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Differences in self-control, self-efficacy and depressive symptoms between active and inactive middle-aged and older adults after 1 year of COVID restrictions

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ABSTRACT

Objectives: The psychological impact of the prolonged lockdown measures in the UK as a response to the COVID-19 pandemic is unclear. Our aim was to determine if there are significant differences in self-control, self-efficacy, depressive symptoms and leisure motivation between UK older adults with differing levels of physical activity, and which of these variables can be used to predict activity level after 1 year of lockdown restrictions,

Methods: 521 adults aged 50–92 years completed an online survey consisting of several validated measures relating to physical activity, self-control, self-efficacy, depressive symptoms, and leisure motivation. Participant's responses were grouped into active (≥150minutes activity per week) and inactive (<150minutes activity per week). Data was analysed using ANOVA, Pearson's Correlation and Multiple Regression (forward stepwise).

Results: We found significant differences in self-efficacy, self-control, and depressive symptoms between physically active vs inactive subjects. High levels of self-control and self-efficacy were associated with higher levels of activity and fewer depressive symptoms. Self-control, amotivation, depressive symptoms and self-efficacy were predictors of physical activity level.

Conclusion: Psychological variables including self-control, self-efficacy, depressive symptoms and amotivation can be used to predict physical activity levels in UK middle-aged and older adults following 1 year of Covid restrictions.

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Self-control; self-efficacy; motivation; depressive symptoms; physical activity; quantitative methods and statistics

Introduction

One year after COVID-19 was announced as a global pandemic, the global death toll was around 2.6 million with reported cases of COVID-19 around 120 million. In the United Kingdom alone, 125,000 people had died and around 4.2 million cases had been reported as of the 16th March 2021, around the time that this research was conducted (*Johns Hopkins Coronavirus Resource Center*, 2021). As the disease mainly spreads through close contact, the UK government introduced several national lockdowns, which were in place for a total of 7 months over the course of a year (*The Institute for Government*, 2021). These lockdowns involved social distancing and isolation policies, as well as the closure of most commercial establishments including gyms and leisure centres.

These measures, although essential to control the spread of the disease, have been shown to have deleterious psychological effects (Brooks et al., 2020). Globally, mental wellbeing has decreased over the course of the pandemic (Carriedo et al., 2020; Cheval et al., 2021; Meyer et al., 2020; Sepúlveda-Loyola et al., 2020; Stockwell et al., 2021). It is well known that social isolation, or the physical separation from others (Cacioppo & Patrick, 2008), can induce many negative emotions and decrease cognitive abilities (Pancani et al., 2021). Alongside this, it has also been suggested that long periods of isolation can cause people to enter a state of 'psychological resignation' (Williams, 2009), resulting in increased feelings of depression and helplessness. Encouraging online social interactions can help to reduce the effects of social isolation (Gabbiadini et al., 2020) through fostering sociability and human connection when physical, face-to-face connection is impeded (Waytz & Gray, 2018).

The lockdown restrictions have been especially difficult for older adults who may be less adaptable to some of the technology which have allowed people to remain in contact with family and friends. Krendl and Perry (2021) found that among US older adults, there was an increased reporting of depression and loneliness, which was associated with how close they felt they were to their social network. Essentially, those who were able to maintain a close relationship with their social network experienced slightly less depression than those without the close social relationships, leading to an increase in loneliness in those without (Krendl & Perry, 2021).

As a result of lockdown closures of gyms and leisure centres, there has been a general reduction in physical activity in several countries. For example, Maugeri et al. (2020) observed a reduction in physical activity (PA) and energy expenditure across age groups in Italy, and Cheval et al. (2021) showed a reduction in vigorous activity in younger adults from France and Switzerland. In the UK, within the first months of the pandemic (until May 2020), older adults reported similar PA levels to pre-pandemic but an increase in self-reported sedentary behaviour (Richardson et al., 2021). Sedentary behaviour (SB) is any waking behaviour characterized by an energy expenditure ≤1.5 metabolic equivalents (METs) while in a sitting,

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reclining or lying posture (Tremblay et al., 2017). It has been shown that older adults are typically more sedentary than other groups in society, even without pandemic restrictions, with many sitting for an average of nine waking hours per day (Harvey et al., 2014).

