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Home-based exercise for adults with overweight or obesity: A rapid review

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ABSTRACT

The COVID-19 pandemic has impacted the ability of people globally to consistently engage in their typical physical activity and exercise behaviour, contributing to the rising number of people living with overweight and obesity. The imposed government lockdowns and quarantine periods saw an increase in social media influencers delivering their own home-based exercise programmes, but these are unlikely to be an evidence-based, efficacious, long-term solution to tackle sedentary behaviour and increase physical activity.

This rapid review aims to conceptualise home-based exercise and physical activity programmes, by extracting relevant programme characteristics regarding the availability of evidence and effectiveness of home-based exercise programmes. Fifteen studies met the inclusion criteria, of which there were varied reports of significant positive effects of the exercise programme on weight management and related outcomes. The two most common measures were Body Mass Index and body mass, as of which almost all reported a trend of post intervention reduction. Some programmes reported qualitative data, identifying barriers to physical activity and preferred programme components, highlighting a need to consider factors outside of physiological measures.

The findings provide guidance and direction for the development of future home-based physical activity and exercise programmes for adults living with overweight and obesity.

1. Introduction

The most recent published global data states that the rising number of individuals living with overweight and obesity was estimated at 1.9 billion in 2016 [1], highlighting the need for continued preventative strategies, such as increasing physical activity and reducing sedentary behaviour as part of a comprehensive weight management strategy. The World Health Organisation recently updated its Physical Activity Guidelines [2], to increase awareness of the benefits of an active lifestyle in contributing towards controlling the rising prevalence of overweight and obesity [1]. However, at the time of writing and as a result of restrictions and imposed isolation due to COVID-19, the means by which individuals can meet the physical activity guidelines are significantly limited [3].

Enforced restrictions have significantly impacted the lives of individuals around the world. Community fitness opportunities have been reduced [4], energy expenditure has decreased as a result of reduced physical activity [5], and energy intake has increased through additional snacking and stress eating [6], contributing to the rising prevalence of people living with excess weight. Notwithstanding, if individuals living with overweight and obesity were to contract COVID-19, they have been found to be at an increased risk of hospitalisation, a need for more advance treatment and mortality [7]. Individuals living with overweight and obesity have been identified as being at a higher risk of experiencing adverse health outcomes if they were to contract COVID-19 [7].

Increasing physical activity and reducing sedentary behaviour has been proven as an effective lifestyle behaviour-related weight management strategy [8]. Physiologically, an active lifestyle contributes towards the prevention, management and reversal of overweight and obesity and related comorbidities, such as hypertension [9], type 2 diabetes [10] and cardiovascular disease [11] as well as improving psychological wellbeing [12], irrespective of reductions in body mass. Despite this, within the UK specifically only 70% of men and 65% of women with excess weight were reported to be meeting the UK Chief Medical Officers guidelines between 2018 and 2019 [13], and globally there has not been significant improvement in physical activity behaviour since 2001 [14]. Throughout both of these time periods, access to fitness and leisure opportunities were not restricted and of further

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concern, the published data is likely to be inflated due to self-report methods prone to over reporting the true volume of physical activity undertaken. Regardless, the opportunities and resources are currently significantly limited [3], making achieving the physical activity guidelines more challenging, which has been reflected in physical activity behaviour data collected during the pandemic [3].

As a morale boost to society, the first lockdown period within England (commenced in March 2020) saw an increase in people with large public followings promoting and delivering exercise programmes [15]. One example of this saw the rise of 'PE with Joe' as Joe Wicks used his platform to motivate and engage children and young people to keep active. Whilst this example in particular was nationally well received, there have been incidences in which self-proclaimed fitness gurus without the appropriate knowledge or expertise, were promoting and delivering sessions via their online platforms. Whilst this may encourage positive behaviour change in the short term, such as during imposed restrictions, it is not a sustainable, evidence-based solution tailored to specific population groups.

