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# **Exercise changes and challenges across two lockdowns in England: A mixed-methods exploratory study**

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## Abstract

While physical activity has been extensively positively associated with physical and mental health, evidence indicates that some individuals have struggled to maintain sufficient exercise levels during the recent Covid-19 lockdowns. Using a mixed-methods design, this study aimed to characterise the features of lockdown-related physical activity and exercise behaviour changes and explore the challenges that people faced during these periods. Adult participants (N=163) who had experienced both the first and second formal lockdowns in England in 2020 were recruited to take part in an online survey. The questionnaire included demographic questions, measures of physical activity and resilience, and four open-ended questions about challenges and changes in physical activity over lockdown. Results indicated that younger adults were more likely to have reduced their activity over lockdown than others and that commonly reported challenges to exercise included logistical, motivational and time-related difficulties. Strategies to accommodate these challenges often relied on technology. Implications for future interventions are discussed.

It is well established that physical activity is beneficial for physical and mental health and social wellbeing (Aylett et al., 2018; Helmrich et al., 1991; Lavie et al., 2015). Indeed, physical inactivity has been proposed as a leading cause of death across the globe (Katzmarzyk, Min-Lee, Martin & Blair, 2017) and as a risk factor for mental illness (Galper et al., 2006). Furthermore, physical activity has been identified as a protective factor against Covid-19 and as a support to recovery from the illness (Dwyer et al., 2020). Numerous studies have indicated that the Covid-19 pandemic and its related lockdowns have impacted individuals' physical activity levels globally and within both developing and developed countries; the majority of these have indicated an overall decrease in physical activity and increase in sedentary behaviour (Stockwell et al., 2021). The principal proposed explanation for this is the ban imposed in many countries on leaving the house for 'unnecessary reasons' during lockdown. Several studies, however, have identified separate sub-groups who have increased, decreased or not changed their physical activity levels. Perez-Rodrigo et al. (2021), for example, reported that women and individuals who are younger were more likely to increase their physical activity over lockdown in Spain, while Robinson et al. (2021) found that individuals with high BMI or declining mental health were more likely to decrease their exercise in a UK-based study.

There are a number of plausible explanations for the variation in people's physical activity levels over lockdown, many of which concentrate on exercise specifically. Some groups might find it easier to maintain motivation to exercise because of their circumstances, preferred exercise type or personality factors. Studies addressing other health behaviours such as eating and alcohol consumption have

indicated that specific groups may be particularly vulnerable to deterioration of positive health behaviours during lockdown. For example, Robinson and colleagues (Robinson et al., 2021) found that individuals who were younger, had fewer educational qualifications or experienced negative mental health during lockdown were all more likely to overeat during this period. Similarly, being younger predicted increased alcohol consumption during lockdown (Jacob et al., 2021).

Alternatively, some types of physical activity lend themselves more than others to a lockdown situation; for example, face to face exercise classes were cancelled and gyms closed across the globe but running alone continued to be allowed in most countries (Stockwell et al., 2021). On the other hand, some individuals use their daily commute to incorporate physical activity into their life (Humphreys et al., 2013) which will inevitably have stopped for those forced to work from home.

Resilience may also play a role in the maintenance or deterioration of physical activity habits during lockdown. Resilience has been associated with physical activity in previous research such that higher levels of resilience have been associated with higher levels of physical activity (Childs & de Wit, 2014). Resilience is defined as the ability to 'bounce back' from challenging circumstances (Smith et al., 2008). Undoubtedly, the pandemic has created numerous challenging circumstances for the majority of individuals. It stands to reason that individuals with high levels of resilience might be more likely to maintain or increase physical activity levels during lockdown situations than those with lower resilience.

Most research looking at physical activity levels in lockdown to date has been quantitative in its approach (Stockwell et al., 2021). This is useful to explore patterns across time but does not contribute to understanding why different groups struggle more or less to engage in exercise and physical activity, or what the specific lockdown-related challenges might be.

There are two reasons why it is valuable to improve understanding areas around lockdown related change to physical activity. First, reports suggest that Covid-19 variants will continue to emerge, raising the possibility of further 'waves' of the pandemic and of future lockdowns (BBC, 2021). Second, even in the absence of lockdown, there is an expectation in many countries that unemployment levels will continue to be high for some time (OECD Data, 2021) and that many of those who are in employment will continue to work from home for the foreseeable future (Global Workforce Analytics, 2021). If these situations contribute to the challenges of maintaining physical activity, it is important that those affected can receive support to help them engage or re-engage in appropriate and realistic exercise routines.