Two of the key determinants of older adult physical activity engagement are self-control and self-efficacy (Lee et al., 2020; Maher & Dunton, 2020; Sansano-Nadal et al., 2019). Self-efficacy refers to the individuals' belief that they can perform a given activity or behaviour (Bandura, 1977). Self-control relates to an individual's willingness, or not, to engage with a certain activity based on their individual goals (Maher & Dunton, 2020). Although subtly different, these two concepts are closely related in that to perform any kind of PA, an individual must have the belief that they can perform the movement and the willingness or desire to engage in it. When considering PA interventions for older populations, focusing on self-efficacy and self-control are two of the most common strategies employed (Sansano-Nadal et al., 2019). Within the older population, people often have less rigid schedules due to retirement or switching to working part-time and therefore may have more opportunity to engage in PA (Maher & Dunton, 2020). However, they are also more likely to experience functional limitations, and be influenced by ageing stereotypes relating to increased SB; these may lead to reduced self-efficacy in relation to PA tasks and therefore a reluctance to engage with PA (Greenwood-Hickman et al., 2015; Sparling et al., 2015).

Due to the ongoing lockdown measures in the UK, many people are adopting a more sedentary lifestyle (Stockwell et al., 2021), which may in part relate to the reduced access to social relations which has been suggested as a key component in older adult PA engagement (Lee et al., 2020). Motivation to engage in exercise comes from either an internal or external sources (Galli et al., 2018). In older adults, much of the motivation comes externally from peer or other social interactions (Lee et al., 2020), therefore a reduction in social interactions leads to a decrease in motivation and an increase in SB. This increase in SB has also been linked to higher rates of self-reported fatigue (Maher & Dunton, 2020). This feeling of fatigue leads to impeded decision making and a preference for easier, or more gratifying decisions such as sitting and relaxing rather than engaging with PA (Maher & Dunton, 2020), which in turn leads to a greater sedentary lifestyle.

This constant cycle of having a sedentary lifestyle, which leads to feeling fatigued, and therefore a reluctance to be active may be having a negative influence on mental health, including an increase in depressive symptoms (Wang et al., 2019; Zhai et al., 2015). Older adults showed an increase in both sedentary behaviour and depression within the first few weeks of the pandemic and initial lockdown (Maugeri et al., 2020; Richardson et al., 2021). Conversely, PA can confer protection against the onset of anxiety (Schuch et al., 2019) and depression (Schuch et al., 2018), is strongly associated with self-efficacy (Netz et al., 2005) and has been shown to positively associate with mood (Chan et al., 2019). Additionally, recent results indicate that physical inactivity is associated with a higher risk of severe COVID-19 outcomes. Physically inactive people had a greater risk of hospitalization, admission to the ICU and death when compared to physically active ones (Sallis et al., 2021).

To date, the literature published regarding the associations between PA, SB and the mental well-being of adults during the COVID-19 pandemic have focused on the beginning of the pandemic when all these forced changes were being made. The relationship between depression, self-efficacy, self-control and physical activity level after one year of lockdown restrictions are still unknown. The aims of this study were to; (1) determine if there are significant differences in self-control, self-efficacy, depressive symptoms and leisure motivation between UK older adults with differing levels of physical activity after 1 year of lockdown restrictions and (2) to determine which of these variables predict physical activity levels

Methods

Sample and recruitment

A sample of older adults (aged 50+) was recruited via email from local charity groups (e.g. AgeUK, U3A), as well as through social media platforms including Facebook and Twitter. To recruit a sample as large and diverse as possible, the only exclusion criteria stated was age. Ethical approval was granted by Nottingham Trent University, School of Science and Technology, Non-Invasive Human Ethics Committee, Case number: 19/20-08 V.

