This is a repository copy of *Why do new members stop attending health and fitness venues? The importance of developing frequent and stable attendance behaviour*.

White Rose Research Online URL for this paper:
http://eprints.whiterose.ac.uk/164212/

Version: Published Version

**Article:**
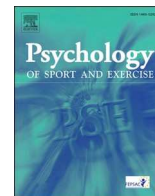
# Why do new members stop attending health and fitness venues? The importance of developing frequent and stable attendance behaviour

Matthew Rand [a,*], Elizabeth Goyder [a], Paul Norman [b], Robert Womack [c]

[a] School of Health and Related Research, The University of Sheffield, 30 Regent St, Sheffield, S1 4DA, United Kingdom
[b] Department of Psychology, The University of Sheffield, Cathedral Court, 1 Vicar Ln, Sheffield, S1 2LT, United Kingdom
[c] Sheffield City Trust, 23 Carbrook Hall Rd, Sheffield, S9 2EH, United Kingdom

## ARTICLE INFO

## ABSTRACT

*Objectives:* Attendance at health and fitness venues often declines dramatically during the first year of membership. The present study sought to identify factors associated with continued attendance in new members.
*Methods:* A secondary data analysis was conducted on the attendance data of 1726 new members of a health and fitness organisation over the first 12 months of their membership. Associations were assessed between members' frequency and pattern of attendance during the first quarter of their membership, age, gender, and home location and their attendance levels in the fourth quarter after joining.
*Results:* There was a significant reduction in the frequency of attendance over time from a mean of 7.48 times in the first month to a mean of 0.92 in the 12th month after joining. Older age, starting membership in the autumn or spring, frequency of attendance in the first quarter and stability of the context of attendance (i.e., same time and location) in month three were all significantly associated with increased attendance levels in the fourth quarter.
*Conclusions:* The findings indicate that new members' early attendance behaviour, in terms of the frequency and the stability of attendance, may be important for supporting continued attendance at health and fitness venues. Interventions to increase longer-term attendance and, in turn, physical activity, should focus on promoting regular and consistent attendance, especially in terms of day, time and location, early on in individuals' membership of health and fitness venues.

## 1. Introduction

Physical activity (PA) is associated with many health benefits including the prevention of chronic conditions such as cardiovascular disease, cancer and type 2 diabetes (Albright et al., 2000; Clague & Bernstein, 2012; Whelton, Chin, & Xin, 2002). Public Health England (PHE) recommends that adults undertake at least 150 min of moderate intensity activity each week in bouts of 10 min or more or 75 min of vigorous intensity activity spread across a week (PHE, 2016). However, in the UK it is estimated that 26% of all adults do not meet the recommended guidelines for PA in a week (Sport England, 2016). Increasing the levels of PA in the adult population remains a public health priority.

According to PHE, the sport and leisure sector is one of four broad areas, along with local authorities, National Health Service commissioners and healthcare professionals, where local and national bodies

can take action to ensure people are active (PHE, 2016). However, the sport and leisure sector is the only one that provides PA as a primary service. Health and fitness is one of the largest subsectors of the sport and leisure industry, with approximately 15% of the population estimated to be a member of a health and fitness venue in the UK (The European Commission, 2014). Health and fitness venues typically provide PA equipment within gyms, and many offer swimming pool facilities and exercise class activities. These locations are also where many PA professionals (e.g., personal trainers in gyms, swimming teachers and PA class instructors) are employed (REP, 2019). Health and fitness venues are therefore ideally placed to help to increase population PA levels. However, little is known about the extent to which people actually use these venues.

A study of 259,355 ex-members at 267 Dutch health and fitness venues concluded that only 10% of members attended regularly (defined

as at least four times a month) for the first six months of their membership (Middelkamp, Van Rooijen, & Steenbergen, 2016). Similarly, a study in the United States of health and fitness members' attendance concluded that many members were 'paying not to go to the gym' (Dellavigna & Malmendier, 2006). In particular, the mean attendance of 145 members on an annual contract was only 4.36 times a year. Given that many members join a health and fitness venue to improve their health or physical fitness (Crossley, 2006), these findings are concerning from a public health perspective. Moreover, little is known about the factors that are associated with continued (or discontinued) attendance at health and fitness venues.

