# Moderating Effects of Socioeconomic Status in a Randomised Controlled Trial of a Brief Planning Intervention to Promote Physical Activity

A thesis submitted to the University of Manchester for the degree of Master of Philosophy in the Faculty of Biology, Medicine and Health

**2020**

**Claire A Hanlon**

**School of Health Sciences, Division of Psychology and Mental Health**

# List of Contents

**Word count (excluding thesis reference and appendices): 9577**

**List of Tables and Figures**

# Abstract

*Background*: To address socioeconomic health gaps, there has been a call for tailored behaviour change interventions that meet the specific needs of their targeted audience. However, socioeconomic status is typically operationalised as a single measure such as education, which disregards other indicators and aspects of socioeconomic status, and little is known about the most potent drivers of intervention-generated inequalities. This study aimed to explore the differential effects of socioeconomic status measures of income, education, occupation and IMD area deprivation upon the operation of an established brief behaviour change intervention that has been shown to increase physical activity among manual workers. To achieve this aim, the magnitude of correlations among these socioeconomic status measures was explored and their potential moderating effects upon the effectiveness of the intervention were investigated.

*Method:* A two-armed randomised controlled design was used, with participants ($n$ = 98) assigned to either the intervention ($n$ = 47) or control condition ($n$ = 51). Participants in each condition were given identical physical activity volitional help sheets, the only difference being that individuals in the intervention were encouraged to make "*if-then*" plans by linking challenges and solutions, whereas those in the control condition were not asked to make "*if-then*" plans. Individual socioeconomic status measures of income, education and occupation, and IMD area-level deprivation were taken for each participant. The primary outcome measure was leisure centre attendance, which was measured objectively over 12-months using electronic entry swipes.

*Results*: To enable moderator analyses, categorical variables were created distinguishing between high versus low-socioeconomic status participants on socioeconomic status measures of IMD area-deprivation, income, occupation and education. While mean 12-month leisure centre attendance was marginally higher among participants in the intervention condition ($M$ = 20.00, $SD$ = 24.08) compared to those in the control condition ($M$ = 12.55, $SD$ = 16.36), an independent-samples t-test showed that there was no significant statistical difference between the conditions ($t$ (96) = -1.78, $p$ = .079, $d$ = -.36). Two-way, between-group ANOVA's assessed the main and interaction effects of high versus low socioeconomic status measure of income, education, NS-SEC occupation and IMD-area deprivation upon leisure centre attendance between both conditions. No significant main effect of income, IMD deprivation and occupation status on leisure centre was found, but borderline significant effects of condition on leisure centre was found for income and IMD deprivation (F = (1, 73) = .72, $p$ = .400, $d$ = .2; F = (1, 83) = 4.03, $p$ = .048, $d$ = .14 and (F = (1, 94) = 4.27, $p$ = .041, $d$ = .42). In addition, a main effect of occupation status on leisure centre attendance (F = 1, 94) = 5.09, $p$ = .026, $d$ = .46).

*Conclusion*: The findings highlight that individual- and area-level measures of socioeconomic status are not interchangeable and that leisure centre attendance related research outcomes are predicted by occupation and not income, education or IMD area-deprivation. This means that future research in this area should avoid using a single measure of socioeconomic status to operationalise socioeconomic status in health research.

## Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

**Copyright Statement**

i. The author of this thesis (including any appendices and/or schedules to this thesis) owns certain copyright or related rights in it (the "Copyright") and s/he has given The University of Manchester certain rights to use such Copyright, including for administrative purposes.

ii. Copies of this thesis, either in full or in extracts and whether in hard or electronic copy, may be made **only** in accordance with the Copyright, Designs and Patents Act 1988 (as amended) and regulations issued under it or, where appropriate, in accordance with licensing agreements which the University has from time to time. This page must form part of any such copies made.

iii. The ownership of certain Copyright, patents, designs, trademarks and other intellectual property (the "Intellectual Property") and any reproductions of copyright works in the thesis, for example graphs and tables ("Reproductions"), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property and/or Reproductions.

iv. Further information on the conditions under which disclosure, publication and commercialisation of this thesis, the Copyright and any Intellectual Property and/or Reproductions described in it may take place is available in the University IP Policy (see http://documents.manchester.ac.uk/DocuInfo.aspx?DocID=24420), in any relevant Thesis restriction declarations deposited in the University Library, The University Library's regulations (see http://www.library.manchester.ac.uk/about/regulations/) and in The University's policy on Presentation of Theses.

## Rationale for Submitting in Journal Format

This MPhil has been prepared in journal format for submission to the peer-reviewed journal of Health Psychology. It is envisaged that a final draft will be submitted for consideration of publication very shortly.

## Acknowledgements

Thank you to my supervisors Professor Chris Armitage and Dr Laura Brown for their feedback and comments that have helped see this thesis come to fruition. It's been a long and bumpy road, but (I think) we got there in the end. In particular, thank you Laura for coming on board when others would have ran a mile. Thank you also to my advisor Dr Sarah Peters for being a listening ear during those difficult times.

Mostly thank you to my friends and family for weathering the storm with me. To my friends, thank you for your unwavering support. In particular, thank you to Dr David McIlroy and Dr Karen Poole for picking me up, dusting me off and holding me up when I couldn't, and others wouldn't. You'll never know how much your heart-felt kindness, limitless support and ever-lasting friendship mean to me. To Dr Tracy Epton, thank you for your friendship, encouragement and guidance that helped me to navigate my way through my Manchester experience, and helped keep my research passion alive. A big thank you to the LJMU gang (there's so many I hope I don't miss anyone off!); Sharon, Alex, Kat, Connor, Ben, Adarsh, Jaime, Kate, Rhiannon, Michelle, Sarah, Sue, Dave, Elaine, Masi, Naomi, Elena, Emma, Taz and last (but certainly not least) my research buddy Clare, some of you have moved on, but thank you all for your friendship, and for being there with me every step of the way.

To my weird but wonderful parents, thank you Mum for being my voice and fighting spirit when mine failed me, and Dad for giving me your determination (some may say stubbornness) to never give up and see this through – love you always. To my two kids, Evan thank you for teaching me the world *can* be black and white, Scarlett for reminding me to laugh, and to both of you for the love and hugs, and for teaching me there's more important things in life, all of which was most needed throughout my Manchester journey. And lastly, Rob my love, you never fail to be there for me through the good, the bad and the ugly! In the immortal words of Peter Cetera (haha!) *"I could never make it alone"* and the second verse…

**The Author**

Claire Hanlon discovered education much later in life, and fell in love with Psychology thanks to a wonderful Liverpool community college tutor, Sue George.  In 2001, Claire entered higher education for the first time, and went on to attain a Bachelor of Science (Honors) degree in Applied Psychology (first class) from Liverpool John Moores University, whilst working full-time and through the birth of her first child Evan.  From there, Claire earned a Distinction in Health Psychology Masters from Liverpool John Moores University.  Since 2012, Claire has consistently worked as a Research Assistant in many varied health-related areas including physical activity such as on the Sports England "*This Girl Can*" campaign and a study exploring the acceptability and effectiveness of physical activity monitoring devices among children and young people with Cystic Fibrosis.  Other studies Claire has been involved on include an evaluation of the NHS Health Checks scheme, the effectiveness of anti-knife carrying messages and more recently, health professional's conscientious objection to abortion.

**Publications to Date**

Shelly, J., Fairclough, S., Knowles, ZR., Southern, K., McCormack, P., Dawson, E., Graves, LEF., Hanlon, C.  (2018).  A formative study exploring perceptions of physical activity and physical activity monitoring among children and young people with Cystic Fibrosis.  BMC Pedeatrics, 18, 335.

Palasinsksi, M., Zhang, L., Ingale, S & Hanlon, C.  (2016).  Gangs in Asia:  China and India.  Asian Social Science. 12, 141 – 145.

**Conference Publication (Oral)**

Hanlon, CA., Knowles, ZR., Graves, L., Southern, K., McCormack, P. & Fairclough, S.  (2014).  A Formative Study Exploring the Use of Technology-Based Strategies to Reduce Sedentary Behaviour and Promote Physical Activity among Children and Young People with Cystic Fibrosis.  4th International Conference on Qualitative Research in Sport & Exercise.

## 1. Introduction

A "health gap" exists such that people of lower socioeconomic status are more susceptible to poorer health and health-related outcomes than people of higher socioeconomic status (Marmot, 2005; 2010). The drivers of such inequalities in health have been linked to a marked difference in the performance of important and modifiable health behaviours, including physical activity, between people in high- and low-socioeconomic groups (Stringhini et al., 2010). Relatedly, population-wide behaviour change interventions can exacerbate inequalities between high- and low-socioeconomic groups through multiple pathways (Lorenc et al., 2013) including those related to intervention uptake and adherence across the social groups (White et al., 2009). This has led to a call for more targeted interventions that address the social determinants of health to reduce the risk of "*intervention-generated inequalities*" (White et al., 2009), particularly among vulnerable groups, such as those of low socioeconomic status. However, socioeconomic status is typically operationalised in terms of a single index such as educational level, access to economic resources or occupation, and little is known about what are the most potent drivers of intervention-generated inequalities. The aim of the present research is to explore whether there are differential effects of indices of socioeconomic status on the operation of a behaviour change intervention.

Measures of socioeconomic status are designed to reflect the availability of, and access to, resources by individuals (Shavers, 2007; Psaki et al., 2014) including those that may facilitate physical activity (Gidlow et al., 2006). They can broadly be divided into individual-level indicators, such as income, education and occupation (Adler & Ostrove, 1999; Galobardes et al., 2006a, 2006b; Galobardes et al., 2007) and area-level or neighbourhood deprivation indices (Galobardes et al., 2006a, 2006b; Galobardes et al., 2007), such as the Index of Multiple deprivation. Each socioeconomic measure captures a specific aspect of the broader social milieu, carrying its own relative strengths and limitations that may impact differently upon reported outcomes in health research.

Income is used as an index of access to economic resources (Braveman et al., 2005; Shavers, 2007), and is typically examined as a continuous population or population sub-group variable, or grouped by poverty level (e.g. poor versus not poor) (Galobardes et al., 2006a). However, obtaining level of income in research is problematic as it is often considered sensitive information (Braveman et al., 2005), leading to poor response rates (Grundy & Holt, 2001). Additionally, income levels often vary across the lifespan due to, for example, retirement, illness and disability, or unemployment (Shaver, 2007). Subsequently income level may not accurately represent access to economic resources at the point of measurement as it neglects the accumulation of wealth across the lifespan that may mitigate or exacerbate periods of more or less deprivation or affluence (Adler & Rehkopf, 2008; Robert & House, 1996).

Education is often measured as either a continuous variable of number of years completed in education or a categorical variable of highest level of education completed (Galobardes et al., 2006a). It is predictive of enhanced housing, employment, working conditions and higher income rates (Braveman & Gottlieb, 2014; Davey-Smith et al., 1998; Shaver, 2007). However, as greater numbers of adults complete higher education (Connolly et al., 2016), it does not necessarily translate to success within the labour market, with increasing numbers of graduates working in low-pay jobs (Shavers, 2007), meaning that education is often not strongly correlated with income (Braveman et al., 2005).

Occupational status is inherently linked to education and income (Braveman et al., 2005), and is often assessed in research by an individual's current or most recent occupation (Duncan et al., 2002). For example, in the UK, the National Statistics Social Socioeconomic Stratification Classification (NS-SEC) system is used to analyse job titles in order to distinguish manual versus non-manual workers. However, although assessment of questions about occupation are likely to elicit greater response rates than those about income (Shavers, 2007), they lack the ability to capture those individuals who are not actively employed or working, such as carers, home-makers, the retired and unemployed (Gallo & Matthews, 2003). Furthermore, occupational measures do not account for diversity in education, income and prestige that is associated with heterogeneous occupations and racial/ethnic and gender differences within occupations, such as gender pay gaps (Shavers, 2007).

Area-level socioeconomic status measures represent either an aggregate or an average value of particular individual-level socioeconomic measures, such as levels of unemployment or average income, relative to a specific geographical area (Galobardes et al., 2006b; 2007). Alternatively, a composite score is created by combining multiple aggregates of individual-level socioeconomic status measures such as income, education and, home ownership that is representative of a proxy socioeconomic indicator of individuals residing in a specific geographical area (Galobardes et al., 2006b; 2007). These areas are categorised along a continuum from most deprived to most affluent (Galobardes et al., 2006b; 2007). Area-level deprivation measures reflect the social and economic conditions of the entire community residing in these areas, but may not accurately represent any one individual (Galobardes et al., 2006b; 2007). In addition, these measures do not allow comparison of different communities residing in the same area, as well as across different areas. This is because, although individuals living within a specific area may be homogenous in race, ethnicity and employment, their socioeconomic status profile may differ (Pardo-Crespo et al., 2013). Thus, using area-level deprivation measures presents problems in separating the effects exerted by features of the neighbourhood environment from those imposed by individual-level socioeconomic effects (Pardo-Crespo et al., 2013) such as income, education and occupation.

In separate studies, each individual- and area- level socioeconomic index has been found to influence health, including health behaviours, such as physical activity (e.g. Gidlow et al., 2006). For instance, people with greater disposable income have improved access to physical activity

opportunities (e.g. Giles-Corti & Donavan, 2002); better educated individuals are better able to understand health messages (e.g. Goldman et al., 2011); and people living in more affluent neighbourhoods have improved access to physical activity facilities (e.g. Powell et al., 2006). However, there are discrepancies in the way that an individual's socioeconomic status might be categorised across the different indicators. For example, educated people may not live in affluent areas, and people living in affluent areas may lack disposable income. Whilst using a single socioeconomic status measure in health research allows researchers to clearly interpret intervention effects (Adler & Rehkopf, 2008), this approach therefore neglects the multidimensional nature of socioeconomic status, and may lead to the misinterpretation that an independent effect exerted by a single socioeconomic status measure (e.g. income) upon a health-related outcome applies across other different socioeconomic status indices also (e.g. occupation and education).

Little is known about how closely related these multiple measures of socioeconomic status are, or whether some are more likely to undermine the effectiveness of interventions to boost physical activity than others. Furthermore, different patterns of findings emerge when different indices of low socioeconomic status are used. For example, Nocon et al., (2007) found that while income, education and occupational status were independently associated with physical inactivity. Yet, Hoebel et al., (2017) found that higher levels of education and occupation, but not income were independently associated physical activity levels. The interchangeable use of different socioeconomic measures based on the assumption that one measure captures the same underlying features of another socioeconomic status measure has been criticised because they are outcome specific (Geyer et al., 2006).