This mixed-methods exploratory study aimed first to explore the characteristics of lockdown-related physical activity change and then sought to understand the challenges individuals have faced relating

to physical activity in lockdown as well as methods employed to overcome those challenges. Finally, we consider how our findings can be used to support physical activity interventions in the future.

### **Methods**

The study was granted ethical approval by the University of Reading Research Ethics Committee (reference 2020-126-SS).

#### **Design**

The study had a mixed methods design. The quantitative element of the study had a repeated measures, within-subjects design whereby participants were asked to think about three time periods: pre-lockdown, the first national lockdown and the second national lockdown. They were asked to think about the first two of these time periods retrospectively. The study took place during the second national lockdown in England (November 2020) so for this period they were asked to think about the current time. Participants were additionally asked for brief qualitative feedback as described in Measures.

#### **Participants**

Participants were recruited through a snowballing technique (the researchers advertised the study on their personal social media channels, inviting connections and networks to share as well as advertising through a central University participant recruitment system, SONA) between 18th November and 2nd December 2020. All participants were therefore under lockdown conditions when they participated because these dates fell into the second formal Covid lockdown in England. Individuals who were over 18, could read and understand English, and resided in England during the Covid-19 lockdown periods were eligible to take part. There were no further exclusion criteria.

Power Analysis using G\*Power (Faul et al., 2007) based on previous relevant research (Savage et al., 2020), assuming a medium effect size and power of 0.8, indicated that the sample should comprise minimum 78 participants to detect a change in activity levels. In total, 176 participants were recruited. Thirteen were excluded (two reported their age as under-18, one reported infeasibly high physical activity scores and 10 reported being outside of the country during one or more of the lockdown periods).

The final sample therefore comprised 163 participants with an age range of 18 – 77 years. Demographics and descriptives can be seen in Table 1.

**Table 1***Sample demographics*

	<b>M</b>	<b>SD</b>
<i>Age</i>	38.3	18.4
	<b>n</b>	<b>%</b>
<i>Gender</i>		
Female	134	82.2
Male	27	16.6
Prefer not to say	2	1.2
<i>Current employment (at LD2)</i>		
Employed (full or part-time)	56	34.3
Student	56	34.4
Self-employed	16	9.8
Retired	15	9.2
Unemployed	15	9.2
Furloughed	4	2.5
Full time parent/carer	1	0.6
<i>Furlough status in LD 1</i>		
Furlough	25	15.3
Not furlough	71	43.6
Not applicable	67	41.1
<i>Current work from home status (during LD2)</i>		
Working from home	28	17.2
Working in workplace	28	17.2
Both	16	9.8
Neither/not working	91	55.8
<i>Work from home status in LD 1</i>		
Working from home	42	25.8
Working in workplace	17	10.4
Both	12	7.4
Neither/not working	92	56.4
<i>Shielding status* in LD 1</i>		
Shielding	15	9.2
Not shielding	158	90.8
<i>Resilience (BRS) scores &amp; categories</i>		
Low resilience	60	36.8
Normal resilience	84	51.5
High resilience	19	11.7
BRS score	M =	SD =
	1.75	0.65

LD = Lockdown. \* Shielding refers to the act of not leaving home at all and minimizing all face to face contact; people deemed most clinically vulnerable in the first lockdown were advised to do this.

## **Procedure**

Prior to data collection, participants were provided with a brief information sheet detailing what participation would involve and the purpose of the study. They were then invited to provide consent and upon doing so were taken to the first page of the online questionnaire, hosted by Online Surveys (formerly Bristol Online Surveys). On completion of the questionnaire, they were taken to a webpage that provided a short debrief explaining the study aims and reminding them how to contact the research team should they have any outstanding questions.

