Final Report – GHT2000 Trial
GET HEALTHY GET INTO SPORT
Getting into Sport in Surrey



Abstract

A 4-arm randomised controlled trial (RCT) to test two types of GP referral intervention that were intended to increase physical and sporting activity among currently inactive 18-74 year old people with hypertension, suspected hypertension, pre-hypertension or high-normal blood pressure.

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Acronyms:

BMI - Body Mass Index
CCG - Clinical Commissioning Group (the local commissioner of NHS services)
GPPAQ - General Practice Physical Activity Questionnaire
IPAQ-S - International physical activity questionnaire short form
IQR - Interquartile range
MET - metabolic equivalent of task (a measure of intensity and energy expenditure of activities)
PA - physical activity
Ps - trial participants
RCT - randomised controlled trial
RF - research fellow
SD - Standard Deviation
S-R - self-report
SSP - Surrey Sports Park
WHR - waist-to-hip ratio

1 Executive summary

- This 4-arm randomised controlled trial (RCT) shows that participation in exercise referral programmes raised activity and levels of sports participation by more than 30 minutes per week for more than 40% of participants over a period of 12 months.

- Three of the four trial arms produced improvements that exceeded our criterion of increasing general physical activity by 100 metabolic equivalent minutes per week (METs) per week.

- The programmes generally were effective in producing a meaningful reduction in blood pressure over a period of 12 months.

- The study was a 4-arm RCT to test two types of GP referral intervention that were intended to increase physical and sporting activity among currently inactive 18-74 year old people with hypertension, suspected hypertension, pre-hypertension or high-normal blood pressure.

- The study assessed the long-term (1 year) effectiveness of a 12-week sports-oriented exercise programme, the efficacy of a web-delivered interactive tool to promote and support sports participation and healthy behaviour change and the effect of these interventions in combination. The control arm was standard care GP referral for gym-based exercise. The interventions focussed on promoting sporting activity with the assumption that this would prove more engaging and motivating for participants than existing gym-based exercise referrals.

- The primary outcome measures were time spent in physical activity assessed in METs using the International Physical Activity Questionnaire (IPAQ short form). Secondary outcome measures included increased involvement in sporting activity and biomedical health outcomes including change in body mass index (BMI), and waist and hip measurement and reductions in blood pressure.

- The key analyses were conducted on an intention-to-treat basis using multiple imputation of missing data for 469 participants.

- Proportionately more of the participants in the two sports arms were likely to achieve the sporting activity target though this finding did not reach conventional levels of statistical significance.

- Participants in the two sports arms enjoyed them more than those in the two gym-based conditions though feelings about the coaching were high in all groups.

- Over 40% of participants took up a year's membership at the Surrey Sports Park after completing their 12 week programme. People doing the sports-based arms were more likely to do this than those doing gym-only programmes.

- The study's achieved sample was smaller than planned leading to a reduction in statistical power but suggests that a larger, multi-site study of these interventions is merited. The study's eligibility target may have been too strict. Many people who considered themselves sedentary actually exceeded minimum levels of activity.

2 Introduction

2.1 Background

Exercise referral by a physician is used around the world to promote physical activity (PA) and as a treatment for a range of conditions including hypertension, diabetes, some cancers and mental health among others (Cavill, Richardson, & Foster, 2012; Dept of Health, 2011). Despite its widespread use the success of this intervention is variable (Pavey et al., 2011; Sorensen et al., 2006). While some health benefits are usually evident after 12 weeks of an exercise programme they tend not to be maintained in the longer term. Williams et al. (2007), for example, show that 17 sedentary people need to be referred for one person to remain moderately active 12 months later.

Individuals report numerous barriers that impede their ability to be physically active (Napolitano & Marcus, 2000). Lack of time and access to facilities are among the most common barriers that have been identified. We know that affective (mood and emotional) responses during exercise are predictive of activity maintenance and that many people report not enjoying exercise when they do it (Ekkekakis et al., 2004; Hall et al., 2002; Welch et al., 2012a). There is also evidence that feeling that you have control over the intensity of the exercise you do (i.e. perceived autonomy) is related to maintenance (Ekkekakis, 2009) and interestingly when left to self-determine exercise intensity levels many will exercise at levels that will provide measurable health benefits. Most exercise referral schemes, however, involve a trained exercise specialist designing a programme of individual gym-based activities that set intensities for patients thus limiting the amount of control they feel they have over their exercising.

In this project we asked whether there was anything that could be done to change exercise referral programmes that would enhance their effectiveness. Given what we know from the research literature it seemed clear that promoting choice of intensity and activity ought to promote positive affective responses during the course of an exercise programme and that should in turn increase the likelihood of a maintained increase in activity levels. We also predicted that giving people the choice of sports-related activities which did or did not (depending on the person's preferences) involve social contact ought to help increase positive affective responses during the programmes. To this end we tested an alternative to the traditional individual gym-based activity referral programmes that involved giving people a choice of sports-related activities.

The sports-based intervention was a 12 week alternative to solo gym-based standard programme and was monitored by a qualified exercise referral specialist. Participants were given a choice of low-intensity sports-like activities (e.g. walking football, 'Badmintone', 'Netfit', 'AthleFIT', swimming etc.) which could be combined with some flexibility to make up an equivalent total amount of time as the traditional gym-based programmes. As with normal referral for exercise participants paid a notional gym fee of £3 per session with a one-off payment of £15 at the start of the 12 week programme.

Maintenance of activity levels beyond the period of the exercise referral programme itself is a major challenge. While lifestyle advice is routinely given to all exercise referral recipients the evidence is clear that most people find this advice hard to follow and activity levels usually revert to pre-referral levels (Williams et al. 2007). To address this we also tested an on-line self-help tool that was intended to help people plan activities after their referral programme. There is good evidence that web-based self-help tools are effective (e.g. Biddle et al., 2012; Davies et al., 2012) and we developed our self-help tool around the notion of implementation intentions (Gollwitzer & Sheeran, 2006). Implementation intentions refer to the idea that in order to achieve some goal – in our case doing physical activity – people need not only to intend to achieve their goal but need to make plans to do the interim activities necessary to achieve the goal. For example, if someone intends to go for a swim next Wednesday they need to make sure that they have their swimming costume and towel

ready and to have coins available for the car park etc. These are in some senses trivial plans but if these are not followed through the goal may not be achieved.

Our website self-help tool contained a calendar of local activities that people could choose to do and invited them to 'book' the event into their personalised calendar and to identify the intermediate actions they needed to take to make sure that they were able to take part in the activity. Nearer the date of the event they were automatically emailed a reminder about the activity and of the intermediate actions they had said that they needed to take. The website was based on the principles of Let's Get Moving (LGM) and offered the opportunity to browse the host health and wellbeing (HWB) website and secondarily self-refer to other web-delivered health behaviour interventions (smoking, alcohol and diet). Screen-shots of the website are presented in Appendix 8.3.

2.2 Study Design

The study was set up as a formal randomised control trial (RCT) and the full protocol for the study was published in Fife-Schaw et al. (2014). NHS ethical approval for the trial was received in September 2013 (REC Reference 13/LO/1170). The key features of the study are described below but full details are to be found freely available in Fife-Schaw et al. (2014).

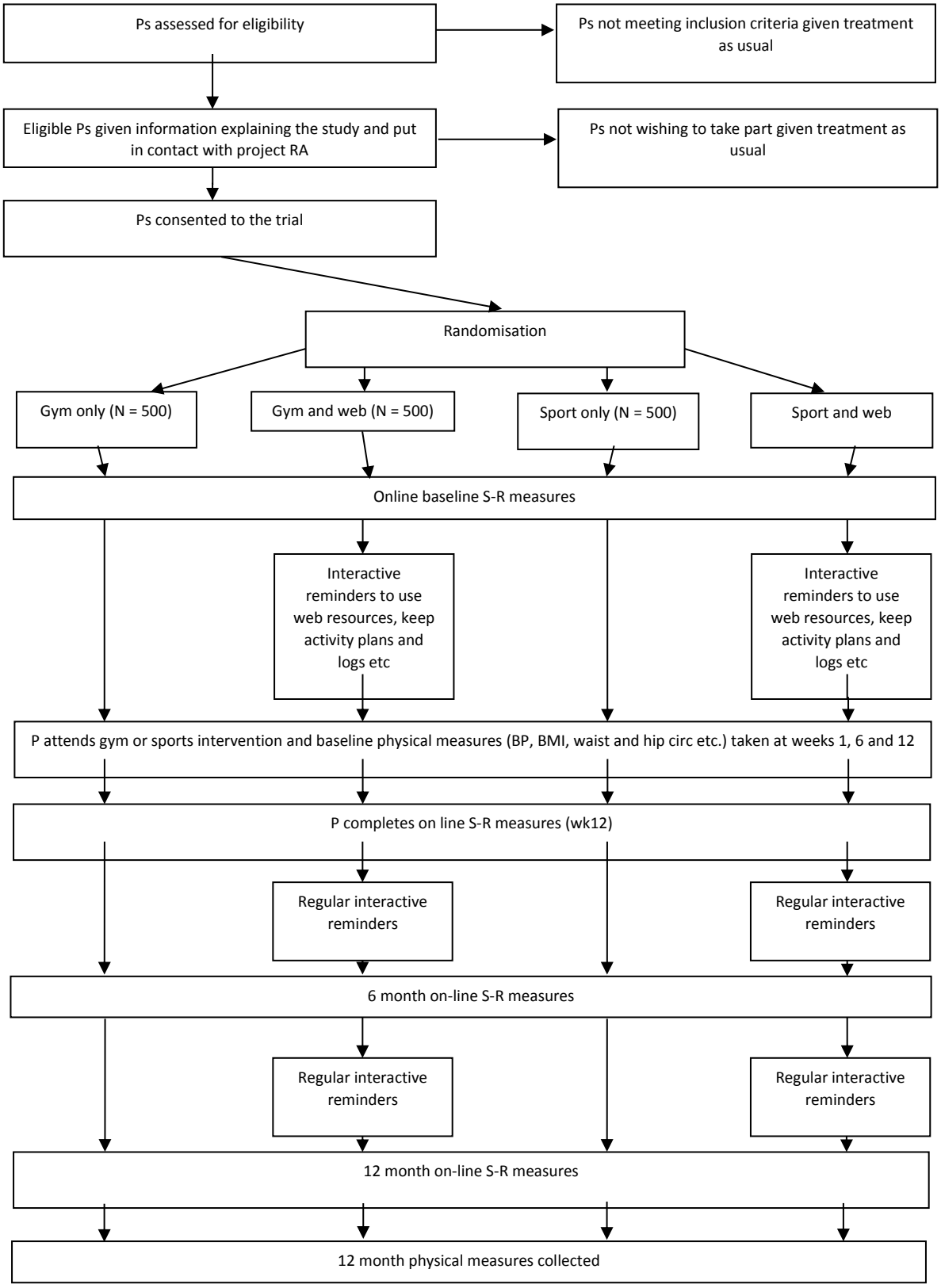
There were two interventions being tested; the sports-based 12 week programme and the self-help web-based tool and these were to be compared with the treatment as usual (TAU) individual gym-based 12 week programme. The study had a 2 by 2 design as we wished to compare each intervention against the TAU gym-based programme and the two interventions in combination. Thus we had four treatment arms; 1) GP gym-based referral (the treatment as usual control), 2) GP gym-based referral plus web tool, 3) sport referral at Surrey Sports Park and 4) sport referral plus web tool. Participants then attended a 12 week exercise programme (sport or gym) and their activity levels and sporting participation were monitored at 6 months and 12 months after starting the exercise programme. The trial diagram on the next page describes the study more fully.

The study was conducted in the Guildford and Waverley CCG area and targeted inactive people with hypertension, suspected hypertension, pre-hypertension or high-normal blood pressure and assessed as being inactive or moderately inactive using the General Practice Physical Activity Questionnaire (GPPAQ) screening tool (see inclusion criteria below). Based on an *a priori* power calculation the target sample size was 2000 (see Fife-Schaw et al. 2014 for the details of this).

As participants and the exercise referral specialists knew which trial arm they had been allocated to the trial could not be blinded.

Potential participants were identified from clinical records on the basis of a computerised search. GPs then reviewed the selected cases and recommend referral where appropriate. They were written to with the referral letter and invited to join trial and given the GPPAQ screening tool to fill in if they wished to take part. People who did not respond to the letter were sent a single reminder. Those consenting to take part were given a form to present at Surrey Sports Park (SSP) which was used both to book a consultation with the exercise referral specialist and to get the reduced rate temporary membership of SSP. As with normal exercise referral participants had to pay £75 for the 12 week programme.

2.3 Trial Design Diagram



Key: S-R – self-report

After randomisation to condition (trial arm) those in the two conditions that involved use of the web-based self-help tool were sent a link to the website and encouraged to log onto it and set up their profile.

Most self-report data was collected electronically but some people requested paper versions of the materials which we were happy to provide. Physical indicators of health (blood pressure, waist-to-hip ratios etc.) were collected by SSP staff during the exercise programme and either by the person's GP surgery or SSP staff at 12 month follow-up.