Several factors have been associated with maintenance of PA participation, more generally, that might also be expected to be associated with continued attendance at health and fitness venues, including younger age, male gender, seasonality, and proximity to a sports facility (Cepeda et al., 2018; Marques, Martins, Peralta, Catunda, & Nunes, 2016; Rich, Griffiths, Dezateux, 2012). In addition, past behaviour is one of the strongest correlates of PA, with an average correlation of $r = 0.54$ across a meta-analysis of 44 studies (McEachan, Conner, Taylor, & Lawton, 2011). A key way in which past behaviour may impact on continued PA is through the formation of a habitual response by repeatedly performing the same behaviour in the same context. Habit is a process formed through repetition of behaviour in a specific context (Lally, van Jaarsveld, Potts, & Wardle, 2010) in which a stimulus generates an impulse to act, resulting in a learned stimulus-response association (Gardner, 2014). Habitual behaviour is therefore proposed to develop through repeated execution of behaviours in the consistent presence of salient cues or contextual features (Gardner & Lally, 2018; Wood, 2017). Thus, both the frequency with which, and the stability of the context in which, the behaviour is performed are key antecedents for forming a strong habit. Moreover, Ouellette and Wood (1998) have argued that as behaviours are repeated more often in stable contexts, their performance switches from being under the control of intentional (i.e., reflective) to habitual (i.e., automatic) processes. In line with this argument, Norman and Cooper (2011) reported that a measure of habit strength was only associated with subsequent behaviour (breast self-examination) when it had been performed frequently in a stable context (i.e., same time and place) in the past. Similarly, Kaushal and Rhodes (2015) reported that engaging in regular exercise for at least six weeks in a consistent context (i.e., place and time) was predictive of habit formation. Measures of habit strength have, in turn, been found to have a medium-sized average correlation with PA ($r = 0.43$) (Gardner, De Bruijn, & Lally, 2011). In addition, a systematic review found that 26 of 37 studies included in the review reported a significant positive association between measures of habit and PA (Rebar et al., 2016). The development of habitual behaviours has also been proposed to have an impact on increased attendances in health and fitness venues (Calzolari & Nardotto, 2017; Muller & Habla, 2018).

The aim of the present study was to analyse the pattern of new members' attendance behaviour at a health and fitness organisation's venues and to assess potential correlates of continued attendance, including age, gender, proximity to a venue, seasonality, frequency of early attendance and context stability (i.e., time and location of attendance). In particular, the following research questions were addressed: (1) What are the attendance levels of new members of a UK health and fitness organisation over the first 12 months of their membership? and (2) What are the correlates of continued attendance?

## 2. Methods

This study reports a secondary data analysis of attendance records of new members at a health and fitness organisation over a 12-month period.

### 2.1. Design

Attendance data of individuals who joined a health and fitness organisation as members between October 2015 and July 2016 were included for analysis. Anonymised data were extracted from the health and fitness organisation's database.

### 2.2. Participants and study setting

All included members had purchased a 12-month contract with the health and fitness organisation. Such contracts cannot be cancelled during their duration. The organisation has six venues in a UK city, each offering gym equipment and group exercise classes, with five of the venues providing swimming pool facilities. Individuals who utilised the health and fitness facilities on a 'pay as you go' basis were excluded as were individuals who were part of exercise referral schemes. In total, 1726 new members were included in the sample for data analysis.

### 2.3. Procedure

Ethical approval for the study was obtained from the School of Health and Related Research, University of Sheffield Research Ethics Committee. Following ethical approval, anonymised attendance data of the health and fitness members were downloaded from the organisations' reporting system. The data were then cleaned to remove members who did not meet the inclusion criteria. Attendance records for each member were then automatically counted and categorised into four week periods to produce 12 months of attendance data (with each month consisting of four weeks). All statistical analyses were conducted in SPSS (version 25).

### 2.4. Measures

Each time a member uses one of the organisation's health and fitness venues, the location, date and time of the attendance is electronically recorded through their member card or wristband at the venue turnstile. This automatic recording of attendance is saved on a database. This electronic record of attendance was used for the analysis in the current study. Using these data, the frequency of attendance in each month and quarter was analysed. In addition, a measure of context stability was calculated from the number of times a member attended the same venue on the same day of the week and within a 3-h time window more than once during a month. Thus, if members attended the same venue on the same day of the week and within a 3-h time window *twice* during a month they had a context stability score of 1, *three times* they had a score of 2 and *four times* they had a score of 3. If members did not attend the same venue on the same day/time more than once in a month, they received a score of 0. The total of these scores in month 3 was taken as the measure of context stability.

Age, gender and member start date were also recorded in the database and included for analysis. The distance in miles members lived from a venue was calculated from the first part of their postcode and used as a measure of location in the analyses.

### 2.5. Statistical analysis

#### 2.5.1. Frequency of attendance

Two repeated measures ANOVAs were conducted to assess changes in the mean frequency of monthly and quarterly attendance over the 12-month period. The percentage of members attending at least once a month over the 12-month period was also calculated.