The present study addresses these issues by taking different measures of socioeconomic status that commonly feature in health-related research; namely area deprivation, occupation status, education and income, and investigates the magnitude of correlations among multiple indices of socioeconomic status as well as the potential moderating effects of different indices of socioeconomic status on the effectiveness of an established brief behaviour change intervention designed to increase physical activity that has, to date, only been shown to work in people in manual occupations (Armitage & Arden, 2010). For the purpose of this study, leisure centre attendance will be used as a proxy measure of physical activity. Leisure centre attendance captures the behavioural element of physical activity (Amireault, 2014) and has previously been used in studies as non-obstructive method of objectively measuring physical activity (e.g. Armitage, 2005; Nigg et al., 1999; Jekauc et al., 2015). Strong correlations between leisure centre attendance and physical activity have been reported. For example Armitage (2005) reported a strong correlation between leisure centre attendance and physical activity ($r = 0.63$, $p < 0.01$). Moreover, Amierault (2014) findings confirm the use of leisure centre attendance as a validated measure of objectively assessing physical activity behaviour, thus justifying the use of leisure centre attendance in the present study.

## 2. Method

### 2.1. Design

A two-armed, parallel randomised controlled design was used, with participants randomised either into the intervention or control condition using an online random number generator (random.org). Weekly leisure centre attendance was monitored objectively by tracking individuals' electronic entry swipes over a 12-month period for each participant. Participants were asked to complete a questionnaire at baseline and at follow-up periods of 6-weeks, 3-, 6- and 12-months. The only difference between the baseline questionnaire and follow-up questionnaires was that the volitional help sheet and questions pertaining to socioeconomic status were not included in follow-up questionnaires. Therefore, participants only received the intervention once.

### 2.2. Participants

Participants ($n$ = 118) were purposively recruited from leisure centres in areas of high deprivation in a city in the North West of England. All newly registered adult members (aged 18 years or over) were eligible to participate. Different membership options were available to the participants including day time only access, evening access only, gym and class access only, and total membership which allowed access to pool, classes and the gym. Subsequently, the cost of membership varied according to the type of membership and number of facilities this provided access to. For example, a daytime only membership cost £15 and total membership cost £30 in 2014. Members could choose to pay by direct debit or annually.

### 2.3. Intervention

The intervention comprised a volitional help sheet (VHS) that has been shown to increase physical activity among people in manual occupations (Armitage & Arden, 2010). The volitional help sheet is a self-completion psychological tool that has been shown to support individuals in creating implementation intentions (e.g. Armitage, 2008; Armitage and Arden 2010). Theoretically underpinned by the transtheoretical model (TTM) (Prochaska and DiClemente, 1983; Prochaska, Norcross and DiClemente, 1992), the volitional help sheet comprises a list of challenges to attending the leisure centre (e.g. "If I'm tempted not to go to the gym because it's cold outside") and a list of possible ways to overcome those challenges (e.g. "then I will make myself go to the gym anyway because I know I will feel better afterward"). In the intervention group, people were encouraged to form "if-then" plans (Gollwitzer, 1993; 1999) by drawing a line to link challenges with solutions that are relevant to them. Participants in the control group were given the same sheet but wer not asked to form "if-then" plans. Instead, control group participants were asked to tick challenges and solutions that they feel were relevant to them. The volitional help sheet intervention was not tailored as each challenge and solution in the list presented to the intervention and control groups were identical and specific to attending the gym, however each participant could choose their own challenges and solutions relevant to them as an individual. In the present study, the volitional help sheet intervention was enclosed in paper format inside a questionnaire pack which was given to participants during a

mandatory induction to the leisure centre.  The volitional help sheet intervention was delivered to participants once at baseline once and was not repeated again during the 12-month follow up period.

Additional measures of intention, self-efficacy, self-regulation, action planning and habit were taken at baseline and at each follow-up.  Intention and self-efficacy were measured as an indication of motivation (Sheeran, 2002).  Whilst motivation plays an important role in engendering behaviour change, it fails to secure behavioural enactment (Sniehotta et al., 2005a) giving rise to an intention-behaviour gap (Hagger, 2010).  Rather, self-regulatory processes are implemented in translating motivation into action (Sniehotta et al., 2005a). An automated behavioural response induced by an implementation intention occurs immediately, efficiently and unconsciously (Gollwitzer & Sheeran, 2006). Automaticity of leisure centre attendance (i.e. unconscious enactment of the solution to attend the leisure centre when the specified challenge is encountered).  Behaviours which are habituated occur in a conceptually similar way (Gollwitzer & Sheeran, 2006). Therefore, self-regulation and action planning were measured to evaluate the potential mediating role they have upon the volitional help sheet intervention.  Also, habit was measured to provide an index of the level to which leisure centre attendance had become a habituated behaviour over the 12-month period.  These variables were not reported in the final analyses due to a high participant attrition rate at follow-up.

### 2.4. Measures

The following measures of area of residence, household income, occupational status, and educational status were taken for each participant at baseline.

Area Deprivation.  The English Indices of Multiple Deprivation (IMD, 2015a) online tool was used to obtain a small area deprivation score for each participant from their postcodes (called a Lower Super Output Area: LSOA).  LSOA's represent a hierarchy of small geographical areas in England and Wales, comprising approximately 1500 residents or 650 households and provide a standardised method for reporting statistics (IMD, 2015b) including those produced by the Office of National Statistics.  There are 32 844 LSOA's situated within England, and each is grouped into deciles, with 1 representative of the most deprived and 10 the least deprived (IMD, 2015b).  In this study, the resultant area deprivation score reported for each participant was used to represent their relative position as ranked along decile groupings.  Decile position for eleven participants (11.2%) were unobtainable because they reported only partial post-codes and so these participants were excluded from final analyses involving area deprivation.  Consistent with the sampling frame, most participants fell at the lower end (mean IMD score = 3.63) with a quarter of the sample achieving an IMD score of 1 (25 participants), while just one participant ranked at the highest IMD score of 10.

Household income was assessed using a single question derived from the Living Costs and Food Survey (LCFS) (LCFS, 2014), which is a survey produced by the Office for National Statistics.

Participants were asked to select from a total of 11 income bands that increase by £100 increments, and range from "Less than £100 per week" to "Over £1000 per week" (LCFS, 2014). In recognition of poor response rates associated with income measures (LCFS, 2014), this measure was selected to promote greater participant response rate as participants are not required to specify an exact income amount. Twenty-one participants (21.4%) still failed to report their household income, highlighting the sensitive nature of accessing income details in research. Thus, these participants were excluded from the analyses involving income. Median household income of the sample fell in the "£300, but less than £400 per week" bracket, which was below the median gross weekly earnings (before tax) for all persons in full-time employment in the UK (£539) and for the North West (median = £503.20) in April 2016 (Annual Survey of Hours and Earnings (ASHE), 2016).

An Occupational measure of socioeconomic status for each participant was derived using an adapted version of the National Statistics Socio-economic Classification NS-SEC method (NS-SEC, 2010). Initially, participants were asked to indicate their current employment status from a list of six potential responses ("Employed", "Self-Employed", "Retired", "Student", "Unemployed" and "Other (please specify)"). This item was then followed by two open-ended questions in which participants were asked to report their most recent or current job and to describe in one sentence what their job role entailed. Participants' job titles were then mapped onto the NS-SEC coding framework. Two researchers independently coded the entire sample. One hundred percent agreement was achieved in the coding of occupation among the researchers. Once verified, the occupation code was used in conjunction with participant responses to employment status and size of organisation related questions to establish an NS-SEC analytic class and operational category using an additional NS-SEC coding tool. Half of the sample was classified as employed (50%), 11.2% (n = 11) reported being unemployed, 6.1% (n = 6) retired and almost one quarter of participants (n = 24; 24.5%) reported being a student. There were no missing data for NS-SEC occupation as each participant in the sample provided their current occupation.

Highest level of Educational Attainment was indexed using the qualifications question derived from the Office of National Statistics Household Questionnaire, England, Census 2011. Participants were required to indicate, from a list of qualifications ("1 – 4 O levels / CSEs / GCSEs (any grade), Entry Level, Foundation Diploma", "Apprenticeship", "Degree (for example BA, BSc), higher degree (for example MA, PhD, PGCE" and "No qualifications") every qualification that applied to them from the list. Participants were instructed to tick the nearest equivalent qualification if their UK qualification was not listed. For those participants who had acquired qualifications outside of the UK (n = 8), they were instructed to tick "Foreign Qualifications" and then the nearest UK equivalent qualification, if known. Eight (8.2%) participants indicated that they possessed "foreign qualifications". It was not possible to identify UK equivalent qualifications for seven participants (7.18%) as they did not report which foreign qualifications they possessed. Almost half of the sample (n = 48) indicated that they were educated to degree or higher degree level, while just four (4.1%) participants indicated that they had no qualifications.

2.5. Moderator Variables

To enable moderator analyses, categorical variables were created distinguishing between high versus low-socioeconomic status participants on socioeconomic status measures of IMD area-deprivation, income, occupation and education.

For IMD-area deprivation, as over 50% of the sample fell within deciles 1 to 3 representing up to 30% of the most deprived areas of England, participants that ranked an IMD score of 3 or below were considered to be of low-socioeconomic status. Guidance contained within the English Indices of deprivation 2015 - FAQ's document advises common cut-offs of 10%, 20% and 30% (indicative of IMD deciles one, two and three respectively) are used to categorise areas as being deprived (The English Indices of deprivation, 2015). Since 50% of the sample fell below achieved an IMD decile score of 3 or below and this coincides with an acceptable cut-off for defining an area as being deprived (The English Indices deprivation, 2015), this cut-off was used to distinguish high- versus low- socioeconomic status for the area-level measures. As a result, participants who ranked an IMD of score of 4 or more were categorised as high socioeconomic status.

For education, participants who indicated that they were educated to level 4 or above (i.e. degree level or above) were categorised as high socioeconomic status, whereas those of level 3 or below, and those with foreign qualifications, were categorised as low-socioeconomic status. This categorisation follows the reporting method used in the Census 2011 to distinguish the percentage of population in England and Wales who possess the highest level of qualification (Census General Report, 2011).

Occupational status was coded and categorised using the NS-SEC full method coding. Information participants provided was used to assign each participant's occupation to one of seventeen operational- and sub- categories, and one of nine analytic classes (including "higher managerial, administrative and professional occupations" to "never worked and long term unemployed") which were then collapsed into the eight class version of the NS-SEC. To facilitate moderator analyses, binary categories were created by assigning those in the lower supervisory and technical occupations sub-group or below, to the low-socioeconomic status groups. In accordance with NS-SEC operational categories retired and students were categorised as "unclassifiable", but unlike NS-SEC these residual categories were included in the low socioeconomic status category to allow sufficient sample in the final analysis.

Lastly, for income, an income bracket of "£300 but less than £400" was used as a cut off to distinguish participants within the sample as being of low-socioeconomic status. The department of work and pensions calculates low income by extracting income data from the Family Resources

Survey that then undergoes equivalisation to allow comparison across differing household unit sizes (Department of Work & Pensions (DWP), 2016). A couple with no children and a weekly household income of £300 is used as a reference point to calculate the household income, with each household member being assigned a relative standard weighting (DWP, 2016). Conversely, participants who indicated they fell into income brackets of £400 but less than £500, or above, were categorised as high-socioeconomic status.

Physical Activity

Self-reported levels of current physical activity were measured using the short form of the International Physical Activity Questionnaire (IPAQ-SF) (Craig et al., 2003). This provided a baseline measure of participant's physical activity levels. The IPAQ-SF consists of 7-open-ended questions in which respondents are asked to self-report the number of days and the amount of time (hours and minutes) that they have engaged in vigorous and moderate physical activity, as well as walking, and the amount of time (hours and minutes) that they have spent sitting during the past 7 days.

Leisure Centre Attendance

Leisure centre attendance for each participant was obtained from a centralised electronic system that is used to record each member's leisure centre attendance electronically. Each member is provided with a membership card that they need to present to the leisure centre receptionist to gain entry to the leisure centre. When the receptionist scans a member's card, this generates a record of attendance and the facilities they were gaining access to (e.g. gym suite, pool). Leisure centre attendance was obtained for each participant for 12-months from the date that they completed the baseline questionnaires. As each participant was required to attend the leisure centre for a mandatory induction, this initial session was discounted from each participants' leisure centre attendance during week 1 to allow an understanding of how participants' attendance varied under their own volition.

Additional demographic questions pertaining to gender, age, marital status and ethnicity, as well as previous gym membership status, were also taken at baseline. In addition, measures of intention, self-efficacy, self-regulation, action planning, habit and physical activity were taken at baseline and at each follow-up. Intention and self-efficacy were each measured using 3-items (e.g. "*I intend to go to the gym in the next six weeks*" and "*I believe I have the ability to go to the gym in the next six weeks*" respectively). Six items measured self-regulation (e.g. "*During the last six weeks I constantly monitored my gym attendance*") which were derived and adapted from those used by Sniehotta et al., (2005a) to tap into self-regulation (i.e. self-monitoring, awareness of standards and self-regulatory effort. Five items adapted from Sniehotta et al's., (2005b) measure of action planning were used to capture action planning (e.g. "*Going to the gym in the next six weeks is something I will start doing before I realise I'm doing it*"). Four items derived from an adapted version of Gardner et al., (2011) self-report behavioural automaticity index (SRBAI) were

used to measure habit (e.g. *"Going to the gym in the next six weeks is something I will do without thinking".* Lastly, self-reported physical activity was assessed using the shortened International Physical Activity Questionnaire (IPAQ-SF; Craig et al., 2003).

2.6. Procedure

Recruitment occurred from April 2016 to November 2016 inclusive. Senior management responsible for ten leisure centres were approached to take part in the study, all of whom agreed to take part. These leisure centres were specifically targeted as they are located within a deprived city in the North West of England that ranks among the most deprived local authority areas in England according to the English Indices of Multiple Deprivation (2015). Each invited leisure centre offers a wide range of facilities, including a gym suite and badminton courts, and activities such as structured classes (e.g. Zumba), that members can choose to engage in.

New leisure centre members were individually invited face-to-face to take part in the study either by a member of staff (receptionist or gym instructor) or the principal researcher (CH) at the point of registering as a member of the leisure centre. Staff members were trained by the principal researcher (CH) in what to say to participants during recruitment, however the questionnaire containing the intervention was completed by the participant therefore staff did not need specific training on how to deliver the intervention. A secondary passive recruitment approach involving posters advertising the study were placed in high footfall areas, including reception and changing areas, as well as community boards alerting new leisure centre members to either speak with a member of staff or to contact the primary researcher directly (CH) via email, should they be interested in participating. Participants did not receive direct training in how to complete the questionnaire and volitional help sheet, but were guided by instructions contained in the questionnaire on how to complete the intervention. Additionally, each participant had the opportunity to ask leisure centre staff and/or the researcher (CH) specific questions relating to the study either in person or by email, both prior to taking part and throughout the duration of the study.