2.3.1 Inclusion criteria

- The patient was aged 18 to 74 years at randomisation.
- The patient had been diagnosed as having hypertension (BP> 140/90 mmHg), suspected hypertension or having high normal BP (BP 130-139/85-89 mmHg).
- The patient was screened as being 'inactive' or 'moderately inactive' on the GPPAQ.
- The patient had access to the internet and an e-mail account.
- The patient was able to understand the Informed Consent Form (ICF), and understand study procedures.

2.3.2 Exclusion Criteria

- The patient was pregnant.
- The patient was unable to freely consent to take part in the study
- The patient was unable to understand the study materials.
- The patient was unable to access the internet/email
- The patient was participating in another clinical trial relating to physical activity or exercise
- The patient had condition that, in the GP's opinion, compromised the person's ability to meet protocol requirements.
- The patient was referred out of the trial by the exercise professional on the grounds that the programme was, in their judgement, likely to cause harm.

2.4 Criteria for Success

As this was a formal trial we had to specify criteria for success in advance. In the study protocol (Fife-Schaw et al., 2014) we said that the interventions individually were to be regarded as successful if they led to an average increase in activity of 100 Metabolic Equivalent-minutes (MET-minutes) per week as measured by the IPAQ-S self-report physical activity measure (Criterion 1). This equates to engaging in an extra moderate intensity activity, say brisk walking (3.3 MET) for 30 minutes per week. The new interventions were to be regarded as superior to the standard gym-based referral if they increased activity levels above those of the standard care gym-based exercise by 20 MET-minutes per week (Criterion 2).

The interventions were to be deemed to have been successful in promoting sports participation if they led to participants engaging in more than 30 minutes a week of sporting activity (Criterion 3).

The interventions were seen to have been successful in promoting sports participation if they increased sports related activity by 30 minutes per week (Criterion 3).

We also assessed changes in indicators relating to cardiovascular health including blood pressure, weight and waist and hip circumference. In terms of blood pressure the interventions were to be regarded as successful if they led to an average decrease in blood pressure of 2.5mmHg (Criterion 4). We also assessed the proportion of the sample reducing their blood pressure by more than 10 mmHg and an intervention was to be regarded as a success if more than 20% of the members of that study arm achieve a reduction greater than this (Criterion 5).

2.5 Analytic Approach

We have included statistical details of our analyses in the text and tables for those who want to see this kind of supportive evidence but for those not so concerned the essential messages of this report are in the text and the statistical figures can be ignored without any loss. The description of the results of the study start in Section 3.

For those interested in the details the dataset contains measures taken at up to 5 time points and for the present purposes most analyses will focus on data from the start-up of the trial before people have commenced their 12 week exercise programme, and at the 12 month follow-up. The rationale for this is that, while we will be able to conduct a range of interesting analyses in the future, the primary concern is whether either intervention was capable of inducing sustained change in behaviour and well-being.

The trial data set has some missing data. For example, some people were able to provide 12 month self-report data but not physical health indicators as they either were unable to visit their GP surgery in the required time period and/or were unable to attend SSP to have the measures taken. In other cases people did not answer all the questions asked of them at each wave of the study. More importantly still, some people dropped out from the trial and it is likely that the people who drop out for whatever reason are different from those who stay with it. In this trial, for instance, we know that those who were relatively less healthy at the start of the trial and those with work commitments were less likely to complete the trial (see section 3.1). This is almost inevitable in a pragmatic trial such as this one. The effect of this is that we have those who were relatively more keen and healthy in the sample at the end of the trial and so we may over-estimate the effectiveness of the interventions.

There are a number of ways in which RCT trial data can be analysed to address this and we have adopted an intention-to-treat (ITT) approach which is a relatively conservative one (i.e. less likely to claim there is an effect even when there is one present). In ITT analyses we analyse the data from all participants based on the trial arm that they were allocated to irrespective of whether they completed the study or not. We infer the data for people that drop out (i.e. make a range of informed guesses) rather than analyse only the data for those who completed the whole study. We have done this using a statistical procedure called multiple imputation of missing data using a Markov Chain Monte Carlo (MCMC) procedure. The specification of how we did this is set out in Appendix 8.1 but in essence the procedure makes a sequence of informed guesses about what a person's missing data would have been based on the pattern of information that they have provided. It produces a number of replicates of the data set and most of the analyses of the key effects of the interventions are conducted on each of these replica data sets and a kind of average (pooled) result is reported. While this looks like, and indeed is, a way of making up the data it is less likely to overstate the effectiveness of an intervention than would be the case if we only analysed the data from those who completed the whole study. It is currently regarded as normal practice in the analysis of RCTs.

The number of people completing the trial through to the 12 month follow-up is only 283 compared with the target of 2000 (before imputation). We discuss a range reasons for this in the Discussion section later in the document but the immediate import of this is that the trial is relatively underpowered. This means that the chances of correctly identifying an effect of the interventions and being confident about the conclusions are reduced – we may fail to find an effect when there was one there to detect. It is therefore important to note that a non-statistically significant result should not be automatically interpreted to mean that there was absolutely no difference between interventions/trial arms but just that there is insufficient evidence of a reliable difference – a subtle point but an important one.

Where continuous variables are normally distributed we report means and standard deviations, where they are not we report medians and inter-quartile ranges. Bar charts are used to illustrate effects related to normally distributed variables and box and whisker plots are used for non-normal continuous variables. An explanation of how to interpret box and whisker plots is given in appendix 8.2.

Qualitative data from the feedback survey and the in-depth semi-structured interviews was analysed using thematic analysis (Braun and Clarke, 2006).

2.6 Data screening and cleaning

All IPAQ-S data were treated using the guidelines provided by the IPAQ authors (International Physical Activity Questionnaire, 2005). This addresses common 'mistakes' made by study participants and provides rules for excluding people who report unrealistically high levels of activity. Additional questions relating to sporting activity which were presented in the IPAQ format were treated to similar procedures defined by the project sponsors, Sport England (GHGA Sports questions scoring protocol V1.0).

All variables analysed were first screened for outliers and data integrity was checked where these were identified. Where data entry errors were identified these were corrected but no trimming or alteration of non-erroneous data points has been attempted.

3 Results

3.1 Sample Characteristics and Attrition

Thirteen GP surgeries in Guildford and Waverley CCG area agreed to participate and from these surgeries 7078 potential Ps were identified as potential beneficiaries of exercise referral and were contacted. From this figure 1005 (14%) responded though 344 were excluded as they reported being too active on the GPPAQ and 192 indicated a willingness to start the trial but failed to attend the initial start-up session. A requirement of all the projects within the Sport England programme was that people needed to be 'inactive' or 'moderately inactive' at the start of the interventions as assessed using the GPPAQ screening tool. This means that they either had a sedentary job and did no physical exercise or cycling (inactive) or that they had a sedentary job and did some but less than one hours physical exercise and/or cycling per week OR had a standing job and did no physical exercise or cycling (moderately inactive).

Of the 469 that started the 12 week exercise programme 291 completed the full study through to the 12 month follow-up. Appendix 8.3 gives the full study CONSORT diagram which lists the reasons for withdrawal where known. We compared baseline data for those who completed the full trial with those who started their exercise programmes but were lost to the trial before the 12 month follow-up.

Table 2.1. Baseline descriptive statistics for those completing the full trial and those starting but withdrawing before the 12 month follow-up.

Variable (at Baseline)	Completed 12 months (n=291)	Recruited but withdrew before 12 months (n=178)
Age	Mean = 61.10 (SD = 8.10)	Mean = 59.92 (SD = 9.52)
Gender = female[a]	128 (44.0%)	87 (48.9%)
Ethnicity declared as white British or Irish[a]	258 (88.7%)	156 (87.6%)
Not in paid employment and/or retired[a]	137 (45.0%)	81 (47.7%)
Married or in civil partnership[a]	212 (72.9%)	124 (69.7%)
Not in education[a]	276 (96.2%)	175 (97.2%)
IPAQ-S total activity (MET-minutes)	Median = 862 IQR = 2178.00	Median = 792 IQR = 2345.7
Body Mass Index[b]	Mean = 30.04 (SD = 5.35)	Mean = 31.16 (SD = 5.95)
Waist-to-hip ratio[b]	Mean = .91 (SD = .08)	Mean = .91 (SD = .08)
Systolic BP	Mean = 148.49 (SD = 18.10)	Mean = 149.94 (SD = 18.54)
Diastolic BP	Mean = 83.37 (SD = 10.43)	Mean = 84.50 (SD = 11.98)

a – note that not all Ps responded to all questions – percentages are of those providing information on each question.

b – not all Ps who completed the trail self-report measures had complete health measurements at 12 months (see discussion section)

Table 2.1 suggest that those who dropped out of the study were likely to be slightly younger, female, and less likely to be married or in a civil partnership. None of the differences were large but there are some differences relating to self-assessed health based on the RAND SF36®. The SF-36® subscales measure self-reported well-being in eight domains which are subsequently collapsed in to two composite scores – a measure of physical health and one of mental health. Each scale is measured with a higher score indicating better health. While our sample as a whole reported generally good health those who did not complete the trial reported lower scores on both measures (see Table 2.2 below). Though this difference was not statistically significant it is important to note that this ties in with what we know from people who told us why they had withdrawn. Where we know them the reasons people gave are given in Appendix 8.3 and it is clear that health problems were an important factor in withdrawing.

Table 2.2. Differences on the RAND SF-36® self-report health indicators between those completing the full trial and those withdrawing.

SF-36® subscale at start of programme	Completed full 12 months?	N	Mean	Std. Deviation	t, p, Cohen's d
SF36 Physical Component	No	180	67.98	24.38	t = -1.93, p = .054, d = .18
	Yes	286	72.20	22..08	
SF36 Mental component	No	180	65.03	24.48	t = -1.64, p = .103, d = .16
	Yes	286	68.59	20.10	

We also asked Ps a series of six questions about their general orientation towards physical activity based on measures developed by Prestwich et al. (2012). While these questions assess distinct aspects of orientation towards activity such as intentions, control, confidence and enjoyment the responses are very highly correlated with each other so we created a composite approach-avoidance index by summing the item scores ($\alpha = .85$). Scores can range from 6 to 42 with high scores indicating a more positive orientation towards activity. At baseline most Ps were fairly positively oriented towards activity (mean = 32.5, SD = 6.92) and we assume that those less positive about this would have been less likely to consent to join the trial in the first place. While there was no significant difference between those completing the trial and those dropping out those remaining were slightly more positive about exercise at the outset of the trial (means = 32.89 and 32.92, $t(445) = 1.54$, $p = .13$, $d = .15$).

The Sport and Web arm had the highest attrition rate (see Appendix 8.3) which, while not statistically significantly different from the other arms, is slightly surprising since the rationale for the study was that the interventions, especially in combination, would be more enjoyable and encourage continued participation. As we have seen that poor(er) health may be a factor in retention we checked to see whether at the beginning of the trial those in the Sport and Web arm had worse self-reported health than those in the other arms. Whilst not reaching conventional levels of statistical significance those in the Sport and Web arm had the lowest scores on the SF36® subscales suggesting that, although randomly allocated to the arms, the Sport and Web arm may have contained proportionately more people with health problems at the beginning of the trial.

3.2 Intention to treat (ITT) Analysis of Trial Outcomes: Activity

3.2.1 Sporting Activity

The major focus of the project has been to look at the effect of interventions on levels of participation in sport. Sporting activity was measured in a number of different ways but we focus here on two measures. The first is the proportion of the sample who report more than 30 minutes per week of sporting activity and the second is the number of minutes of sport-related activity reported per week. At baseline 15.6% of all participants reported doing 30 or more minutes of activity per week. By 12 months the figure had more than doubled to 40.1%. The table below gives baseline and 12 month follow-up numbers of those achieving the 30+ minutes criterion broken down by trial arm.

Table 2.3. Numbers achieving 30 or more minutes per week of sport-related activity (all participants).