The social environment created through group exercise can impact on engagement, commitment and enjoyment for participants [16], and the support and sense of groupness enables people to maximise their exertion and enjoyment [17]. Individuals have always been free to tailor their exercise to their preferences and goals until restrictions due to COVID-19 constrained physical activity to once per day, and limited the number of people an individual could exercise with. Since community based, group exercise classes were prohibited, virtual sessions were instead delivered through online platforms to be undertaken in the home setting. As a result, accessibility, engagement and social opportunities decreased, just as they were experiencing a high period of growth [18]. This reduction has led to a decline in physical activity behaviour [3,19], and subsequently a predicted decline in physiological and psychological health across a large proportion of the population, that will be prevalent in future national and global health surveys.

As restrictions have continued, the aim of these home-based programmes have primarily been to benefit overall health, providing individuals with the opportunity to remain active in their own environment, unaffected by seasonal variations, on a flexible schedule, with increased accessibility and reduced cost. Specifically for those living with overweight and obesity, an opportunity to be active in an arguably more comfortable environment than a gym or leisure facility [20].

Overweight and obesity is reversible through a positive change in lifestyle to increase physical activity and reduce sedentary behaviour, which a home-based exercise programme can provide. Evidence regarding the general effectiveness and development of home-based exercise programmes, specifically for adults with overweight and obesity, is of limited availability. A rapid review of the research area is needed to begin developing a comprehensive understanding that will contribute towards establishing guidelines for building and implementing effective, evidence-based home exercise programmes for people with overweight and obesity. Considering the current climate, home-based exercise may be the only option for an extended period of time, and could eventually become a preferred alternative due to increased accessibility and adaptability, as well as reduced cost.

This rapid review aims to address this gap and will conceptualise and analyse programmes to understand the availability of evidence and effectiveness of home-based exercise programmes for adults living with overweight and obesity.

2. Materials and methods

The rapid review received ethical approval, granted from Coventry University Ethics Committee (project number P121974). Our intention to conduct a rapid review was submitted to PROSPERO on 8th February 2021 and approved on 17th February 2021.

For the purpose of this review and in the absence of a clear, consistent scientific definition within the existing literature, a home-based exercise programme will be defined as 'any form of exercise, undertaken in or within the immediate vicinity of the home, including the yard, garden, driveway and garage' proposed by a recent commentary regarding the accuracy of defining home-based exercise programmes [21].

2.1. Inclusion and exclusion criteria

As demonstrated within Table 1, included studies reported on home-based exercise programmes in adults and older adults, (aged ≥19 years, as classified by the UK the Chief Medical Officers Physical Activity Guidelines) living with overweight or obesity (Body Mass Index ≥25 kg/m^2). Participants must have been exposed to a home-based exercise programme, as defined above, that may be independent or include combinations of aerobic exercise, muscle strengthening exercises, balance exercises and flexibility exercises. The study must have also been published within the last ten years and there were no restrictions on study design.

Excluded studies were those that reported programmes delivered within a community or clinical setting, away from the vicinity of the home. Programmes that were part of a multi-component intervention, in which the effects of the exercise intervention could not be isolated were excluded. Publications not available in English and exercise prescribed solely for rehabilitative purposes were also excluded.

2.2. Search strategy and data extraction

In consultation with an expert information scientist, MEDLINE, SPORTDiscus, CINAHL and AMED databases were selected and searched for studies published between January 2011 and January 2021. PROSPERO and COCHRANE library were also searched to ensure that any similar reviews were not underway or had already been published, which is accurate to the authors knowledge at the time of writing. The initial search was conducted in February 2021 and repeated before manuscript submission in September 2021. No additional studies were included following the most recent search.