Procedure

An online survey was published between January 2021 and March 2021, with the link distributed via email and sharing on social media. These dates coincided with the third national lockdown mandated by the UK government. Following the closure of the survey, responses were checked for eligibility (ensure participants were aged 50+), and any that did not meet the criteria were removed. Participants were then categorised as either 'physically active' or 'inactive' based on their reported level of physical activity. To be considered 'physically active' participants had to report at least 150 min of moderate to vigorous physical activity per week (as stated in the WHO, 2020 guidelines on physical activity; Bull et al., 2020). The participants that reported less than 150 min of physical activity per week were considered 'inactive'. Data then underwent a series of statistical analyses to assess the differences between the two groups.

Data collection instruments

Jisc online surveys (www.onlinesurveys.ac.uk) was used to create an online survey which included several validated measures related to physical and mental wellbeing, self-control, self-efficacy and physical activity/sedentary behaviour:

a. Socio-demographic data (e.g. gender, age, ethnicity, living arrangements) and health history questionnaire (Do you suffer from any diagnosed long-term health condition (s)? E.g. depression, anxiety, asthma, joint problems, cancer, diabetes, intestinal problem, cardiac illness.),
b. *Physical activity* was assessed using a single question 'how many hours have you spent exercising in the last week?' This type of question has been shown to be a valid measure for baseline physical activity (Milton et al., 2013)
c. *Self-control* was assessed using the Brief Self Control Scale (Tangney et al., 2004). Participants were asked to rate how much they related to 13 statements, such as 'I am good at resisting temptation', using a 5-point scale ranging from 1 (not at all) to 5 (very much). This scale results in an overall composite score of between 13 and 65, where 13 indicates low self-control and 65 indicates high self-control.

d. *Self-efficacy* was assessed using the General Self-Efficacy Scale (GSE) (Schwarzer & Jerusalem, 1995). Participants were asked to rate how much each of the 10 included items related to them, such as 'I can always manage to solve difficult problems if I try hard enough', from 1 (not at all true) to 4 (exactly true). This scale results in an overall composite score of between 10 and 40, where 10 indicates low self-efficacy and 40 indicates high self-efficacy.
e. *Depressive symptoms* were assessed using the CES-D Scale (Orme et al., 1986). Participants were given 20 statements relating to how they may feel or behave, such as 'I was bothered by things that usually don't bother me' and were asked to state how often they have felt or behaved that way in the last week, from rarely (less than 1 day) to most or all of the time (5–7 days). This scale results in an overall score of between 0 and 60, where 0 indicates low depressive symptomology and 60 indicate high depressive symptomology.
f. *Motivation to engage in leisure activities* was assessed using the Leisure Motivation Scale (LMS-28) (Pelletier et al., 1991). Participants were asked to state their most common leisure activity, and then rate each of the 28 items on a scale of 1 (does not correspond at all) to 7 (corresponds exactly) in relation to why they engage in their leisure activity, for example 'Because I experience a lot of pleasure and satisfaction in learning new things.' For the purpose of this study, the different types of intrinsic motivation were grouped, as well as the types of extrinsic motivation. Therefore, intrinsic and extrinsic motivation were each scored on a scale of 12 (low) to 84 (high). Amotivation was scored on a scale ranging from 4 (low) to 28 (high).

Statistical analysis

As a preliminary analytical step, data were examined for accuracy of data entry and missing values. Little's test was used to determine whether data were missing completely at random (MCAR) throughout the dataset rather than revealing a systematic pattern. Little's test was applied to the entire data set of activity level, self-control, self-efficacy, depressive symptoms and motivation and no differences were identified ($\chi^2 = 23{,}77$, df = 12.0, $P = .86$), indicating that these data were MCAR and supporting expectation maximization (EM) imputation. If the percentage of missing data over the four data points were less than 3%, an EM algorithm was used to handle missing values (Nelwamondo et al., 2007).