#### 2.5.2. Correlates of attendance

First, associations were examined between each of the independent variables (i.e., age, gender, location, frequency of attendance in the first quarter, context stability, and season) and frequency of attendance in

the fourth quarter. Pearson's correlations were conducted to assess how strongly age, location, context stability in months one to three and frequency of attendance in the first quarter were associated with frequency of attendance in the fourth quarter. Independent t-tests were conducted to assess associations between gender and frequency of attendance in the fourth quarter. An analysis of variance was conducted to assess the effect of the season of members' start date on attendance in the fourth quarter. Second, a multiple regression analysis was conducted to examine how much variance these variables could explain the frequency of attendance in the fourth quarter as well as the unique contribution of each independent variable.

### 2.5.3. Power analysis

A power analysis indicated that with a sample of 1,726, it would be possible to detect small-sized correlations ($r = 0.07$), according to Cohen's (1992) effect size indexes, between the potential correlates of continued attendance and frequency of attendance in the fourth quarter, at 80% power and alpha set at 0.05.

## 3. Results

### 3.1. Participant characteristics

Of the 1726 members, 845 (49%) were female and 881 (51%) were male. Members ranged in age from 19 to 70, with a mean age of 35.30 ($SD = 10.21$). There was missing data on age for 20 members. Members resided in 52 different postcode areas, with members living on average 3.4 miles from the nearest health and fitness venue. There was missing data on location for 15 members.

### 3.2. Frequency of attendance

The mean attendance for each month is reported in Table 1. In total across the 12 months, members attended the venues 59,762 times. Over the 12 months there was a significant effect of time on attendance, $F(11, 1715) = 260.61, p < .001$. Post-hoc comparisons using Bonferroni post-hoc tests indicated there were significant differences ($p < .05$) between each of the months apart from between months eight and nine ($p = .418$). As shown in Figure 1, each month had a drop in attendance from the previous month. The largest drop in mean attendance was between months one and two, $t(1725) = 63.68, p < .001$. There was also a significant effect of time on attendance over the four quarters, $F(3, 1723) = 688.66, p < .001$ (see Table 2). Post-hoc comparisons using Bonferroni post-hoc tests indicated that each quarter was significantly different from each other ($p < .01$). The drop in attendance can also be seen in the percentage of members who attended at least once each month over the first 12 months of their membership. As shown in Table 1, 100% of members attended at least once in the first month of their membership;

**Table 1**
Means and standard deviation of monthly attendance, and number and percentage of members attending each month, in the first 12 months of membership.

| Month | Mean | SD | N | % |
|---|---|---|---|---|
| 1 | 7.48 | 4.88 | 1726 | 100 |
| 2 | 4.99 | 5.01 | 1371 | 79 |
| 3 | 4.19 | 4.79 | 1207 | 70 |
| 4 | 3.38 | 4.42 | 1065 | 62 |
| 5 | 2.88 | 4.16 | 941 | 55 |
| 6 | 2.44 | 3.93 | 863 | 50 |
| 7 | 2.14 | 3.73 | 766 | 44 |
| 8 | 1.90 | 3.52 | 702 | 41 |
| 9 | 1.76 | 3.40 | 656 | 38 |
| 10 | 1.39 | 3.08 | 540 | 31 |
| 11 | 1.15 | 2.81 | 449 | 26 |
| 12 | 0.92 | 2.46 | 379 | 22 |
| Overall | 2.89 | 1.90 | | |

this figure fell to 50% and 22% at six and 12 months.

### 3.3. Correlates of attendance in quarter four

Considering the correlates of attendance frequency in quarter four, there was a small but significant correlation between age and attendance in quarter four, $r(1724) = 0.11, p < .001$, such that older members attended more frequently. Neither gender, $t(1724) = 1.52, p = .13 d = 0.07$, or distance to the nearest venue (i.e., location), $r(1724) = 0.009, p = .71$, were significantly associated with attendance in quarter four. Season had a significant effect on attendance frequency in quarter four, $F(2, 1722) = 508.43, p < .001, \eta_p^2 = 0.016$. Post hoc analyses indicated that members who started their membership in autumn ($M = 4.52, SD = 8.54$) or spring ($M = 4.55, SD = 8.84$) attended more frequently in quarter for than those who started in summer ($M = 2.35, SD = 6.13$) or winter ($M = 2.88, SD = 6.26$). There was a significant medium-sized correlation between frequency of attendance in quarter one and attendance in quarter four, $r(1724) = 0.36, p < .001$, indicating that increased attendance in quarter one was associated with increased attendance in quarter four. Context stability in month one, $r(1724) = 0.19, p < .001$, month two, $r(1724) = 0.28, p < .001$, and month three, $r(1724) = 0.36, p < .001$, were significantly correlated with attendance in quarter four, such that increasing levels of context stability in each of the first three months were associated with increased attendance in quarter four. The strongest (medium-sized) correlation was between context stability in month three and attendance in quarter four.