Potential participants were asked if they would like to participate in a study "exploring the effects of an intervention aimed to promote gym attendance". "Gym attendance" rather than "leisure centre attendance" was used to describe the purpose of the study and main study outcome to potential participant's, and was also used in the research materials, including the volitional help sheet intervention, participant information sheet and consent form. It was perceived by the researchers that describing leisure centre attendance in this way (i.e. as "gym attendance") would be more acceptable to potential participants as it is consistent with the colloquial language used by local people living in and around the area to describe attending the leisure centre (e.g. "I'm going to the gym"). Each participant received a questionnaire pack containing paper versions of a participant information sheet, consent form and questionnaire that had been prepared and randomised in advance, before any participant had been recruited into the study. An online random number

generator was used to randomise questionnaire pack allocation order prior to being distributed to participating leisure centres. The volitional help sheet intervention was placed in the middle of the identical looking questionnaire by the principal researcher (CH) to ensure blinding to condition occurred.

Each questionnaire pack contained an identical paper based questionnaire that differed only by the instructions given on how to complete the volitional help sheet. Training was not provided to participants on how to complete the volitional help sheet, instead participants were instructed in writing on how to complete the intervention in the questionnaire. In the intervention group, people were encouraged to form "if-then" plans (Gollwitzer, 1993; 1999) by using a pen to draw a line to link challenges with solutions that are relevant to them. Participants in the control group were given the same volitional help sheet but are not asked to form "if-then" plans. Instead, control group participants were asked to tick challenges and solutions that they feel are relevant to them (please see appendices 3 and 4 for copies of the instructions given to participants in the control and intervention groups respectively). Each participant was instructed to read the participant information sheet before deciding whether or not to take part in the study. It was explained to each participant in writing through the consent form and participant information sheet, that their attendance at the leisure centre would be tracked for 12-months by accessing their electronic entry swipes. If a participant decided to take part, they were advised to complete the paper-based questionnaire either on-site or later at home, and to return the completed questionnaire in the post directly to the research (CH), or to a secured box situated within the leisure centre using the return envelope provided. This study was retrospectively registered at ClinicalTrials.gov, on 26th March 2020, registration number NCT04325399.

### 2.7. Ethical Approval

Ethical approval was sought and granted by the University of Manchester Research Ethics Committee (UREC reference 15254).

### 2.8. Power Calculation

A power calculation was performed using g* power for ANOVA with two groups, assuming 80% power and an alpha value of .05. Previous implementation intention studies have found varying attrition rates from 20.7% (De Vet et al., 2009) and 36.7% (Godin et al., 2010). To account for this, a conservative follow-up effect size of .24 at six month follow up reported by Belanger-Gravel et al., (2013) in their meta-analysis examining the effect of implementation intentions on physical activity was used. Accordingly, a sample size of 548 participants (274 participants per condition) would be required to detect a change in the outcome variable of leisure centre attendance at 12 month follow up, assuming 80% power and a significance level of .05.

2.9. Data Analysis

Data were analysed using IBM SPSS statistics for windows, version 25. Descriptive analyses were undertaken to compare baseline means and standard deviations for gender, ethnicity, age, each socioeconomic status measure and physical activity across each condition. In addition, chi square test was used to test for between condition differences of gender and ethnicity. The range of dispersion of socioeconomic status scores for each individual- and area-level socioeconomic status measure was also explored between conditions. Effectiveness of the randomisation procedure was determined using a one-way between group multivariate analysis of variance (MANOVA) with condition (intervention versus control) as the independent variable. Age, gender, vigorous- and moderate physical activity, walking, sitting and individual- and area-level socioeconomic status measures of income, education, and occupation, and IMD-area level deprivation comprised the dependent variables. The strength and direction of relationships between physical activity, leisure centre attendance and each measure of socioeconomic status was explored using bivariate Spearman's rank order correlations. Normality and homogeneity of the data was assessed to determine the suitability of parametric tests. An independent-samples t-test was used to test the effect of the VHS intervention upon post-intervention leisure centre attendance between each conditions. Using the categories of low versus high socioeconomic status created for each individual- and area-level socioeconomic status measure (as discussed above), a between condition comparison of mean leisure centre attendance for each low and high individual- and area-level socioeconomic status measure was conducted. A series of 2-way between-group ANOVA's tested for the main and interaction effects of socioeconomic status upon leisure centre attendance between both conditions (intervention and control) so as gain insight into which indices of socioeconomic status influences leisure centre attendance. It was not possible to report any potential change in motivation (as indicated by intention and self-efficacy), self-regulation, action planning or habit formation in the present study. Follow-up questionnaire uptake was poor, subsequently there was insufficient data to allow further analyses of these variables.

## 3. Results

3.1. Sample Characteristics

Approximately 1250 participants were invited to take part in the study "exploring the effects of an intervention aimed to promote gym attendance" (see CONSORT diagram – Figure 1). Leisure centre attendance data were unobtainable for twenty participants within the sample due to problems locating their record on the centralised data system that records electronic entry swipes. For this reason questionnaire data for these participants were removed from the sample. Subsequently, the final sample comprises 98 participants aged from 18 to 66 years (M = 35, SD= 13.31), of whom sixty .0(61.2%) identified as female (38 (38.8%) males) and 77 (88.8%) participants as White British (11 (11.2%) participants as Black, Asian or Minority Ethnic). This fell short of the 548 participants calculated to be required to achieve 80% power at a significance level of .05.

More women ($n$ = 60) than men ($n$ = 38) participated in the study.  However, gender was almost equally split across conditions and chi square test confirmed that the difference was non-significant ($\chi$ = .51, $p$ = .474).  The majority of the sample in both conditions were white ($n$ = 87), although the control condition had more participants who identify as non-white ($n$ = 8) than the intervention condition ($n$ = 3).  Nevertheless, chi square results show that the difference in ethnicity between the groups is non-significant ($\chi$ = 1.29, $p$ = .255).  Comparison with Census (2011) data shows that the ethnicity of the study sample is ethnically not as diverse as England and Wales.  In 2011, 81.4% of people living in England and Wales identified as white and 18.6% as Black, Asian or minority ethnic.  However, the percentage of Black, Asian or minority ethnic people living in the city from where participants were recruited falls below that of England and Wales in 2011 (13.8% regionally compared to 18.6% nationally).

Area IMD score, household income, NS-SEC occupation classification and education status comprised the multiple socioeconomic status indicators (Table 1).  With the exception of education, socioeconomic status of the sample across the different indicators used were found to cover the spectrum from low through to high socioeconomic status, with most participants falling within the parameters of low socioeconomic status as described below (Table 1).  IMD deprivation score ranged from decile 1 through to 10 for the intervention group (M = 3.42, SD = 2.60) and 1 to 9 for the control group (M = 3.77, SD = 2.67).  Dispersion in income across the intervention group  (M = 5.21, SD = 2.83) and control group was similar, ranging from band 1 representative of a household income of £100 per week or less, through to the top band of 11 indicative of £1000 or more per week.

Randomisation was checked using a one-way between-group multivariate analysis of variance (MANOVA) with condition with two levels: intervention versus control group as the independent variable.  Age, gender, vigorous- and moderate physical activity, walking, sitting and individual- and area-level socioeconomic status measures of income, education, occupation and IMD-area level deprivation comprised the dependent variables.  There was no significant multivariate effect (F (11, 52) = 1.02, $p$ = .445, Wilks lambda = .82; partial eta squared = .18).  These results confirm that participants in each condition were similarly active in terms of their vigorous and moderate physical activity, walking and sitting levels prior to the intervention exposure, although neither condition achieved the Chief Medical Officer's (in England) recommended levels of 150 minutes of moderate physical activity per week.  Also, participants across conditions did not significantly differ in their socioeconomic status by the indicators used in this study.

Figure 1:  CONSORT Diagram Showing Flow of Participants through Each Study Phase

**Enrolment**

Assessed for eligibility (N=1250)

Excluded (N=0)

- Not meeting inclusion criteria (N=0)
- Declined to participate (N=1132)
- Other reasons (N=0)

Randomised (N= 118)

**Allocation**

Allocated to control (N=59)

- Completed allocated instruction (N=59)
- Did not complete the intervention (N=0)

Allocated to intervention (N=59)

- Completed allocated intervention (N=59)
- Did not complete intervention (N= 0)

**12-Month**

Lost to follow-up (control) (N=8)

Lost to follow-up (intervention) (N=12)

**Analysis**

Analysed (control) (N=51)
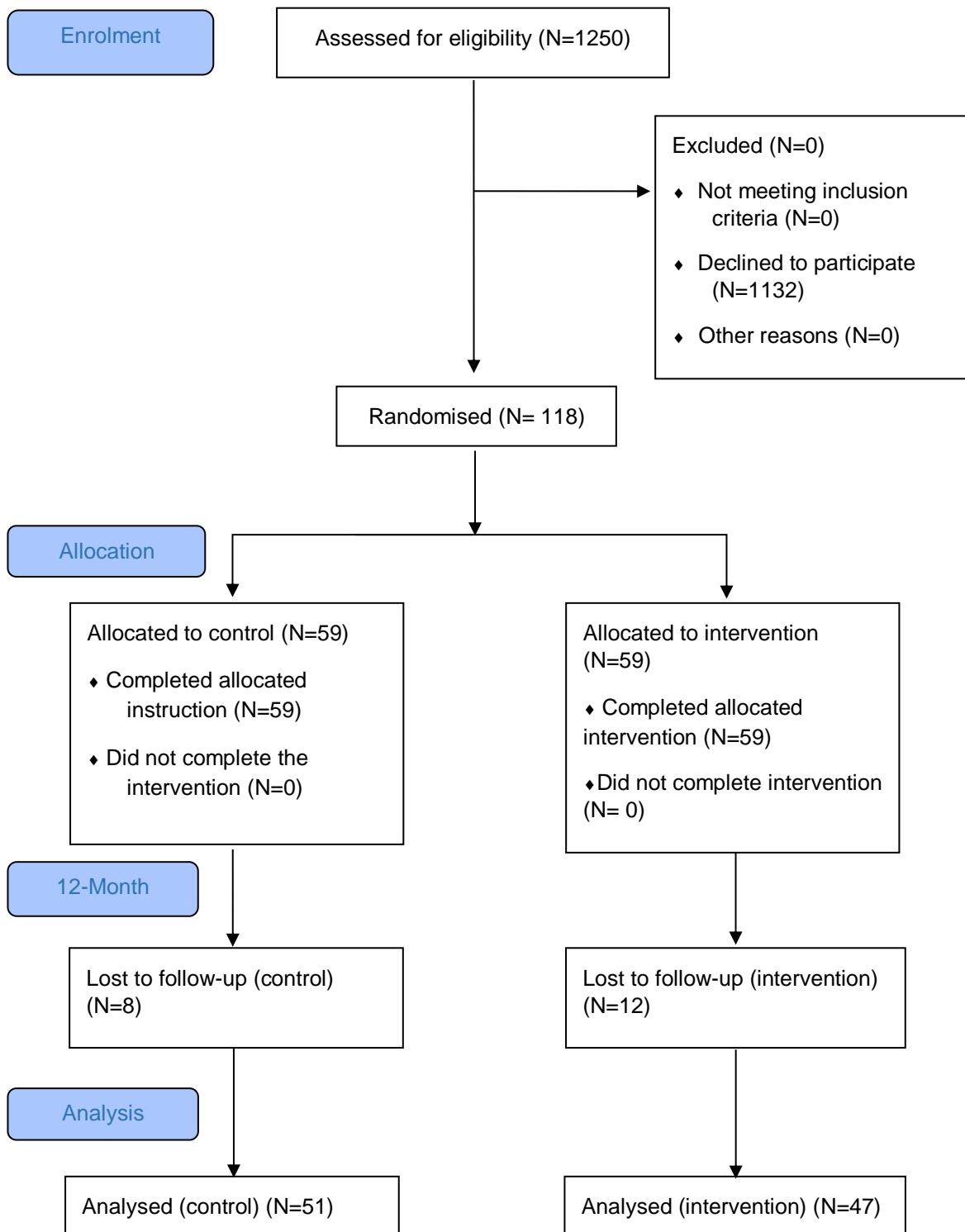
Analysed (intervention) (N=47)

Table 1: Descriptive Data for Sample: Comparison of Intervention and Control Condition Baseline Demographic Characteristics, Socioeconomic Measures and Physical Activity Levels.

| Variable | Intervention Condition (n = 47) | | | | | Control Condition (n = 51) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | Min | Max | N | Mean | SD | Min | Max |
| *Gender* | | | | | | | | | | |
| Females | 29 | | | | | 31 | | | | |
| Males | 22 | | | | | 16 | | | | |
| *Ethnicity* | | | | | | | | | | |
| White | 44 | | | | | 43 | | | | |
| Black, Asian or minority ethnic | 3 | | | | | 8 | | | | |
| *Age (in years)* | 47 | 34.34 | 13.89 | 18 | 66 | 50 | 35.56 | 12.86 | 18 | 63 |
| *SES Measures* | | | | | | | | | | |
| Income | 38 | 5.21 | 2.83 | 1 | 11 | 39 | 4.85 | 2.67 | 1 | 11 |
| IMD Area Deprivation (*deciles*) | 43 | 3.42 | 2.6 | 1 | 10 | 44 | 3.77 | 2.67 | 1 | 9 |
| Education (*highest level attained*) | 47 | 4.72 | 1.69 | 1 | 7 | 50 | 5.12 | 1.67 | 1 | 7 |
| NS-SEC Occupation | 47 | 7.34 | 2.86 | 2 | 10 | 51 | 7.43 | 2.72 | 3 | 10 |
| *Physical Activity (mins per week)* | | | | | | | | | | |
| Vigorous | 47 | 58.94 | 106.41 | 0 | 600 | 49 | 40.22 | 49.14 | 0 | 180 |
| Moderate | 47 | 84.15 | 143.57 | 0 | 600 | 50 | 72 | 108.98 | 0 | 480 |
| Walking | 43 | 179.07 | 220.74 | 0 | 900 | 49 | 73.16 | 61.46 | 0 | 300 |
| Sitting | 45 | 376.67 | 252.43 | 0 | 1200 | 49 | 348.06 | 227.26 | 0 | 1200 |

## 3.2. Spearman's Rank Order Bivariate Correlations Showing Socioeconomic Status and Physical Activity Indices

Table 2 shows the results of Spearman's rank order bivariate correlations between physical activity levels and each measure of socioeconomic status across condition at baseline. No significant correlation was found between the socioeconomic status indices and the different types of physical activity measured by the IPAQ-SF. A moderate, positive correlation between income and IMD area deprivation was found ($r = .40$, $p < .01$). This suggests that higher income is associated with living in a less deprived area. Contrastingly, a strong negative correlation was found between NS-SEC occupation and income was found ($r = -.54$, $p < .01$). This suggests higher occupational status is associated with lower income. Also, a weak negative correlation was found for NS-SEC occupation and IMD area deprivation ($r = -.24$, $p < .05$) suggesting that higher occupational status is associated with residing in a less deprived area as indicated by IMD area deprivation measures. The remaining individual- and area-deprivation measures of socioeconomic status were not significantly correlated with each other.

