.g., social media, half-time announcements at home
147 matches, club magazines) and all men interested in participating were invited to
148 apply through the official homepage www.ffit.de, where they were informed of
149 the inclusion criteria. Men were eligible to take part in the program if they were
150 aged between 35 and 65 years with a BMI ≥ 28 and waist circumference \geq
151 100 cm at objective measurements prior to course start. At the initial health
152 check, all potential participants were asked to fill out a German version of the
153 Physical Activity Readiness Questionnaire (PARQ)²⁷. The PARQ questionnaire
154 and blood pressure readings indicated possible contraindications to physical
155 activity. Therefore, men who answered 'Yes' to any PARQ question or who had
156 resting systolic blood pressure of 160 and higher or diastolic blood pressure of
157 100 and higher had to provide a letter of support from their physician or were
158 excluded from participating in physical activity during club sessions (although
159 they were still able to take part in the 'classroom' part of the session and the

160 pedometer-based walking program). Most clubs opened recruitment to all male
161 supporters, but three restricted participation in FFIT to season ticket holders.
162 By the end of July 2018, a total of 934 men had registered for 29 courses in the
163 15 clubs, of whom 477 were allocated to the intervention group. Allocation was
164 mostly done on the basis of first come, first served. Two clubs allocated the
165 participants on their own terms which are unknown to the research team. These
166 men were measured twice, with baseline assessments conducted during the
167 initial health check one week prior to program start. The second (follow up)
168 measurement was conducted during the week 12 session of FFIT. Thus,
169 baseline and follow-up measurements were 13 weeks apart.

170 To strengthen the validity of the study, a comparison group (N=84) was
171 recruited from waiting lists.²⁸ The lists included all men who had applied to a
172 course at their club but had not been selected by the methods described above.
173 These men, if any, were then invited to take part in objective comparison group
174 measurements in the time leading up to the following course which they were
175 considered to join. Attendance to those measurements was voluntary, without
176 further incentives and the same through all clubs. They were measured twice,
177 following the same protocols as the intervention group measurements, with
178 follow up occurring 13 weeks after baseline data collection. A flow chart of
179 participants is presented in Figure 1.

180 **Outcome Measures**

181 All measurements and questionnaire administration were conducted by the
182 FFIT coaches who had been trained to a standard measurement protocol. In
183 addition, to quality assure data collection, all measurement sessions were
184 supervised by members of the research teams. Men who were not able to take
185 part in the official measurement session were asked to attend at a subsequent
186 time that was convenient to them. The primary outcomes were objectively-
187 measured weight and waist circumference. Secondary outcomes were BMI,
188 body fat percentage, and systolic and diastolic blood pressure. Weight and body
189 fat percentage were recorded with an electronic scale (Omron BCM BF 511)
190 with men wearing light clothes and having removed their shoes and anything in
191 their pockets. Waist circumference was measured with an ordinary tape
192 measure about 5cm above the navel. Blood pressure assessments were
193 conducted in a separate room for a more relaxed atmosphere and nobody to
194 talk to. Men were asked to sit down and relax for at least one minute before
195 measurement. Height was measured without shoes. All self-reported data were
196 obtained using a short questionnaire that participants filled out in between the
197 objective measurements.

198 To assess sedentary time, men were asked to estimate the average number of
199 hours per day they had spent sitting during the last 7 days. A modified, German

200 version of the DINE questionnaire²⁹ was used to assess fruit and vegetable
201 intake, fatty food intake, sugary food intake and the proportion of whole grain
202 intake among pasta, rice and bread over the last week. In the Fatty Food Score,
203 Sugary Food Score, Vegetable and Fruit Score as well as Whole Grain Score, a
204 higher score indicated a higher number of days during the last week on which
205 the respective food types were consumed. Additionally, the Warwick-Edinburgh
206 Mental Well-being Scale³⁰ was used to measure participants' psychological
207 well-being.

208 **Statistical Analysis**

209 All statistical analyses were conducted with Stata 15 (Stata Corp, College
210 Station, TX). To follow the Intention-to-treat principle, Multiple Imputation was
211 used to decrease bias due to missing data following the assumption that data
212 were missing at random (MAR).³¹ Missing data were imputed using the MICE
213 technique (multivariate imputations by chained equations) with M = 10
214 imputations.³² The pooling of the regression estimates followed Rubin's rule.³³
215 Baseline characteristics were analyzed with linear regression to check for
216 baseline differences between intervention and comparison group. Table 2
217 reports mean values and standard deviations, as well as mean differences
218 between groups. Multilevel mixed-effects linear regression analysis was applied
219 to evaluate effects of the intervention on primary and secondary outcomes.

220 Time of assessment (baseline vs follow-up), group (intervention vs comparison)
221 and the interaction term between time and group were included as fixed effects.
222 Additionally, participants' age was included as a fixed effect because of a
223 significant baseline difference between groups (Table 1). To deal with the
224 clustered structure of the data, random intercepts were included for the three
225 levels, i.e. club, course and individual. Sensitivity analysis was performed with
226 the same regression model using complete data sets only (per protocol) and
227 replacing missing data with the participants' respective data from baseline
228 measurements (LOCF). Adjusted mean scores (95% CI) for baseline and post-
229 assessment, mean changes for both groups, intraclass correlations (ICCs) for
230 club and course level and group-by- time interaction effects are presented

231 **Results**

232 On average, courses were attended by 18 (Range: 12-26) participants with one
233 or two coaches. Ninety-one of the 477 men (19%) measured at baseline in the
234 intervention group were lost to follow-up 13 weeks later; equivalent figures for
235 the comparison groups were 6/84 (7%) (see Figure 1).