## **Measures**

Participants were asked to provide demographic data as detailed in Table 1. Additional questions were administered and participants were asked to answer them with reference to the current time, as well as to retrospectively think back and report how they would have answered during the previous lockdown (i.e. March-May 2020), and before any lockdowns (i.e. January/February 2020). In order to assist participants in thinking about how they felt and behaved during these periods, they were given a visual timeline image to look at which indicated various events that had taken place during the periods they were being asked to think about. For example, 'pre-lockdown' was graphically represented as being before the moment that the Prime Minister announced the first lockdown.

### ***The Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ; Godin & Shephard, 2015)***

Participants were asked to complete this questionnaire for the three time points described above. It asks people to identify how many times, over an 'average' 7-day period, they do the following types of exercise for more than 15 minutes during leisure time: strenuous (heart beats rapidly), moderate (not exhausting) and mild (minimal effort). These scores are multiplied by the corresponding metabolic equivalent of task (MET) value (9, 5 and 3 respectively) and then summed to produce a Leisure Score Index (LSI). Two of the sub-scales (moderate and strenuous exercise) are also used to categorise whether an individual is sufficiently active or not (Amireault & Godin, 2015). (See supplementary information for further detail on scoring).

### ***Brief Resilience Scale (BRS, Smith et al., 2008)***

This is a six-item questionnaire in which participants rate their agreement with statements (e.g. 'I tend to bounce back quickly after hard times'). The final score is used to categorise participants as 'low', 'normal' or 'high' in resilience (Smith et al., 2008). For the purposes of this study, resilience is treated as trait rather than state and therefore the measure was only administered once. There is some debate around whether resilience is stable or not (Windle, 2011), but it was felt that asking people to

remember retrospectively how resilient they were would be challenging (as compared, for example, to quantifying how much exercise they had done previously).

### ***Open-ended questions***

In order to explore further participants' challenges and behaviours around exercise during the pandemic, they were asked four additional open-ended questions:

1. How did your exercise change during National Lockdown 1?
2. What challenges did you face when trying to adapt your exercise routines during National Lockdown 1?
3. If you did face any challenges, how did you overcome them?
4. How has your exercise changed during National Lockdown 2 in England in November 2020?

### **Analysis**

Descriptive data to characterise LSI scores and changes were calculated. To examine changes in physical activity, a one-way repeated measures ANOVA was conducted with LSI as the outcome measure. Further repeated measures ANOVAs were conducted with the demographics outlined in Table 1 entered as between-subjects factors to establish whether any groups were more likely to increase or decrease their leisure time physical activity (LTPA) levels over time.

To assess whether resilience influenced the relationship between lockdowns and leisure time physical activity (LTPA), specifically whether there was an interaction between resilience and LTPA level, a repeated measures ANOVA was conducted with LSI as the outcome measure and resilience category (high, low or medium) as a between-subjects factor.

Thematic analysis was applied to all open-ended questions, following the 6-phase process by Braun and Clarke (Braun & Clarke, 2014). Additional content analysis was applied to the first and last of these questions (change in exercise in Lockdown 1 and 2) to gather information about changes in exercise type carried out over time. The data was coded by the first author (WW) and 10% of this was double coded by another author (SS) with 100% inter-rater reliability.

## **Results**

### **Descriptives**

Descriptive data indicated that LSIs increased slightly between pre-lockdown and Lockdown 1, with a decrease between Lockdown 1 and Lockdown 2. This was reflected in the Moderate-Strenuous LSIs which showed over 50% of the sample reporting 'sufficient activity' in pre-lockdown and Lockdown 1 and fewer than half reporting this in Lockdown 2.

**Table 2***Descriptive physical activity data*

	Pre-lockdown		Lockdown 1		Lockdown 2	
	M	SD	M	SD	M	SD
Leisure Score Index	37.4	22.33	38.31	26.29	33.89	22.66
	%	n	%	n	%	n
Sufficiently active	54.0	88	55.8	91	44.8	73

Table 3 shows how many people decreased, increased or had no change in their Leisure Score Index (LSI) between different time points.

