Health Promotion International, 2021, 1–10
doi: 10.1093/heapro/daab113
Article

Time and belief in exercise importance predict increased activity during initial COVID-19 restrictions in Ireland

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Summary

The aim of this work was to investigate physical activity levels and the associated barriers and facilitators to physical activity in Irish adults during initial COVID-19 restrictions. Members of the general population completed an online questionnaire. Responses from 1274 participants (1274/1568, 81% completion rate) indicated that the majority (46.1%, $n = 587$) of people were more active than usual during the restrictions, however, 28.6% ($n = 365$) reported being less active. Fifty-five percent (55.3%, $n = 702$) of participants were meeting public health physical activity guidelines and more than half (53.3%, $n = 679$) reported finding new ways to be active. Walking (86%, $n = 1101$), physical activity in the home (47%, $n = 593$) and online resources (38%, $n = 483$) were the most frequently reported types of physical activity people engaged in. Having more time to be physically active [OR 2.326 (SD 1.948–2.794)] and a greater belief in the importance of physical activity [OR 1.192 (SD 1.001–1.444)] were predictive of exercising more than usual. Being unable to access their usual means of exercise [OR 1.612 (SD 1.369–1.902)], advised not to go outside the home [OR 1.402 (SD 1.165–1.698)] and working more than usual [OR 1.201 (SD 1.013–1.443)] were predictive of exercising less than usual. There was a positive trend in physical activity engagement by Irish adults during initial COVID-19 restrictions, likely influenced by increased time, belief that exercise was important and increased use of home-based and online exercise resources. However, almost one in three people reported being less active than usual, highlighting the need for targeted support during restriction periods.

Lay Summary

Our study aimed to find out what helped and what hindered people being physically active during the initial COVID-19 restrictions (May 2020). At this time, people in Ireland were advised to stay at home and only permitted to exercise within a limited distance from their homes. The vast majority of exercise facilities, such as gyms and swimming pools were closed. We collected our information using an online survey, which 1274 people completed. Results showed that close to half of people reported

being more active than usual during this time, however almost one in three people reported being less active than usual. Those who were more active reported having more time than before and had a strong belief that exercise was important. A lot of people found new ways to exercise, such as online exercise classes. Walking was the most popular physical activity. Those who were exercising less than usual reported their usual means of exercise being unavailable to them, being advised not to leave their homes and having to work more than usual. Understanding what helps and prevents people from being physically active during COVID-19 restrictions helps governments, health professionals and exercise specialists plan how best to promote physical activity if periods of similar restrictions occur.

Key words: physical activity, exercise, COVID-19, facilitators, barriers

INTRODUCTION

Living during a global pandemic resulted in many changes and challenges to our lifestyles. In countries across the world, people were asked to stay in their homes, limit their personal contacts and maintain social distancing in an effort to control the spread of COVID-19. Coupled with the closure of gyms, swimming pools and exercise facilities and the suspension of organised and team-sporting activities, many of the normal opportunities for physical activity and exercise were lost. In addition, many individuals were required to make significant alterations to their daily routine to facilitate changing work habits, commuting practices and caregiving duties, all of which had the potential to impact, both in a positive and negative way, on their time, ability and motivation for physical activity.

During a time of wide-reaching restrictions, many governments nonetheless, recognized the importance of facilitating physical activity and several countries permitted citizens to leave their homes, to engage in physical activity and exercise (GOV.UK Cabinet Office, 2020; Government of Ireland. Department of an Taoiseach; Department of Health, 2020; International Sport and Culture Association, 2020). The multiple health benefits incurred as a result of a physically active lifestyle are well established and include a lower risk of all-cause mortality, cardiovascular disease, hypertension, diabetes and of several types of cancers (Powell *et al.*, 2019) However, it is the positive effect that physical activity exerts on mental health that may be of particular importance presently, given the increased stress and uncertainty associated with the pandemic. There is increasing acknowledgement that the psychological impact resulting from unemployment, financial pressures, bereavement, sickness and the worry of catching the disease can all have a significant negative impact on a person's mental health (Asmundson and Taylor, 2020; O'Connor *et al.*, 2021). Physical activity is known to reduce feelings of anxiety and depression in healthy populations as well as in people with pre-existing clinical syndromes, in addition to lowering the risk of developing depression and improving overall quality of life (Powell *et al.*, 2019; Dishman *et al.*, 2021). In older people, regular physical activity reduces the risk of falls and fall-related injuries, as well as leading to improvements in physical functioning and activities of daily living, important considerations given the public health advice to stay at home and the associated impact this may have on an older persons ability to be physically active (Powell *et al.*, 2019).