236

237  Place holder for Figure 1

238

239 Participants' baseline characteristics are shown in Table 1. Between-groups
240 analysis showed no significant differences except for the men's age. Therefore
241 age was added to all analysis as a confounding variable.

242

243  Place holder for Table 1

244

245 Mixed-model regression analysis results indicated significant differences
246 between intervention group and comparison group effects over time for weight
247 and most other outcomes. After undertaking the 12 weeks FFIT program, men
248 in the intervention group had lost an adjusted mean of 6.24 kg in weight (95 %
249 CI: 5.82 to 6.66), while men in the comparison group had lost 0.50 kg (-0.47 to
250 1.49). ICCs were 0.014 for club and 0.000 for course level.

251 Figure 2 shows the proportion of participants in the intervention and comparison
252 group who lost more than five and ten percent of their baseline weight,
253 respectively.

254

255 Place holder for figure 2

256

257 Weight loss data translated into a drop of BMI by 1.97 kg/m² (1.81 to 2.13)
258 against 0.15 (-0.18 to 0.48) and of body fat by 2.86 % (2.50 to 3.22) against
259 0.67 (-0.63 to 1.41), both in favor of the intervention group.

260 Further significant group-by-time effects were found for all DINE-based
261 outcomes related to food intake. Fatty food intake and sugary food intake
262 scores both showed a significantly larger drop in the intervention group. The
263 inverse was seen for the intake of vegetables and fruit: intervention group
264 participants increased their vegetable intake score by 0.98 (0.76 to 1.19)
265 compared to 0.31 (-0.07 to 0.69) in the comparison group; fruit intake score
266 increased by 1.52 (1.29 to 1.75) in the intervention group and decreased by
267 0.06 (-0.52 to 0.41) in comparison group. The measured increase in proportion
268 of whole grain products among pasta, rice and bread was 23.40 % (18.69 to
269 28.12) compared to 6.63 % (2.07 to 15.33). Sedentary time in the intervention
270 group decreased by 1.37 hours a day (0.89 to 1.85) on average, which was

271 significantly more than the decrease by 0.30 hours a day (-0.42 to 1.02) in the
272 comparison group. For the Warwick-Edinburgh Mental Well-Being Scale no
273 group-by-time interaction effect was found. The increase by 0.19 (0.14 to 0.24)
274 in the intervention group was slightly higher than the 0.14 (0.05 to 0.24) in the
275 comparison group. All adjusted results of the linear regression analysis on basis
276 of ITT and after Multiple Imputation for each outcome are shown in Table 2.
277 Sensitivity analyses showed similar results with a loss of 6.50 kg (6.08 to 6.92)
278 for the intervention group and 0.58 kg (-0.36 to 1.51) in the comparison group
279 when data were per-protocol, and 5.28 kg (4.89 to 5.68) weight loss for the
280 intervention group and 0.50 kg (-0.46 to 1.47) weight loss for the comparison
281 group when missing data at follow-up was conservatively replaced with baseline
282 weight (LOCF imputation). Also, we drew three random samples of 84
283 participants from the intervention group to match the number of comparison
284 group participants. Weight loss results were:

- 285 1. Intervention: 5.66 kg (4.88 to 6.45), Comparison: 0.50 (-0.31 to 1.31)
- 286 2. Intervention: 5.54 kg (4.75 to 6.33), Comparison: 0.50 (-0.32 to 1.32)
- 287 3. Intervention: 6.50 kg (5.60 to 7.40), Comparison: 0.50 (-0.40 to 1.40)

288

289

Place holder for Table 2

290 Discussion

291 **Summary and perspective**

292 In this research report we described the evaluation of a weight loss program
293 delivered to male football fans in close collaboration with 15 professional
294 football clubs in the German Bundesliga. The program is an adapted version of
295 the Scottish “Football Fans in Training”, which has been successfully
296 implemented in the Scottish Profession Football League since 2010.^{20-22, 34}

297 Earlier research shows the translation and adaptation process as well as the
298 success at recruiting clubs and fans from Germany for the program²⁴

299 Over an 18 month study period, 477 participants were recruited into the
300 intervention arm, and 84 into a comparison arm. Statistically significant
301 differences between the intervention and comparison groups were found for
302 changes in weight, BMI, girth, blood pressure, body fat percentage, fruit and
303 vegetable intake, whole grain percentage, fatty food and sugary food intake and
304 sedentary time. More than fifty percent of men in the intervention group lost at
305 least 5% of their baseline body weight.

306 Previous research has reported that men successfully lose weight once enrolled
307 in either men-only or mixed weight loss programs.^{11, 17, 18} Participation in FFIT in
308 Germany resulted in an average weight loss similar to the original trial

309 conducted in Scotland. In their randomized controlled trial, Hunt et al. reported a
310 weight loss of 5.80 kg after 12 weeks compared to 0.42 kg in the control group.