**Table 3***Change in LSIs across timepoints*

	Pre-lockdown - Lockdown 1		Pre-lockdown - Lockdown 2		Lockdown 1 - Lockdown 2	
	n	%	n	%	n	%
Decrease	63	38.7	83	50.9	86	52.8
No change	26	16	22	13.5	25	15.3
Increase	74	45.4	58	35.6	52	31.9

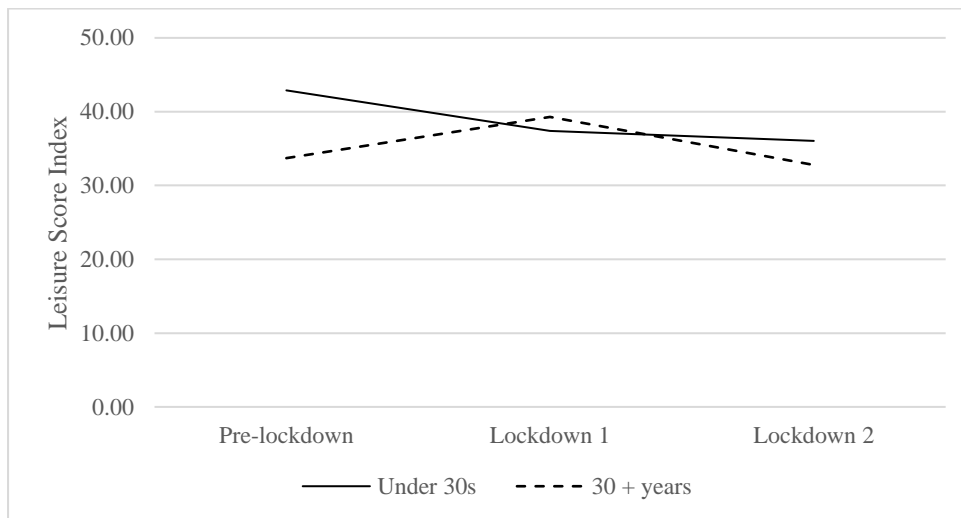
**Changes in physical activity**

A one-way repeated measures ANOVA indicated that there was no significant change on LSIs across time ( $F(2,324)=2.97$ ,  $p=0.053$ ). The p-value was close to significance and post-hoc tests indicated that the greatest change was a decrease in exercise between Lockdown 1 and Lockdown 2.

Further repeated measures ANOVA analyses indicated no between-groups differences on physical activity levels across time for any of gender, shielding status, working from home status or employment status ( $p>0.05$  in all cases). There was a significant interaction between age group ( $F(2,322)=3.91$ ,  $p=0.021$ ) such that individuals under 30 years of age had significantly higher LSIs ( $M=42.5$ ,  $SD=22.7$ ) than the rest of the sample ( $M=33.5$ ,  $SD=21.3$ ) pre-lockdown, but there was no significant difference in Lockdown 1 ( $M=37.4$ ,  $SD=25.3$ ,  $M=39.1$ ,  $SD=27.1$  respectively) or Lockdown 2 ( $M=35.5$ ,  $SD=23.3$ ,  $M=32.6$ ,  $SD=22.2$  respectively).

**Figure 1**

*Leisure Score Index (LSI) across time with age group as a between-groups factor*



One way repeated measures ANOVA analyses indicated that there was a significant interaction between resilience category and time for LSI ( $F(4,316)=2.806$ ,  $p=0.026$ ) but further Tukey post-hoc tests did not reveal any between category differences. Observation of the data indicated that this is likely because of the small number of participants in the 'high resilience' category ( $n=19$ ) and that any potential difference lay between the 'high resilience' group and the remainder of the sample, such that those with higher resilience increased their physical activity by the most in Lockdown 1 and maintained this difference in Lockdown 2, while other participants reduced their physical activity levels in Lockdown 2.