Table 2:  Correlation Coefficients Showing Associations among Physical Activity and Socioeconomic Status Measures for the Sample

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1.  *Vigorous PA* | - | | | | | | | |
| 2.  *Moderate PA* | .54** | - | | | | | | |
| 3.  *Walking* | .07 | .23* | - | | | | | |
| 4.  *Sitting* | -.00 | -.17 | -.25* | - | | | | |
| 5. *IMD Area Deprivation* | -.09 | .03 | -.20 | .04 | | | | |
| 6.  *Income* | .03 | -.12 | -.14 | .03 | .40** | - | | |
| 7.  *NS-SEC Occupation* | .14 | .10 | .06 | .05 | -.24* | -.54** | - | |
| 8.  *Education* | .00 | .01 | -.01 | .05 | .11 | .03 | -.07 | - |

*\*\*p < .01 (two tailed)*        *\*p < .05 (two-tailed)*

3.3. Assumptions

Distribution of the data was assessed to evaluate whether the assumptions for multivariate analyses were met.  Eyeball analysis of histograms showed some skewness among the leisure centre attendance data and socioeconomic variables of interest across both conditions. Nevertheless, leisure centre attendance and each socioeconomic status variable fell within an acceptable range of skewness of between -2 and  less than +2, and kurtosis range of between -7 and +7 (Byrne, 2010).  Indeed, inspection of box-plots shows some extreme scores within the leisure centre attendance and socioeconomic status variables data.  However, examination of the trimmed mean suggests that these extreme scores are generally well tolerated within the data, therefore these remained within the data set to reflect the individual differences in variable variance evident among the sample.  Although a significant Levene's test suggests unequal variance between the groups, multivariate analyses used are robust and have been found to tolerate violation of the assumption of homogeneity (Stevens, 2001).

3.4. VHS Intervention Effects upon Leisure Centre Attendance

An independent-samples t-test was used to test the effect of the VHS on leisure centre attendance between the groups.  While mean leisure centre attendance was marginally higher among participants in the intervention condition (M = 20.00, SD = 24.08) compared to participants in the control condition (M = 12.55, SD = 16.36), the difference was not statistically significant ($t$ (96) = -1.78, $p$ = .079, $d$ = -.36).

3.5. Moderating Effects of Socioeconomic Status on the VHS Condition and Leisure Centre Attendance

Table 3 shows mean leisure centre attendance across the low and high socioeconomic status groups, and between intervention conditions.  An examination of mean leisure centre attendance across each socioeconomic status measure shows that participants in the intervention condition, irrespective of socioeconomic status measure, consistently attained higher mean leisure centre than those participants in the control group.  Moreover, leisure centre attendance was higher among participants categorised as low socioeconomic status in each socioeconomic measure, with the exception of occupation.

Table 3:  Moderator Analysis:  Comparison of Means and Standard Deviations for Leisure Centre Attendance across each Socioeconomic Status Measure and Between Experimental and Control Condition

| | Condition | | |
| Socioeconomic Status Variable | Experimental | Control | Total leisure centre attendance |
|---|---|---|---|
| *Income* | | | |
| Low Income (*n* = 40) | 20.50 (SD = 29.61) | 11.80 (SD = 12.96) | 16.15 (SD = 22.99) |
| High Income (*n* = 37) | 16.89 (SD = 17.55) | 8.16 (SD = 6.13) | 12.41 (SD = 13.56) |
| Total Leisure Centre Attendance (*n* = 77) | 18.79 (SD = 24.37) | 10.03 (SD = 10.26) | |
| | | | |
| *IMD area deprivation* | | | |
| Low IMD Area Deprivation (*n* = 51) | 18.07 (SD = 26.17) | 15.42 (SD = 19.61) | 16.82 (SD = 23.12) |
| High IMD Area Deprivation (*n* = 36) | 24.94 (SD = 22.65) | 9.15 (SD = 11.11) | 16.17 (SD = 23.12) |
| Total Leisure Centre Attendance (*n* = 87) | 20.63 (SD = 24.87) | 12.57 (SD = 16.43 | |
| | | | |
| Education | | | |
| Low Education (*n* = 50) | 18.23 (SD = 21.86) | 14.45 (SD = 14.43) | 16.72 (SD = 19.16) |
| High Education (*n* = 47) | 23.12 (SD = 28.02) | 11.67 (SD = 17.81) | 15.31 (22.45) |
| Total Leisure Centre Attendance (*n* = 97) | 20.00 (SD = 24.08) | 12.78 (SD = 16.44) | |
| | | | |
| NS-SEC Occupation | | | |
| Low NS-SEC Occupation (*n* = 58) | 13.07 (SD = 17.10) | 11.71 (SD = 13.07) | 12.34 (SD = 14.96) |
| High NS-SEC Occupation (*n* = 40) | 29.35 (SD = 29.05) | 13.85 (SD = 20.78) | 21.60 (SD = 26.14) |
| Total Leisure Centre Attendance | 20.00 (SD = 24.08) | 12.55 (SD = 16.36) | |

Income. The main effect of condition on leisure centre attendance was borderline significant ($F = (1, 73) = 4.14$, $p = .046$, $d = .47$). The univariate effects of income on leisure centre attendance were also statistically non-significant ($F = (1, 73) = .72$, $p = .400$, $d = .2$). There was no significant interaction between income and intervention condition on leisure centre attendance ($F (1, 73) < .01$, $p = .997$, $d = 0$).

Education. There were no significant main effects for education ($F = (1, 93) = .06$, $p = .808$, $d = .05$) or condition ($F = (1, 93) = 3.12$, $p = .081$, $d = .36$) on leisure centre attendance. Additionally, the interaction between education and intervention condition was non-significant ($F = (1, 93) = .79$, $p = .377$, $d = .18$).

NS-SEC Occupation. Significant main effects of occupational status ($F = 1, 94) = 5.09$, $p < .026$, $d = .46$) and condition ($F = (1, 94) = 4.27$, $p = .041$, $d = .42$) on leisure centre attendance was found. This indicates that individuals with higher occupational status had significantly greater levels of leisure centre attendance ($M = 21.60$) than those of participants of low occupational status ($M = 12.34$). Similarly, participants in the intervention condition attended the leisure centre significantly more at the end of the follow-up period than those in the control condition ($M = 20$ and $M = 12.55$ respectively). No significant interaction between occupation status and intervention condition on leisure centre attendance was found ($F = (1, 94) = 3.0$, $p = .086$, $d = .35$).

IMD Area Level Deprivation. A marginally significant main effect for intervention condition on leisure centre attendance was found ($F = (1, 83) = 4.03$, $p = .048$, $d = .14$). No significant main effect of IMD area level deprivation on leisure centre attendance was found ($F = (1, 83) = .00$, $p = .948$, $d = .0$). The model showed no significant interaction for IMD area level deprivation and intervention condition on leisure centre attendance ($F = (1, 83) = 2.04$, $p = .157$, $d = .29$).

## 4. Discussion

### 4.1. Summary

The aim of the present study was to investigate the potential moderating effects of different measures of socioeconomic status upon an established behaviour change intervention designed to increase physical activity. This is the first study to longitudinally test the potential moderating effects of multiple socioeconomic status indices upon an objectively measured physical activity related outcome, that of leisure centre attendance. Spearman's rank order bivariate correlations confirmed a moderate, positive relationship between the socioeconomic status measures of income and IMD area deprivation suggesting higher income is associated with living in a less deprived area. Similarly, a moderate, positive relationship was found between NS-SEC occupation and income suggesting having a higher occupational status is associated with residing in a less deprived area. Also, a negative relationship was found between NS-SEC occupation and IMD area deprivation suggesting

that higher occupational status is associated with residing in a less deprived area as indicated by IMD area deprivation measures. The remaining individual- and area-deprivation measures of socioeconomic status were not significantly correlated with each other. No significant moderating effects were found each socioeconomic status of education, occupational status, income and IMD area deprivation which indicates that the intervention is not more effective in high or low socioeconomic groups irrespective of how socioeconomic status is defined. However, there was some evidence of a significant main effect of occupational status and condition upon leisure centre attendance. Additionally, there is some evidence that shows that the intervention was found to work in significantly increasing leisure centre attendance during the 12-month period among participants. Taken together, these findings suggests that the way in which socioeconomic status is measured does influence research related outcomes such as leisure centre attendance. The following discussion will consider the theoretical implications of these findings and how they sit within the broader research, with a particular focus on potential future research.

## 4.2. Interpretation of Findings

### Relationship between Individual- and Area-Level Measures of Socioeconomic Status

The correlation findings of the present study showing weak- to moderate significant relationship between the individual-level socioeconomic status measures of income and occupation, and IMD area-level deprivation, as well as no correlation between education and income, occupation and IMD area-level deprivation add to arguments contesting the interchangeable use of different socioeconomic status measures in health research (e.g. Geyer et al., 2006). Research has shown that income, occupation, education and area deprivation measures of socioeconomic status share some conceptual similarities, yet are distinct concepts measuring different aspects of socioeconomic status (e.g. Galobardes et al., 2006a; 2006b; Geyer et al., 2006). The present correlation findings indicate that using individual- and area-level measures of socioeconomic status used in the present study either interchangeably or as a proxy measure of socioeconomic status in research aiming to increase leisure centre attendance fails to capture the breadth and depth of socioeconomic status as a concept by omitting key composite elements (Geyer et al., 2006). For example, using education as a single, parsimonious socioeconomic status measure in research aiming to increase leisure centre attendance would overlook other important socioeconomic status aspects relating to income, occupation and IMD area level deprivation altogether.

### Effect of VHS Intervention on Leisure Centre Attendance

The present findings are partially consistent with, and build upon those of Armitage and Arden (2010) who showed that the physical activity volitional help sheet significantly increased moderate physical activity among manual workers at 1 month follow-up. In extending this work and using leisure centre attendance as a proxy but related measure of physical activity, the present study found that participants in the intervention condition were found to attend the leisure centre more frequently than those in the control condition for 12-months after receiving the VHS intervention. In

comparison, increased leisure centre attendance among participants in the experimental condition in the present study is numerically modest, but this difference is not statistically significant. However, the relationship between physical activity and its benefits is described as being dose-response dependent, with small increases in physical activity associated with positive health benefits with the greatest health benefits accrued by the least active individuals (Ekelund et al., 2015). Therefore, attending the leisure centre on one additional occasion each week over 12-months may accrue significant health benefits to the individual. Additionally, the present study findings adds to an increasing body of evidence that supports its role as a vehicle for supporting the formation of implementation intentions as an effective means for engendering behaviour change across different health behaviours, including physical activity (Armitage & Arden, 2010; Epton & Armitage, 2017).

Effect of Different Socioeconomic Status Indices on Leisure Centre Attendance

With no significant interaction effect being found between each individual- (education, occupation and income) and area-level socioeconomic status indices and leisure centre attendance, the findings of this study fail to replicate those of previous studies that support a moderating relationship between socioeconomic status and health behaviours (e.g. Connor et al., 2013; Schüz, 2017). However, occupational status was found to significantly increase leisure centre attendance as a main effect, suggesting that the way in which socioeconomic status is measured impacts on leisure centre attendance related outcomes. This is important given that it is not uncommon for researchers, in assuming different indices of socioeconomic status are qualitatively equivalent, to foster a "one size fits all approach" to socioeconomic status measurement when examining health inequalities (Geyer et al., 2006). These results, as well as the correlation results, contribute to emerging evidence that highlights the problems with this approach. For example Geyer et al., (2006) found that the socioeconomic indicator associated with the strongest effect varied across type of index used (either income, education or occupation) and health outcomes, such that education was the strongest predictor of diabetes, income for all-cause mortality, while myocardial infarction morbidity and mortality results were varied. Continued interchangeable application of variant operationalisations of socioeconomic status in health research will thwart understanding of the mechanisms by which different socioeconomic status indicators influences different health domains and contribute to health inequalities, including intervention generated inequalities.

Research evidence has shown that universal behaviour change interventions can unequally effect different population sub-groups so as to create intervention generated inequalities. Inequalities that subsequently arise have the unintended effect of more affluent groups gaining greater benefits from an intervention than less affluent groups, the impact of which is to further widen health inequalities between poorer and affluent groups (Lehne & Bolte., 2017; Lorenc et al., 2012). While targeted interventions for people with low socioeconomic status may avert intervention generated inequalities (Lorenc et al., 2012), arguably a pertinent methodological step within such targeted intervention approaches is to ensure accurate assessment of the different facets of socioeconomic status. To employ a singular socioeconomic status measure (e.g. income) in the interest of

parsimony neglects other key facets that underpin the concept socioeconomic status such as occupation, education and area-level deprivation. This in turn neglects the mechanisms of the social determinants of health itself, specifically access to different resources available to the participants within the study sample, and limits the researcher's ability to accurately deduce and report the intervention effects upon a specific population sub-group, such as people with low socioeconomic status.

4.3. Strengths and Limitations

One strength of the present research is the 12-month follow-up period extends the duration of that previously used in studies involving the volitional help sheet within a physical activity related context (Armitage & Arden, 2010 and Epton & Armitage, 2017), albeit it using leisure centre attendance as a proxy measure of physical activity. In addition, it extends the follow-up periods that are typically used in implementation-intentions based physical activity intervention studies. For example, in their meta-analysis of the effect of implementation intentions on physical activity Belanger-Gravel et al., (2013) reported that just five studies had follow-up periods of over 3-months, none of which included a follow-up period of 12-months. Thus, the follow-up period included here is adequate to allow a long-term pattern of leisure centre attendance to emerge, and to determine whether this is consistent with maintenance of behaviour (e.g. Prochaska & DiClemente, 1983).

A second strength, is in the involvement of leisure centres situated across a deprived city within the North West of England to recruit people with low socioeconomic status. Recruitment of people with low socioeconomic status begins to redress limitations in previous studies that have used implementation intentions that are dominated by student samples (Belanger-Gravel et al., 2013).