Primary search terms and Boolean operators were discussed and applied across all searches and databases. The search terms detailed key phrases relevant to the research area: 'home-based exercise', 'home-based training', 'home-based fitness', 'home-based physical activity', 'home-based activity' AND/OR 'home exercise', 'home training', 'home fitness', 'home physical activity', 'home activity' AND 'overweight','-obesity', 'obese', 'weight status'. Following the first application of search filters, the remaining articles were exported to an Excel document to allow for titles and abstracts to be independently screened by two members of the research team. A traffic light system was implemented by each member to categorise articles as: meeting the inclusion criteria (green), more information needed before a decision could be made (amber), or exclusion from the review (red). Discussion took place between the two review team members to ensure continuity and mutual agreement on included and excluded papers. Articles needing more clarity were read before a decision on inclusion or exclusion was made. In the case of any disagreements unresolvable by discussion, a third reviewer on the research team was contacted for mediation in order to reach a consensus. Reviews primary sources were also checked for potential manuscripts to be included. The search filtering process is detailed in Fig. 1.

Table 1
PICOS strategy for including and extracting programme data [22].

Population	Adults aged ≥ 19 years
Intervention	Home-based exercise programme
Comparison	Usual care control
Outcomes	Change in adiposity, physical activity behaviour and self-efficacy
Study Design	No restriction

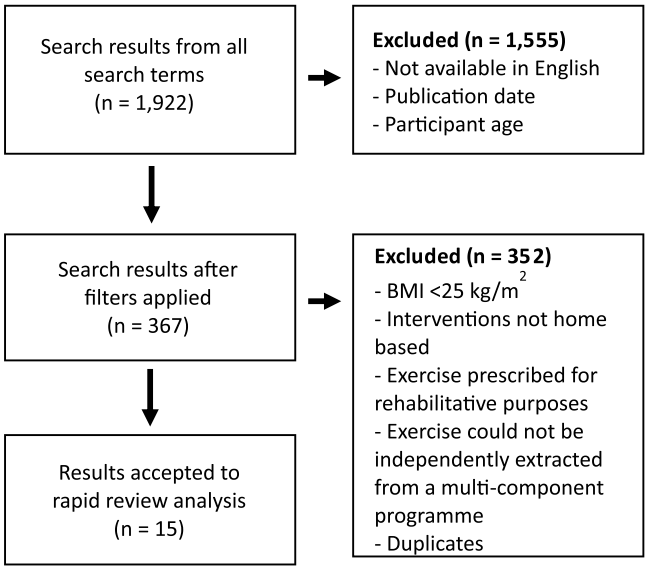

Fig. 1. Search filtering with exclusion criteria.

All articles deemed to meet the inclusion criteria were read in full and key relevant outcome data was extracted and recorded for comparison between the 15 studies. Extracted data included the programme aim and participant demographics, exercise programme characteristics such as exercise frequency, intensity, and type. Progress measuring tools such as BMI and body mass and the resulting outcomes of each programme were recorded along with suggested directions for future research. Any discrepancies or queries regarding the data resulted in the corresponding author being contacted for clarification.

Inferential statistical data analysis has not been conducted, however, from the results provided comparisons have been made regarding programme characteristics, population demographics and effectiveness using the measures provided within each individual study.

3. Results

Fifteen studies met the full inclusion criteria for this rapid review. Within each of the accepted articles, the programme characteristics varied in regards to exercise type, progress measures used and specific population characteristics, additional to living with overweight and obesity. Different findings from one intervention study were presented in multiple publications that were included [23,24] but for the purposes of calculating total participant number and means for demographic data, these were only counted once. Table 2 shows an overview of the 15 studies accepted for interpretation in the rapid review, with a selection of notable information that was extracted during the data screening process.

In regard to general demographics, across all 15 programmes, there was an overall higher number of female participants (n = 972) than

Table 2
Summary of extracted data from the 15 studies included within the rapid review.