### 3.4. Regression analysis to predict attendance in quarter four

A regression analysis was conducted with age, gender, location, season (autumn/spring versus summer/winter), frequency of attendance in quarter one and context stability in month three as the independent variables and frequency of attendance in quarter four as the dependent variable. The regression model was significant, $F(6, 1684) = 59.20, p < .001, f^2 = 20$, and explained 17% of the variance of attendance behaviour in quarter four; a medium-sized effect according to Cohen's (1992) indexes. Table 3 displays the results of the regression analysis. Inspection of the beta weights revealed that age, season, attendance in quarter one, and context stability in month three made significant unique contributions to the prediction of attendance in quarter four. Thus, increased frequency of attendance in quarter four was associated with older age, starting membership in autumn or spring, increased quarter one attendance, and increased context stability (i.e., attending at the same place and time) in month three.

## 4. Discussion

This study analysed the attendance data of new members of a health and fitness organisation in the UK over the first 12 months of their membership. Substantial and significant reductions were found in attendance over time, with the mean frequency of attendance falling from 7.48 in month one, to 2.44 in month six and 0.92 in month 12. Similarly, the percentage of new members who attended at least once fell from 100% in month one, to 50% in month six and 22% in month 12. The levels of attendance in the current study suggest that by the end of the first year of membership, many members do not attend health and fitness venues often. This finding is in line with previous studies in the Netherlands and USA (Dellavigna & Malmendier, 2006; Middelkamp et al., 2016). Given that many members decide to join a health and fitness venue in order to increase their levels of physical activity to address concerns about physical health or fitness (Crossley, 2006), it is unlikely that the low level of attendance is due to members engaging in PA in locations outside of the health and fitness venue. As a result, it is likely that most of the members who stop attending remain physically inactive.

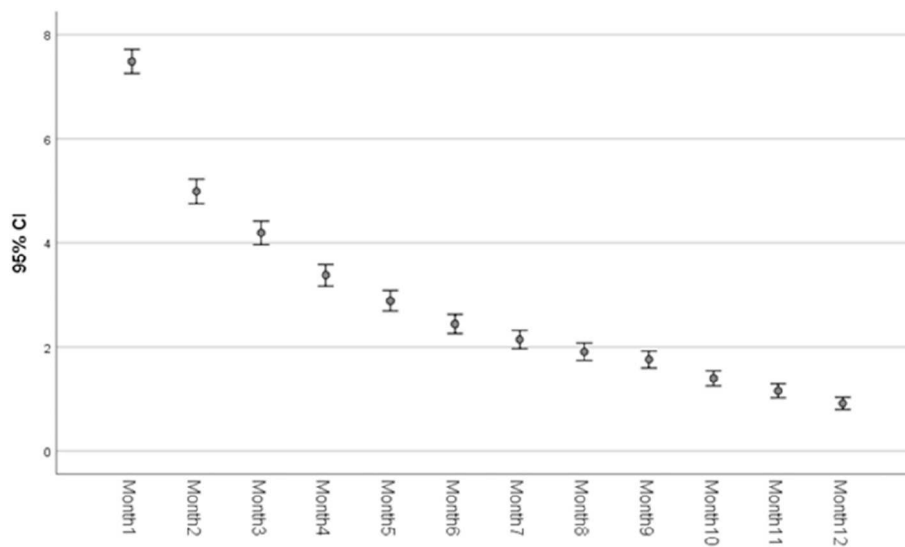Considering the correlates of attendance, older members were found

**Fig. 1.** Mean attendance over time (with 95% CIs).

**Table 2**
Means and standard deviations of quarterly attendance in the first 12 months of membership.

| Quarter | Mean | SD |
|---------|------|------|
| Q1 | 16.66 | 12.73 |
| Q2 | 8.70 | 11.32 |
| Q3 | 5.80 | 9.68 |
| Q4 | 3.46 | 7.45 |

**Table 3**
Summary of regression analysis predicting attendance in quarter four.

| Variable | B | SE | β |
|----------|------|------|--------|
| Age | 0.06 | 0.02 | .08** |
| Gender | 0.29 | 0.33 | .02 |
| Location | 0.01 | 0.30 | .01 |
| Season | 1.90 | 0.34 | .13*** |
| Quarter 1 attendance | 0.13 | 0.02 | .22*** |
| Context stability in month 3 | 0.69 | 0.12 | .20*** |