Preliminary reports suggest that many people have availed of the opportunity to be physically active, with initial data pointing to increased levels of cycling and recreational walking during the restrictions (Ipsos MRBI, 2020; Savanta ComRes, 2020). High levels of community interest in exercise, as measured by online search traffic, have been reported in several countries during initial phases of COVID-19 restrictions (Ding *et al.*, 2020). In addition, general attitudes to physical activity including its perceived benefits were generally more positive during the pandemic (Savanta ComRes, 2020). However, increased physical activity levels were not reported by all, with established inequalities based on gender, socioeconomic level, age and disability still prevalent or indeed worsened by the pandemic (Savanta ComRes, 2020; Smith *et al.*, 2020). To date, there have been no studies that have sought to determine the factors that place people at risk of low physical activity levels or indeed the factors that facilitate them to be more active at times when social restrictions are in place. A greater understanding of the barriers and facilitators to physical activity during these unprecedented times could help support people's physical and mental health during periods of further restrictions, as well as potentially providing key learnings to inform future practice in physical activity promotion, particularly in relation to situations requiring physical distancing or social isolation.

The aim of this study was to determine how the physical activity levels of Irish adults were impacted by restrictions imposed to limit the spread of COVID-19 during Wave 1 of the disease. A secondary aim was to determine the relevant barriers and facilitators to physical activity at this time.

MATERIALS

This was a cross-sectional study that utilised an online, study-specific questionnaire to collate data from Irish adults.

Questionnaire design

An online survey was considered the most feasible method of data collection for this study. The research team used a multi-step process to develop an instrument informed by previously validated surveys and influenced by factors relating to good questionnaire design including survey length, distribution mode and instrument clarity (Sechrist *et al.*, 1987; Salmon *et al.*, 2003; Bull *et al.*, 2009; Molanorouzi *et al.*, 2014; Hoffmann *et al.*, 2018; Government of Ireland, 2019; Sport Ireland, 2020). A number of preexisting questionnaires examining motivators and barriers to physical activity were considered, however due to the unique set of circumstances associated with COVID-19, a study-specific questionnaire was created. Following several iterations of the questionnaire and piloting with 10 members of the public, the final survey consisted of four sections totaling 14 questions and is provided as Supplementary Material (Questionnaire).

In summary, section one captured physical activity details including whether participants were meeting the national public health physical activity guidelines (Department of Health and Children, Health Service Executive, 2009), exercising more/less or the same as before the restrictions and the types of activities carried out. Sections two and three of the questionnaire consisted of a series of statements listing the potential motivators (11 statements) and barriers (8 statements) to physical activity to which participants indicated their agreement/disagreement on a 5-point Likert scale. The final section asked participants to detail their gender, age, employment status, highest level of education and whether they were cocooning at the time of survey completion.

Data collection

The survey was hosted on Microsoft Forms. A link to the survey was posted on the twitter accounts of the research team inviting any person over the age of 18 to participate. A link to the survey was also posted on the website of the university for whom the research team worked and circulated through a number of professional organizations targeting groups traditionally underrepresented by online surveys which included older people and males (Shih and Fan, 2008; Smith, 2008).

Participants were encouraged to distribute the questionnaire amongst their family and peers.

In Ireland, nationwide stay-at-home restrictions were launched by the Government at the end of March 2020, however people were permitted to exercise within a 2-km distance from home, with the exception of those advised to cocoon (older adults and people with certain medical conditions). On 5 May 2020, the distance permitted to exercise was extended to 5 km from home and people cocooning could leave their homes to exercise. The survey was 'live' for 20 days from 1 May to 20 May 2020.

Ethical approval for this study was granted by the Trinity College Dublin School of Medicine Research Ethics Committee.