The use of an objective measure to assess leisure centre attendance is both a strength and a weakness of the present study. Although using electronic swipe entry does represent an objective method of monitoring frequency of leisure centre attendance and physical activity engagement, it is uninformative about the frequency and/or intensity of physical activity that may have occurred while the participant attended. While increasing engagement with facilities that provide opportunities for physical activity is a valuable pursuit in its own right, it would be preferable to gain a more complete picture of the type and amount of physical activity undertaken.

In spite of the strengths, the present study has a number of limitations that future research in this area should consider redressing. While the sample size is comparable to that of Armitage & Arden's (2010) study, the sample size remains underpowered ($n$ = 98) due to poor uptake of the study (as discussed below) and missing values of the socioeconomic measures of income, education and IMD area deprivation. This may have accounted for the failure to detect significant changes in

leisure centre attendance between VHS conditions. Future studies should look to undertake a fully powered randomised controlled trial.

In accordance with NS-SEC operational categories, retired and students should be categorised as "unclassifiable" and omitted from the final analysis. However, to allow a sufficient sample size to facilitate analyses in the present study, retired ($n$ = 6) and student ($n$ = 24) participants were added to the "never worked and long-term employed" group and subsequently categorised within the low-socioeconomic group. This decision was based upon the assumption that retired participants would be on fixed-incomes. In the case of students, an examination of the descriptions of the job roles, if applicable and provided, was undertaken. Of those students who provided a job title ($n$ = 17), these could be considered low-paid (e.g. bar tender, waitress). This is problematic as it artificially conflates the sample size. Future research could overcome this issue by recruiting an adequate sample size to constitute a fully powered study.

It is notable that the occupation and education categories are the only socioeconomic measures for which almost all participants responded ($n$ = 97). Some participants either omitted or provided incomplete information for the other socioeconomic status measures of income ($n$ = 77) and IMD area-level deprivation ($n$ = 87). Since these missing values reduced the data set further, it is feasible that this missing data may have influenced how the findings are interpreted. Nevertheless, the small sample size here reflects and underscores the well-documented challenges involved in recruiting from "hard-to-reach" communities (e.g. Bonevski et al., 2014). Future studies aiming to be inclusive of low socioeconomic groups and wishing to be adequately powered, should pay careful attention to understanding their target population and look to employ specific strategies to overcome challenges in engaging the "hard-to-reach". That is not to say that "hard to reach" populations are any less accessible than other populations per se (e.g. clinical groups). Rather, consideration and provision should be given for any extra resources that may be required to recruit from hard to reach populations including people with low socioeconomic (Bonevski et al., 2014). For example, extending project timelines to allow more time to recruit and extra financial implications to include additional strategies to promote recruitment such as tailoring research materials to suit the targeted audience (Bonevski et al., 2014).

A final limitation is that participants were recruited at the point of undertaking an induction programme, having enrolled as a new member of a leisure centre, and therefore were likely to have been highly motivated towards regularly attending the leisure centre. In this regard, the sample is arguably selective, and future research should seek to recruit a sample from which any conclusions drawn are generalizable to the broader low socioeconomic status population. Nevertheless, it has been repeatedly shown that intention alone is inadequate to accrue increased physical activity (e.g. Godin & Conner, 2008; Rhodes & de Bruijn, 2013). This suggests that motivation to attend the leisure centre attendance more frequently may not have translated into actual leisure centre attendance during the study period. However, further research would be required to confirm this.

4.4. Implications for Future Research

The present study findings show some promise that the intervention works in sustaining increased leisure centre attendance over 12-months among an adult population. Although the main effect of the VHS upon leisure centre attendance at 12-month follow-up was not statistically significant, future research in this area should seek to capture a sufficient sample size to undertake a fully-powered randomised controlled trial in replication of this study. Relatedly, researchers seeking to test the differential effects of different socioeconomic status indices upon the VHS and long-term physical activity-related outcomes such as leisure centre attendance among a low-socioeconomic sample, could also look to employ alternative recruitment strategies to increase participant uptake in efforts to secure an adequate sample size for a randomised controlled trial. For example, undertaking a significant period of consultation with key community stakeholders when designing the procedure, and to testing the resultant design under pilot conditions.

.

Changing socio-demographics within society could mean that traditional socioeconomic status measures are no longer relevant in terms of representation of low- socioeconomic status. For example, increasingly more individuals are educated to degree level, as was evident within the present study sample. Therefore, future studies may consider using an approach to mitigate issues relating to generalisability of findings when recruiting for an intervention aimed towards people of low-socioeconomic status, such as using multiple individual- and area-level socioeconomic measures to ensure they adequately tap into the composite facets of socioeconomic status of the study sample.

4.5. Conclusion

In conclusion, the present study findings highlight that individual-level and area-level measures of socioeconomic status are not interchangeable and that research outcomes pertinent to leisure centre attendance are directly predicted by occupation and not income, education or IMD area-deprivation. Also, this study highlights the inherent difficulties in attracting people of low socioeconomic status to participant in research, and the inconsistencies surrounding socioeconomic status definition that require clarification if we are ever to truly understand the effects of low socioeconomic status upon research outcomes and to be able to tailor intervention designs to suit this audience.

## 5. References

Adler, N.E & Ostrove, J.M. (1999). Socioeconomic status and health: What we know and what we don't. Annals of the New York Academy of Sciences, 896, 3-15. https://doi.org/10.1111/j.1749-6632.1999.tb08101.x

Adler, N.E. & Rehkopf, D.H. (2008). U.S. Disparities in health: descriptions, causes and mechanisms, Annual Review of Public Health, 29, 235-252. https://doi.org/10.1146/annurev.publhealth.29.020907.090852

Annual survey of hours and earnings (ASHE): 2016 provisional results retrieved October, 21, 2018 from

https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2016provisionalresults#regional-earnings

Armitage C. J. (2005). Can the theory of planned behavior predict the maintenance of physical activity?. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association, 24*(3), 235–245. https://doi.org/10.1037/0278-6133.24.3.235

Armitage, C. & Arden, M.A. (2010). A volitional help sheet to increase physical activity in people with low socioeconomic status: A randomised exploratory trial. Psychology & Health, 25 (10), 1129 - 45. https://doi.org/10.1080/08870440903121638

Bélanger-Gravel, A., Godin, G. & Amireault, S. (2013). A meta-analytic review of the effect of implementation intentions on physical activity. Health Psychology Review, 7 (1), 23-54. https://doi.org/10.1080/17437199.2011.560095

Bonevski, B., Randell, M., Paul, C., Chapman, K., Twyman, L., Bryant, J., Brozek, I., & Hughes, C. (2014). Reaching the hard-to-reach: a systematic review of strategies for improving health and medical research with socially disadvantaged groups. BMC Medical Research Methodology, 14(42). https://doi.org/10.1186/1471-2288-14-42

Braveman, P.A., Cubbin, C., Egerter, S., Chideya, S., Marchi, K.S., Metzler, M., & Posner, S. (2005). Socioeconomic status in health research: One size does not fit all. JAMA, 294 (22), 2879-2888. doi: 10.1001/jama.294.22.2879

Braveman, P.A. & Gottlieb, L. (2014). The social determinants of health: It's time to consider the causes of the causes. Public Health Reports, 129 (suppl 2), 19-31. doi: 10.1177/00333549141291S206

Byrne, B. M. (2010). *Structural equation modelling with AMOS: Basic concepts, applications, and programming.* New York: Routledge.

Census General Report (2011). Retrieved March 1, 2015, from https://www.ons.gov.uk/census/2011census/howourcensusworks/howdidwedoin2011/2011censusgeneralreport

Connelly, R., Gayle, V., & Lambert, P. (2016). A Review of Educational Attainment Measures for Social Survey Research. Methodological Innovations Online, 9, 1-11. https://doi.org/10.1177/2059799116638001

Connor, M., McEachan, R., Jackson, C., McMillan, B., Woolridge, M. & Lawton, R. (2013). Moderating effect of socioeconomic status on the relationship between health hognitions and behaviors. Annals of Behavioral Medicine, 46(1), 19–30. https://doi.org/10.1007/s12160-013-9481-y

Craig, C.L., Marshall, A.L., Sjöstrom, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J.F. & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. Medicine and Science in Sports & Exercise, 35 (8), 1381-1395. doi: 10.1249/01.MSS.0000078924.61453.FB

Davey Smith, G., Hart, C., Hole, D., Mackinnon, P., Gillis, C., Watt, G., Blane, D., & Hawthorne, V. (1998). Education and occupational social class: which is the more important indicator of mortality risk? Journal of Epidemiology & Community Health, 52, 153-160. http://dx.doi.org/10.1136/jech.52.3.153

Department of Work & Pensions Guidance: How low income is measured in households below average income. (2016). Retrieved March, 23, 2018 from https://www.gov.uk/government/publications/how-low-income-is-measured/text-only-how-low-income-is-measured

De Vet, E., Oenema, A., Sheeran, P., & Brug, J.  (2009).  Should implementation intentions interventions be implemented in obesity prevention:  the impact of if-then plans on daily physical activity in Dutch adults.  International Journal of Behavioural Nutrition and Physical Activity, 6, 11. https://doi.org/10.1186/1479-5868-6-11

Duncan, G.J., Daly, M.C., McDonough, P., & Williams, D.R.  (2002).Optimal indicators of socioeconomic status for health research.  American Journal of Public Health, 92 (7), 1151–1157. https://doi.org/10.2105/ajph.92.7.1151

Ekelund, U., Ward, H.A., Norat, T., Luan, J., May, A., Weiderpass, E., Sharp, S.J., Overvad, K., Nautrup Østergaard, J., Tjønneland, A., Føns Johnsen, N., Mesrine, S., Fournier, A., Fagherazzi, G., Trichopoulou, A., Lagiou, P., Trichopoulos, D., Li, K., Kaaks, R., Ferrari, P., Licaj, I., Jenab, M., Bergmann, M., Boeing, H., Palli, D., Sieri, S., Panico, S., Tumino, R., Vineis, P., Peeters, P.H., Monnikhof, E., Bueno-de-Mesquita, H.B., Quirós, J.R., Agudo, A., Sánchez, M.J., Huerta, J.M., Ardanaz, E., Arriola, L., Hedblad, B., Wirfält, E., Sund, M., Johansson, M., Key, T.J., Travis, R.C., Shaw, K.T., Brage, S., Wareham, N.J., & Riboli, E.  (2015).  Physical activity and all-cause mortality across levels of overall and abdominal adiposity in European men and women: the European Prospective Investigation into Cancer and Nutrition Study (EPIC).  The American Journal of Clinical Nutrition, 101 (3),  613–621.  https://doi.org/10.3945/ajcn.114.100065

English Indices of Multiple Deprivation (IMD) Postcode Look Up.  (2015a). Retrieved January 22, 2017, from http://imd-by-postcode.opendatacommunities.org/imd/2015

English Indices of Multiple Deprivation (IMD).  (2015b).  Retrieved January 22, 2017, from https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

Epton, T. & Armitage, C.  (2017).  Does situation-specific affect the operation of implementation intentions?  Behavior Therapy, 48(6), 860-869.  https://doi.org/10.1016/j.beth.2017.08.003

Gallo, L.C. & Matthews, K.A.  (2003).  Understanding the association between socioeconomic status and physical health:  do negative emotions play a role?  Psychological Bulletin, 129 (1), 10-51.  https://doi.org/10.1037/0033-2909.129.1.10

Galobardes, B., Shaw, M., Lawlor, D.A., Lynch, J.W. & Davey Smith, G. (2006a). Indicators of Socioeconomic position (part 1). Journal of Epidemiology and Community Health, 60 (1), 7-12. http://dx.doi.org/10.1136/jech.2004.023531

Galobardes, B., Shaw, M., Lawlor, D.A., Lynch, J.W. & Davey Smith, G. (2006b). Indicators of Socioeconomic position (part 2). Journal of Epidemiology and Community Health, 60 (2), 95-101. http://dx.doi.org/10.1136/jech.2004.028092

Galobardes, B., Lynch, J., & Davey Smith, G. (2007). Measuring socioeconomic position in health research. British Medical Bulletin, 81 & 82, 21-37. https://doi.org/10.1093/bmb/ldm001

Gardner, B., de Bruijn, G.J. & Lally, P. (2011). A systematic review and meta-analysis of applications of the self-report habit index to nutrition and physical activity behaviours. *Annals of Behavioural Medicine, 42,* 174-187. https://doi.org/10.1007/s12160-011-9282-0

Geyer, S., Hemström, Ö., Peter, R. & Vågerö, D. (2006). Education, income, and occupational class cannot be used interchangeably in social epidemiology. Empirical evidence against a common practice. Journal of Epidemiology & Community Health, 60, 804-810.

Gidlow, C., Halley Johnston, L., Crone, D., Ellis, N., & James, D. (2006). A systematic review of the relationship between socioeconomic position and physical activity. Health Education Journal, 65 (4), 338-367. https://doi.org/10.1177%2F0017896906069378

Giles-Corti, B. & Donovan, R.J. (2002). Socioeconomic status differences in recreational physical activity levels and real and perceived access to a supportive physical environment. Preventative Medicine, 35, 601-611. https://doi.org/10.1006/pmed.2002.1115

Godin, G. & Conner, M. (2008). Intention-behaviour relationship based on epidemiologic indices: An application to physical activity. American Journal of Health Promotion, 22 (3), 180-182. https://doi.org/10.4278%2Fajhp.22.3.180

Godin, G., Belanger-Gravel, A., Amierault, S., Gallani, M., Vohl, M., & Perusse, L. (2010). Effect of implementation intentions on behaviour: Moderation by intention stability. Psychological Reports, 106 (1), 147-159. https://doi.org/10.2466%2FPR0.106.1.147-159

Goldman, N., Kimbro, R. T., Turra, C. M., & Pebley, A. R. (2006). Socioeconomic gradients in health for white and Mexican-origin populations. American Journal of Public Health, 96(12), 2186–2193. https://doi.org/10.2105/AJPH.2005.062752

Gollwitzer, P.M. (1993). Goal achievement: The role of intentions. European Review of Social Psychology, 4, 141-185. https://doi.org/10.1080/14792779343000059

Gollwitzer, P.M. (1999). Implementation intentions: Strong effects of simple plans. American Psychologist, 54, 493-503. https://psycnet.apa.org/doi/10.1037/0003-066X.54.7.493

Gollwitzer, P.M. & Sheeran, P. (2006). Implementation Intentions and Goal Achievement: A Meta-Analysis of Effects And Processes. *Advances in Experiemental Social Psychology, 38,* 69-119.