Following this, a staged analysis process was used. Firstly, analysis of variance (ANOVA) was used to determine whether self-efficacy, self-control, depressive symptoms, and motivation to engage in leisure activities were significantly different between active and inactive adults. Age, gender and presence/absence of chronic disease (e.g. diabetes, obesity, heart diseases and arthritis) were used as covariates. Pearson's Correlation was then used to evaluate the strength of the relationships between activity level, self-efficacy, self-control, depressive symptoms, and motivation to engage in leisure activities. Finally, multiple linear regression analysis (forward stepwise selection) was performed to investigate significant predictors of physical activity hours performed. The independent variables relevant to the model were selected from the univariate analysis based on a threshold p-value of 0.05. All data were analysed using the SPSS computer package (SPSS V. 20.0; Chicago, IL), with statistical significance defined as $p < 0.05$.

Results

Overall, 521 participants completed this questionnaire (male = 161, female = 360, mean age = 67.21, SD = 8.86), who were divided into groups based on number of reported weekly activity hours completed. The low activity group consisted of 240 participants (male = 61, female = 179, mean weekly hours = 26.99, SD = 5.93). The high activity group consisted of 281 participants (male = 100, female = 181, mean weekly hours = 35.33, SD = 7.40).

ANOVA results

A series of univariate ANOVA were conducted to check for differences between active and non-active participants whilst controlling for age, gender and presence of chronic disease. There was a significant difference between active and non-active participants in all variables, except extrinsic leisure motivation (Table 1).

None of the variables showed a significant interaction with age or the presence/absence of chronic disease, with self -efficacy and leisure motivation also showing no significant interactions with gender. However, there was a significant difference in self-control when acknowledging the interaction between activity level and gender [$F(1)=6.720$, $\eta^2=0.013$ $P<0.01$], with active males reporting the highest self-control ($M = 36.96$, SD = 8.03), followed by active females ($M = 34.43$, SD = 6.90), inactive females ($M = 27.13$, SD = 6.05) and inactive males reporting the lowest self-control ($M = 26.57$, SD = 5.59).

There was also a significant difference in depressive symptoms when acknowledging the interaction between activity level and gender [F(1)=9.02, $\eta^2=0.017$ $P<0.01$], with inactive females reporting the most depressive symptoms ($M = 40.64$, SD = 7.45), followed by inactive males ($M = 37.90$, SD = 8.18), active males ($M = 35.21$, SD = 7.11) and then active females reporting the fewest depressive symptoms ($M = 33.60$, SD = 6.09).

Pearson correlation results

Altogether, the results show that higher activity levels are positively correlated with self-control, self-efficacy, total motivation, intrinsic and extrinsic motivation, whereas it is negatively correlated with depression and amotivation (Table 2).

Multiple regression analysis (forward stepwise) results

Based on the univariate analyses, self-control, self-efficacy, depressive symptoms, total motivation, intrinsic motivation and amotivation were the selected variables for the multivariate model (Table 3). Self-control, amotivation, depressive symptoms and self-efficacy were retained as significant predictors of physical activity level ($p < 0.001$). This model could explain 55.5% of the variance in physical activity level (adjusted $R^2 = 0.555$).

Discussion

Previous studies reported that lockdown restrictions led to an increased incidence of low physical activity and depressive symptoms in UK adults aged over 50 years, however these findings focused on the initial months of the pandemic (Richardson et al., 2021). The aims of this study were to; (1) determine if there

Table 1. Summary of univariate ANOVA results.