Statistical analysis

Cleaning and analysis of data were carried out in R version 3.6.3 (R Core Team, 2020). Raw data imported from Microsoft Forms contained questionnaires from 1568 participants. Data were explored to identify any errors or omissions. Inconsistencies (e.g. free text typos) were resolved when this could be done unambiguously, otherwise records were removed. Incomplete questionnaires ($n = 193$), participants under the age of 18 ($n = 5$) and response groups with 15 or fewer responses ($n = 96$) were excluded from the analysis. The potential to do granular modelling for these sparsely represented groups was impacted by the elevated uncertainty consequential to small group sizes. Exclusion allowed for a transparent overall characterization of physical activity during the early stages of the COVID-19 restrictions. Subsequent to cleaning, the survey responses were explored using descriptive statistics including an incidence plot to represent physical activity type.

For the purpose of analysis, any Likert-scale fields were treated numerically as running from 1 to 5 with 1 representing 'strongly disagree' and 5 representing 'strongly agree'. Logistic regression using the Bayesian lasso (Park and Casella, 2008) through the R package Bayesreg (Makalic and Schmidt, 2016) was used to determine the main facilitators for those exercising more than usual and barriers for those exercising less than usual during the restrictions. Two logistic regression

models were used: one compared those exercising more with the 'same as usual' respondents and the second compared those exercising less with the 'same as usual' respondents. In each of these models exercising more or less than usual was considered the case (outcome 1) and those exercising 'the same as usual' the control (outcome 0).

The Bayesian lasso employs shrinkage prior to determining which of the many potential factors are most explanatory for physical activity behaviour. The models were fitted through Markov chain Monte Carlo (MCMC) (Makalic and Schmidt, 2016). Visual inspection of MCMC trace-plots confirmed convergence. Results are reported in graphical form with posterior credible intervals for the odds ratios (OR) associated with each variable. The posterior OR interval is a natural way to interpret logistic regression output, with credible intervals not containing 1 suggesting a variable to be sufficiently interesting.

RESULTS

In total, 1568 people took part in this survey. Following data cleaning procedures, the final dataset had 1274 participants, indicating a completion rate of 81%. Participant demographics are presented in Table 1.

Change in physical activity levels and types of activities reported

Figure 1 graphically presents the change in physical activity levels reported by participants during the Wave 1 restrictions and the types of physical activities they reported. Over half (55.3%, $n = 702$) of participants reported being physically active for at least thirty minutes on five or more days of the preceding week, thus meeting the physical activity guidelines. More than half (53.3%, $n = 679$) of respondents reported finding new ways to be physically active.

Facilitators and barriers to physical activity

Figures 2 and 3 present the results from the logistic regression models. Presented are the 95% credible intervals of the ORs of variables associated with exercising more than usual (Figure 2) and less than usual (Figure 3). In Figures 2 and 3, the questionnaire number and an abbreviated format of the questionnaire statement are shown. Please see Supplementary Material (Questionnaire) for a complete list of questionnaire items. As presented in Figure 2, analysis identified three questionnaire fields predictive of those exercising more than usual. These were agreeing more strongly with statements 6.1 (Since the COVID-19 restrictions, I have more time to be physically active) and 6.11 (Since the COVID-19 outbreak, I feel it is more important to exercise) and disagreeing more strongly with statement 8.8 (My usual means of getting exercise are not currently available to me).

As presented in Figure 3, five questionnaire fields discerned those exercising less than usual during the restrictions. These were agreeing more strongly with statements 8.8 (My usual means of getting exercise is currently not available to me), 8.1 (I find it hard to be active because I'm advised not to go outside my home) and 8.6 (I find it hard to be active because I am working more than usual) and disagreeing more strongly with statement 6.1 (Since the COVID-19 restrictions, I have

Table 1: Participant demographics

$N = 1274$		% (n)
Gender	Female	71.4 (909)
	Male	28.6 (365)
Employment status	Employed	71.8 (915)
	Unemployed	9.7 (123)
	Student	7 (89)
	Retired	11.5 (147)
Highest education level	Diploma/certificate	16.2 (207)
	Junior certificate or equivalent	1.6 (21)
	Leaving certificate or equivalent	9.6 (122)
	Third level/university degree or higher	72.5 (924)
Advised to cocoon	No	92.2 (1175)
	Yes	7.8 (99)
		Mean (SD)
Age	All participants	44.32 (14.1)