*Note.* **$p < .01$, ***$p < .001$.

to attend more often in quarter four than younger members, although the size of the effect of age on attendance was small according to Cohen's (1992) criteria. The significant positive correlation is in contrast to the majority of previous research on PA which has found that activity decreases with age (Rhodes et al., 1999). However, the mean age of the members in the current study was only 35.30 and only 1.3% of the sample was aged over 60. It is possible that younger members in the present sample may have faced increased barriers in terms of other commitments or competing priorities (Nikolaou, Hankey, & Lean, 2015; Strong, Parks, Anderson, Winett, & Davy, 2008) which may have reduced attendance. In addition, the significant correlation between attendance and age might also be explained by the important social factors for engaging in PA in older people (Franco et al., 2015); these factors are likely to be present in health and fitness venues (e.g., interaction with peers or dependence on professional instruction).

The finding that males and females had similar levels of attendance is in contrast to previous research on PA which has identified males to have higher PA rates than females (Althoff et al., 2017). The current finding is somewhat surprising given that various factors, such as self-efficacy, social support, and motivation have been previously identified to impact on differences in PA participation between males and females (Edwards & Sackett, 2016). In addition, barriers such as

time expenditure or childcare responsibilities have also been identified to be factors in non-exercising adult females (El Ansari & Lovell, 2009). It is possible that membership of a health and fitness venue may help to overcome some of these barriers. For example, venues may provide personal support and encouragement to exercise and members may be able to fit attendance in and around other commitments (e.g., before/-after work or during a lunch break).

The finding that those living closer to a health and fitness venue were no more or less likely to attend a health and fitness venue in quarter four also contrasts with previous research outlining the importance of accessibility and proximity as a correlate of PA (Sallis et al., 2016). One possible reason for the current finding may be the small number of members (3.4%) living in the same postcode location as the most frequently attended venue which is located in the city centre. It is possible that many members attend this venue when they are already near the venue location (e.g., for work). Unfortunately in the current dataset there was no record of the location where members worked; future research could seek to assess accessibility and proximity in relation to both members' home and workplace.

The finding that members who joined the health and fitness organisation in autumn or spring attended more often in quarter four than those who joined in winter or summer is consistent with previous research that has reported seasonal variations in PA (e.g., Cepeda et al., 2018; Rich, Griffiths, & Dezateux, 2012). There are two possible explanations for why members who joined in the summer or winter were less likely to maintain their attendance. First, the reasons associated with joining in winter (e.g., New Year's resolutions) and summer (e.g., wanting a 'summer body') may not be strong enough to maintain continued attendance, especially if the expected outcomes are not obtained (Rothman, 2000). Second, there may be more disruptions to people's normal routines in winter (e.g., bad weather) and summer (e.g., extended holidays) that prevent the formation of strong habits that help to maintain new behaviours (Kwasnicka, Dombrowski, White, & Sniehotta, 2016).

Frequency of attendance in the first quarter was associated with frequency of attendance in the fourth quarter. This finding is in line with previous research that has shown that past behaviour is a strong correlate of future PA behaviour (McEachan et al., 2011). There are two main ways in which past behaviour is hypothesised to influence future behaviour (Ajzen, 2011). First, past behaviour may influence people's beliefs about the behaviour which, in turn, influences their decisions. For example, members may find attending rewarding or enjoyable and make a conscious choice to keep attending as a result. Accordingly, in a

study of 94 health and fitness members, cognitions from the theory of planned behaviour predicted maintenance of PA behaviour over a 12-week period (Armitage, 2005). Second, when a behaviour is performed frequently in a consistent context it can then be performed relatively automatically with little conscious deliberation (Ouellette & Wood, 1998). For example, members may attend venues to do a particular class at the same time each week.

In the current study, measures of both the frequency of attendance and the extent to which to which members attended at the same venue/ time (i.e., context stability) were found to have significant, and medium-sized, effects on attendance in the fourth quarter. These findings are consistent with the idea that frequent and stable attendance behaviour in the first few months of membership may have led to the formation of strong habits which ensure continued attendance. For example, Kaushal and Rhodes (2015) reported that new gym members who exercised regularly for six weeks in a consistent (i.e., stable) context were more likely to form a strong exercise habit (as assessed by the Self-Report Behavioural Automaticity Index; Gardner, Abraham, Lally, & de Bruijn, 2012). Kaushal and Rhodes (2015) further found that those who developed a strong exercise habit also reported more positive affective judgements about exercise, exercising in a more positive (i.e., support-ive) environment, and engaging in exercise that was easy to do and required little effort. Encouraging strong habits may be crucial for maintaining behaviour given the typically strong correlation found between measures of habit and PA (Rebar et al, 2016).