311 ²² Positive changes could be confirmed for German football fans in terms of a
312 healthier diet. The slight weight loss and small trend to positive outcomes
313 among comparison group participants' data also confirmed the findings of Hunt
314 et al. The original research discussed this extensively and was followed by
315 further research into this.

316 The only non-significant group-by-time effect was observed for the Warwick-
317 Edinburgh Mental Well Being Scale. Considering the items and questions asked
318 it is very unclear if this construct measures what was supposed to be an
319 estimation of a rise in overall psychological well-being due to lost weight and
320 improved physical fitness. Other instruments more suited to capturing the
321 positive feelings about a more active and healthy life might lead to different
322 results Hunt et al. reported significantly positive changes and between-group
323 differences for self-reported psychological health and quality of life after using
324 the Rosenberg self-esteem scale and the Short Form of the positive and
325 negative affect scale (PANAS).

326 FFIT in Germany compares well to other research about weight loss programs
327 in professional football or other professional sports. The EuroFIT trial³⁵ which
328 also used and slightly adapted the FFIT formula to football clubs throughout

329 Europe reported 2.60 kg weight loss and 3.3 cm loss of waist circumference
330 post-program. Positive effects on sedentary time and behavioral components
331 were also reported. The Scottish FFIT has also branched into rugby and
332 hockey. In rugby a pilot trial delivered through professional rugby clubs in New
333 Zealand was held in which the difference in weight loss favored the intervention
334 group by 2.5 kg and loss of waist circumference favored the intervention group
335 by 3.5 cm³⁶. In Canada, in a pilot trial of Hockey Fans in Training participants
336 lost 3.6 kg more than the comparison group and reported positive effects on
337 nutrition and other components aswell.³⁷

338 **Limitations**

339 The FFIT study in Germany was not a fully powered randomized controlled trial
340 to replicate the original FFIT study.²². Several considerations led to this
341 decision. Observational studies have found that without a specific intervention
342 the weight of German men who met the inclusion criteria for this study is very
343 unlikely to decrease and likely to increase slightly.^{38, 39} It is therefore very
344 unlikely that decreases in weight could be attributed to “spontaneous
345 remission”. The focus of our study was easy and practicable implementation of
346 an evidence-based, successful weight loss programme for clubs under routine
347 “field-conditions” and thus we prioritized high external validity. We made these
348 decisions based on the knowledge that clubs did not want to exclude their fans

349 from a programme which existing evidence suggests the participants are very
350 likely to benefit from. Further, our main aim was to evaluate the transfer of FFIT
351 into the German Bundesliga and whether German fans would also experience
352 similarly positive outcomes. We found that the programme could be transferred
353 and German fans could benefit.

354 Although an effort was made to recruit participants to a comparison group we
355 were not wholly successful and there are many fewer participants in that group
356 compared to in the intervention group. It was difficult to recruit to the
357 comparison group for several reasons. First, there were only limited numbers of
358 men on waiting lists. Second, clubs would often decide not host comparison
359 group measurements particularly if they had not yet made a decision to
360 continue delivering the FFIT programme. Third, participation in the
361 measurements was not required for those wanting to participate in the next
362 upcoming course. Limiting the size of the intervention group was out of the
363 question as the program funding required that as many participants as possible
364 should benefit and it would also have sharply reduced the overall sample size.
365 Because of this large equality between group numbers we simulated an even
366 number as part of our sensitivity analysis described in the results. The numbers
367 indicated that the effects are strong enough to maintain in this much smaller
368 sample.

369 In spite of the lack of randomization, baseline data were very similar between
370 intervention and comparison group, with the exception of participants age,
371 which was significantly different between groups. Thus, age was included in the
372 regression models as a fixed effect, alongside club, course and time. We were
373 not able to follow up any fans that did not participate in the end of course
374 measurements. Thus, all results were analyzed following the Intention-to-treat
375 principle with Multiple Imputation to deal with drop-outs and missing data. There
376 were no drop-outs on course level. Although every FFIT coach was trained to
377 standard measurement protocols, facility circumstances during measurements
378 differed between clubs and sometimes courses. As blood pressure is strongly
379 affected by the environment or discomfort during the measurement procedure
380 this might have resulted in confounding effects for the BP outcomes. Such
381 systematic influences on club or course level have been considered in our
382 statistical model with the addition of club and course as a random effect.. To
383 assure high quality, all data collection sessions at clubs were monitored by the
384 scientific project staff. Outcomes like sedentary time and diet-related
385 information were self-reported and limited to the last week. This week could
386 have been influenced by confounding events like illness, injuries or holidays.

387 **Conclusion**

388 The study suggests that “Football Fans in Training” is a very promising program
389 to help fill a gap in Germany’s health care landscape as far fewer men than
390 women are attracted to take part in existing preventive courses and offers of
391 health systems, including weight reduction programs. To date, there have been
392 very few programs that are specifically designed to try and attract men in
393 Germany. The FFIT has previously been shown to be very effective in Scotland
394 in attracting overweight, middle-aged men and supporting them in weight loss
395 and lifestyle changes, building on its concept of using the socio-cultural
396 environment of the professional football clubs as a ‘draw’. We have shown that
397 the idea and concept was transferrable to professional football in Germany
398 before²⁴ and successful in promoting positive health and lifestyle changes in
399 men here. Long-term results have still to confirm that FFIT in Germany enables
400 participants to sustain weight loss. Future research will evaluate weight loss
401 results one year after initiation of courses.