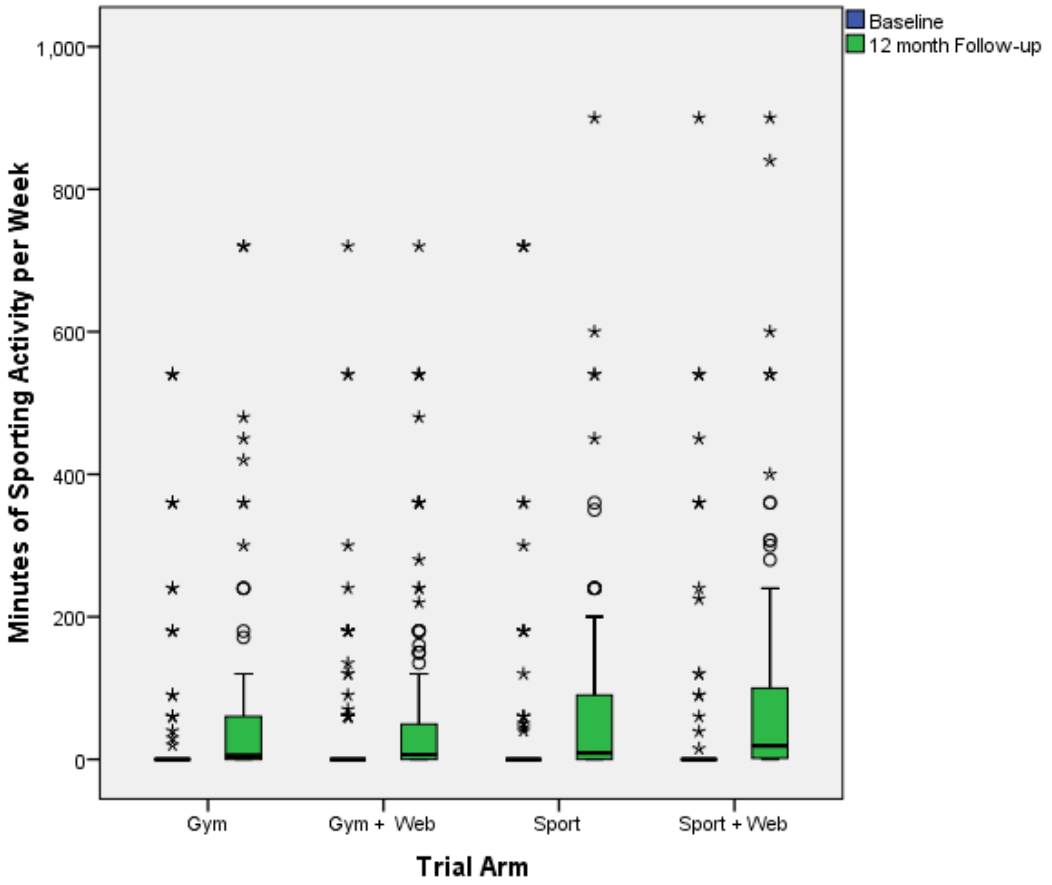
	Gym	Gym + web	Sport	Sport + web	Total
Baseline	18	22	17	16	73
%	14.9	18.2	15.5	13.7	15.6
12 m follow-up[a]	45	44	46	53	188
%	36.9	36.5	41.8	45.3	40.1

a – pooled figures rounded to the nearest integer

While the sports and web arm seemed to produce the largest proportion of participants achieving the target a simple χ^2 test shows that this is not statistically significant (pooled $\chi^2(3) = 2.699$, $p = .44$).

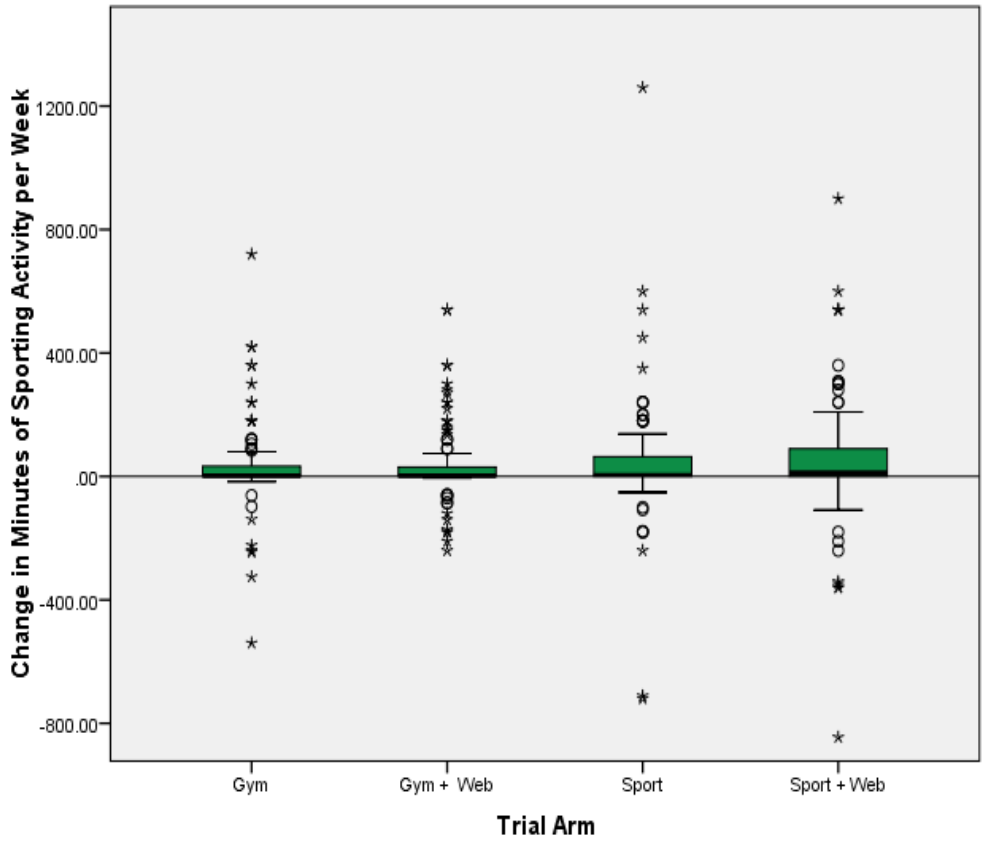
Looking at this from the perspective of total minutes of sporting activity engaged in per week we see that participation in the trial had a beneficial effect though not for all participants; indeed 9.1% of participants reported doing less sporting activity at the follow-up than at the beginning of the trial.

Figure 3.1: Minutes of sporting activity per week reported at baseline and at 12 month follow- up.



Due to the extremely non-normal distribution of the data we calculated a simple difference score which was the number of minutes of sporting activity reported at 12 months minus the number of minutes reported a prior to starting the exercise programmes. Using the success Criterion 3 of interventions leading to an increase of 30 minutes of sporting activity per week none of the arms appeared to have achieved this. Even in the group with the most change, the sport and web arm, the pooled median change was 13.09 (IQR = 101) thus failing to reach the criterion. The other interventions had median change scores close to zero. There was no significant difference in the degree of increase in minutes spent on sport attributable to the different trial arms (pooled $\chi^2(3) = 5.40$, $p = .14$) as there was considerable variability between individuals within each trial arm; this is confirmed visually in the figure 3.2 below.

Figure 3.2: Change in minutes of sporting activity reported at baseline and at 12 month follow- up.



Participants were asked to tell us what sporting activities they engaged in and these are presented in Table 3.4. It is worth noting that these are the 'sporting' activities as defined by the participants themselves and clearly some do not map on to Sport England's definitions of sports. Given the figures it looks like many have interpreted sporting activity to be anything that is done in a gym or leisure centre. Note that this table is based on observed rather than imputed data.

Table 3.4. Sporting activities carried out by participants.

Activity/Sport	**Number at 12 months follow-up**
Gym-based (e.g. circuits, treadmill, spinning, weights etc.)	85
Swimming	11
Aquafit/Aqua aerobics	10
Golf	9
Badminton	7
Cycling	5
Boxercise	5
Pilates	4
Squash/Rackets	3
Dancing	3
Rowing	2
Basketball	1
Fitball	1
Table tennis	1
Tai Chi	1
Ten pin bowling	1

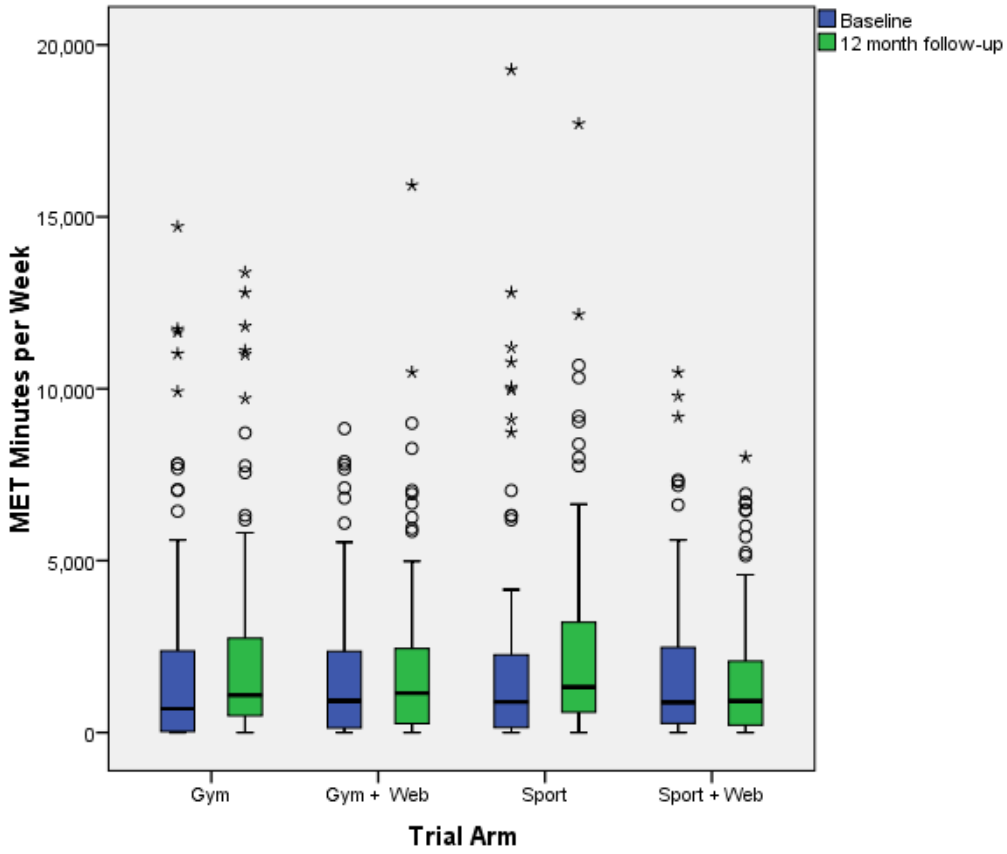
3.2.2 Physical Activity in General: The IPAQ-S activity measures

While the project was concerned with promoting sporting activity the main rationale for exercise referral is to increase all forms of physical activity (PA) with the intention that this will produce a sustained and increased level of PA in the long term. Exercise referral specialists provide explicit advice on lifestyle changes that include ways to build PA into daily lives in addition to encouraging sports participation.

In the trial PA was primarily measured using the IPAQ-S (Craig et al., 2003) which provides a total score that is expressed in MET-minutes. MET-minutes are multiples of resting metabolic rate and can be converted to calories if the person's weight is known. For the present purposes we report PA in terms of MET-minutes to be consistent with other projects funded by Sport England. Summaries of MET-minutes are usually given as medians rather than means due to the measures being highly skewed (because most people do relatively little PA but a small minority do a lot). These figures will naturally include activities related to sports and exclude Ps with unrealistically high PA levels (as specified in the IPAQ scoring guidelines).

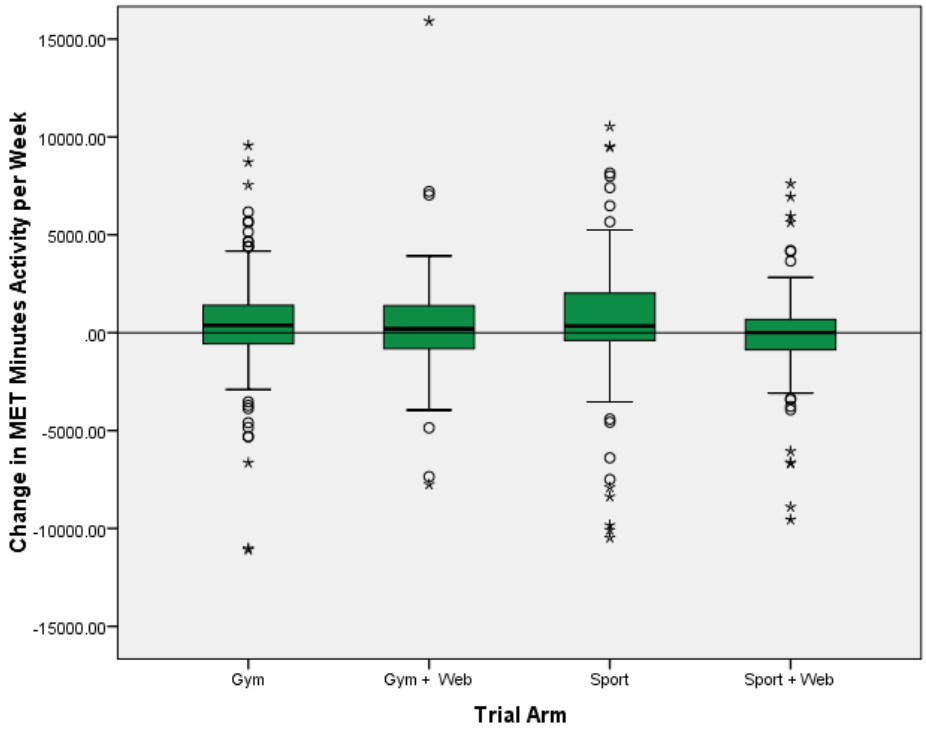
Across the trial the median improvement in MET-minutes per week was 272 (IQR = 2613). This suggests taking part in the trial led to a useful increase in PA at least as self-reported by our participants. All trial arms except the Sport+Web arm produced median improvements that exceeded our criterion of 100 MET-minutes per week.

Figure 3.4: MET-minutes of activity per week reported at baseline and at 12 month follow- up.



As with the sports activity measure we created a difference score by subtracting MET-minutes reported at 12 months from the baseline measures and looked to see whether any of the trial arms produced more change than the others (see figure 3.4). There was a reliable difference between the trial arms ($\chi^2(3) = 9.44$, $p = .024$). The primary difference was between the Sport and the Sport+Web arms ($z = -2.57$, $p=.01$) with the Sport only arm doing better than the Sport+Web arm. In contrast to the sporting activity findings the sport + web arm produced the least change in general levels of PA though not too much should be read into this given the high levels of individual variability within the trial arms.