The current study has a number of strengths. In particular, the study comprised the analysis of the attendance patterns of a large sample of all new members of a health and fitness organisation, rather than a subset of members recruited into a research study. As a result, the sample should be free of any participation biases and the results more generalizable to other health and fitness venues. In addition, the study employed objective measures of the frequency and stability of attendance behaviour that was recorded electronically through the member's card or wristband at the venue turnstile. In contrast, previous research focusing on the frequency and stability of exercise behaviour has relied on self-report data (e.g., Kaushal & Rhodes, 2015) which might be open to presentational and consistency biases.

However, there are a number of study limitations that should also be noted. First, attendance data was calculated from the time members entered a health and fitness venue. Although this provides objective and accurate data detailing the location, date and time of the attendance, the data output does not detail how long each member spent at the venue. Assessing the length of time members spend at a venue could help to explore the amount of PA members undertake instead of merely the day and time they attended. Second, the attendance data did not include a record of the type of activity members undertook. This would have provided some information on the likely intensity of PA members were undertaking. Both the amount and intensity of PA is likely to impact on health outcomes. Understanding the type of activity undertaken could also have been used as an additional marker of context stability to assess whether members attended the same activity, in addition to attending the same venue on the same day and the same time. Additionally, it could be that certain activities, such as exercise classes which have a pre-defined time, are more likely to be associated with consistent attendance behaviour. Third, the study only considered a limited range of variables that were available in the dataset. There may be other variables that are important for attendance such as goals, motivations or beliefs, which are factors identified in models of health behaviour (Conner & Norman, 2005). In addition, factors such as the length of contract bought or the price of the membership may also influence members' attendance behaviour. Future research could therefore assess the impact of non-renewal or shorter-term contracts and different price points on the maintenance of attendance. Fourth, it was not possible to assess any activities members were undertaking outside of the health and fitness venue. It could be that some members decided to switch to undertaking PA outside of the venues during the course of their membership. Fifth, it

was not possible to assess whether the members had any prior experience of using health and fitness venues and the extent to which this has an impact on the maintenance of attendance. For example, some members may have already have been frequent attenders at other venues, but had taken out a new membership (e.g., due to moving to a new city). Finally, the study was conducted within a single health and fitness organisation with six venues based in a large city in England. Further studies in other health and fitness organisations across, and beyond, the UK are needed to establish the generalisability of these findings in a range of organisations with different facilities and attendees.

Notwithstanding these limitations, the current findings have a number of implications for policy makers and organisations providing health and fitness facilities. Most importantly, the current findings highlight that attendance in new members declines over time. In particular, attendance dropped from a mean of 7.48 times in month one to 0.92 times in month 12. In addition, whereas all new members attended at least once in month one, only 22% did so in month 12. Health and fitness organisations therefore face a large challenge to maintain attendance levels in new members, particularly among those who join in the winter or summer. The current findings suggest that interventions should encourage more frequent attendance in the early part of an individual's membership. Thus, health and fitness venues should also seek to provide members with a positive experience in the early part of their membership to ensure that they want to return to a venue. However, it is also important for health and fitness venues to put in place mechanisms that not only encourage increased attendance, but establish habitual behaviour in new members by encouraging them to attend the same venue at the same day and time each week. One way through which this could be achieved is through instructing members to form action plans detailing which venue and time they will attend (as well as which activity they will engage in). Correlational (Fleig et al., 2013) and experimental evidence (Orbell & Verplanken, 2010) indicates that engaging in action planning leads to the formation of stronger habits. Encouragingly, a recent trial has shown that an 8-week habit formation intervention resulted in a significant increase in PA in a sample of new gym members (Kaushal, Rhodes, Spence, & Meldrum, 2017). The intervention focused on the importance of preparation cues (e.g., preparing appropriate clothes for PA) and practice consistency (e. g., establishing a particular time for PA and stabilising the preceding events that lead to the preparatory stage of PA) as well as the use of actions plans to specify when they would engage in PA.

## 5. Conclusions

The current study examined levels of attendances and correlates of attendance behaviour in new members at UK based health and fitness venues over a 12-month period. New members' early attendance behaviour, specifically the frequency and consistency of attendance, was found to be important for supporting continued attendance at health and fitness venues. The findings identify a need to develop effective interventions with the potential to increase sustained attendance levels at health and fitness venues.