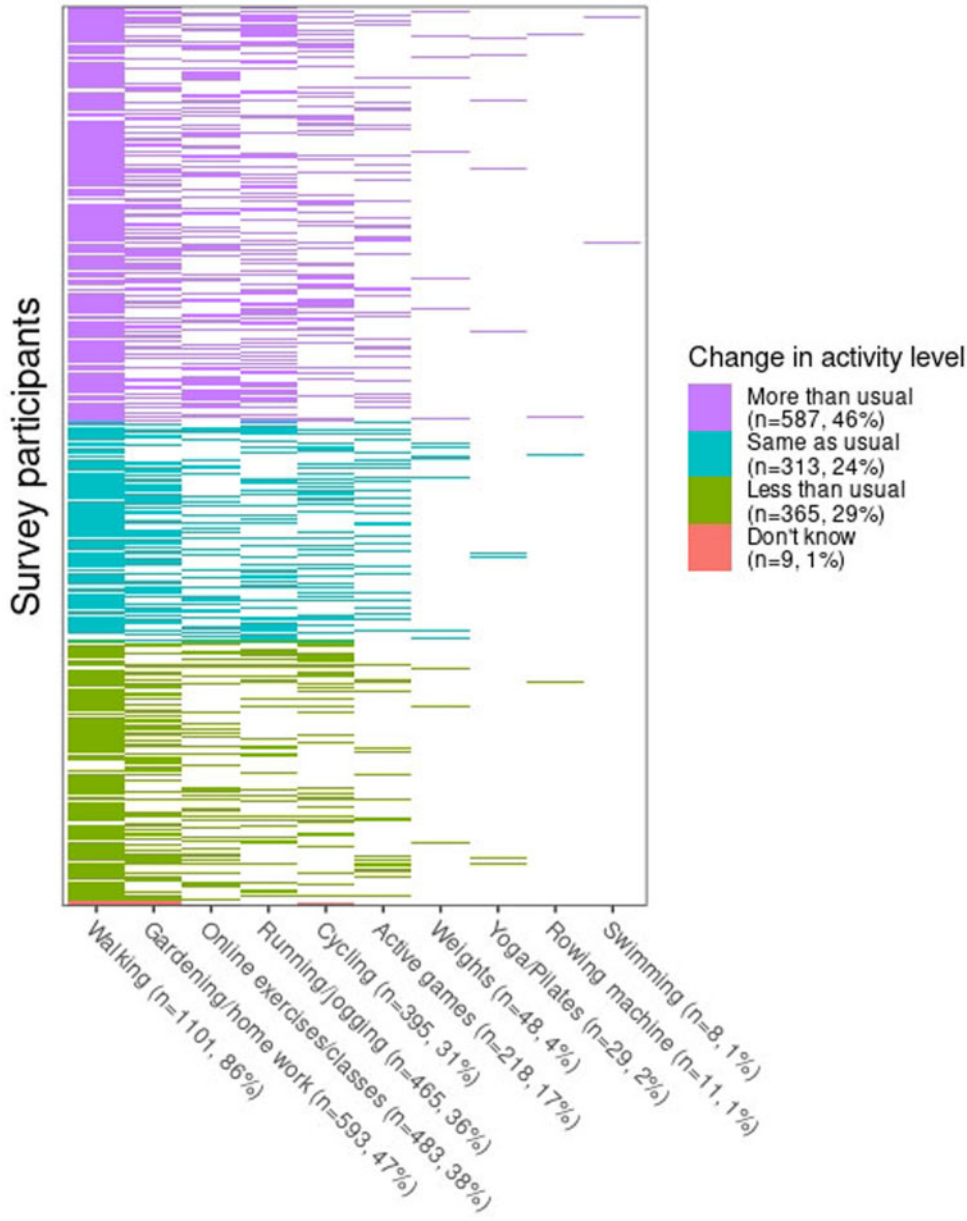

Fig. 1: Change in physical activity levels and types of activities reported here.

more time to be physically active). In addition, level of educational attainment (not having a third level/university degree) was also predictive of exercising less than usual.