Figure 3.4: Change in MET-minutes of activity per week reported at baseline and at 12 month follow-up in each trial arm.



In terms of the success criterion 2 above, that a trial arm produce an improvement of 20 METS per week greater than the Gym-only arm, only the Sport arm achieved this.

3.3 Intention to treat (ITT) Analysis of Trial Outcomes: Health Benefits

Increased physical activity is known to have a range of both physical and psychological benefits and we assessed these using both self-report measures and physical/clinical measures of health. We have taken each in turn and focussed mostly on the long-term benefits.

3.3.1 Blood Pressure (BP)

BP was recorded four times during the trial; at the beginning, middle and the end of the 12 week exercise programme and at 12 month follow-up.

Figure 3.5: Systolic BP recorded across the trial

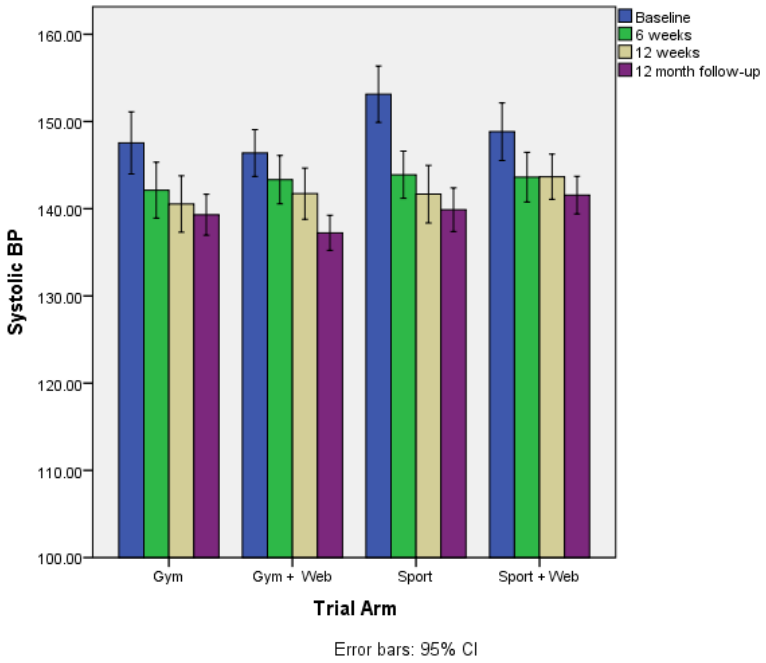
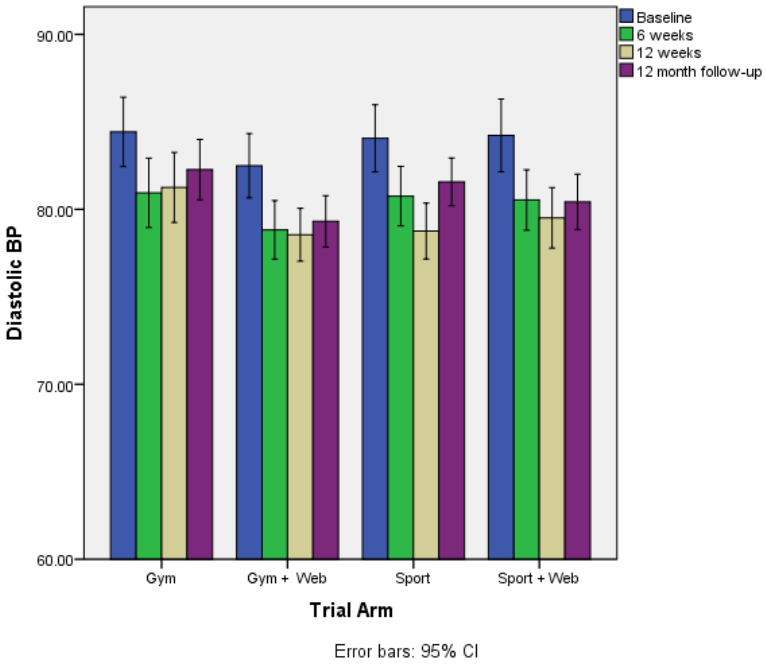


Figure 3.6: Diastolic BP recorded across the trial



On average systolic BP dropped 9.41mmHg (SD = 19.85) and diastolic BP by 2.91mmHg (SD = 11.47). Focusing on long-term effects we ran an analysis of variance (ANOVA) which demonstrated that there was a statistically reliable drop in systolic BP across the trial (pooled $F(1,465) = 90.56$, $p < .001$, $\eta_p^2 = .16$) but no significant main effect of trial arm or interaction between arm and time (pooled $F(3,465) = 3.22$, $p = .06$, $\eta_p^2 = .02$ and pooled $F(3,465) = 2.27$, $p = .263$, $\eta_p^2 = .01$). The picture was similar for diastolic BP with a drop over the trial (pooled $F(1,465) = 35.03$, $p = .01$, $\eta_p^2 = .07$) but no significant effects for trial arm or the time by arm interaction (pooled $F(3,465) = 1.77$, $p = .25$, $\eta_p^2 = .01$ and pooled $F(3,465) = .87$, $p = .59$, $\eta_p^2 = .01$ respectively).

Criterion 5 required that 20% of a trial arm's Ps reduce their BPs by 10mmHg. All four trial arms showed more than 20% achieving this target. It appears that the target was achieved in all trial arms however there was no significant advantage for any particular arm ($\chi^2(3) = 4.45$, $p=.21$ and $\chi^2(3) = .063$, $p = .89$ for systolic and diastolic BP respectively).

Table 3.5: Numbers achieving a 10mmHg drop in BP in each trial arm.

	Gym	**Gym + Web**	**Sport**	**Sport + Web**
Systolic BP N[a]	61	63	62.4	50
%	50.4%	52.3%	56.7%	42.7%
Diastolic BP N	35	35	28	35
%	29.1%	28.8%	25.5%	30.1%

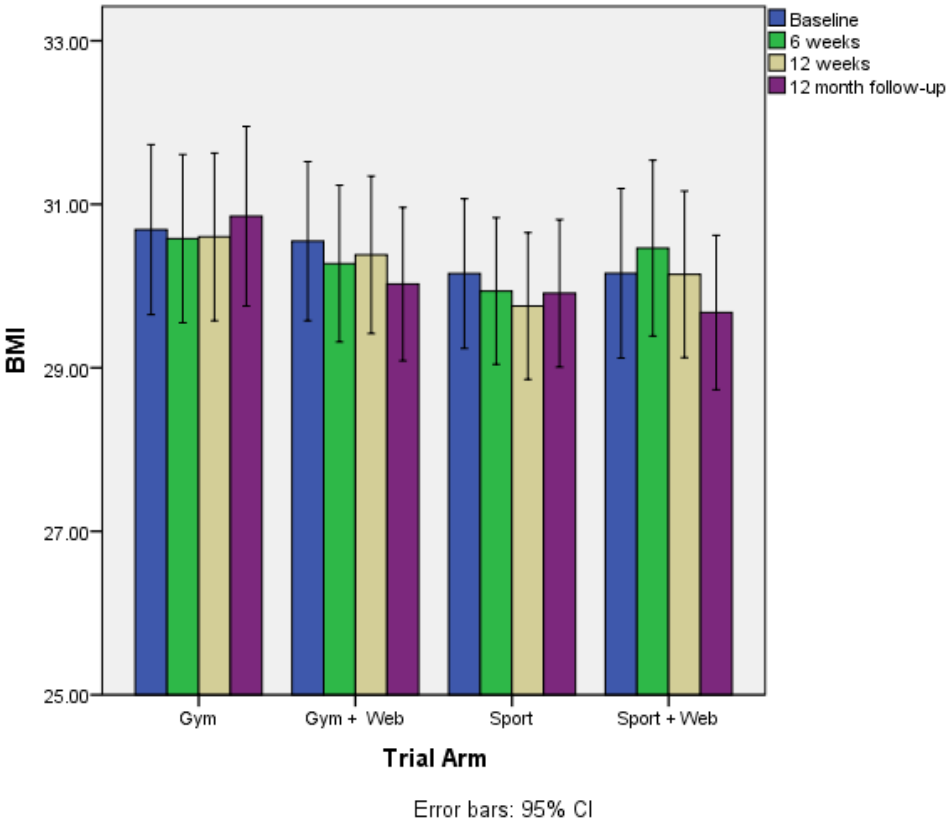
a – pooled figures have been rounded to the nearest integer

Taken together these figures suggest that the programmes generally were effective in producing a meaningful reduction in BP over a period of 12 months though there was no clear evidence for the superiority of any one of the trial arms.

3.3.2 Body Mass Index (BMI)

BMI is an indirect indicator of the amount of body fat a person has and is used to categorize a person as underweight, normal weight, overweight, or obese. Conventionally BMI figures for each category are underweight: under 18.5, normal weight: 18.5 to 25, overweight: 25 to 30, obese: over 30. BMI was assessed throughout the exercise programme and again at 12 month follow-up (note: unlike BP, BMI was not available at referral). The scores are given in the figure overleaf:

Figure 3.7: Mean BMI scores in each trial arm.



If we limit ourselves to the primary focus on changes between starting the programme and the 12 month follow-up and conduct a 2x2 mixed measures ANOVA it shows that there was no reliable long-term effect of time on BMI scores with participants dropping an average of 0.27 BMI units (SD = 2.34) across the period of the trial ($F(1,465) = 8.07$, $p = .12$, $\eta_p^2 = .017$). There was no reliable trial arm main effect nor interaction with time.

3.3.3 Waist-to-Hip Ratio (WHR)

Although BMI is widely understood it is an imperfect indicator of health risk and many argue that WHR is a better measure to use (e.g. Srikanthan et al., 2009). WHR data were available at the beginning and during the exercise programme and at 12 month follow-up for those for whom we have health check data. Like the BMI data there is no evidence of a significant improvement in WHR over time (pooled mean change in WHR = .00, SD = .06) overall nor in any of the trial arms (all mean differences < .02).

3.3.4 Health Benefits – Self Reports on the SF-36®

For the self-reported health status measures we used the RAND 36-Item Short Form Health Survey® (Ware and Sherbourne, 1992) which is a self-report measure of well-being in eight domains which are subsequently collapsed in to two scores – a measure of physical health and one of mental health. Scores measuring each of these concepts are out of 100 with 100 indicating good health.

At the start of the trial most Ps reported being in generally good health with scores similar to norm averages produced in the Medical Outcomes Survey (Steward et al., 1992) which was used to

validate the original SF-36®. While our participants were identified from their medical records as having a health status that merited referral for exercise most subjectively felt well. This is an important observation since in the absence of overt or debilitating symptoms most people are unlikely to seek to change their lifestyles so being invited to join this trial might have seemed initially odd.

Figure 3.8: Mean SF-36 Physical Component Score in each trial arm.

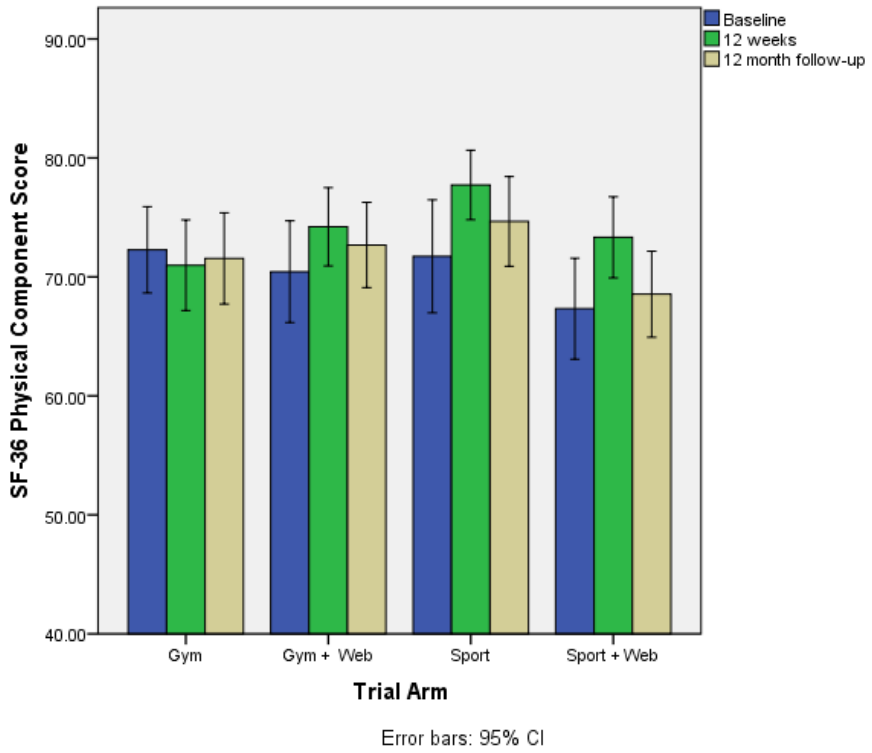
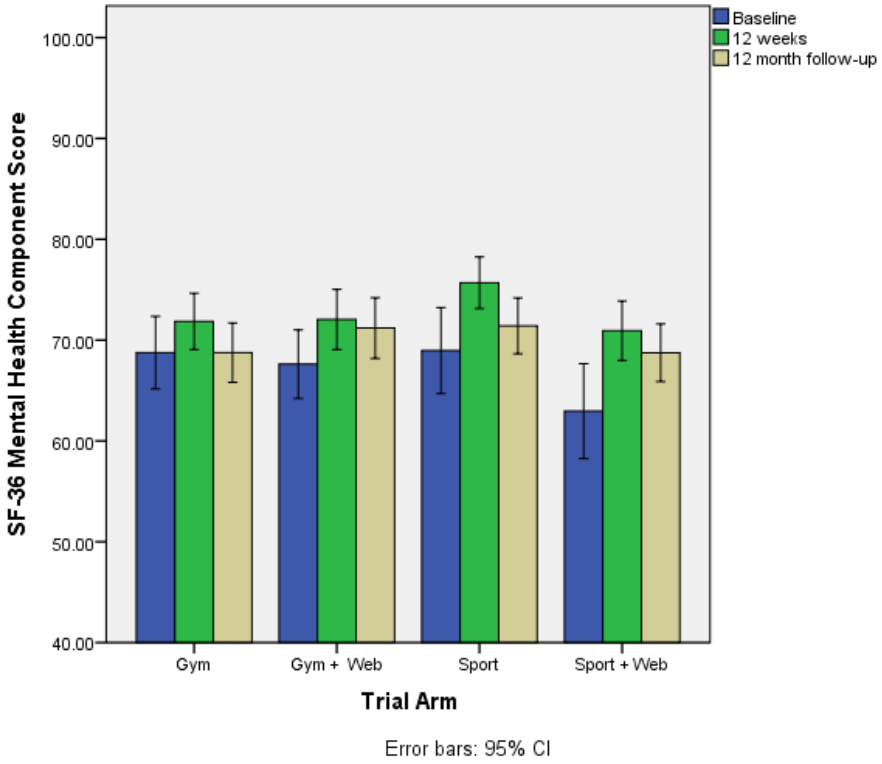