**Ethics approval and consent to participate**

The study's protocol was approved by the University of Sheffield's Research Ethics Committee in the School of Health of Related Research before the start of data collection (application number: 018874). Sheffield City Trust provided written approval to use their data for research purposes.

**Consent for publication**

Not applicable.

## Authors' contributions

MR developed the design, analysed the data and wrote the manuscript. EG and PN reviewed and critiqued the manuscript. RW provided guidance on decisions including access to data, data extraction and the applied impact of the study. All authors approved the final version of the manuscript.

## CRediT authorship contribution statement

**Matthew Rand:** Conceptualization, Methodology, Formal analysis, Writing - original draft, Project administration. **Elizabeth Goyder:** Writing - review & editing, Supervision, Funding acquisition. **Paul Norman:** Writing - review & editing, Supervision. **Robert Womack:** Resources, Project administration.

## Declaration of competing interest

The other authors have no conflicts of interest. This study was conducted by University of Sheffield and was a collaborative project with Sheffield City Trust. Sheffield City Trust provided access to the data but played no role in the study design, analysis or interpretation of the data.

## References

Ajzen, I. (2011). The theory of planned behavior: Reactions and reflections. *Psychology and Health, 26*, 1113–1127.

Albright, A., Franz, M., Hornsby, G., Kriska, A., Marrero, D., Ullrich, I., & Verity, L. (2000). American College of Sports Medicine position stand. Exercise and type 2 diabetes. *Medicine & Science in Sports & Exercise, 32*, 1345–1360.

Althoff, T., Sosic, R., Hicks, J., King, A., Delp, S., & Leskovec, J. (2017). Large-scale physical activity data reveals worldwide inequality. *Nature, 547*, 336–339.

Armitage, C. (2005). Can the theory of planned behavior predict the maintenance of physical activity? *Health Psychology, 24*, 235–245.

Calzolari, G., & Nardotto, M. (2017). Effective reminders. *Management Science, 63*, 2915–2932.

Cepeda, M., Koolhaas, C. M., van Rooij, F. J. A., Tiemeier, H., Guxens, M., Franco, O. H., & Schofour, J. D. (2018). Seasonality of physical activity, sedentary behaviour, and sleep in a middle-aged and elderly population: The Rotterdam study. *Maturitas, 110*, 41–50.

Clague, J., & Bernstein, L. (2012). Physical activity and cancer. *Current Ongology Reports, 14*, 550–558.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155–159.

Conner, M., & Norman, P. (Eds.). (2005). *Predicting health behaviour: Research and practice with social cognition models* (2nd ed.). Maidenhead: Open University Press.

Crossley, N. (2006). In the gym: Motives, meaning and moral careers. *Body & Society, 12*, 23–50.

Dellavigna, S., & Malmendier, U. (2006). Paying not to go to the gym. *The American Economic Review, 96*, 694–719.

Edwards, E. S., & Sackett, S. C. (2016). Psychosocial variables related to why women are less active than men and related health implications. *Clinical Medicine Insights: Women's Health, 9*, 47–56.

El Ansari, W., & Lovell, G. (2009). Barriers to exercise in younger and older non-exercising adult women: A cross sectional study in London, United Kingdom. *International Journal of Environmental Research and Public Health, 6*, 1443–1455.

Fleig, L., Pomp, S., Parschau, L., Barz, M., Lange, D., Schwarzer, R., & Lippke, S. (2013). From intentions via planning and behaviour to physical exercise habits. *Psychology of Sport and Exercise, 14*, 632–639.

Franco, M. R., Tong, A., Howard, K., Sherrington, C., Ferreira, P. H., Pinto, R. Z., & Ferreira, M. L. (2015). Older people's perspectives on participation in physical activity: A systematic review and thematic synthesis of qualitative literature. *British Journal of Sports Medicine, 49*, 1268–1276.

Gardner, B. (2014). A review and analysis of the use of 'habit' in understanding, predicting and influencing health-related behaviour. *Health Psychology Review, 9*, 277–295.

Gardner, B., Abraham, C., Lally, P., & de Bruijn, G. J. (2012). Towards parsimony in habit measurement: Testing the convergent and predictive validity of an automaticity subscale of the Self-Report Habit Index. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 102.

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 Behavioral Medicine, 42*, 174–187.

Gardner, B., & Lally, P. (2018). Modelling habit formation and its determinants. In B. Verplanken (Ed.), *The Psychology of habit* (pp. 207–229). Springer.