DISCUSSION

Results from this study demonstrate that Irish adults reported being more physically active than usual during restrictions imposed due to COVID-19. Self-reported physical activity levels indicated a greater proportion (55%) of the study population were meeting the physical activity guidelines when compared with pre-pandemic population estimates of 46% (Government of Ireland, 2019). This finding was also reflected by the majority of respondents who reported exercising more than usual during the restrictions and acts as a positive

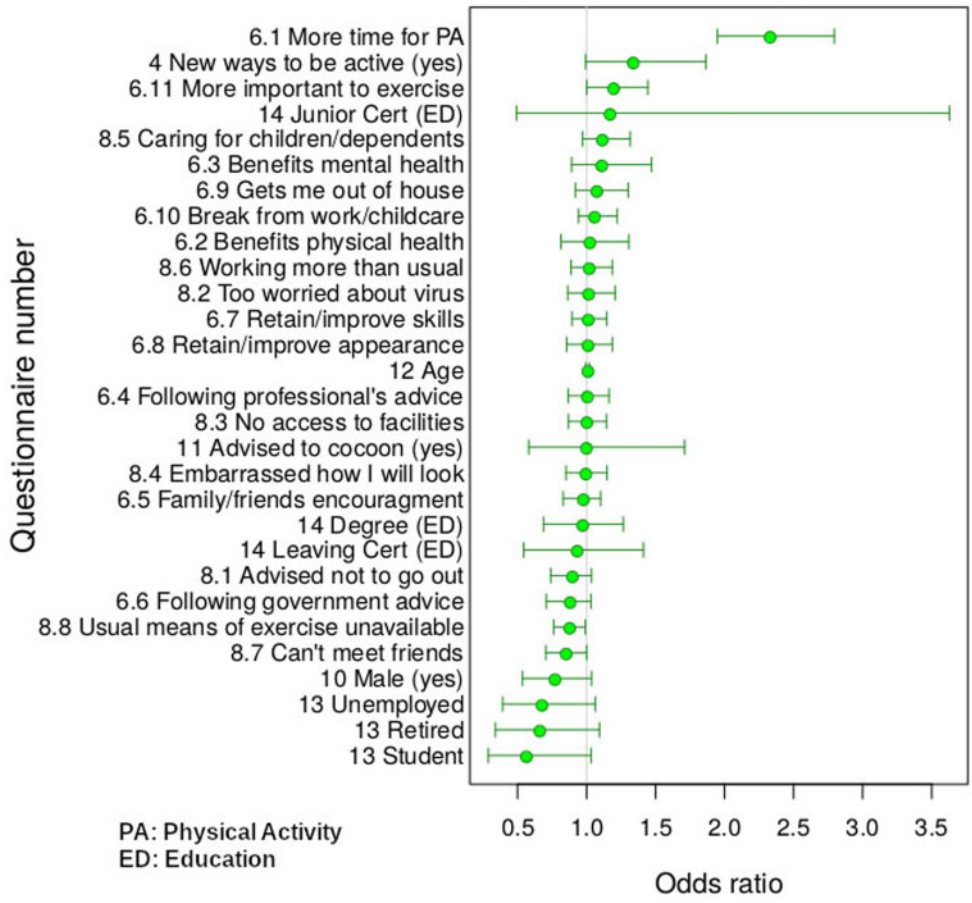

Fig. 2:OR for exercising more than usual here.

reinforcement of the ability to remain physically active even during times when social interactions need to be kept to a minimum. However, improvements in physical activity were not uniform, with almost one in three people reporting they were exercising less than usual during the restrictions, identifying a cohort who may need additional supports during times of restrictions.

The most common activity reported by participants was walking. Walking has been heralded as "man's best medicine" for centuries (Stamatakis *et al.*, 2018) and our research suggests that even during a global pandemic walking remains an accessible and popular physical activity. The second most popular physical activity during COVID-19 restrictions were those that could be engaged with in the home, an option available to all including those who were cocooning. The traditional activities of gardening and housework were juxtaposed with online exercise classes showing diverse activity choices. Further analysis of the barriers and facilitators to physical activity during this time may help explain changes in physical activity reported.

What facilitated people to be more active?

The greatest reported facilitator to being more active than usual was having more time. As the majority of participants reported being employed, it is possible that the additional time reported was due to the ability to work from home. Previous research has reported that the average time spent commuting to work in Ireland is 28.2 min (Central Statistics Office, 2017). Doubling this to include the return journey equates to an approximate saving of 1 h in the day. Although some people may have had an active commute to work, the majority tend to drive, a trend which is increasing in recent years (Central Statistics Office, 2017). It is also likely that some employed participants were unable to work during the restrictions, which may have afforded them more time to engage in physical activity.