402 Although the psychological mechanisms behind the attraction of FFIT for men in
403 the UK, Germany or elsewhere have not been fully evaluated yet the supposed
404 appeal consisting of a mixture of a “male” environment and methodical
405 approach as well as an emotional connection for the participants should be
406 applicable to various fields in German health promotion. Health care providers

407 of all institutions have to make the effort of developing programs men are more
408 likely to attend. The FFIT might also show promise to be disseminated to a
409 broader field, including smaller professional clubs and clubs on an amateur
410 level. This should be one aim of future research. FFIT in Germany also extends
411 the evidence that the FFIT works in various different countries and sports when
412 emotionally engaged men are targeted.

413 Acknowledgements

414 We want to thank all the clubs for their participation and our colleagues from
415 mm sports and IFT-Nord for their help in recruiting and collecting the data.

416 Between January of 2016 and July of 2018 FFIT was carried out by the
417 following professional German Soccer Clubs in alphabetical order: 1. FC Köln,
418 1. FC Nürnberg, 1. FSV Mainz 05, Bayer 04 Leverkusen, Borussia Dortmund,
419 DSC Arminia Bielefeld, Eintracht Braunschweig, FC Ingolstadt 04, Hertha BSC,
420 Holstein Kiel, RB Leipzig, Schalke 04, SV Darmstadt 98 and SV Sandhausen.

421

422 “The Fußballfans in Training project utilises the Football Fans in Training
423 programme, the development and optimisation of which was undertaken by a
424 research team led by Glasgow University in partnership with the SPFL Trust.

425 We gratefully acknowledge some source material from the Nutrition & Dietetic
426 Department, NHS Forth Valley and Men’s Health Clinic, Camelon, Falkirk. The
427 programme development is described in Gray et al (2013), the results of the
428 programme evaluation are reported in Wyke et al (2015) and Hunt et al (2014).

429 These publications (and others relating to the programme) are available from
430 www.ffit.org.uk.”

431 Conflicts of Interest

432 The authors declare that there are no conflicts of interest. "Fußballfans im

433 Training" is funded by the "Stiftung Deutsche Krebshilfe" (German Cancer Aid)

434 The German Cancer Aid had no influence on the article or authors.

435 Tables

Table 1: Participant characteristics at baseline

	Intervention Group (n=477) Mean (SD)	Comparison Group (n=84) Mean (SD)	p-value
Age	48.82 (7,82)	52.62 (7,63)	0.001
Height (cm)	179.71 (6,60)	179.73 (5,91)	0.981
Weight (kg)	113.52 (17,19)	111.89 (16,02)	0.419
BMI (mmHg)	35.14 (4,71)	34.70 (4,76)	0.430
Waist Circumference (cm)	119.62 (11,37)	119.63 (11,64)	0.997
Body Fat (%)	34.37 (5,01)	33.78 (5,40)	0.327
Systolic BP (mmHg)	152.35 (19,12)	154.49 (17,63)	0.355
Diastolic BP (mmHg)	95.59 (11,35)	96.06 (11,31)	0.730
Fruit Score	3.04 (1,96)	3.34 (1,96)	0.198
Vegetable Score	3.37 (1,64)	3.27 (1,66)	0.614
Fatty Food Score	23.94 (6,99)	24.52 (5,75)	0.479
Sugary Food Score	11.05 (4,06)	11.52 (4,59)	0.350
Whole Grain (%)	27.70 (31,20)	22.09 (26,40)	0.124
Sedentary time (h/day)	8.29 (3,42)	9.05 (3,41)	0.063
WEMWEBS	3.79 (0,52)	3.78 (0,46)	0.887

n, sample size; SD, standard deviation; BP, Blood Pressure; WEM, Warwick-Edinburgh Mental Well-Being Scale; Whole Grain, whole grain proportion of total starchy food intake

Table 2: Adjusted mean scores and changes in outcomes from baseline to post-intervention as well as group-by-time interaction effects