Variable	Mean	Std. deviation	F	Sig
Self-control				
Active	35.33	7.41	196.61	.00***
Inactive	26.99	5.93		
General self-efficacy				
Active	33.15	3.98	287.91	.00***
Inactive	25.33	6.42		
Depressive symptoms				
Active	34.17	6.51	85.95	.00***
Inactive	39.94	7.72		
Leisure motivation: Total motivation				
Active	112.34	29.49	11.46	.00***
Inactive	102.87	34.38		
Intrinsic motivation				
Active	56.56	14.70	108.63	.00***
Inactive	41.96	17.26		
Extrinsic motivation				
Active	50.13	14.95	3.89	.05
Inactive	47.36	17.07		
Amotivation				
Active	5.66	3.52	526.07	.00***
Inactive	13.55	4.32		

* $p < .05$, ** $p < .01$, *** $p < .000$.

are significant differences in self-control, self-efficacy, depressive symptoms, and leisure motivation between UK older adults with differing levels of physical activity after 1 year of lockdown restrictions and (2) to determine which of these variables predict physical activity levels

Several studies have shown that reduced physical activity during the COVID-19 pandemic is associated with poorer mental health in adults (Cheval et al., 2021) including worse depressive symptoms (Meyer et al., 2020; Schuch et al., 2020; Stanton et al., 2020). This is especially true for older adults, who have reported higher levels of sedentary behaviour (Richardson et al., 2021) and depressive symptoms (Krendl & Perry, 2021) since the pandemic began. Our findings add to these existing findings of the interaction between depressive symptoms and physical activity by demonstrating a negative correlation between depressive symptoms and physical activity hours, and that depressive symptoms were significantly higher in the inactive group. However, the factors which can influence this relationship have been largely ignored. Self-efficacy, self-control and leisure motivation are all known to influence physical activity engagement (Maher & Dunton, 2020; Maher et al., 2016), and are likely to have been impacted during the pandemic through significant restrictions in access to facilities and individual's choice to participate in usual activities.

Self-control and self-efficacy were both significantly higher in the active group, were positively correlated with time spent in physical activity and were predictors of physical activity level. This is expected, as engagement with physical activity is dependent on the willingness to participate (self-control) and belief that one can be successful (self-efficacy) (Maher & Dunton, 2020). Although we did not determine pre-covid physical activity levels, it is possible that those who reported that they are currently physically active have higher levels of self-control and self-efficacy and have therefore been able to overcome the barriers presented by covid restrictions (e.g. the closure of gyms) and maintain some level of physical activity. Cheval et al. (2021) reported that although vigorous activity reduced, moderate PA and walking time increased, demonstrating the willingness of people to adjust their habits. This is further supported by Maugeri et al. (2020) who reported that 33.0% of inactive individuals became more active while 40.3% of active individuals became more active during the COVID-19 pandemic.

Total leisure motivation was positively correlated with number of exercise hours and was significantly higher in the active group. Interestingly, intrinsic motivation was significantly

Table 2. Summary of Pearson correlation results.

	Activity level	Self-control	Self-efficacy	Depressive symptoms	Total motivation	Intrinsic motivation	Extrinsic motivation	Amotivation
Activity level	1	–	–	–	–	–	–	–
Self-control	.64***	1	–	–	–	–	–	–
General self-efficacy	.56***	.52***	1	–	–	–	–	–
Depressive symptoms	−.43***	−.29***	−.36***	1	–	–	–	–
Total motivation	.16***	−.17***	−.27***	−.13**	1	–	–	–
Intrinsic motivation	.37***	.30***	.42***	−.23***	.95***	1	–	–
Extrinsic motivation	.12**	.13***	.24***	−.10*	.99***	.93***	1	–
Amotivation	−.54***	−.33***	−.44***	.26***	−.06	−.33***	−.10*	1

* $p < .05$, ** $p < .01$, *** $p < .000$.

Table 3. Summary of multivariate analysis (forward stepwise) of predictors for physical activity level.