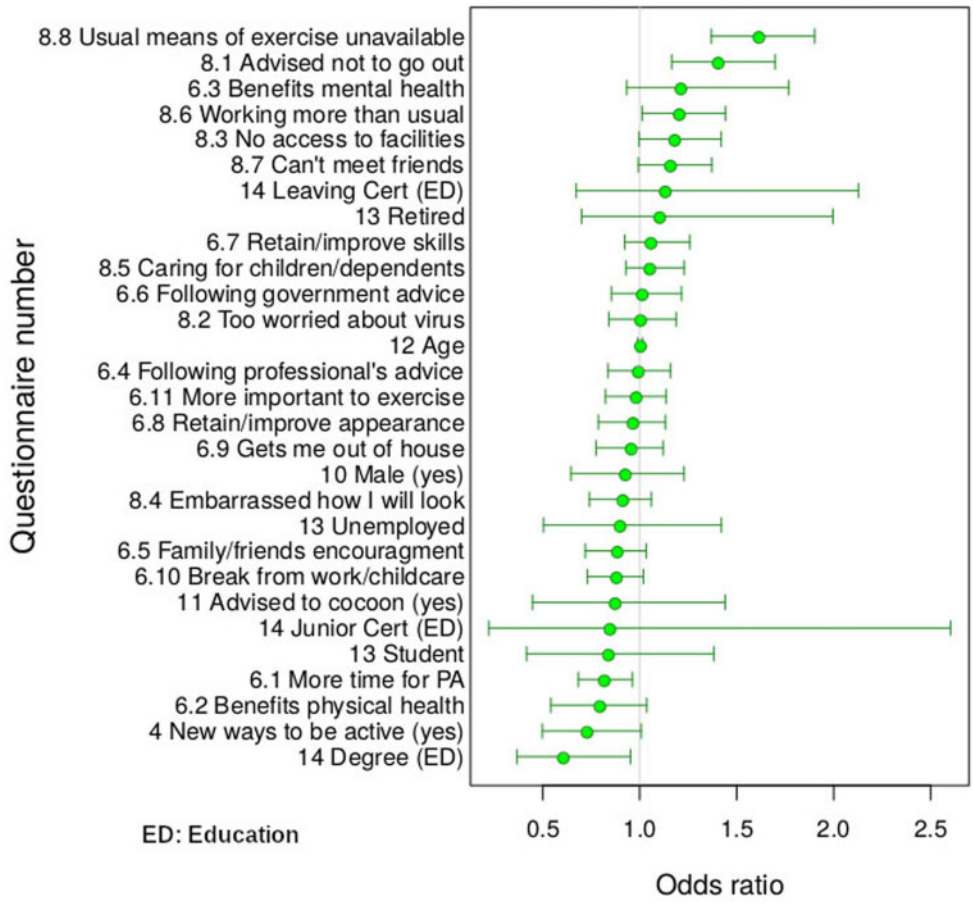

Fig. 3:OR for exercising less than usual during the restrictions here.

The second greatest facilitator to being more active was having a belief that exercise is important. Physical activity is known to result in multiple health benefits, including benefits to the immune system (Campbell and Turner, 2018). Fear of illness and a belief in the protective effects of exercise may therefore have motivated people to be more physically active than usual. This highlights the beneficial effects of national public health campaigns which educate people about the protective effects of exercise and is likely strengthened by the Irish Government's decision permitting citizens to leave home to exercise, as a key exemption to the 'stay at home' advice.

Those who disagreed with the statement that their usual means of getting exercise were not available were more likely to report being more active. There are three possible ways to explain this result: first, it is possible that those whose usual form of activity (for example, walking) was not affected by the restrictions were able to increase their physical activity levels. Second, it is possible that people found new ways to engage with their usual activities. For example, those who used to attend yoga classes in person were now attending them online. In support of this theory, results from this study reported that many people found new ways to be active with a large proportion using online resources. Finally, it is possible that people with a positive perception of access to physical activity opportunities were more likely to be active. Regardless of a person's usual means of getting exercise and potential alternatives, those with a positive outlook who did not perceive a barrier to access, or were able to see a way around a barrier when faced with change, were more likely to increase their physical activity levels. As outlined by Schroeder *et al.*, it may be important to consider perceived access to physical activity opportunities (Schroeder *et al.*, 2019).