		Mean (95%CI)	Mean (95%CI)	Mean (95%CI)	ICCs	p-value
Objectively measured outcomes						
Weight (kg)	Intervention	113.08 (111.19 to 114.97)	106.84(104.94 to 108.74)	-6.24 (-6.66 to -5.82)	0.014 (Club)	< 0.001
	Control	113.17 (109.20 to 117.15)	112.68 (108.69 to 116.67)	-0.50 (-1.47 to 0.47)	0.000 (Course)	
BMI (kg/m ²)	Intervention	35.07 (34.61 to 35.53)	33.10 (32.63 to 33.57)	-1.97 (-2.13 to -1.81)	0.004(Club)	< 0.001
	Control	34.90 (33.85 to 35.95)	34.75 (33.69 to 35.81)	-0.15 (-0.48 to 0.18)	0.000(Course)	
Girth (cm)	Intervention	119.42 (117.96 to 120.90)	111.59 (110.06 to 113.12)	-7.83 (-8.44 to -7.23)	0.024(Club)	< 0.001
	Control	119.84 (116.94 to 122.74)	118.69 (115.76 to 121.62)	-1.15 (-2.27 to -0.37)	0.000 (Course)	
Systolic blood pressure (mmHg)	Intervention	152.50 (150.36 to 154.65)	141.39 (138.92 to 143.86)	-11.11 (-13.14 to -9.08)	0.013(Club)	0.003
	Control	154.15 (149.48 to 158.82)	149.37 (144.81 to 153.93)	-4.78 (-8.75 to -0.81)	0.001(Course)	
Diastolic blood pressure (mmHg)	Intervention	95.52 (94.11 to 96.92)	87.05 (85.56 to 88.55)	-8.46 (-9.50 to -7.42)	0.025 (Club)	< 0.001
	Control	96.45 (93.69 to 99.22)	94.62 (91.80 to 97.46)	-1.83 (-4.03 to 0.38)	0.000 (Course)	
Body Fat (%)	Intervention	34.29 (33.76 to 34.82)	31.43 (30.89 to 31.98)	-2.86 (-3.22 to -2.50)	0.002(Club)	< 0.001
	Control	34.17 (33.00 to 35.36)	33.50 (32.33 to 34.68)	-0.67 (-1.41 to 0.63)	0.000(Course)	
Self-reported outcomes						
WEM	Intervention	3.80 (3.75 to 3.84)	3.99 (3.93 to 4.04)	0.19 (0.14 to 0.24)	0.000(Club)	0.367
	Control	3.75 (3.64 to 3.86)	3.89 (3.78 to 4.00)	0.14 (0.05 to 0.24)	0.000(Course)	
Sedentary time (h/day)	Intervention	8.19 (7.81 to 8.57)	6.82 (6.30 to 7.33)	-1.37 (-1.85 to -0.89)	0.013(Club)	0.013
	Control	8.94 (8.12 to 9.75)	8.64 (7.77 to 9.50)	-0.30 (-1.02 to 0.42)	0.000(Course)	
DINE-based measures						
Fatty food score	Intervention	23.97 (23.31 to 24.64)	19.38 (18.37 to 20.39)	-4.60 (-5.58 to -3.61)	0.004(Club)	< 0.001
	Control	24.42 (22.94 to 25.91)	22.81 (21.29 to 24.32)	-1.61 (-3.04 to -0.19)	0.000(Course)	
Sugary food score	Intervention	11.00 (10.62 to 11.38)	7.66 (7.20 to 8.13)	-3.34 (-3.80 to -2.87)	0.000(Club)	0.009
	Control	11.59 (10.76 to 12.43)	9.47 (8.61 to 10.33)	-2.12 (-2.97 to -1.28)	0.016(Course)	
Fruit score	Intervention	3.06 (2.88 to 3.42)	4.57 (4.35 to 4.81)	1.52 (1.29 to 1.75)	0.000 (Club)	< 0.001
	Control	3.31 (2.90 to 3.72)	3.25 (2.81 to 3.70)	-0.06 (-0.52 to 0.41)	0.000 (Course)	
Vegetable score	Intervention	3.35 (3.19 to 3.51)	4.33 (4.11 to 4.55)	0.98 (0.76 to 1.19)	0.000(Club)	0.003
	Control	3.35 (2.98 to 3.62)	3.56 (3.20 to 3.93)	0.31 (-0.07 to 0.69)	0.000(Course)	
Whole-grain proportion (%)	Intervention	28.11 (24.50 to 31.72)	51.51 (47.22 to 55.81)	23.40 (18.69 to 28.12)	0.000(Club)	0.001
	Control	22.16 (14.33 to 30.00)	28.79 (20.70 to 36.88)	6.63 (2.07 to 15.33)	0.000(Course)	