Model		Unstandardized coefficients B	Unstandardized coefficients Std. Error	Standardized coefficients Beta	t	Sig.	Adjusted R^2
1	(Constant)	−7.568	.681		−11.121	.000	.410
	Self-Control	.399	.021	.641	19.034	.000	
2	(Constant)	−2.576	.816		−3.157	.002	.498
	Self-control	.311	.021	.500	14.515	.000	
	Amotivation	−2.73	.028	−.330	−9.581	.000	
3	(Constant)	2.661	1.142		2.330	.020	.533
	Self-control	.288	.021	.462	13.717	.000	
	Amotivation	−.230	.028	−.278	−8.124	.000	
	Depressive symptoms	−.132	.021	−.204	−6.326	.000	
4	(Constant)	−1.179	1.377		−.856	.392	.552
	Self-control	.249	.022	.401	11.306	.000	
	Amotivation	−.184	.029	−.222	−6.258	.000	
	Depressive symptoms	−.114	.021	−.177	−5.495	.000	
	Self-efficacy	.136	.028	.180	4.781	.000	

* $p < .05$, ** $p < .01$, *** $p < .000$.

greater in the active group, whereas extrinsic motivation appeared to have no significance in relation to exercise hours. This suggests that, when forced to exercise alone because of restrictions, those who rely more on other people, or external rewards, have been the most negatively influenced. This may have been a greater issue for older adults, as external support of family and friends is known to influence older adults' participation in physical activity (Orsega-Smith et al., 2007). However, none of these aspects of motivation were considered predictors of physical activity within our analysis, whereas amotivation was. It is known that motivation typically comes from autonomy, or having choice, and being supported by significant others (Galli et al., 2018). During the lockdown restrictions, both were significantly reduced, which may have led to increased feelings of amotivation and therefore may explain why amotivation can predict physical activity level while the others cannot.

When considering the second aim of this study, our analysis demonstrated that self-control, amotivation, depressive symptoms and self-efficacy were all predictors of physical activity hours during the pandemic restrictions. This suggests that those with better self-control and self-efficacy and reduced depressive symptoms and amotivation may be more likely to engage with physical activity. This is also supported by other studies that found that better mental health was associated with being physically active in adults (Schuch et al., 2020) and older adults (Carriedo et al., 2020). This may be important to note as the restrictions begin to ease, any depressive symptoms or feelings of amotivation may be more prominent due to the lockdown measures and may therefore have to be mitigated to encourage a return to physical activity.

Strengths and limitations

To our knowledge, this is the first paper looking at measures of physical activity after 1 year of covid restrictions, as well as how differences in self-control and self-efficacy may relate to these. However, there are several limitations.

Firstly, the assessment of weekly PA was self-reported, and can be subject to bias. Within our sample, there were more participants in the high activity group ($N = 281$) compared to the low activity group ($N = 240$). Secondly, the fact that online questionnaires were used may have led to a biased population due to the participants needing to be technology literate. The digital divide which currently exists within the older population may have led to a significant portion of the population being excluded. Thirdly, although using a single question to determine physical activity has proved to be valid, the question we used had been slightly reworded and therefore is not an internally valid measure. Alongside this, we used general questionnaires such as the GES, rather than more specific measures such as the Self-Efficacy for Exercise Scale (SEE) as we were interested in self-efficacy during daily life, rather than specifically in relation to exercise. Due to the cross-sectional design of this study, it is not possible to establish a cause-effect relationship between the amount of physical activity and mental health outcomes or vice-versa. Future studies should employ a longitudinal design to investigate which variables influence which, as well as specifically focus on hours spent at different levels of physical activity, e.g. moderate and vigorous activity as separate groups. None of our participants reached the threshold to be considered 'vigorously' active, which could be an interesting addition to future work.

Conclusions

In conclusion, data from the present study shows that, in this sample of UK adults aged between 50 to 92 years old, there are significant differences in self-control, self-efficacy, leisure motivation and depressive symptoms between physically active vs inactive subjects. Furthermore, self-control, amotivation, depressive symptoms and self-efficacy are significant predictors of physical activity level in middle aged and older UK adults following 1 year of COVID-19 restrictions.

Disclosure statement

No potential conflict of interest was reported by the authors.

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