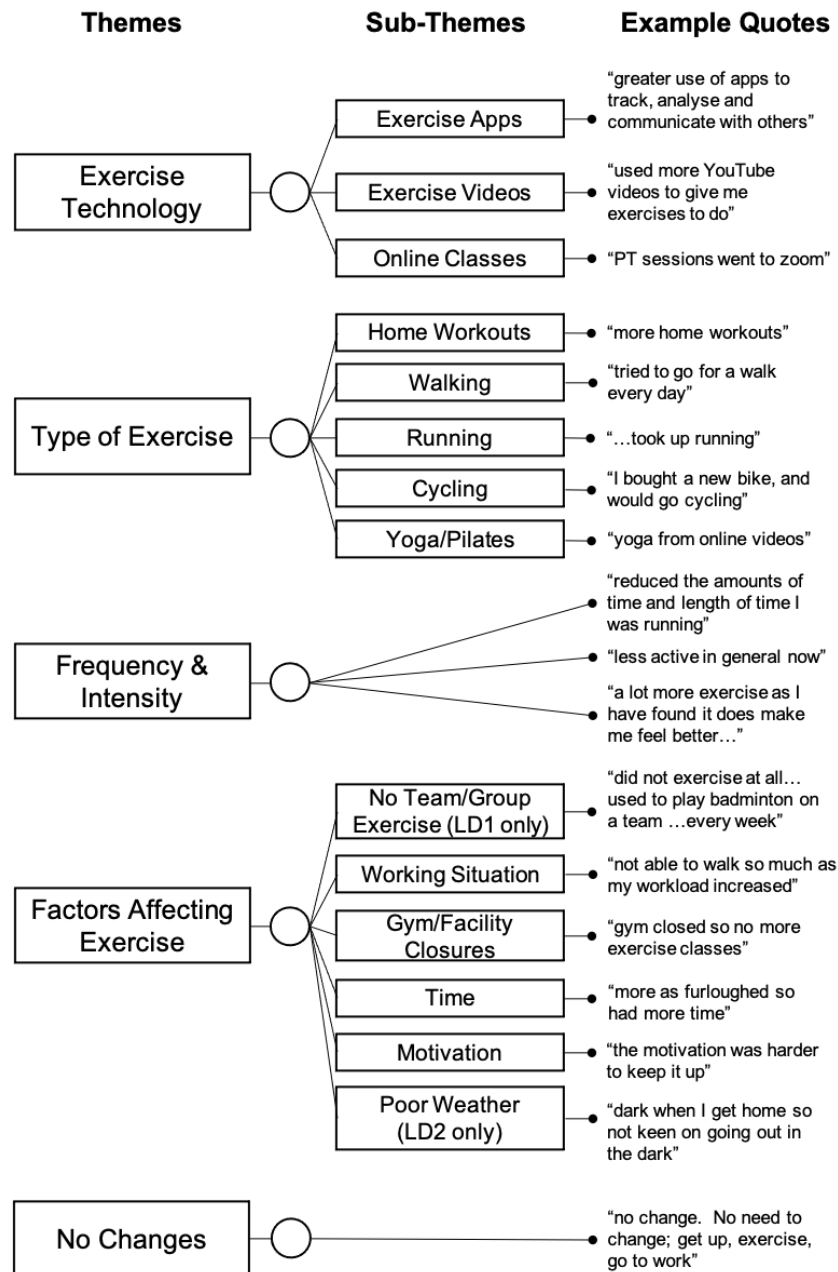
All 163 participants responded to the open-ended questions about changes in exercise during Lockdown 1 and Lockdown 2. These participants reported increases, decreases and no change to frequency and intensity of exercise for both time periods. Five key themes emerged from participants' responses to the first and last open-ended questions regarding change in exercise in Lockdown 1 and 2: A) 'Exercise Technology' (3 sub-themes); B) 'Type of Exercise' (5 sub-themes); C) 'Frequency and Intensity'; D) 'Factors Affecting Exercise' (6 sub-themes); and E) 'No Changes'. (See Figure 2). Participants reported greater use of technology to support their exercise (such as apps or online videos) alongside a change in the type of exercise they engaged in and the frequency/intensity of the exercise. A range of factors which affected participants' exercise were reported, such as gym closures and a lack of motivation. However, for some participants no changes to their exercise were reported during Lockdowns 1 and 2.

Conceptual content analysis indicated that exercise type predominantly centered on walking and home-workouts (including videos and online classes). Other exercises that participants mentioned

the most were running, cycling, yoga and pilates. All of these were mentioned more for Lockdown 1 than Lockdown 2. (See Figure 3).