439 Figures

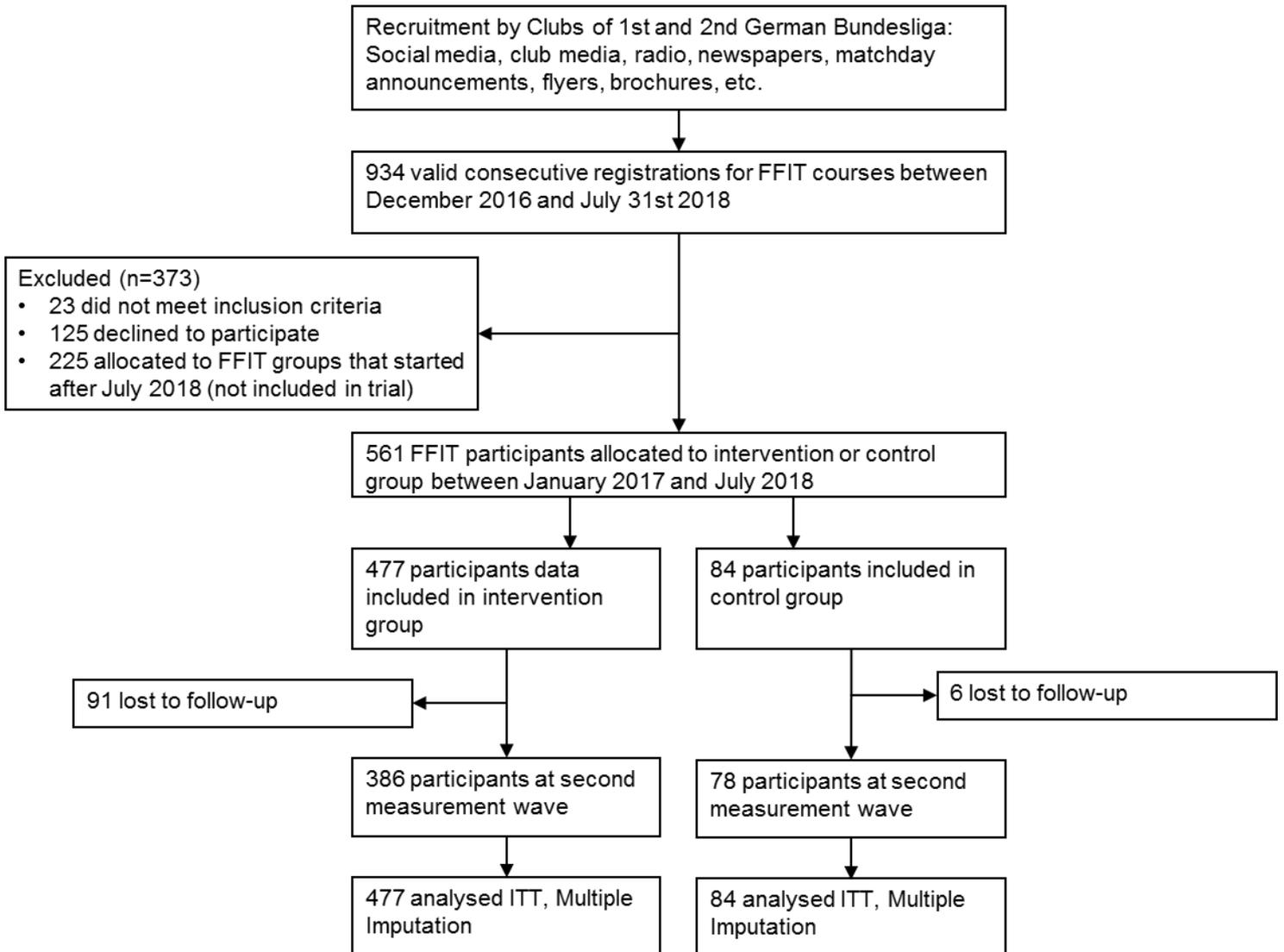
440 Figure 1: Participant Flow Chart

441 Figure 2: FFIT participants with over 5 percent and over 10 percent weight loss

442 after 12 weeks.