Figure 3.9: Mean SF-36 Mental Health Component Score in each trial arm.



Looking at long-term change there were no reliable effects for the physical health measure (all pooled Fs < 3.01, all ps > .05). For the mental health component scores there was a significant improvement across the trial (pooled $F(1,465) = 10.74$, $p = .008$, $\eta_p^2 = .02$) though the effect size is very small (pooled mean change = 2.94, SD = 20.03). The trial arm main effect and the interaction with time were not significant ($F(3,465) = 3.01$, $p = .24$, $\eta_p^2 = .01$; $F(3,465) = .92$, $p = .49$, $\eta_p^2 = .01$ respectively).

In both cases, physical and mental health, the graphs suggest there were short term gains in health during the 12 week programmes and there is a suggestion that the gym only group reported less initial improvement than the other arms of the study. This will be the focus of further analyses.

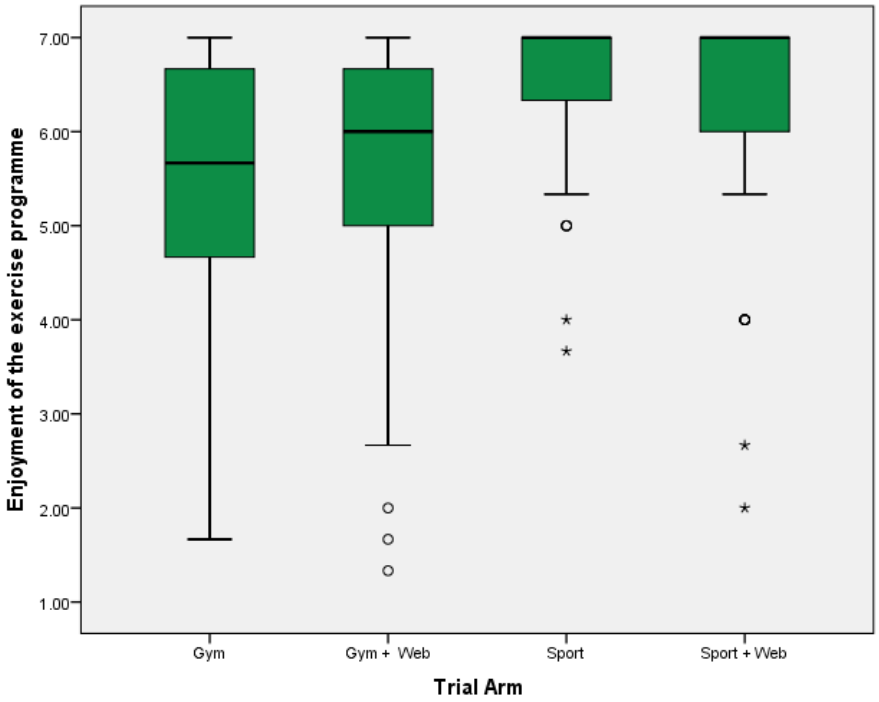
3.4 Responses to the Exercise Programmes

The following analyses were conducted on observed data only.

We asked those completing the programmes what they thought about them in a series of questions. These asked about how they felt about the coaching, the options available and how much they had enjoyed programmes generally and were answered on a 7-point Likert scale of agreement with 7 indicating strong agreement. We created two composite indices from these items. The first drew on 7 questions that asked about their relationship with their coach ($\alpha = .95$) with example questions such as “My coach tried to understand how I saw things before suggesting a new way to do things” and “My coach listened to how I would like to do things”. The index had scores that could range from 1 to 7 with 7 indicating a very favourable response to the coaching. The second index measured enjoyment and included three items such as “felt in a good mood while I was exercising during the programme” and “The sessions were fun” ($\alpha = .93$). Again scores could range from 1 to 7 with higher scores indicating greater enjoyment.

Overall participants were very happy with both their coaches and the exercise programmes over all and the scores were very skewed (medians = 6.0, IQR = 2.25 and 6.33, IQR = 1.67 respectively). Looking these scores there was no reliable difference between the different trial arms in terms of relationships with the coaches ($\chi^2(3) = 3.47$, $p=.33$) but the two sports based arms were more consistently enjoyed than the two gym arms ($\chi^2(3) = 40.85$, $p < .001$).

Figure 3.10: Programme enjoyment scores broken down by trial arm.



This finding pretty clearly demonstrates that people seemed to enjoy the sports-based programmes more than the gym variants as expected when we designed the study. To gain further understanding of people's experiences of the programme we analysed the open-ended responses people gave to some of the survey questions. In the survey, we asked participants three open ended questions:

1) Which aspects of the programme did you like the most?
2) Which aspects of the exercise programme did you think could be improved?
3) Is there anything else you would like to tell us about the exercise programme you attended?

Clear themes emerged from participants' responses. Across all arms of the trial, participants liked: the variety of activity offered; the health benefits gained; the personal benefits such as increased confidence; the support and motivation of the coaches and the coaches ability to understand their injury or health concerns; and seeing their own progress. In relation to the variety, many participants mentioned specific activities that they had enjoyed, however there was no clear indication that one particular activity was favoured over others. Participants on the sport only and sport + web arms reported the social aspects and benefits gained as a key contributing factor to their enjoyment. Participants said it was motivating, they liked the competition and being around people of a similar age in the sports sessions.

Improvements that participants across all arms would like to see included: wanting less restriction on the timings of sessions, to have more choice of activity and to have a programme that was longer than 12 weeks. Specific feedback for the gym only and gym + web included wanting more coach input on a more regular basis, in particular at the beginning of the sessions; to have the option of doing classes as well as the gym; wanting to do different exercises in the gym; and wanting more reliable equipment as they often reported faulty machines. The sport only and sport + web arms both wanted to see improvements in reliability of the sessions as many were cancelled, with poor communication on this; and to have more sessions as they were often overcrowded, in particular the water based activities and circuits. The sport + web arm also wanted a more reliable booking system.

Other feedback reinforced how highly the coaches were thought of and the restrictions on timings of sessions being an issue which prevented them from participating as much as they would have liked. There was a strong reporting of enjoyment with more than one participant saying it was "life-changing" and many stated that the referral to the programme was the "kick-start" they needed to start their active journey. Participants expressed their plans to continue exercising now the programme has finished. Other feedback included participants who would like to see a reduced price for a membership upon completion of the scheme; and that they felt demotivated if they did not see progress.

3.4.1 Sports centre membership

One of the positive outcomes of the trial was the encouraging number of Ps who chose to pay extra to extend their SSP gym membership for a year after they had completed the exercise programmes. Over 40% of Ps took up the offer with as many as 47.8% of the Sport arm members joining. People in the two sports arms were more likely to take this up than those in the two gym conditions ($\chi^2(1) = 5.27$, $p = .022$, phi = .11) indirectly suggesting that the sports arms had been seen as more attractive. This level of membership take up is encouraging since it suggests an additional motivation for leisure centres to promote GP referral and to run sports-oriented versions of exercise programmes. These analyses refer to observed gym membership rather than imputed membership.

3.5 Web Usage

For this section of the report where we look at what people did with the web tool and it is not possible or indeed sensible to impute 'missing' data in this situation so in this section the findings refer to just observed data.

In two of the four trail arms Ps were invited to use our on-line activity planning tool. The intention of the tool was to prompt people to select and make definite plans to do certain activities and to get them to make implementation intentions (e.g. find my running shoes) in order to carry them out. The prompts were then emailed back to people in the hope of reminding them of their plans and encouraging enactment. We regularly updated the site with lists of local activities from a number of organisations. The tool also provided links out to a range of health-promoting websites and we were able to monitor these to see how people used the site. Appendix 8.4 gives screenshots of the various pages of the site.

Two hundred and thirty-eight people were allocated to the two arms that involved the use of the web tool and the site was accessed from 281 separate IP addresses. Across the period of the study there was an average of 210 hits per month and on an average visit 6.04 pages were accessed.

As expected engagement with the site was variable. Eighty-five percent of visits lasted less than 5 minutes with many people not using many of the facilities of the site. At the other extreme one individual managed to visit 406 separate pages during a single login session. There were 864 visits to people's 'goals' pages and 757 to the activities pages.

Some of the facilities were disappointingly underused. For example, the personal calendars were available so that people could book in events, make plans and receive reminders about these. However, only a total of 137 bookings were made across the period of the trial suggesting that few were using it. A possible reason for this, and we only know this anecdotally, is that the 'booking' was not linked to the event or organisation responsible for the event itself so effectively two 'bookings' had to be made, one on the trial's site and one with the event organiser. As people could 'book' any event from the wide range of sites we populated the site with, it was impractical to attempt to synchronise the site with so many different organisations' web sites. Similarly, on first registering

with the site people were invited to fill out a questionnaire listing their global goals for the immediate future. Only 109 of the 238 got around to doing this, again suggesting a limited appeal for the site.

One of the features that fared slightly better was the ability to link out to other self-help health and sports-related websites. Table 2.6 lists these in rank order of popularity.

Table 3.6: most visited external sites.

Outlinks and downloads	Hits
www.activesurrey.com/activity-finder	73
spogo.co.uk/	50
www.nhs.uk/Tools/Pages/Healthyweightcalculator.aspx	20
www.activesurrey.com/	20
www.spogo.co.uk/	17
www.surreycc.gov.uk/business-and-consumers/food-advice/eat-out-eat-well-in-surrey	16
www.nhs.uk/Livewell/Goodfood/Pages/eatwell-plate.aspx	11
www.guildfordwalks.org.uk/	7
www.surrey.ac.uk/	6
dontbottleitup.org.uk/	6
www.surreycc.gov.uk/environment-housing-and-planning/countryside/explore-surrey	6
www.nhs.uk/Tools/Pages/HealthyEating.aspx	5
www.surreywalkingclub.org.uk/	5
www.nhs.uk/Tools/Pages/Change4Life-meal-planner-and-recipe-finder.aspx	4
www.guildfordramblingclub.org.uk/	4
www.sportengland.org/	3
www.nhs.uk/Livewell/fitness/Pages/physical-activity-guidelines-for-adults.aspx	3
www.springstreetsurgery.co.uk/file_download/6/Structured-Brief-Advice-Leaflet-for-Alcohol-NHS-Surrey-Increasing-and-Higher-Risk-Drinkers.PDF	3
www.walk4life.info/	2
www.walkingforhealth.org.uk/walkfinder/south-east/waverleys-walks-for-health	2
www.slimmingworld.com/joining-a-group/	2
www.nhs.uk/Tools/Pages/couch-5K-running-plan.aspx	2
www.weightwatchers.co.uk/	2
www.freedom-leisure.co.uk/centrepage	2
www.welcomeprojectsurrey.co.uk/	1
www.time-to-change.org.uk/	1
www.surreysportspark.co.uk/events/calendar/over_50s_taster_session.htm	1
www.sabp.nhs.uk/IAPT	1
www.nhs.uk/Tools/Pages/Walking-video-wall.aspx	1
www.bbc.co.uk/news/health-	1
www.activesurrey.com/getstarted	1
www.nhs.uk/Change4Life/Pages/alcohol-lower-risk-guidelines-units.aspx	1
www.nhs.uk/Change4Life/Pages/alcohol-and-health.aspx	1
www.neweconomics.org/publications/five-ways-to-wellbeing	1
www.bbc.co.uk/news/health-	1
www.nhs.uk/Livewell/alcohol/Pages/Alcoholtracker.aspx	1

While these figures do not suggest high levels of visits to other sites these are visits that in all probability would not have been made had the site not been available.