Grundy, E. & Holt, G. (2001). The socioeconomic status of older adults: How should we measure it in studies of health inequalities. Journal of Epidieology and Community Health, 55 (12), 895-904. http://dx.doi.org/10.1136/jech.55.12.895

Hagger, M.S. (2010). Self-regulation: and important construct in health psychology research and practice. *Health Psychology Review, 4 (2),* 57-60. https://doi.org/10.1080/17437199.2010.503594

Hoebel, J., Finger, J., Kuntz, B. & Lampert, T. (2016). Socio-economic differences in the physical and sporting activity of middle-aged workers. Bundesgesundheitsbl, 59, 188-196. https://doi.org/10.1007/s00103-015-2278-3

Jekauc, D. (2015). Prediction of attendance at fitness center: a comparison between theory of planned behavior, social cognitive theory, and physical activity maintenance theory. Frontiers in Psychology, 6:121. https://doi.org/10.3389/fpsyg.2015.00121

Lehne, G., & Bolte, G. (2017). Impact of universal interventions on social inequalities in physical activity among older adults: an equity-focused systematic review. *International Journal of Behavioural Nutrition & Physcial activity, 14* (20). https://doi.org/10.1186/s12966-017-0472-4

Living Costs and Food Survey (LCFS). (2014). Retrieved March 1, 2015, from https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/methodologies/livingcostsandfoodsurvey

Lorenc, T., Petticrew, M., Welch, V., & Tugwell, P. (2013). What types of interventions generate inequalities? Evidence from systematic reviews. Journal of Epidemiology & Community Health, 67, 190-193. http://dx.doi.org/10.1136/jech-2012-201257

Marmot, M. (2005). Social Determinants of Health Inequalities. The Lancet, 365 (365), 1099-104. https://doi.org/10.1016/S0140-6736(05)71146-6

Marmot, M., Allen, J., Goldblatt, P., et al. (2010). Fair society, healthy lives: strategic review of health inequalities in England post 2010. London: Marmot Review Team.

Nigg, C.R., Courneya, K.S., & Estabrooks, P.A. (1997). Maintaining Attendance at a Fitness Center: An Application of the Decision Balance Sheet. *Behavioral Medicine, 23*(3), 130-137. https://doi.org/10.1080/08964289709596369

Nocon, M., Keil, T. & Willich, S.N. (2007). Education, income, occupational status and health risk behaviour. Journal of Public Health, 15, 401–405. https://doi.org/10.1007/s10389-007-0120-6

Office for National Statistics Household Questionnaire, England, Census. (2011). Retrieved March,1, 2015, from file:///C:/Users/Claire%20Hanlon/Downloads/2011censusquestionnaireenglandh1.pdf

Office for National Statistics; National Records of Scotland ; Northern Ireland Statistics and Research Agency (2016): 2011 Census aggregate data. UK Data Service (Edition: June 2016). DOI: http://dx.doi.org/10.5257/census/aggregate-2011-1

Pardo-Crespo, M.R., Narla, N.P., Williams, A.R., Beebe, T.J., Sloan, J., Yawn, B.P., Wheeler, P.H., & Juhn, Y.J. (2013). Comparison of individual-level versus area-level socioeconomic measures in assessing health outcomes of children in Olmsted County, Minnesota. Journal of Epidemiology & Community Health, 67, 305-310. http://dx.doi.org/10.1136/jech-2012-201742

Powell, L. M., Slater, S., Chaloupka, F. J., & Harper, D. (2006). Availability of physical activity-related facilities and neighborhood demographic and socioeconomic characteristics: a national study. American Journal of Public Health, 96(9), 1676–1680. https://doi.org/10.2105/AJPH.2005.065573

Prochaska, J.O. & DiClemente, C.C. (1983). Stages and processes of self-change in smoking: Toward an integrative model of change. Journal of Consulting & Clinical Psychology, 51, 390–395. https://psycnet.apa.org/doi/10.1037/0022-006X.51.3.390

Psaki, S.R., Seidman, J.C., Miller, M., Gottlieb, M., Bhutta, Z.A., Ahmed, T., Ahmed, A.M.S., Bessong, P., John, S.M., Gagandeep, K., Kosek, M., Lima, A., Shrestha, P., Svenson, E., Checkley, W., & MAL-ED Network Investigators. (2014). Measuring socioeconomic status in multicountry studies: results from the eight-country MAL-ED study. Population Health Metrics, 12 (8) https://doi.org/10.1186/1478-7954-12-8


Robert, S. & House, J.S. (1996). SES differentials in health by age and alternative indicators of SES. Journal of Aging and Health, 8 (3), 359-388. https://doi.org/10.1177%2F089826439600800304


Rhodes, R.E. & de Bruijn, G.J. (2013). How big is the physical activity intention-behaviour gap? A meta-analysis using the action control framework. British Journal of Health Psychology, 18, 296-309. https://doi.org/10.1111/bjhp.12032


Schüz, B. (2017). Socio-economic status and theories of health behaviour: Time to upgrade a control variable. British Journal of Health Psychology, 22, 1-7. https://doi.org/10.1111/bjhp.12205


Shavers, V.L. (2007). Measurement of socioeconomic status in health disparities. Journal of the National Medical Association, 99 (9), 1013-1023.


Sniehotta, F.F., Scholtz, U., Schwarzer, R., Fuhrmann, B., Kiwus, U. and Voller, H. (2005a). Long-term effects of two psychological interventions on physical exercise and self-regulation following coronary rehabilitation. *International Journal of Behavioural Medicine, 12 (4),* 244-255. https://doi.org/10.1207/s15327558ijbm1204_5


Sniehotta, F.F., Schwarzer, R., Scholtz, U. & Schuz, B. (2005b). Action planning and coping planning for long-term lifestyle change: Theory and assessment. *European Journal of Social Psychology, 35,* 565-576. https://doi.org/10.1002/ejsp.258


Stevens.J. (1996). *Applied multivariate statistics for the social sciences (3rd edition)*. Mahwah: Lawrence Erlbaum.

Stringhini, S., Sabia, S., Shipley, M., Brunner, E., Nabi, H., Kivimaki, M., & Singh-Manoux, A. (2010).  Associations of socioeconomic position with health behaviours and mortality.  JAMA, 303 (12), 1159-1166.  doi:10.1001/jama.2010.297

The English Indices of Deprivation 2015 – FAQ's.  (2015).  Retrieved March, 22, 2018 from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/579151/English_Indices_of_Deprivation_2015_-_Frequently_Asked_Questions_Dec_2016.pdf

The National Statistics Socio-economic Classification (NS-SEC).  (2010).  Retrieved March, 1, 2015 from https://www.ons.gov.uk/methodology/classificationsandstandards/otherclassifications/thenationalstatisticssocioeconomicclassificationnssecrebasedonsoc2010

White, M., Adams, J., & Heywood, P. How and why do interventions that increase health overall widen inequalities within populations? In Babones, S (Ed.). Health, inequality and society. Bristol: Policy Press (2009).

## 6. Appendices

### 6.1. Appendix 1: Study 1 – Participant Consent Form

| University of Manchester Participant Consent Form |
| :-- |

*A Brief Planning Intervention to Promote Physical Activity*

**Participant Consent Form**

**Name of Researcher: Claire Hanlon; School of Psychological Sciences, University of Manchester.**

If you are happy to participate please complete and sign the consent form below.

**Please initial box**

| | | |
| :-- | :-- | :-- |
| 1. | I confirm that I have read the attached information sheet on the above project and have had the opportunity to consider the information and ask questions and had these answered satisfactorily. | |
| 2. | I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving a reason and without detriment to any service. | |
| 3. | I understand that any personal information collected during the study will remain confidential. | |
| 4. | I understand that the researcher will access my electronic gym attendance records that are held by my gym. | |
| 5. | I agree that any data collected may be passed as anonymous data to other researchers and/or used as anonymous data in research publications. | |

I agree to take part in the above project.

_____    _____    _____
Name of participant          Date                Signature

_____    _____    _____
Name of researcher           Date                Signature

**This Project Has Been Approved by the University of Manchester's Research Ethics Committee**

**MANCHESTER**
1824

The University
of Manchester

## Participant Information Sheet
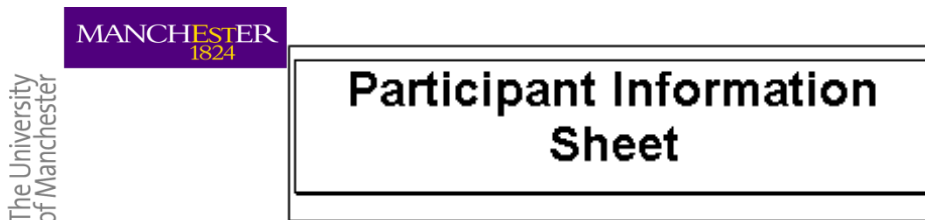
*A Brief Planning Intervention to Promote Physical Activity*

**Name of Researcher:**  Claire Hanlon
**School/Faculty:**                  School of Psychological Sciences
                                                Coupland 1 Building,
                                                Oxford Road,
                                                Manchester,
                                                M13 9PL

You are being invited to take part in a research study.  Before you decide it is important that you understand why the research is being done and what it will involve. Please take time to read the following information and discuss it with others if you wish.  Please ask the gym instructor or receptionist, if there is anything that is not clear or if you would like more information.  Take time to decide whether or not you wish to take part.  Thank you for taking the time to read this.  You may wish to retain this information sheet for future reference.

### 1. What is the aim of the research?
The aim of the project is to find out whether use of a planning technique increases gym attendance among adults.

### 2. Why have I been chosen?
You have been invited to take part in the study because you are a newly registered gym member and you are aged 18 or over.

### 3.  What would I be asked to do if I took part?
If you decide to take part you will be asked to sign a consent form.  You will then be randomly allocated to one of two groups, and asked to complete a questionnaire and to make a plan to attend the gym in one of two ways.  This will enable us to compare the two interventions.  It should take fewer than 10 minutes to complete the questionnaire and plan.

The questionnaire will ask questions relating to general information such as age and gender, as well as questions about your beliefs around gym attendance.  You will also be asked to form a plan to help you attend the gym in one of two ways using the information provided and to use this plan over the next 12 months. This will allow us to compare the two different types of plans.

**In order for the study to be success we would like you to complete a much shorter questionnaire again in 6-weeks, 3-, 6- and 12-months' time.  Again, this should take fewer than 10 minutes.  We would also like your permission to look at your gym attendance by using gym records of your entry swipes to see if the plan is effective.**

### 4. Am I going to be contacted again after I have completed this questionnaire?
Yes.  In order for the study to be a success we would like to contact you again to complete a much shorter questionnaire 6-weeks after completing the first questionnaire, and then again in 3-, 6- and 12-months' time.  We will contact you directly either by post or by email, depending on how you tell us you would like us to contact you in the future.  There is a tick box on the contact page attached to the questionnaire where you can indicate how you would prefer to be contacted in the future.  Also, you will be asked to form a personal code at the beginning of the first questionnaire so that we can confidentially match all your future answers together.

### 5. What happens to the data collected?

The data will be collected will be analysed.  The findings will be written in the form of reports and submitted to a research journal for potential publication.  You will receive a summary of the findings.  You will not be identified in any report or publication.

**6. How is confidentiality maintained?**
All information will be treated in strictest of confidence both during and after the study takes place.  Only the research team having access to the data you provide.  Whilst we ask for your contact details on the first questionnaire to enable us to ask you to complete much shorter questionnaires in the future, this information will be removed and kept separate from the information you provide in the questionnaire, so that you cannot be identified.  All questionnaires can be completed confidentially.  All information you provide will be stored securely at the University of Manchester and will be destroyed after the research has ended.  Data will be kept for a period of at least 5 years.

**7. What happens if I do not want to take part or if I change my mind?**
It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form.  If you decide to take part you are still free to withdraw at any time without giving a reason and without detriment to yourself.  This is not a problem and will not affect your gym membership or the standard of service you receive from your gym in any way.  If you withdraw from the study we will use the data collected up to your withdrawal.

**8. Do I have to take part?**
No.  Participation is entirely voluntary and it is up to you to decide whether or not you would like to take part.  If you decide to participate you will be asked to sign a consent form.  Even if after giving consent you are still free to withdraw from the study at any time without giving reason.  Your decision to participate will not affect your gym membership or the standard of service you receive from your gym.

**9. Are there any risks / benefits involved?**
There are no identifiable risks involved in taking part in this study.  We cannot promise that the study will help you, but we expect the intervention to increase gym attendance more.

**10. What is the duration of the research?**
The study will run for 12 months from the point that you join your gym and complete the first questionnaire.  During this time we will contact you in the future, either by post or email according to your preference, to complete 4 much shorter questionnaires in 6-weeks, 3-, 6- and 12-months time after completing the first questionnaire.

**11. Contact for further information**
For further information regarding the study please do not hesitate to contact the project researcher:
Claire Hanlon [email:  Claire.hanlon@postgrad.manchester.ac.uk; Telephone:  0161 306 0444]

Project Supervisors:       Professor Chris Armitage - Chris.Armitage@manchester.ac.uk
                           Professor David French - David.French@Manchester.ac.uk

**12. What if something goes wrong?**
If you have a concern about any aspect of this study, you should contact the researcher, Claire Hanlon, who will do her best to answer your questions;
email: Claire.hanlon@postgrad.manchester.ac.uk.

If you remain unhappy and wish to make a formal complaint about the conduct of the research you should contact the Research Governance and Integrity Team, Research Office, Christie Building, University of Manchester, Oxford Road, Manchester, M13 9PL; email:
Research.Complaints@manchester.ac.uk; or telephone: 0161 275 7583 or 0161 275 8093.

**Thank you for reading this – please ask any questions if you would like any further information.**

**6.3. Appendix 3: Volitional Help sheet - Control**

MANCHESTER 1824

The University of Manchester

> Baseline: Personal and Social Beliefs Questionnaire

# Contact Details

The questionnaire is entirely confidential. We are only interested in the answers of a large group of people, and not the answers of individuals. Your participation is voluntary and you may withdraw at any time without giving reason. University of Manchester has granted full ethical approval for this study.

Please try to be as honest as possible and do not think too long about your answers – your first answer is usually your best.