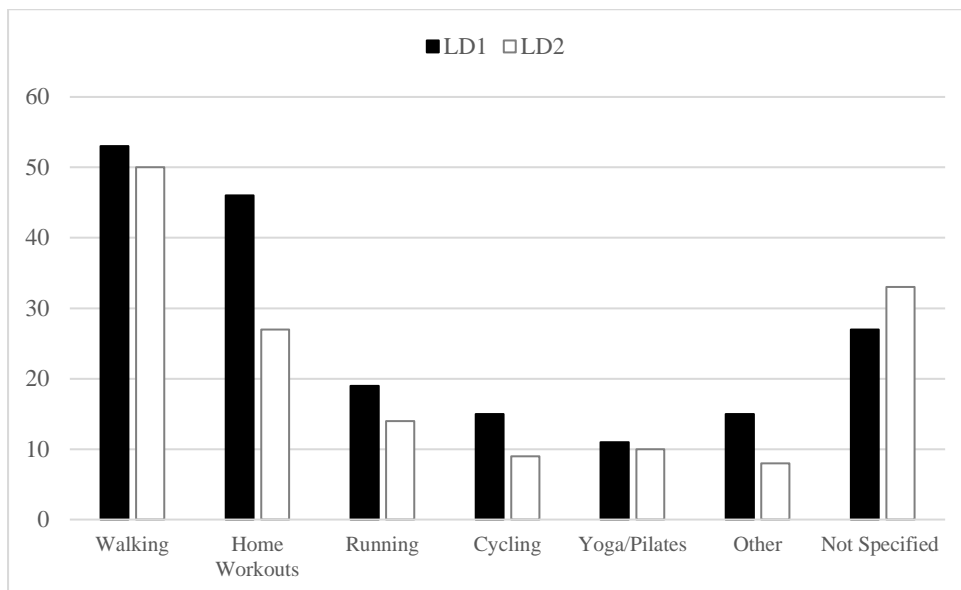
**Figure 2**

*Thematic map of participants' changes to exercise during Lockdowns 1 & 2.*



**Figure 3**

*Conceptual content analysis: frequency of types of exercise reported during both Lockdown 1 (LD1) and Lockdown 2 (LD 2)*