4 Discussion

4.1 Main findings

In this trial we sought to find out whether sports based referral for exercise would be effective compared to traditional gym based programmes and also to see whether a self-help web-based tool would add any additional benefit. The study has shown quite clearly that exercise referral can lead to sustained increases in physical activity and that we can detect some real health benefits from it particularly in terms of lowered blood pressure. The effects are not massive but from a public health perspective are clearly worthwhile.

The two sports arms were well received by participants and these people were proportionately more likely to take up, and pay for, a year's membership of the Surrey Sports Park than those who did the traditional gym based programmes. The data certainly suggest that people liked these programmes and wanted to continue exercising. This could not be explained by coach behaviour as participants in all four arms were very positive about their relationships with the coaches; it seems they really did like the sports programmes. From the point of view of those providing exercise referral programmes getting 47% of participants to join up has a real commercial benefit for leisure centres as well as a public health one.

For reasons to do with recruitment problems that are discussed below the trial was underpowered in the statistical sense and as such we have not been able to demonstrate any clear, reliable, advantage for the sports and/or web tool over the standard gym-based TAU programme. However, looking at the analyses as a whole the two sports arms tended to generate slightly more positive outcomes on a range of outcomes that we looked at. Though further research will be necessary to truly establish any superiority of sports-based programmes over traditional gym-based ones there is nothing here which suggests that sports-based programmes are inferior to gym-based ones. This is important in that running what tend to be group-based sports classes is both easier and cheaper for leisure centres and, if the membership take up is an indication of attractiveness, is more likely to see people at least invest in doing activity in the future.

4.2 Limitations

As noted above one explanation for the failure to detect statistically significant differences between trial arms when looking at the activity measures is a lack of statistical power. Despite an ambitious target sample size based on a formal power calculation, recruitment and retention proved considerably more difficult than initially anticipated and the achieved sample size was much smaller than originally intended. The failure to find an advantage for the sports or web interventions should not be interpreted as indicating that they were equivalent to the gym-based programme but just that there is insufficient evidence to clearly assert their superiority (or indeed, inferiority) on the basis of the present trial.

There were a large number of withdrawals after initial recruitment to the trial and before the exercise programme started. We have limited information on why this was the case but the method of recruitment and referral seems a likely candidate. Most routine exercise referrals are made face-to-face with a person's GP after they have requested an appointment to seek some form of medical help. As GPs refer people for exercise infrequently we were unlikely to be able to recruit many participants had we relied solely on naturally occurring referrals. Thus we resorted to selecting people based on their medical records and writing to them. We speculate that many people may have initially thought that the trial was a good idea but, in the absence of an immediate feeling of ill

health or a problem may have reflected on the idea of committing to 12 weeks of exercise and re-thought their commitment.

We made three attempts to remind people about the trial and their referral but restricted ourselves to written and email reminders. Given additional resources we could have engaged in telephone follow-ups but we felt that this would have put undue pressure on some people and, in any case, would be unlikely to be a practical way of getting people to attend these programmes in the normal course of GP referral thus further undermining the study's ecological validity.

The Guildford and Waverley Clinical Commissioning Group (CCG) area is quite large and some GP surgeries were some considerable distance from SSP. We suspect that many potential participants were put off by the travelling distances and time involved in participation and certainly this was the feeling expressed to us by some surgery staff. The majority of our participants came from the surgeries relatively close to SSP suggesting that people need good access to take up these programmes.

It is unfortunate that we did not get complete full health check follow-up data on all those Ps who completed all the other aspects of the trial. Participants were invited to make an appointment with their GPs to get a health check as they neared their 12 month follow-up date but many did not do this. We also offered to do these at SSP for those who felt this might be more convenient but relatively few took this up this offer. Completing the online questionnaire measures was a relatively easy thing to do but actively having to arrange a health check and take the time out to do it may have been too much of a commitment for some or otherwise inconvenient.

Despite using the relatively strict GPPAQ activity criteria of 'inactive' and 'moderately inactive' to screen people a number subsequently reported being considerably more active on the IPAQ-S than was indicated on their GPPAQ. We did not exclude these people from the trial or the above analyses (unless they were excluded using the IPAQ-S scoring guidelines) though in principle they could have been. 'Moderately inactive' is defined by the GPPAQ as doing less than 1 hour per week of standing or cycling but clearly many people were reporting more activity than this on the IPAQ-S. This leads on to the next point:

For reasons of cost we were reliant on self-reported activity measures and, as did the whole Sport England programme, we used the IPAQ-S which is a well-regarded self-report measure. While it is probably the best self-report measure currently available it is still prone to considerable error. Studies that have compared IPAQ-S scores with objective activity measures (e.g. accelerometry and pedometry) suggest relatively modest correlations of around rho = .30 (Craig et al., 2003). While some people will have overestimated their levels of activity others may have underestimated it. It is certainly the case that a small but non-trivial number of people reported more activity than is allowed for by the IPAQ-S's truncation rules (these people's scores we capped at the maxima identified in the IPAQ-S scoring manual).

The Guildford and Waverley CCG area is one of the most affluent in the UK and, given that patients have to pay for exercise referral themselves in much the same way as they have to pay for prescriptions, we might expect exercise referral take up to be lower in less affluent areas. A broader based multi-centre RCT is needed to look at this issue.

4.3 Implications and Recommendations

4.3.1 For Practice

Relatively high take up of gym membership, especially in the two sports arms, suggests that there is a good business case to be made for promoting sports-based exercise referral programmes. SSP was able to run some of the programmes in the evenings and weekends but most leisure centres offer exercise referral at the subsidised rates by running them in unpopular times of the day when fewer

customers are paying the full commercial rate to use the facilities. The relatively higher proportion of older participants and those not in paid employment suggests that it is easier to engage in these programmes if you have the time and centres should consider whether offering more sports-oriented beginners courses in the evenings might lead to increases in memberships.

GPs should refer more people as all arms indicated some level of increase in sustained physical activity and some health benefits. Although clearly not all of our participants continued exercising enough did to give worthwhile improvements at a population level. Exercise referral is not used extensively by GPs in the UK but it involves very little cost to the NHS and has potential to deliver substantial public health benefits.

Exercise referral schemes should offer both gym and sport sessions as options as participants reported variety and availability of choice as important.

4.3.2 For Future Research

Activity was measured using self-report measures primarily because of limited resources. Any future studies should employ objective measures if interventions such as these are to be persuasive.

We delivered the interventions at SSP as we had their cooperation and the various sports-based activities were already in place or were easily set up. With hindsight, had we recruited nearer to the 2000 target SSP would have been overwhelmed and certainly additional gyms would have been needed to deliver the programmes.

The present study's interventions need testing among more disadvantaged populations and thus a multi-centre RCT is called for.

Future studies of this sort should build in resources to support home visits to get these follow-up data.

The present study found little evidence of enthusiasm for using the web tool that we developed. We should not infer that the failure to find statistically reliable effects of the web tool means that this kind of approach does not work however the low usage rates suggests that our particular site was insufficiently attractive for the kinds of people recruited to this study. More intensive development work with the target population is needed in order to test more engaging designs.

5 Conclusions

In this study we wanted to see whether a sports-based exercise referral programme and a web-based self-help tool would enhance the likelihood that people referred for exercise by their GPs maintaining their levels of activity over a period of 12 months. Our data show that exercise referral does lead to a meaningful increase in sustained activity though we were not able to show that our interventions were superior to normal gym-based referral. Having said this, proportionately more of the participants in the two sports arms were likely to achieve the sporting activity target though this finding did not reach conventional levels of statistical significance and they enjoyed the programmes more than those in the two gym-based conditions. Over 40% of participants took up a year's membership at the Surrey Sports Park after completing their 12 week programme and people doing the sports-based arms were more likely to do this than those doing gym-only programmes. Given the beneficial effects of exercise referral and the logistical benefits of running sports-based classes we feel that there is a good case for promoting such classes more widely. Finally we hope that by

having done this study at least those who took part will have benefitted from the experience and hopefully continue to be more active as a result.

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Project website: http://www.clininf.eu/projects/ght2000.html

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8 Appendices

8.1 Specification of the Multiple Imputation (MI) procedure.

8.1.1 Procedure

The MI was a fully conditional specification Markov Chain Monte Carlo (MCMC) imputation of 5 replications of the original data. Following the analysis of attrition we were aware that failure to complete the study was related in part to information about the Ps contained in the data set. Among these included basic demographic factors such as age, gender, marital status, employment status, self-reported health (on the SF-36) and orientation towards physical exercise. As such we felt it was reasonable to assume that the data were missing at random (MAR) and appropriate for MI. [This is a slight misnomer since MAR means not completely at random (which is MCAR) but that some of the reasons for missing-ness are known and available in the data set].

The imputations were conducted using SPSS v22. To avoid failures to converge and attempts to estimate vast numbers of parameters a reduced form of the main data set was used as the basis for the MI. This data set contained only those variables central to the analysis of the key effectiveness of the interventions and contained measures of PA, sporting activity, BP, WHR and BMI. Demographic variables were included as were the SF-36 and the measure of orientation towards PA. Only the composite scores were included, not the individual items making them up for reasons of avoiding convergence problems. For the same reasons, given this report's focus on the 12 month follow-up 6 month data were not included in this MI exercise.

Demographic variables were used as predictors and missing data were not imputed for these variables. Instead, where demographic data was missing we consigned this to a non-missing category of 'Unknown' so that all cases has useable data on the predictors. All other baseline variables were used as both predictors and in need of imputed values where they were missing. Variables at all subsequent waves were imputed only and not used as predictors. Attempts to use them as predictors as well led to convergence failure problems.

As the algorithms underlying SPSS MCMC imputation procedure assume that dependent variables are symmetrically distributed all the activity variables were log transformed before imputation and the resulting complete distributions untransformed.

8.1.2 Constraints

All scaled self-report variables were constrained to have values within the range of possible scores – for e.g. all SF-36 scales were constrained to range between 0 and 100. Other continuous variables were constrained to have the maximum and minimum values that had been observed in the original data set at any wave.

8.1.3 Sense checking

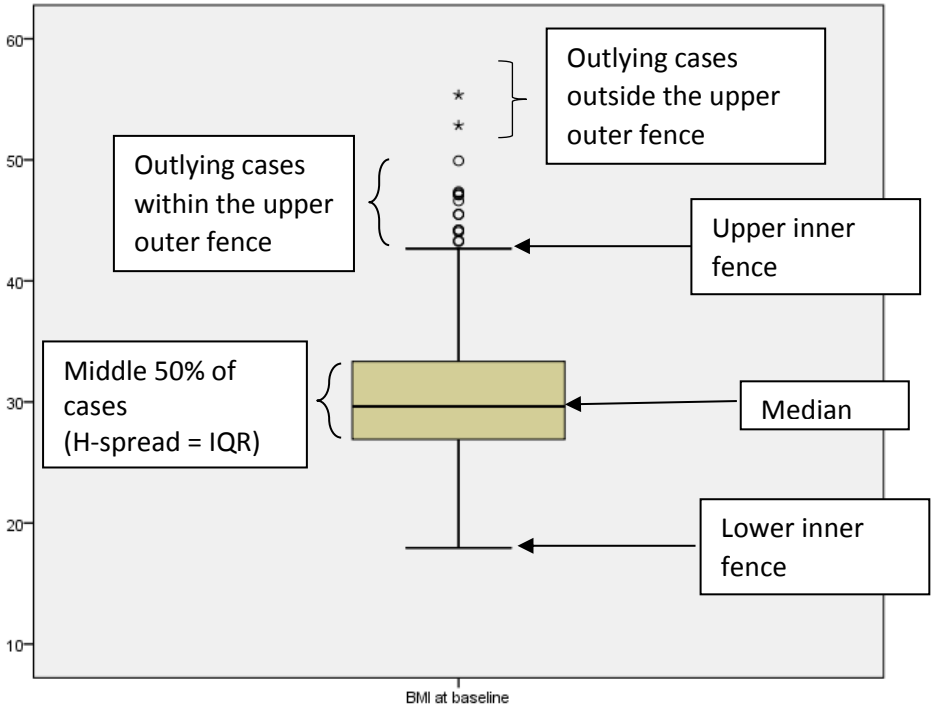
The imputed data sets were sense checked for out of range values and distributional characteristics. As expected all activity indicators suggested less activity overall in all trial conditions.

8.1.4 Subsequent use of the data

The analyses reported in the ITT section are the pooled estimates of the 5 imputed data sets. For clarity the confidence intervals of these estimates are not reported in the body of the text but are available from the authors on request.