443 Figure 1

444

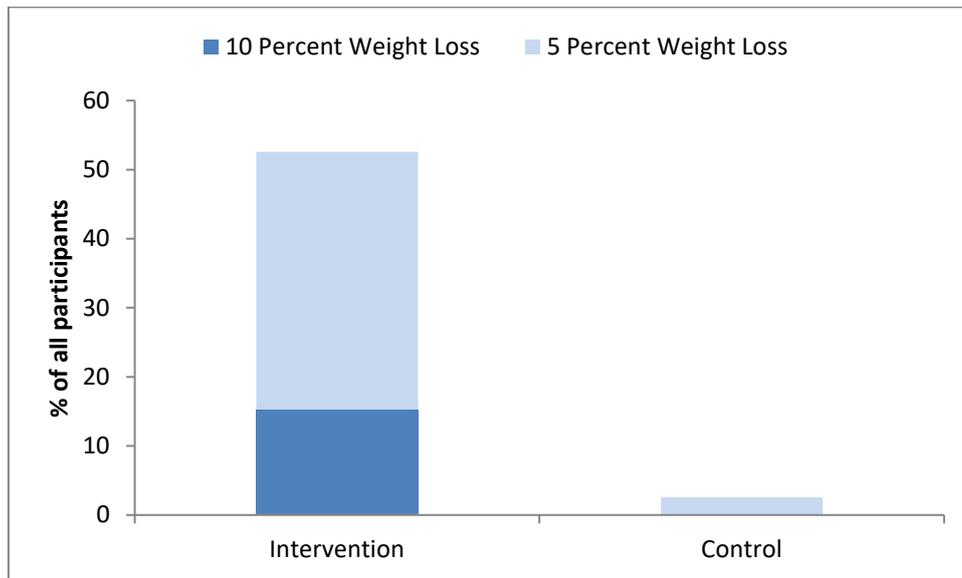


445

446

447 Figure 2

448



449

450 References

- 451 1. World Health Organization. Global status report on
452 noncommunicable diseases.
453 [http://apps.who.int/iris/bitstream/handle/10665/148114/978924](http://apps.who.int/iris/bitstream/handle/10665/148114/9789241564854_eng.pdf?sequence=1)
454 [1564854_eng.pdf?sequence=1](http://apps.who.int/iris/bitstream/handle/10665/148114/9789241564854_eng.pdf?sequence=1). Published 2014. Accessed
455 August 23rd, 2018.
- 456 2. Abarca-Gómez L, Abdeen ZA, Hamid ZA, et al. Worldwide
457 trends in body-mass index, underweight, overweight, and
458 obesity from 1975 to 2016: a pooled analysis of 2416
459 population-based measurement studies in 7.9 million children,
460 adolescents and adults. *Lancet*. 2017;390(10113):2627-2642.
- 461 3. Mensink GB, Schienkiewitz A, Haftenberger M, Lampert T,
462 Ziese T, Scheidt-Nave C. [Overweight and obesity in
463 Germany: results of the German Health Interview and
464 Examination Survey for Adults (DEGS1)].
465 *Bundesgesundheitsblatt Gesundheitsforschung*
466 *Gesundheitsschutz*. 2013;56(5-6):786-794.
- 467 4. Lehnert T, Streltchenia P, Konnopka A, Riedel-Heller SG,
468 König HH. Health burden and costs of obesity and overweight
469 in Germany: an update. *Eur J Health Econ*. 2015;16(9):957-
470 967.
- 471 5. The GBD 2016 Obesity Collaborators. Health Effects of
472 Overweight and Obesity in 195 Countries over 25 Years. *N*
473 *Engl J Med*. 2017;377(1):13-27.
- 474 6. Effertz T, Engel S, Verheyen F, Linder R. The costs and
475 consequences of obesity in Germany: a new approach from a
476 prevalence and life-cycle perspective. *Eur J Health Econ*.
477 2016;17(9):1141-1158.
- 478 7. Di Angelantonio E, Bhupathiraju SN, Wormser D, et al. Body-
479 mass index and all-cause mortality: individual-participant-data
480 meta-analysis of 239 prospective studies in four continents.
481 *Lancet*. 2017;388(10046):776-786.

- 482 **8.** Bischoff SC, Damms-Machado A, Betz C, et al. Multicenter
483 evaluation of an interdisciplinary 52-week weight loss program
484 for obesity with regard to body weight, comorbidities and
485 quality of life—a prospective study. *Int J Obes.* 2011;36:614.
- 486 **9.** Frey I, Dapp N, König D, Deibert P, Predel H, Berg A. Weight
487 Management through M.O.B.I.L.I.S., an Exercise Based
488 Weight Loss Program: 2-Year Results. *German Journal of*
489 *Sports Medicine.* 2010;61(1):19.
- 490 **10.** Scholz GH, Flehmig G, Scholz M, et al. Evaluation des DGE-
491 Selbsthilfeprogramms „Ich nehme ab “. *Ernährungs-Umschau.*
492 2005;52(6):226-231.
- 493 **11.** Pagoto SL, Schneider KL, Oleski JL, Luciani JM, Bodenlos JS,
494 Whited MC. Male inclusion in randomized controlled trials of
495 lifestyle weight loss interventions. *Obesity.* 2012;20(6):1234-
496 1239.
- 497 **12.** Medizinischer Dienst des Spitzenverbandes Bund der
498 Krankenkassen e.V. Präventionsbericht 2017.
499 [https://www.gkv-
503 spitzenverband.de/media/dokumente/krankenversicherung_1/
504 praevention_selbsthilfe_beratung/praevention/praeventions
505 bericht/2017_GKV_MDS_Praeventionsbericht.pdf](https://www.gkv-
500 spitzenverband.de/media/dokumente/krankenversicherung_1/
501 praevention_selbsthilfe_beratung/praevention/praeventions
502 bericht/2017_GKV_MDS_Praeventionsbericht.pdf). Published
506 November 2017. Accessed September 12th, 2018.
- 507 **13.** Robinson E, Oldham M. Weight status misperceptions among
508 UK adults: the use of self-reported vs. measured BMI. *BMC*
509 *Obesity.* 2016;3:21.
- 510 **14.** Gregory CO, Blanck HM, Gillespie C, Maynard LM, Serdula
511 MK. Perceived health risk of excess body weight among
512 overweight and obese men and women: differences by sex.
513 *Prev Med.* 2008;47(1):46-52.
- 514 **15.** Pliner P, Chaiken S, Flett GL. Gender Differences in Concern
515 with Body Weight and Physical Appearance Over the Life
Span. *Pers Soc Psychol Bull.* 1990;16(2):263-273.
- 16.** Davies J, McCrae BP, Frank J, et al. Identifying Male College
Students' Perceived Health Needs, Barriers to Seeking Help,

- 516 and Recommendations to Help Men Adopt Healthier
517 Lifestyles. *J Am Coll Health*. 2000;48(6):259-267.
- 518 **17.** Robertson C, Avenell A, Stewart F, et al. Clinical Effectiveness
519 of Weight Loss and Weight Maintenance Interventions for
520 Men: A Systematic Review of Men-Only Randomized
521 Controlled Trials (The ROMEO Project). *American Journal of*
522 *Men's Health*. 2015.
- 523 **18.** Young MD, Morgan PJ, Plotnikoff RC, Callister R, Collins CE.
524 Effectiveness of male-only weight loss and weight loss
525 maintenance interventions: a systematic review with meta-
526 analysis. *Obes Rev*. 2012;13(5):393-408.
- 527 **19.** Knell G, Li Q, Pettee Gabriel K, Shuval K. Long-Term Weight
528 Loss and Metabolic Health in Adults Concerned With
529 Maintaining or Losing Weight: Findings From NHANES. *Mayo*
530 *Clin Proc*. 2018;93(11):1611-1616.
- 531 **20.** Hunt K, Gray CM, Maclean A, Smillie S, Bunn C, Wyke S. Do
532 weight management programmes delivered at professional
533 football clubs attract and engage high risk men? A mixed-
534 methods study. *BMC Public Health*. 2014;14:50.
- 535 **21.** Gray CM, Hunt K, Mutrie N, et al. Football Fans in Training:
536 the development and optimization of an intervention delivered
537 through professional sports clubs to help men lose weight,
538 become more active and adopt healthier eating habits. *BMC*
539 *Public Health*. 2013;13:232.
- 540 **22.** Hunt K, Wyke S, Gray CM, et al. A gender-sensitised weight
541 loss and healthy living programme for overweight and obese
542 men delivered by Scottish Premier League football clubs
543 (FFIT): a pragmatic randomised controlled trial. *Lancet*.
544 2014;383(9924):1211-1221.
- 545 **23.** Wyke S, Hunt K, Gray C, et al. Football fans in training (FFIT):
546 a randomised controlled trial of a gender-sensitised weight
547 loss and healthy living programme for men. Published January
548 2015. Accessed 25.03.2019.