**For this research to be a success we would like to contact you again to ask you to complete a shorter questionnaire in 6-weeks, 3-, 6- and 12-months' time. You can decide whether you would prefer to receive these in the post or by email.**

Please provide us with your name and tell us how you would like to receive future questionnaires by ticking one of the boxes below. Please remember to provide us with your telephone number, **and** either your postal address or email to enable us to send you the questionnaires in the future. **The researcher will remove this page and keep it separate from the answers given in the questionnaire.**

- Name: _____

- Gym membership number: _____

- Telephone number: _____

- I would like to receive future questionnaires in the post. ☐

- Please give your postal address below:

  _____

  _____

  _____

- I would like to receive future questionnaires by email. ☐

- Please give your Email address: _____

**To ensure that your answers are treated confidentially and that no-one knows your name we would like you to create a personal code using the first letter of your mother's name, last 2 letters of your surname, last 2 numbers of your mobile telephone number and the day of your birthday (e.g. PON1418). We will use this to match your answers given here to any future answers. Please write your code in the boxes below and make a note of your personal number for your own records.**

| First letter of your Mother's name (e.g. P) | The last 2 letters of your surname (e.g. ON) | The last 2 numbers of your mobile number (e.g. 14) | The day of your birthday (e.g. 18 etc.) |
|---|---|---|---|
|  |  |  |  |

| | | | |
|---|---|---|---|
| | | | |

If you have any questions about the study or any other questions, please do not hesitate to contact the researcher [Claire Hanlon; Email: claire.hanlon@postgrad.manchester.ac.uk; Telephone: 0161 306 0444].

**Please now complete the attached questionnaire. Once complete, please return your completed questionnaire using the pre-paid self-addressed envelope to the researcher at the University of Manchester or by posting it in the sealed box at your gym. Thank you for taking part.**

VHS TICK 14.03.16

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |

**Section 1: Using the 7-point scales given, please circle one number that best represents your answer.**

I intend to go to the gym in the next six weeks
    *Definitely do not*          1     2     3     4     5     6     7
    *Definitely do*

I *want* to go to the gym in the next six weeks
    *Definitely do not*          1     2     3     4     5     6     7
    *Definitely do*

How likely is it that you will go to the gym in the next six weeks?
    *Very unlikely*          1     2     3     4     5     6     7
    *Very likely*

My going to the gym in the next six weeks would be...
    *Difficult*          1     2     3     4     5     6     7     *Easy*

I believe I have the ability to go to the gym in the next six weeks
    *Definitely do not*          1     2     3     4     5     6     7
    *Definitely do*

How confident are you that you will go to the gym in the next six weeks?
    *Not very confident*          1     2     3     4     5     6     7
    *Very confident*

Going to the gym in the next six weeks is something I will do automatically
    *Strongly disagree*          1     2     3     4     5     6     7
    *Strongly agree*

Going to the gym in the next six weeks is something I will do without thinking
    *Strongly disagree*          1     2     3     4     5     6     7
    *Strongly agree*

Going to the gym in the next six weeks is something I will do without having to consciously remember
    *Strongly disagree*          1     2     3     4     5     6     7
    *Strongly agree*

Going to the gym in the next six week is something I will start doing before I realise I'm doing it
    *Strongly disagree*          1     2     3     4     5     6     7
    *Strongly agree*

I have made a detailed plan regarding when to go to the gym in the next six weeks
    *Not at all true*          1     2     3     4     5     6     7
    *Exactly true*

I have made a detailed plan regarding which gym to go to in the next six weeks
    *Not at all true*          1     2     3     4     5     6     7
    *Exactly true*

I have made a detailed plan regarding how to fit in going to the gym in the next six weeks
    *Not at all true*          1     2     3     4     5     6     7
    *Exactly true*

I have made a detailed plan regarding how to go to the gym in the next six weeks
    *Not at all true*          1     2     3     4     5     6     7
    *Exactly true*

I have made a detailed plan regarding how often to go to the gym in the next six weeks
    *Not at all true*          1     2     3     4     5     6     7
    *Exactly true*

VHS TICK 14.03.16

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |

**Section 2: We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house work, to get from place to place, and in your spare time for recreation, exercise or sport.**

| *Question 1* | | | | |
|---|---|---|---|---|
| Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time. | | | | |
| During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling? | | days per week | | |
| If you did do **vigorous** physical activities for at least 10 minutes at a time in the last 7 days, how much time did you usually spend doing **vigorous** physical activities on one of those days? | | hours per day | | minutes per day |
| *Question 2* | | | | |
| Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** physical activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time. | | | | |
| During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking. | | days per week | | |
| If you did do **moderate** physical activities for at least 10 minutes at a time in the last 7days, how much time did you usually spend doing **moderate** physical activities on one of those days? | | hours per day | | minutes per day |
| *Question 3* | | | | |
| Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure. | | | | |
| During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time? | | days per week | | |
| If you did walk for at least 10 minutes at a time in the last 7 days, how much time did you usually spend **walking** on one of those days? | | hours per day | | minutes per day |
| *Question 4* | | | | |
| The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television. | | | | |
| During the **last 7 days**, how much time did you spend **sitting** on a **week day**? | | hours per day | | minutes per day |

**Section 3**

We want you to plan to go to the gym.  Research shows that if people can identify situations in which they are likely to be tempted not to go to the gym and ways to overcome temptation, they are much more likely to be successful in their intention to go to the gym more.

On the left hand side of the page are a series of common situations in which people feel tempted not to go to the gym; please tick all those that apply to you personally.  On the right hand side of the page are a series of possible solutions; please tick all those that apply to you personally.  Tick as many or as few situations and solutions as you like.

| SITUATIONS | SOLUTIONS |
|---|---|
| ☐ If I'm tempted not to go to the gym when I'm under a lot of stress | ☐ then I will think about information from articles and advertisements on how to make going to the gym a regular part of my life |
| ☐ If I'm tempted not to go to the gym when I am depressed | ☐ then I will remember how warnings about the health hazards of inactivity move me emotionally |
| ☐ If I'm tempted not to go to the gym because I feel I don't have the time | ☐ then I will think how I would be a better role model for others if I went to the gym more |
| ☐ If I'm tempted not to go to the gym because I don't feel like it | ☐ then I will tell myself that going to the gym more often would make me a healthier, happier person to be around |
| ☐ If I'm tempted not to go to the gym because I am busy | ☐ then I will make myself go to the gym anyway because I know I will feel better afterward |
| ☐ If I'm tempted not to go to the gym because I am alone | ☐ then I will tell myself that I am being good to myself by taking care of my body in this way |
| ☐ If I'm tempted not to go to the gym because I have to exercise alone | ☐ then I will seek out someone who encourages me to go to the gym when I don't feel up to it |
| ☐ If I'm tempted not to go to the gym because I am spending time with friends or family who do not exercise | ☐ then I will tell myself that society is changing in ways that make it easier for people who want to go to the gym more |
| ☐ If I'm tempted not to go to the gym because it's raining or snowing | ☐ then I will tell myself that if I try hard enough I can go to the gym |
| ☐ If I'm tempted not to go to the gym because it's cold outside | ☐ then I will put things around my home to remind me to go to the gym |

Are there any more situations you'd like to tell us about?

Are there any more solutions you'd like to tell us about?

```
[                                                                    ]
[                                                                    ]
[                                                                    ]
[                                                                    ]
```

**Section 4 – To enable us to understand gym attendance among different groups of people, we need to ask you some questions about yourself.**

1. Are you:     Female ☐                    Male ☐

2. What is your: Age (in years)    ☐

                 Marital status    ☐

                 Post-code         ☐

4. Have you previously been a member of a gym?     Yes ☐          No ☐

5. How regularly did you attend (*tick one box only)*?

Daily ☐     Weekly ☐     Fortnightly ☐  Monthly ☐     Other *(please specify)* _____

6. We put answers into income bands. What band represents the total income of the household before all deductions? *Is it*

| | | | |
|---|---|---|---|
| Less than £100 per week | ☐ | £600 but less than £700 per week | ☐ |
| £100 but less than £200 per week | ☐ | £700 but less than £800 per week | ☐ |
| £200 but less than £300 per week | ☐ | £800 but less than £900 per week | ☐ |
| £300 but less than £400 per week | ☐ | £900 but less than £1000 per week | ☐ |
| £400 but less than £500 per week | ☐ | Over £1000 per week | ☐ |
| £500 but less than £600 per week | ☐ | | |

7. Are you currently:     Employed ☐          Self-employed ☐          Retired ☐

Student ☐          Unemployed ☐          Other (*please specify)*

8. Please state your most recent/current job?

```
[                                                                    ]
```

9. Please describe in one sentence what you did/do for your job.

```
[                                                                    ]
[                                                                    ]
```

10. If self-employed, were you working on your own or did you have employees?

            *Tick one box only*     On own     ☐

Employees ☐

Not known ☐

11.  In your job, did/do you have formal responsibility for supervising the work of other employees?

*Tick __one__ box only*   Yes ☐   *If yes*, how many people did/do you supervise

No ☐

12. How many people worked for your employer at the place where you worked?

1-24 ☐

*Tick __one__ box only*   25 – 499 ☐

500+ ☐

Not known ☐

13.  What is your ethnic group? (***Choose __one__ section from A to E, then tick __one__ box to best describe your ethnic group or background)***.

### Section A – White

English / Welsh / Scottish / Northern Irish / British ☐

Irish ☐

Gypsy or Irish Traveller ☐

Any other White background *(please specify)* _____

### Section B – Mixed / Multiple ethnic groups

White and Black Caribbean ☐

White and Black African ☐

White and Asian ☐

Any other Mixed / Multiple ethnic background *(please specify)* _____

### Section C – Asian / Asian British

Indian ☐

Pakistani ☐

Bangladeshi ☐

53

Chinese

Any other Asian background (*please specify*) _____

### *Section D – Black / African / Caribbean / Black British*

African ☐

Caribbean ☐

Any other Black / African / Caribbean background *(please specify)* _____

### *Section E – Other Ethnic Group*

Arab ☐

Any other ethnic group *(please specify)* _____

14. Which of these qualifications do you have? ***Tick every box that applies if you have <u>any</u> of the qualifications listed.  \*\*If your UK qualification is not listed, tick the box that contains its nearest equivalent.  If you have qualifications gained outside the UK, tick the "Foreign Qualifications" box and the nearest UK equivalents (if known).**

1 – 4 O levels / CSEs / GCSE's (any grades) / Entry level, Foundation Diploma ☐

NVQ Level 1,Foundation GNVQ, Basic Skills ☐

5+ O levels (passes) / CSEs (Grade 1) / GCSEs (grades A\* - C), School Certificate, 1 A-Levels / 2 – 3 AS Levels / VCEs, Higher Diploma ☐

NVQ Level 2, Intermediate GNVQ, City and Guilds Craft, BTEC First / General Diploma, RSA Diploma ☐

Apprenticeship ☐

2+ A levels / VCEs, 4+ AS levels, Higher School Certificate, Progression / Advanced Diploma ☐

NVQ Level 3, Advanced GNVQ, City and Guilds Advanced Craft, ONC, OND, BTEC National, RSA Advanced Diploma ☐

Degree (for example, BA, BSc), Higher degree (for example, MA, PhD, PGCE) ☐

NVQ Level 4 – 5, HNC, HND, RSA Higher Diploma, BTEC Higher Level ☐

Professional qualifications (for example, teaching, nursing, accountancy) ☐

Other vocational / work-related qualifications ☐

Foreign qualifications ☐

No qualifications ☐                    55

**Date questionnaire was completed**    _____

**Thank you for taking the time to complete this questionnaire.  Please put it in the envelope
provided and pass it back to the gym or post it directly to the researcher.**

VHS TICK 14.03.16

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |

**6.4. Appendix 4: Volitional Help sheet – Intervention**

# Contact Details

The questionnaire is entirely confidential. We are only interested in the answers of a large group of people, and not the answers of individuals. Your participation is voluntary and you may withdraw at any time without giving reason. University of Manchester has granted full ethical approval for this study.

Please try to be as honest as possible and do not think too long about your answers – your first answer is usually your best.

**For this research to be a success we would like to contact you again to ask you to complete a shorter questionnaire in 6-weeks, 3-, 6- and 12-months' time. You can decide whether you would prefer to receive these in the post or by email.**

Please provide us with your name and tell us how you would like to receive future questionnaires by ticking one of the boxes below. Please remember to provide us with your telephone number, **and** either your postal address or email to enable us to send you the questionnaires in the future. **The researcher will remove this page and keep it separate from the answers given in the questionnaire.**

- Name: _____

- Gym membership number:_____

- Telephone number: _____

- I would like to receive future questionnaires in the post. ☐

- Please give your postal address below:

  _____

  _____

  _____

- I would like to receive future questionnaires by email. ☐

- Please give your Email address: _____

**To ensure that your answers are treated confidentially and that no-one knows your name we would like you to create a personal code using the first letter of your mother's name, last 2 letters of your surname, last 2 numbers of your mobile telephone number and the day of your birthday (e.g. PON1418). We will use this to match your answers given here to any future answers. Please write your code in the boxes below and make a note of your personal number for your own records.**

| First letter of your Mother's name (e.g. P) | The last 2 letters of your surname (e.g. ON) | The last 2 numbers of your mobile number (e.g. 14) | The day of your birthday (e.g. 18 etc.) |
|---|---|---|---|
|  |  |  |  |

If you have any questions about the study or any other questions, please do not hesitate to contact the researcher [Claire Hanlon; Email: claire.hanlon@postgrad.manchester.ac.uk; Telephone: 0161 306 0444].