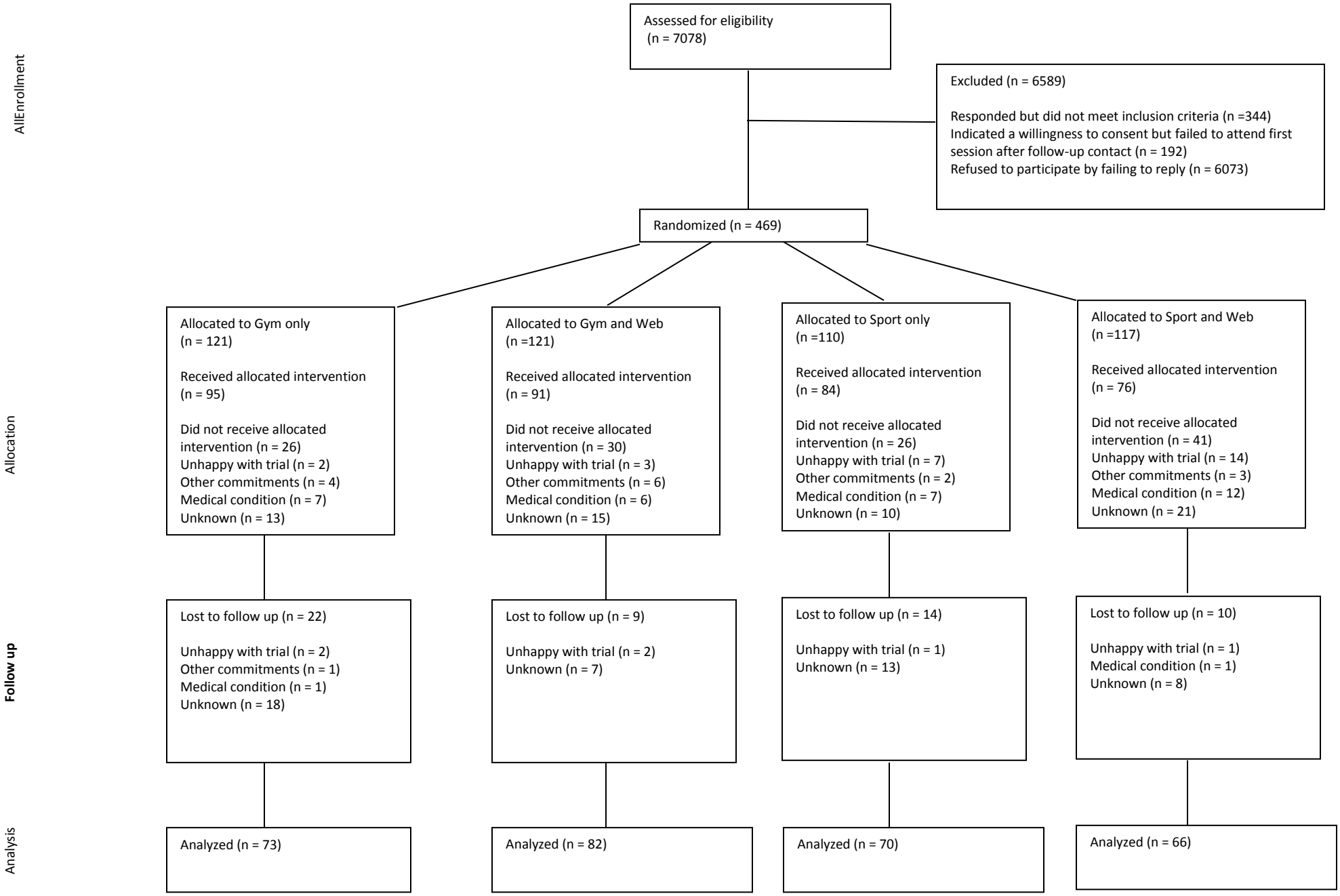
8.2 Understanding Box and Whisker Plots

These plots are used to give an idea of the central tendency ('typical' score) and spread of a variable's distribution. They are used in cases where graphs based on means and confidence intervals would misrepresent the distribution because of its skew (having its most common score not lying at the same point as the mean of the distribution) or kurtosis (relative peaky-ness or flatness).

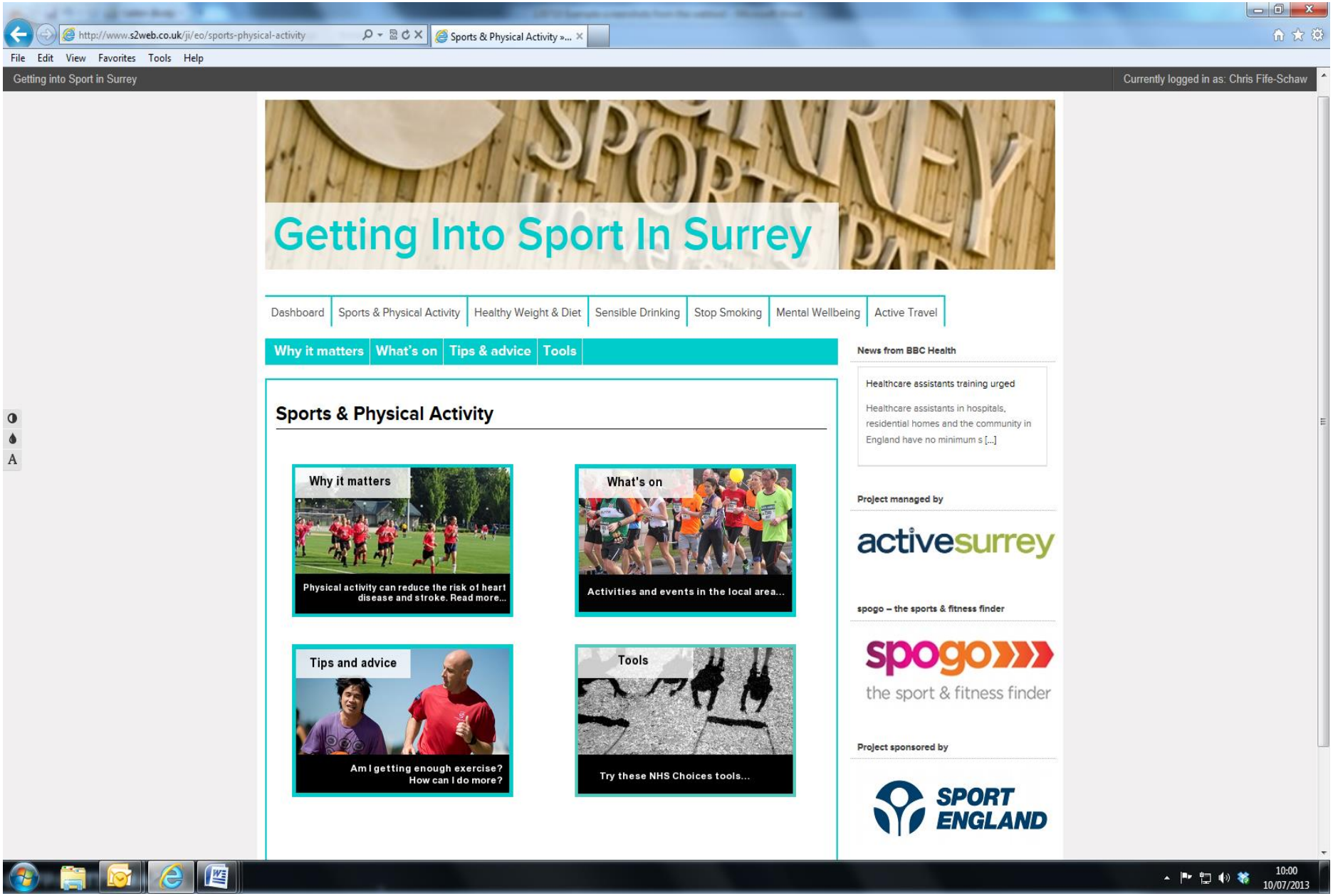


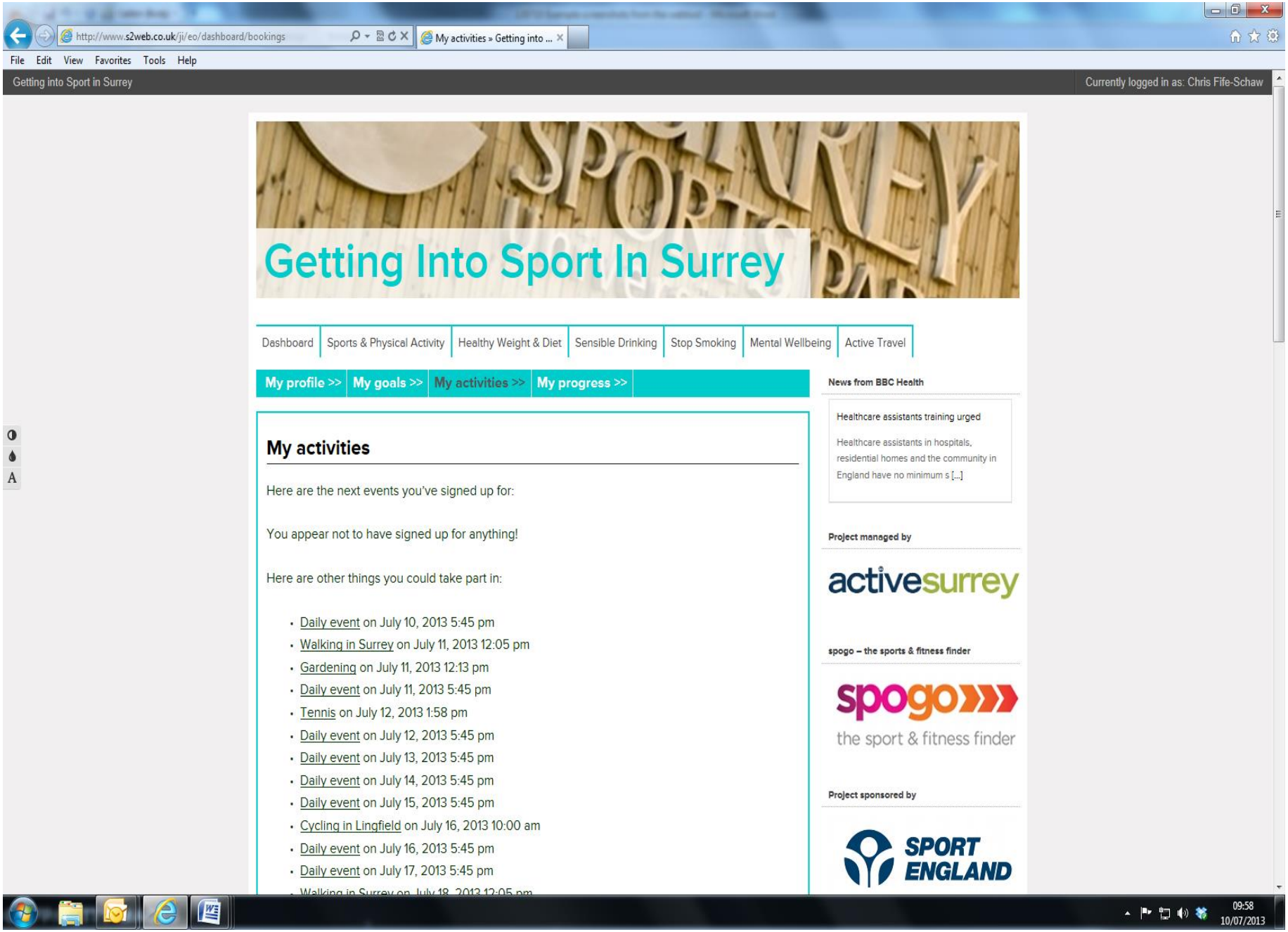
Name	Formula
Upper Hinge	75th percentile
Lower Hinge	25th percentile
H-Spread	Upper Hinge−Lower Hinge or inter-quartile range (IQR)
Step	1.5H-Spread 1.5
Upper Inner Fence	Upper Hinge+1 Step
Lower Inner Fence	Lower Hinge−1 Step
Upper Outer Fence	Upper Hinge+2 Steps
Lower Outer Fence	Lower Hinge−2 Steps
Upper Adjacent	Largest value below Upper Inner Fence
Lower Adjacent	Smallest value above Lower Inner Fence
Outside Value	A value beyond an Inner Fence but not beyond an Outer Fence
Far Out Value	A value beyond an Outer Fence