Kaushal, N., & Rhodes, R. E. (2015). Exercise habit formation in new gym members: A longitudinal study. *Journal of Behavioral Medicine, 38*(4), 652–663.

Kaushal, N., Rhodes, R. E., Spence, J. C., & Meldrum, J. T. (2017). Increasing physical activity through principles of habit formation in new gym members: A randomized controlled trial. *Annals of Behavioural Medicine, 51*, 578–586.

Kwasnicka, D., Dombrowski, S. U., White, M., & Sniehotta, F. (2016). Theoretical explanations for maintenance of behaviour change: A systematic review of behaviour theories. *Health Psychology Review, 10*, 277–296.

Lally, P., Van Jaarsveld, C., Potts, H., & Wardle, J. (2010). How are habits formed: Modelling habit formation in the real world. *European Journal of Social Psychology, 40*, 998–1009.

Marques, A., Martins, J., Peralta, M., Catunda, R., & Nunes, L. S. (2016). European adults' physical activity socio-demographic correlates: A cross-sectional study from the European social survey. *Peer Journal, 4*, 1–15.

McEachan, R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the theory of planned behaviour: A meta-analysis. *Health Psychology Review, 5*, 97–144.

Middelkamp, J., Van Rooijen, M., & Steenbergen, B. (2016). Attendance behaviour of ex-members in fitness clubs: A retrospective study applying the stages of change. *Perceptual & Motor Skills, 122*, 350–359.

Muller, P., & Habla, W. (2018). Experimental and non-experimental evidence on limited attention and present bias at the gym. In *Centre for European Economic research discussion.* Paper No. 18-041.

Nikolaou, C. K., Hankey, C. R., & Lean, M. E. (2015). Weight-changes in young adults: A mixed methods study. *International Journal of Obesity, 39*, 508–513.

Norman, P., & Cooper, Y. (2011). The theory of planned behaviour and breast self-examination: Assessing the impact of past behaviour, context stability and habit strength. *Psychology and Health, 26*, 1156–1172.

Orbell, S., & Verplanken, B. (2010). The automatic component of habit in health behavior: Habit as cue-contingent automaticity. *Health Psychology, 29*, 374–383.

Ouellette, J., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin, 124*, 54–74.

Public Health England. (2016). Health matters: Getting every adult active every day. Retrieved from https://www.gov.uk/government/publications/health-matters-getting-every-adult-active-every-day/health-matters-getting-every-adult-active-every-day.

Rebar, A. L., Dimmock, J. A., Jackson, B., Rhode, R. E., Kates, A., Starling, J., & Vandelanotte, C. (2016). A systematic review of the effects of non-conscious regulatory processes in physical activity. *Health Psychology Review, 10*, 395–407.

Rhodes, R. E., Martin, A. D., Taunton, J. E., Rhodes, E., Donnelly, M., & Elliot, J. (1999). Factors associated with exercise adherence among older adults. An individual perspective. *Sports Medicine, 28*, 397–411.

Rich, C., Griffith, L. J., & Dezateux, C. (2012). Seasonal variation in accelerometer-determined sedentary behaviour and physical activity in children: A review. *International Journal of Behavioral Nutrition and Physical Activity, 30*, 49.

Rothman, A. J. (2000). Toward a theory-based analysis of behavioral maintenance. *Health Psychology, 19*, 64–69.

Sallis, J. F., Bull, F., Guthold, R., Heath, G. W., Inoue, S., Kelly, P., … Hallal, P. C. (2016). Progress in physical activity over the Olympic quadrennium. *The Lancet, 388*, 1325–1336.

Sport England. (2016). Active lives survey. Retrieved from https://www.sportengland.org/media/11498/active-lives-survey-yr-1-report.pdf.

Strong, K. A., Parks, S. L., Anderson, E., Winett, R., & Davy, B. M. (2008). Weight gain prevention: Identifying theory-based targets for health behavior change in young adults. *Journal of the American Dietetic Association, 108*, 1708–1715.

The European Commission. (2014). Becoming the hub: The health and fitness sector and the future of health enhancing physical activity. Retrieved from http://eose.eu/wp-content/uploads/2014/03/hub_the-final-report.pdf.

The Register of Exercise Professionals. (2019). REPs categories. Retrieved from https://www.exerciseregister.org/reps-categories.

Whelton, S. P., Chin, A., & Xin, X. (2002). Effect of aerobic exercise on blood pressure: A meta-analysis of randomized, control trial. *Annals of Internal Medicine, 136*, 493–503.

Wood, W. (2017). Habit in personality and social psychology. *Personality and Social Psychology Review, 21*, 389–403.