**Please now complete the attached questionnaire. Once complete, please return your completed questionnaire using the pre-paid self-addressed envelope to the researcher at the University of Manchester or by posting it in the sealed box at your gym. Thank you for taking part.**

**Section 1: Using the 7-point scales given, please circle one number that best represents your answer.**

I intend to go to the gym in the next six weeks
 *Definitely do not*   1   2   3   4   5   6   7
 *Definitely do*

I *want* to go to the gym in the next six weeks
 *Definitely do not*   1   2   3   4   5   6   7
 *Definitely do*

How likely is it that you will go to the gym in the next six weeks?
 *Very unlikely*   1   2   3   4   5   6   7
 *Very likely*

My going to the gym in the next six weeks would be...
 *Difficult*   1   2   3   4   5   6   7   *Easy*

I believe I have the ability to go to the gym in the next six weeks
 *Definitely do not*   1   2   3   4   5   6   7
 *Definitely do*

How confident are you that you will go to the gym in the next six weeks?
 *Not very confident*   1   2   3   4   5   6   7
 *Very confident*

Going to the gym in the next six weeks is something I will do automatically
 *Strongly disagree*   1   2   3   4   5   6   7
 *Strongly agree*

Going to the gym in the next six weeks is something I will do without thinking
 *Strongly disagree*   1   2   3   4   5   6   7
 *Strongly agree*

Going to the gym in the next six weeks is something I will do without having to consciously remember
 *Strongly disagree*   1   2   3   4   5   6   7
 *Strongly agree*

Going to the gym in the next six week is something I will start doing before I realise I'm doing it
 *Strongly disagree*   1   2   3   4   5   6   7
 *Strongly agree*

I have made a detailed plan regarding when to go to the gym in the next six weeks
 *Not at all true*   1   2   3   4   5   6   7
 *Exactly true*

I have made a detailed plan regarding which gym to go to in the next six weeks
 *Not at all true*   1   2   3   4   5   6   7
 *Exactly true*

I have made a detailed plan regarding how to fit in going to the gym in the next six weeks
 *Not at all true*   1   2   3   4   5   6   7
 *Exactly true*

I have made a detailed plan regarding how to go to the gym in the next six weeks
 *Not at all true*   1   2   3   4   5   6   7
 *Exactly true*

I have made a detailed plan regarding how often to go to the gym in the next six weeks
 *Not at all true*   1   2   3   4   5   6   7
 *Exactly true*

VHS LinK 14.03.16

**Section 2:  We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives.  Please answer each question even if you do not consider yourself to be an active person.  Please think about the activities you do at work, as part of your house work, to get from place to place, and in your spare time for recreation, exercise or sport**.

| | | | | |
|---|---|---|---|---|
| *Question 1*<br>Think about all the **vigorous** activities that you did in the **last 7 days**.  **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.  Think *only* about those physical activities that you did for at least 10 minutes at a time. | | | | |
| During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling? | | **days per week** | | |
| If you did do **vigorous** physical activities for at least 10 minutes at a time in the last 7 days, how much time did you usually spend doing **vigorous** physical activities on one of those days? | | **hours per day** | | **minutes per day** |
| *Question 2*<br>Think about all the **moderate** activities that you did in the **last 7 days**.  **Moderate** physical activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.  Think only about those physical activities that you did for at least 10 minutes at a time. | | | | |
| During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis?  Do not include walking. | | **days per week** | | |
| If you did do **moderate** physical activities for at least 10 minutes at a time in the last 7days, how much time did you usually spend doing **moderate** physical activities on one of those days? | | **hours per day** | | **minutes per day** |
| *Question 3*<br>Think about the time you spent **walking** in the **last 7 days**.  This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure. | | | | |
| During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time? | | **days per week** | | |
| If you did walk for at least 10 minutes at a time in the last 7 days, how much time did you usually spend **walking** on one of those days? | | **hours per day** | | **minutes per day** |
| *Question 4*<br>The last question is about the time you spent **sitting** on weekdays during the **last 7 days**.  Include time spent at work, at home, while doing course work and during leisure time.  This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television. | | | | |
| During the **last 7 days**, how much time did you spend **sitting** on a **week day**? | | **hours per day** | | **minutes per day** |

**Section 3**

We want you to plan to go to the gym. Research shows that if people can identify situations in which they are likely to be tempted not to go to the gym and then link them with a way to overcome that temptation, they are much more likely to be successful in their intention to go to the gym more.

On the left hand side of the page below are a series of common situations in which people feel tempted not to go to the gym; on the right hand side of the page are a series of possible solutions. For each situation that applies to you personally (left hand side) please draw a line linking it to a solution (right hand side) that you think might work for you. Please link one situation to one solution at a time, but make as many situation-solution links as you like.

| SITUATIONS | SOLUTIONS |
|---|---|
| ☐ If I'm tempted not to go to the gym when I'm under a lot of stress | ☐ then I will think about information from articles and advertisements on how to make going to the gym a regular part of my life |
| ☐ If I'm tempted not to go to the gym when I am depressed | ☐ then I will remember how warnings about the health hazards of inactivity move me emotionally |
| ☐ If I'm tempted not to go to the gym because I feel I don't have the time | ☐ then I will think how I would be a better role model for others if I went to the gym more |
| ☐ If I'm tempted not to go to the gym because I don't feel like it | ☐ then I will tell myself that going to the gym more often would make me a healthier, happier person to be around |
| ☐ If I'm tempted not to go to the gym because I am busy | ☐ then I will make myself go to the gym anyway because I know I will feel better afterward |
| ☐ If I'm tempted not to go to the gym because I am alone | ☐ then I will tell myself that I am being good to myself by taking care of my body in this way |
| ☐ If I'm tempted not to go to the gym because I have to exercise alone | ☐ then I will seek out someone who encourages me to go to the gym when I don't feel up to it |
| ☐ If I'm tempted not to go to the gym because I am spending time with friends or family who do not exercise | ☐ then I will tell myself that society is changing in ways that make it easier for people who want to go to the gym more |
| ☐ If I'm tempted not to go to the gym because it's raining or snowing | ☐ then I will tell myself that if I try hard enough I can go to the gym |
| ☐ If I'm tempted not to go to the gym because it's cold outside | ☐ then I will put things around my home to remind me to go to the gym |

Are there any more situations you'd like to tell us about?

Are there any more solutions you'd like to tell us about?

```
┌─────────────────────────────────────────────────────┐
│                                                     │
│                                                     │
│                                                     │
│                                                     │
└─────────────────────────────────────────────────────┘
```

**Section 4 – To enable us to understand gym attendance among different groups of people, we need to ask you some questions about yourself.**

1. Are you:     Female ☐                Male ☐

2. What is your: Age (in years) ☐

                 Marital status ☐

                 Post-code ☐

4. Have you previously been a member of a gym?     Yes ☐          No ☐

5. How regularly did you attend (*tick <u>one</u> box only)*?

Daily ☐        Weekly ☐        Fortnightly ☐  Monthly ☐      Other *(please specify)* _____

6. We put answers into income bands.  What band represents the total income of the household before all deductions?  *Is it*

| | | |
|---|---|---|
| Less than £100 per week ☐ | £600 but less than £700 per week ☐ |
| £100 but less than £200 per week ☐ | £700 but less than £800 per week ☐ |
| £200 but less than £300 per week ☐ | £800 but less than £900 per week ☐ |
| £300 but less than £400 per week ☐ | £900 but less than £1000 per week ☐ |
| £400 but less than £500 per week ☐ | Over £1000 per week ☐ |
| £500 but less than £600 per week ☐ | |

7. Are you currently:     Employed ☐              Self-employed ☐              Retired ☐

Student ☐              Unemployed ☐              Other (*please specify)*

8. Please state your most recent/current job?

```
┌─────────────────────────────────────────────────────┐
│                                                     │
└─────────────────────────────────────────────────────┘
```

9. Please describe in one sentence what you did/do for your job.

```
┌─────────────────────────────────────────────────────┐
│                                                     │
│                                                     │
└─────────────────────────────────────────────────────┘
```

10. If self-employed, were you working on your own or did you have employees?

☐

*Tick <u>one</u> box only*     On own

Employees

Not known

11.  In your job, did/do you have formal responsibility for supervising the work of other employees?

*Tick <u>one</u> box only*     Yes  ☐     *If yes*, how many people did/do you supervise

No  ☐

12. How many people worked for your employer at the place where you worked?

1-24  ☐

*Tick <u>one</u> box only*     25 – 499  ☐

500+  ☐

Not known  ☐

13.  What is your ethnic group? (***Choose <u>one</u> section from A to E, then tick <u>one</u> box to best describe your ethnic group or background***).

<u>**Section A – White**</u>

English / Welsh / Scottish / Northern Irish / British

Irish

Gypsy or Irish Traveller

Any other White background *(please specify)* _____

<u>**Section B – Mixed / Multiple ethnic groups**</u>

White and Black Caribbean

White and Black African

White and Asian

Any other Mixed / Multiple ethnic background *(please specify)* _____

<u>**Section C – Asian / Asian British**</u>

Indian

Pakistani

Bangladeshi

Chinese ☐

Any other Asian background (*please specify*) _____

### *Section D – Black / African / Caribbean / Black British*

African ☐

Caribbean ☐

Any other Black / African / Caribbean background *(please specify)* _____

### *Section E – Other Ethnic Group*

Arab ☐

Any other ethnic group *(please specify)* _____

14. Which of these qualifications do you have? *\***Tick every box that applies if you have <u>any</u> of the qualifications listed.  \*\*If your UK qualification is not listed, tick the box that contains its nearest equivalent.  If you have qualifications gained outside the UK, tick the "Foreign Qualifications" box and the nearest UK equivalents (if known).**

1 – 4 O levels / CSEs / GCSE's (any grades) / Entry level, Foundation Diploma ☐

NVQ Level 1,Foundation GNVQ, Basic Skills ☐

5+ O levels (passes) / CSEs (Grade 1) / GCSEs (grades A* - C),
School Certificate, 1 A-Levels / 2 – 3 AS Levels / VCEs, Higher Diploma ☐

NVQ Level 2, Intermediate GNVQ, City and Guilds Craft, BTEC First /
General Diploma, RSA Diploma ☐

Apprenticeship ☐

2+ A levels / VCEs, 4+ AS levels, Higher School Certificate, Progression /
Advanced Diploma ☐

NVQ Level 3, Advanced GNVQ, City and Guilds Advanced Craft, ONC, OND,
BTEC National, RSA Advanced Diploma ☐

Degree (for example, BA, BSc), Higher degree (for example, MA, PhD, PGCE) ☐

NVQ Level 4 – 5, HNC, HND, RSA Higher Diploma, BTEC Higher Level ☐

Professional qualifications (for example, teaching, nursing, accountancy) ☐

☐ 63

Other vocational / work-related qualifications

Foreign qualifications ☐

No qualifications ☐

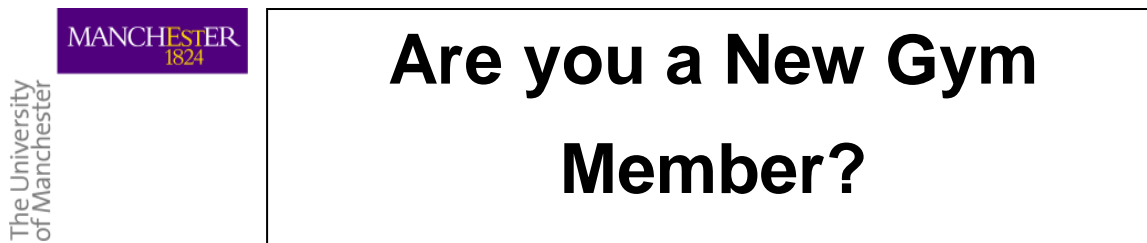**Date questionnaire was completed**  _____

**Thank you for taking the time to complete this questionnaire.  Please put it in the envelope provided and pass it back to the gym or post it directly to the researcher.**

**6.5. Appendix 5: Recruitment poster**

# Are you a New Gym Member?

**Are you joining the gym?  Are you interested in taking part in a study that may help your gym attendance?**

If you answered yes, and you are aged 18 or older, we would like to invite you to take part in a study that aims to find out whether the use of a brief planning intervention increases gym attendance.

**What will I be asked to do if I take part?**

1. Complete a short questionnaire and make a plan to go to the gym in one of two ways.  This will take fewer than 10 minutes to complete.

2. You will be contacted by the researcher via email or post (depending on your preference) in 6 weeks, 3-months, 6-months and 12-months' time and asked to complete another briefer questionnaire on each occasion.  Each questionnaire will take fewer than 10 minutes to complete.

**Want to take part?**

For further details about taking part in the study simply take a slip from below and email the researcher at **manchestergymstudy@gmail.com**, stating "Gym study".  The researcher will then send you some details about taking part in the study.

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

For details about taking part in the gym study email "Gym Study" to Claire Hanlon at: manchestergymstudy@gmail.com

**Appendix 6.6: TIDier Checklist**

**The TIDieR (Template for Intervention Description and Replication) Checklist*:**

Information to include when describing an intervention and the location of the information

| Item number | Item | Where located ** | |
|---|---|---|---|
| | | Primary paper (page or appendix number) | Other † (details) |
| | **BRIEF NAME** | | |
| **1.** | Provide the name or a phrase that describes the intervention. | Pg. 15 | _____ |
| | **WHY** | | |
| **2.** | Describe any rationale, theory, or goal of the elements essential to the intervention. | Pg. 15 | _____ |
| | **WHAT** | | |
| **3.** | Materials: Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers. Provide information on where the materials can be accessed (e.g. online appendix, URL). | Pg. 19-20 | _____ |

| | | | |
|---|---|---|---|
| **4.** | Procedures: Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities. | Pg. 20 | _____ |
| | **WHO PROVIDED** | | |
| **5.** | For each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given. | Pg.19 | _____ |
| | **HOW** | | |
| **6.** | Describe the modes of delivery (e.g. face-to-face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group. | Pg. 15 | _____ |
| | **WHERE** | | |
| **7.** | Describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features. | Pg. 15 | _____ |
| | **WHEN and HOW MUCH** | | |
| **8.** | Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose. | Pg. 15 | _____ |
| | **TAILORING** | | |
| **9.** | If the intervention was planned to be personalised, titrated or adapted, then describe what, why, when, and how. | Pg. 15 | _____ |

**MODIFICATIONS**

**10.‡**     If the intervention was modified during the course of the study, describe the changes (what, why, when, and     N/A     _____
how).

**HOW WELL**

**11.**     Planned: If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies     N/A     _____
were used to maintain or improve fidelity, describe them.

**12.‡**     Actual: If intervention adherence or fidelity was assessed, describe the extent to which the intervention was     N/A     _____
delivered as planned.

\*\* **Authors** - use N/A if an item is not applicable for the intervention being described. **Reviewers** – use '?' if information about the element is not reported/not sufficiently reported.

† If the information is not provided in the primary paper, give details of where this information is available. This may include locations such as a published protocol     or other published papers (provide citation details) or a website (provide the URL).
‡ If completing the TIDieR checklist for a protocol, these items are not relevant to the protocol and cannot be described until the study is complete.

\* We strongly recommend using this checklist in conjunction with the TIDieR guide (see *BMJ* 2014;348:g1687) which contains an explanation and elaboration for each item.

\* The focus of TIDieR is on reporting details of the intervention elements (and where relevant, comparison elements) of a study. Other elements and methodological features of studies are covered by other reporting statements and checklists and have not been duplicated as part of the TIDieR checklist. When a **randomised trial** is being reported, the TIDieR checklist should be used in conjunction with the CONSORT statement (see www.consort-statement.org) as an extension of **Item 5 of the CONSORT 2010 Statement.** When a **clinical trial protocol** is being reported, the TIDieR checklist should be used in conjunction with the SPIRIT statement as an extension of **Item 11 of the SPIRIT 2013 Statement** (see www.spirit-statement.org). For alternate study designs, TIDieR can be used in conjunction with the appropriate checklist for that study design (see www.equator-network.org).