8.3 CONSORT diagram showing the flow of participants through the trial



8.4 Screenshots from the Web Tool

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My activities » Getting into ...
File Edit View Favorites Tools Help
Getting into Sport in Surrey
Currently logged in as: Chris Fife-Schaw
Getting Into Sport In Surrey
Dashboard
Sports & Physical Activity
Healthy Weight & Diet
Sensible Drinking
Stop Smoking
Mental Wellbeing
Active Travel
My profile >>
My goals >>
My activities >>
My progress >>
My activities
Here are the next events you've signed up for:
You appear not to have signed up for anything!
Here are other things you could take part in:
Daily event on July 10, 2013 5:45 pm
Walking in Surrey on July 11, 2013 12:05 pm
Gardening on July 11, 2013 12:13 pm
Daily event on July 11, 2013 5:45 pm
Tennis on July 12, 2013 1:58 pm
Daily event on July 12, 2013 5:45 pm
Daily event on July 13, 2013 5:45 pm
Daily event on July 14, 2013 5:45 pm
Daily event on July 15, 2013 5:45 pm
Cycling in Lingfield on July 16, 2013 10:00 am
Daily event on July 16, 2013 5:45 pm
Daily event on July 17, 2013 5:45 pm
Walking in Surrey on July 18, 2013 12:05 pm
News from BBC Health
Healthcare assistants training urged
Healthcare assistants in hospitals, residential homes and the community in England have no minimum s [...]
Project managed by
activesurrey
spogo – the sports & fitness finder
spogo
the sport & fitness finder
Project sponsored by
SPORT ENGLAND
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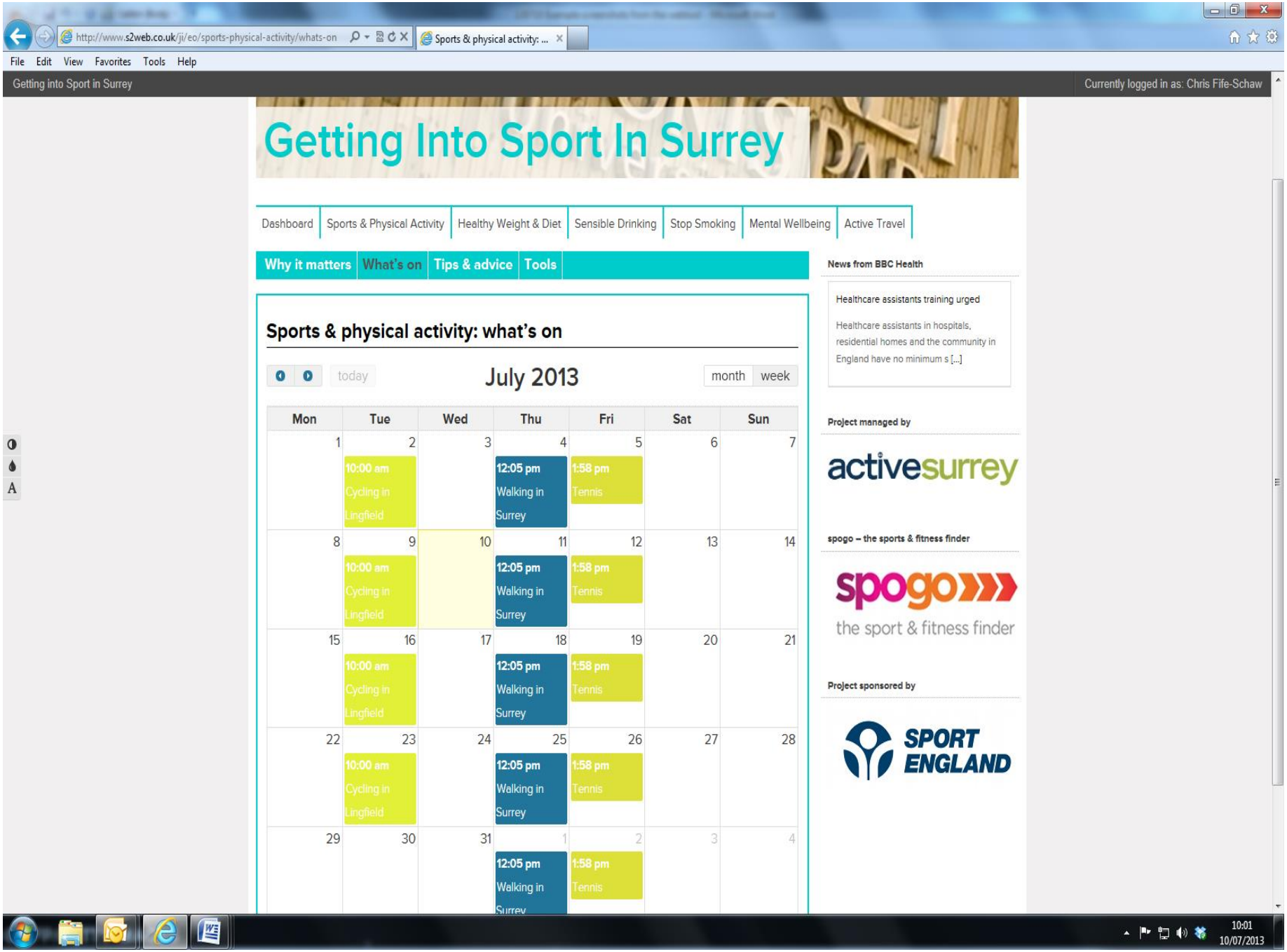
10/07/2013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Getting into Sport in Surrey
Currently logged in as: Chris Fife-Schaw
Getting Into Sport In Surrey
Dashboard
Sports & Physical Activity
Healthy Weight & Diet
Sensible Drinking
Stop Smoking
Mental Wellbeing
Active Travel
Why it matters
What's on
Tips & advice
Tools
Sports & physical activity: what's on
today
July 2013
month
week
Mon Tue Wed Thu Fri Sat Sun
1
2 10:00 am Cycling in Lingfield
3
4 12:05 pm Walking in Surrey
5 1:58 pm Tennis
6
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8
9 10:00 am Cycling in Lingfield
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11 12:05 pm Walking in Surrey
12 1:58 pm Tennis
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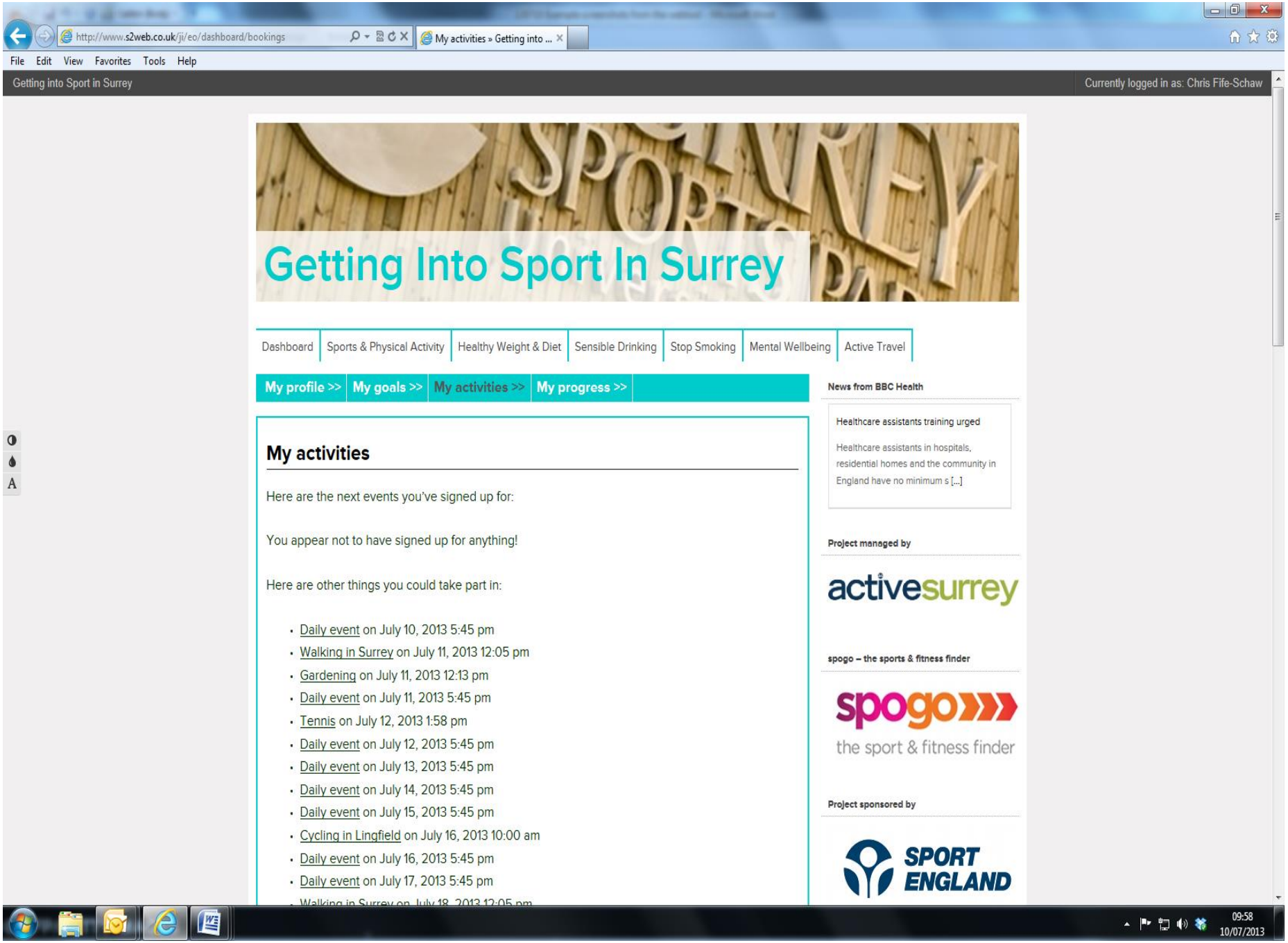
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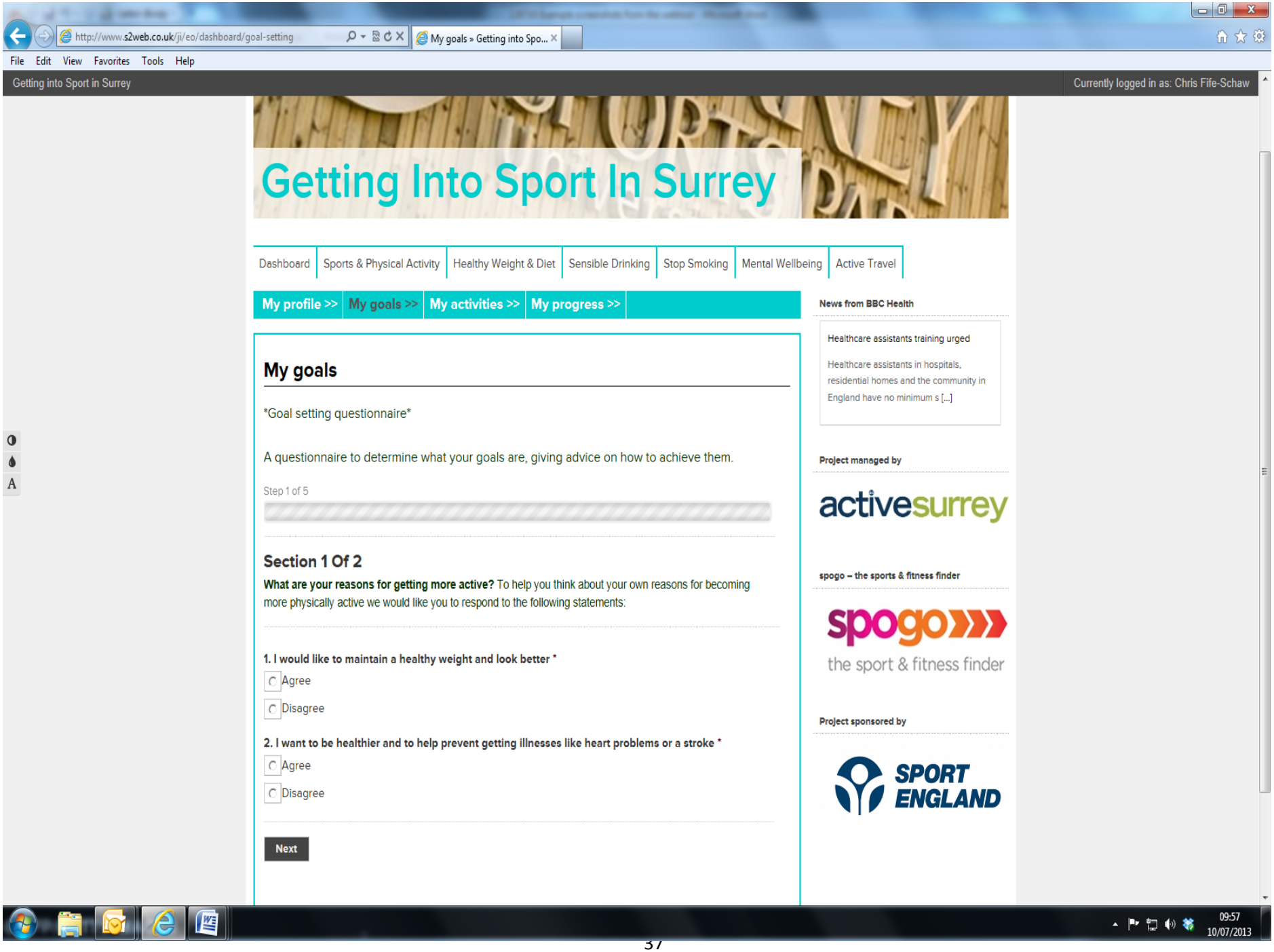
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Healthy Weight & Diet
Sensible Drinking
Stop Smoking
Mental Wellbeing
Active Travel
My profile >>
My goals >>
My activities >>
My progress >>
My goals
Goal setting questionnaire
A questionnaire to determine what your goals are, giving advice on how to achieve them.
Step 1 of 5
Section 1 Of 2
What are your reasons for getting more active? To help you think about your own reasons for becoming more physically active we would like you to respond to the following statements:
1. I would like to maintain a healthy weight and look better *
Agree
Disagree
2. I want to be healthier and to help prevent getting illnesses like heart problems or a stroke *
Agree
Disagree
Next
News from BBC Health
Healthcare assistants training urged
Healthcare assistants in hospitals, residential homes and the community in England have no minimum s [...]
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the sport & fitness finder
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