- 549 **24.** Pietsch B, Hanewinkel R, Weisser B, Morgenstern M.
550 Fußballfans im Training. Können Vereine der
551 Fußballbundesliga ihre Fans zum Abnehmen bewegen?
552 *Prävention und Gesundheitsförderung*. 2018;13:218-224.
- 553 **25.** Baker G, Gray SR, Wright A, et al. The effect of a pedometer-
554 based community walking intervention "Walking for Wellbeing
555 in the West" on physical activity levels and health outcomes: a
556 12-week randomized controlled trial. *International Journal of*
557 *Behavioral Nutrition and Physical Activity*. 2008;5(1):44.
- 558 **26.** Moghaddam AA, Woodward M, Huxley R. Obesity and risk of
559 colorectal cancer: a meta-analysis of 31 studies with 70,000
560 events. *Cancer Epidemiology and Prevention Biomarkers*.
561 2007;16(12):2533-2547.
- 562 **27.** PAR-Q Questionnaire (german version). Deutsche
563 Gesellschaft für Sportmedizin und Prävention (DGSP).
564 https://daten2.verwaltungsportal.de/dateien/seitengenerator/leitlinie_vorsorgeuntersuchung_4.10.2007-anlage-1.pdf. 2018.
565 November 21st, 2018.
- 566 **28.** Hutchins SS, Brown C, Mayberry R, Sollecito W. Value of a
567 small control group for estimating intervention effectiveness:
568 results from simulations of immunization effectiveness studies.
569 *J Comp Eff Res*. 2015;4(3):227-238.
- 570 **29.** Roe L, Strong C, Whiteside C, Neil A, Mant D. Dietary
571 intervention in primary care: validity of the DINE method for
572 diet assessment. *Fam Pract*. 1994;11(4):375-381.
- 573 **30.** Tennant R, Hiller L, Fishwick R, et al. The Warwick-Edinburgh
574 Mental Well-being Scale (WEMWBS): development and UK
575 validation. *Health Qual Life Out*. 2007;5:63-63.
- 576 **31.** Sterne JAC, White IR, Carlin JB, et al. Multiple imputation for
577 missing data in epidemiological and clinical research: potential
578 and pitfalls. *Br Med J (Clin Res Ed)*. 2009;338:b2393-b2393.
- 579 **32.** White IR, Royston P, Wood AM. Multiple imputation using
580 chained equations: Issues and guidance for practice. *Stat*
581 *Med*. 2011;30(4):377-399.

- 583 **33.** Royston P, White IR. Multiple imputation by chained equations
584 (MICE): implementation in Stata. *J Stat Softw.* 2011;45(4):1-
585 20.
- 586 **34.** Gray CM, Wyke S, Zhang R, et al. Long-term weight loss
587 following a randomised controlled trial of a weight
588 management programme for men delivered through
589 professional football clubs: the Football Fans in Training
590 follow-up study.
591 <https://www.ncbi.nlm.nih.gov/books/NBK513426/>. Published
592 July 2018. Accessed November 20th, 2018.
- 593 **35.** Wyke S, Bunn C, Andersen E, et al. The effect of a
594 programme to improve men's sedentary time and physical
595 activity: The European Fans in Training (EuroFIT) randomised
596 controlled trial. *PLoS Med.* 2019;16(2):e1002736.
- 597 **36.** Maddison R, Hargreaves EA, Wyke S, et al. Rugby Fans in
598 Training New Zealand (RUFIT-NZ): a pilot randomized
599 controlled trial of a healthy lifestyle program for overweight
600 men delivered through professional rugby clubs in New
601 Zealand. *BMC Public Health.* 2019;19(1):166.
- 602 **37.** Petrella RJ, Gill DP, Zou G, et al. Hockey Fans in Training: A
603 Pilot Pragmatic Randomized Controlled Trial. *Med Sci Sports
604 Exerc.* 2017;49(12):2506-2516.
- 605 **38.** Fildes A, Charlton J, Rudisill C, Littlejohns P, Prevost AT,
606 Gulliford MC. Probability of an obese person attaining normal
607 body weight: cohort study using electronic health records. *Am
608 J Public Health.* 2015;105(9):54-59.
- 609 **39.** Haftenberger M, Mensink GBM, Herzog B, et al. Changes in
610 body weight and obesity status in German adults: results of
611 seven population-based prospective studies. *Eur J Clin Nutr.*
612 2015;70:300.
613