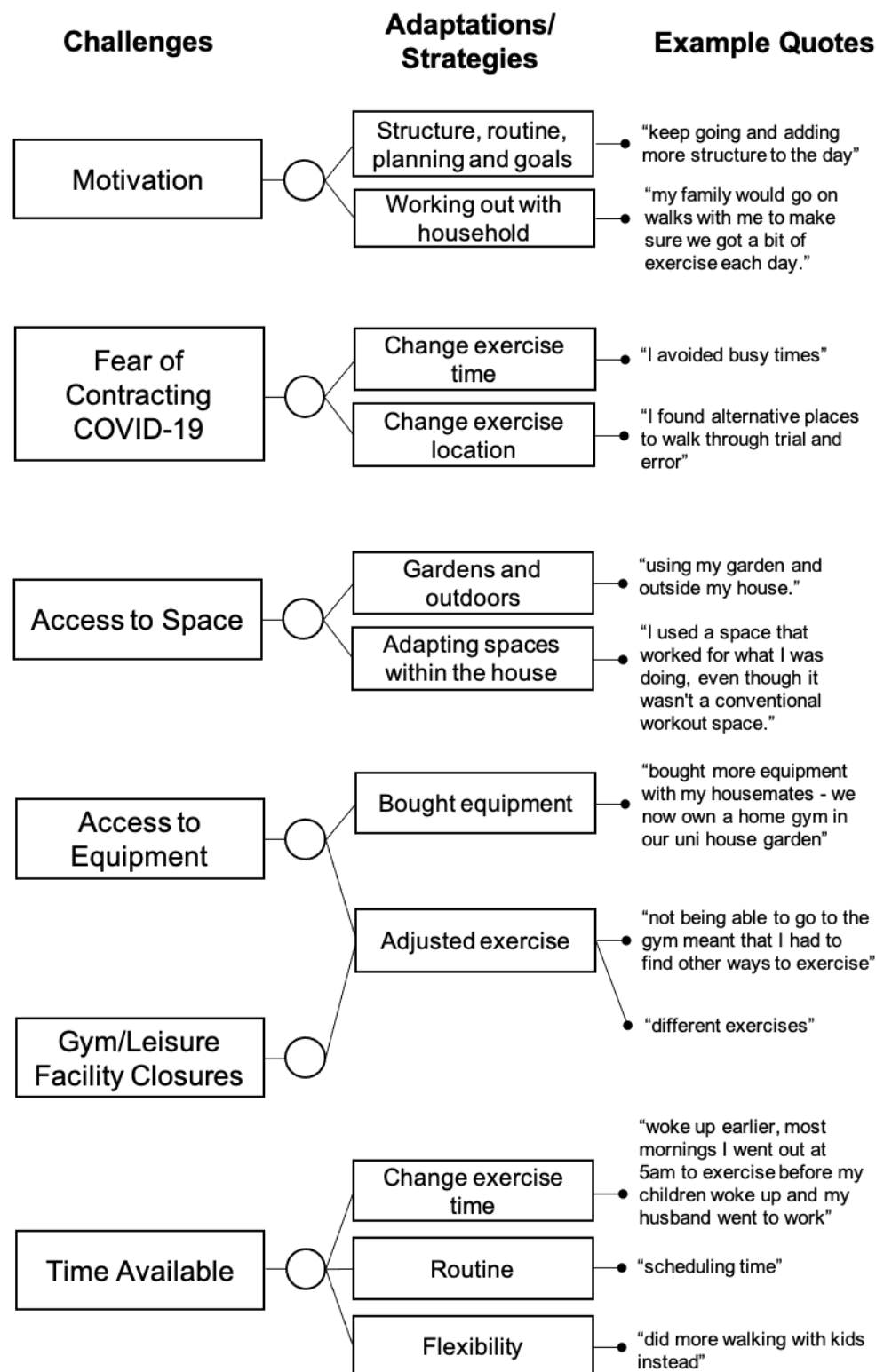


### **Challenges to exercise**

The challenges participants faced when attempting to adapt their exercise habits during Lockdown 1, and how they overcame these, are summarised in Figure 4. Six main challenges were identified: motivation; fears about contracting COVID-19 whilst exercising outdoors; access to space; access to exercise equipment (e.g. weights); gym/leisure facility closures; and time available to exercise. Eleven strategies/adaptations were identified from participants' responses to the second question 'How did you overcome these challenges?'.

**Figure 4**

*Thematic map of the challenges participants faced when adapting their exercise habits during lockdown*



**Discussion**

Overall, no significant changes in physical activity across three time periods, namely pre-lockdown, Lockdown 1 and Lockdown 2 were detected for the whole sample. There was, however, a trend towards a reduction in physical activity over time which reflects previous research (Stockwell et al., 2021). The study also identified specific groups who may be more likely to reduce their physical activity in lockdown; these included under-30s and people with lower resilience levels. An emerging body of research indicates that younger adults have struggled to maintain their health behaviours over the period of the pandemic (e.g. Jacob et al., 2021; Robinson et al., 2021; Snuggs & McGregor, 2021). An important question going forwards will be whether these difficulties remain in the longer term. If they do, implications for long term health difficulties in this groups could be serious, warranting specific new interventions. The qualitative data further identified that people working from home, reliant on external factors in their exercise (e.g. teammates or gyms) and/or under pandemic-related time pressure faced challenges to their ability to implement exercise.

Walking was most commonly cited as an exercise behaviour employed in lockdown, followed by home workouts. With this in mind, it is important to consider how the mental and physical health benefits of walking can be maximised. Murtagh (2015) suggested that to achieve a physical benefit from walking, individuals should do so at a brisk pace for at least 70-90 minutes per week. The current study did not measure duration of exercise behaviours. If people underestimate walking duration and intensity necessary to achieve health benefits, it may actually be detrimental to introduce walking as a permanent replacement for other activities. Data from activity trackers such as Fitbit (Fitbit, 2020) indicate that walking has declined globally since the beginning of the pandemic. Future research would benefit from combining self-report studies with this type of physiological verification.

### **Challenges to physical activity**

A variety of challenges to exercise behaviour were identified by participants. This is useful because it can help identify barriers in future lockdowns and for specific groups, such as individuals working from home. Broadly, challenges covered motivational difficulties, logistical issues (e.g. gym closures), restricted time and access to space. Even as restrictions ease, several of these factors are likely to remain. For example, many people continue to work from home and this will incur practical issues such as challenges to routine and reduced opportunity to incorporate exercise behaviour into commuting.

Strategies to overcome these challenges included attending online classes, using fitness apps and adapting spaces at home to facilitate exercise behaviour. Participants also reported working out with housemates to increase motivation and using outside space to exercise.