Barriers reported by those who were less active

The greatest risk factor for being less active than usual was agreeing with the statement that their usual means of exercise was not available. This is interesting as it appears to have been a differentiating factor between those who were more active than usual and those who were less active than usual. As previously outlined, the reasons for this could have been related to the activity of choice not being available or distance restrictions making it impossible to engage in that activity (for example, long distance cycling or swimming in a pool) however, this result could also highlight the attitude or perceptions of participants towards their ability to access an alternative means of engaging with their preferred activity.

The second greatest risk factor for engaging in less physical activity than usual was being advised not to go outside of the home. Unfortunately for those who were cocooning during the initial stages of COVID-19 restrictions exercise opportunities were limited. Although many people reported exercising in the home, this often depended on technology, a resource certain people may not have availed of or had access to. This highlights the need to support our most vulnerable during times of widespread social restrictions. Examples of ways to support vulnerable populations include protected times where public facilities such as parks are open only to vulnerable populations, and communities exercising on their doorsteps at the same time so that the social aspect of being active is maintained. Recent research among Irish men supports these finding and indicates that additional support is required for vulnerable populations in order to prevent inactivity and loneliness related to social isolation (McGrath *et al.*, 2020).

Results of this study show that the pandemic exacerbated pre-existing inequalities in society. While the greatest facilitator to being more active was having more time available to exercise, a relevant risk factor to being less active than usual was working more and having less time available. It is likely that front line workers and carers of children and dependent others may have found themselves with reduced time to exercise. This is a cause for concern and highlights the need to support the health of those presenting with additional work demands during periods of increased challenge. Policies supporting protected time to engage in physical activity at work are one potential option to support people to remain active.

Finally, participants who had a third level/university degree or higher had a lower risk of being less active than usual compared with those with a lower level of education. The association between physical activity and educational attainment has been well documented in the literature (Kantomaa *et al.*, 2016; Scholes and Bann, 2018; Mitas *et al.*, 2019). This study has shown that even in times of a global pandemic there remains distinct inequalities in society that may lead to health differences.

Strengths and limitations

Although cross-sectional studies come with their limitations, a strength of this study was its design which provided unique information about a distinct and highly unusual period of time. Knowledge acquired from this study may help to support people to retain or increase their activity levels if social restrictions are increased again. Respondent characteristics display diversity in terms of age, gender and level of educational attainment. However, we make the following observations on their overall representativeness of the Irish population at large. Our study sample had a higher mean age (44 years vs 37 years), a greater representation of females, a higher proportion of people in employment (72% vs 61%) and with a third level/university degree (72.5% vs 42%) than that of the general population (Central Statistics Office, 2016). These patterns of representation are commonly reported in survey-based research (Shih and Fan, 2008; Smith, 2008). Despite this, we posit that given the overall diversity in responses given by individuals, and controlling for variables through the regression analysis, our findings are likely to represent patterns in the larger population.

A limitation of this study was the potential seasonal effect on physical activity with people more likely to be physically active during times of the year when the weather is better (Tucker and Gilliland, 2007). The main types of activity reported by participants took place outdoors. While it may be assumed that outdoor activities were reported due to the closure of indoor alternatives and/or due to roads being quieter and safer with reduced traffic, the possibility of fine weather being a hidden confounder cannot be overlooked. Whilst a questionnaire was deemed the most appropriate method of data collection for this survey, it does not permit a deeper analysis of the facilitators and barriers that a qualitative methodology would have facilitated. However, as this is the only known study to date which examined these constructs in relation to COVID-19 restrictions and use such responses to predict potential changes in physical activity behaviour, the results warrant merit in their own right.

CONCLUSION

Results from this study demonstrate that Irish adults reported being more physically active than usual during restrictions imposed due to COVID-19. These encouraging results were seen despite the closure of sport and leisure facilities and may have been influenced by flexible working arrangements and reduced commuting. Positive beliefs regarding the health benefits of physical activity, the ability to seek out novel or alternate forms of exercise and the unwavering support for walking, all point to encouraging signs in the public health agenda of physical activity promotion. Understanding the physical activity behaviours of people during times of severely reduced community interaction may help prepare for possible future restrictions by targeting promotional activities towards relevant resources, as well as highlighting vulnerable groups in need of additional support, actions which have previously been highlighted as a requirement during this time (Van den Broucke, 2020).

Supplementary Material

Supplementary material is available at *Health Promotion International* online.

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