### **Implications for theory & practice**

Findings from this study have important implications for intervention development and public health messages. In line with research on other health behaviours, certain groups, in particular younger adults, have been identified as having struggled more to maintain physical activity than others. This can help inform intervention target audiences. Our findings around resilience need further investigation and could reveal a mechanism with which to help less active individuals; i.e. target improved resilience alongside increased activity. Further implications of our findings can be considered within the context of the COM-B model (Michie, Van Stralen & West, 2011); specific barriers to exercise behaviour for our sample included motivation and opportunity (i.e. access to appropriate space to exercise, time etc.). In the event of future lockdown or increased Covid-19 restrictions, these might be useful targets for intervention development.

The methods of addressing the identified challenges that participants used were overly reliant on technology. This presents an accessibility issue; given that individuals from lower socio-economic status are more likely to be overweight and less like to be sufficiently active (McLaren, 2007), relying on technology in the current environment to help increase physical activity levels will likely further exacerbate this health inequality. Indeed, only 50% of households with an annual income between £6-10,000 have access to the internet (ONS, 2019). Solutions to this problem could include broadcasting home workouts on free-to-access television and providing free access to exercise videos via mobile networks. It should be noted, however, that our sample was recruited online. This finding, may only be applicable to those who already have access to the internet and further research should address whether those with no (or limited) internet access have found different solutions to the challenges of physical activity in lockdown and if not, what alternative solutions might be feasible. Nevertheless, our participants proposed a number of innovative approaches to remaining active in lockdown and an upsurge of smartphone applications and streaming services aimed at physical health (Parker, Uddin, Rodgers, Brown, Veitch, Salmon et al., 2021) has been seen in recent months; for many people, these technological solutions will provide opportunity.

### **Strengths & limitations**

A principal limitation of this study, as with many studies of this kind, is that participants were asked to self-report retrospectively about two-time points, leaving responses vulnerable to inaccurate memory. On the other hand, a strength is that the data were all collected during a period of lockdown in England. Robustly psychometrically tested measures were used, so relative confidence can be held regarding the third time point data.

It is also difficult to make direct comparisons between 'Lockdown 1' and 'Lockdown 2' because of seasonal differences. This is highlighted by the finding that weather and daylight were only reported as a barrier to exercise behaviours in Lockdown 2. Nevertheless, weather and daylight conditions in

November compared to those of the early months of the year were similar in England in 2020. In this sense, the comparisons made between 'pre-lockdown' and 'Lockdown 2' are arguably more justified. Additionally, although participants were asked to indicate their pre-lockdown exercise levels, we did not specifically explore whether some participants had no scope to decrease their exercise from pre-lockdown (i.e. if they were not physically active in the first place). Although the study sample was large, some of the sub-groups were very small. Most notably, our 'high resilience' group only contained 19 people in a sample of 163, and the shielding group only comprised 15 participants. We were also unable to look at more specific older age groups because of the limited number of older adults in the sample. Furthermore, the sample was predominantly female. It is important to consider this study as exploratory; the data is not representative of the UK population, nor can it be considered generalizable to the UK population. Unfortunately, this also prevented more detailed analysis and future research should consider individuals who are shielding in particular as these people are likely to be particularly vulnerable.

It is also important to recognize the impact that recruitment methods may have had on the results. As participants were recruited online, this necessarily requires them to have internet access. As noted above, we cannot infer findings about members of the population who have limited or no internet access. Furthermore, this method of recruitment might create further unseen bias in terms of demographics, related to working environments and socio-economic status.

### **Conclusions**

This study has provided insight into the types of challenges to physical activity that individuals have experienced during recent lockdown periods as well as strategies employed to address these challenges. Accessibility difficulties and decreased motivation were frequently mentioned. Adjustments to routine and online exercise options were often employed to overcome these difficulties. Some groups seem particularly likely to reduce their pre-Covid level of exercise behaviour, in particular, younger adults. Even in the absence of lockdown, it is likely some of these challenges will remain present for some time. There may be an over-reliance on technology to address barriers and future research should explore interventions to support individuals who find it difficult to maintain physical activity due to pandemic-related reasons. Ongoing research in this area is essential to establish whether exercise behaviours have decreased for some groups in the longer term to ensure that long-term health implications (e.g. cardiovascular, respiratory and endocrine conditions) of such a reduction can be addressed.

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