Study and Reference No.	Aim	Age and Sex	Country	Programme Characteristics	Outcomes
Besnier et al., 2015. [28]	To compare the effectiveness of three training programmes on reducing fat mass in people living with overweight and obesity.	136 participants:136 female.20–40 years.	Réunion Island	Primarily aerobic, of participant's choice.	All groups showed significant reductions in fat mass without inter group differences. At home programme showed reductions in BMI and body weight. All groups showed reductions in insulin levels.
Blackford et al., 2016. [31]	To evaluate the effectiveness of an intervention to improve metabolic parameters and cardiovascular risk factors in participants at risk of metabolic syndrome.	401 participants:195 male, 206 female.50–69 years.	Australia	Provision of printed and online materials adapted from guidelines.	Many improvements within the intervention group including body weight, BMI, blood pressure, body fat and waist circumference.
Capodaglio et al., 2011. [25]	Evaluate effectiveness of mixed exercise programme on adults with Prader Willi syndrome.	31 participants:Sex not specified.No age range provided, mean age of 34.0 years.	Italy	Resistance:Choice of four exercises.	Non-significant change in BMI in intervention group and non-significant changes in postural assessment.
Chen et al., 2015. [43]	Investigate home-based exercise self-efficacy, compliance and effectiveness on participants with and without Metabolic Syndrome.	110 participants:42 male, 68 female.No age range provided, mean age of 48.6 years.	Taiwan	Aerobic:Stepping and cardio-dance.	Significant reduction in BMI regardless of Metabolic Syndrome status. Those without MetS performed greater volume of exercise during the intervention. Correlation of baseline exercise self-efficacy and at home exercise volume.
Dash et al., 2018[a]. [24]	Investigate the effect of a 6 month random exercise controlled trial on metabolically unhealthy African American women living with obesity.	213 participants:213 female.45–65 years.	USA	Aerobic:Walking or slow jogging.	Significant decrease in proportion of women with Metabolic Syndrome in supervised and home-based groups. Improvement in Metabolic Syndrome profile in comparison to the control arm, identified by changes in serum HDL and triglycerides in home-based group.
Fukuoka et al., 2015. [35]	Investigate feasibility and efficacy of a diabetes prevention intervention for adults with overweight and at risk for Type 2 Diabetes.	61 participants:14 male, 47 female.No age range provided, mean age of 55.0 years.	USA	Aerobic and mobile phone application:Walking with pedometer.	Significant reductions in intervention weight in comparison to a control group weight gain. Intervention showed reductions in hip circumference and blood pressure. Also, steps per day increased whereas control group steps decreased.
Gary et al., 2011. [36]	Randomised control study to investigate a combined programme on physical activities of daily living in heart failure patients.	24 participants:12 male, 12 female.40–75 years.	USA	Combined aerobic and resistance:Walking and resistance bands.	Exercise group showed increased weight carried and muscle strength. Specific task activities were also performed more rapidly.

(*continued on next page*)

Table 2 (*continued*)

Study and Reference No.	Aim	Age and Sex	Country	Programme Characteristics	Outcomes
Höchsmann et al., 2019. [40]	Investigating if a smartphone game can increase daily physical activity in people living with overweight and type 2 diabetes.	36 participants:19 male, 17 female.45–70 years.	Switzerland	Multidimensional smartphone game:Aerobic, resistance and flexibility.	Increases in daily physical activity for both groups, with a higher increase in the intervention group as well as improved aerobic capacity. Both groups also showed weight loss, greater reduction the intervention group.
Holtz et al., 2014. [34]	Randomised crossover trial to investigate low-cost, home-based diet and exercise intervention in veterans.	26 participants:17 male, 9 female.No age range provided, mean age of 37.0 years.	USA	Three arm intervention: 1. Social support,2. Objective monitoring, 3. Structured high intensity.	Significant weight loss in two of the interventions but weight loss across all. Five overall themes identified concerning social support, objective monitoring, structured activity, awareness and understanding and point-of-decision prompts.
Labrunée et al., 2012. [45]	Investigate the impact of a home-based programme in obese type 2 diabetics and barriers to physical activity engagement.	23 participants:10 male, 13 female.40–70 years.	France	Aerobic:At home cycle ergometer.	Non-significant decrease in body weight and BMI. Significant improvement in max power and quadricep strength. Main barriers identified: low exercise capacity, pain association, reduced motivation and poor tolerance to effort.
Mama et al., 2015. [29]	Investigating a home-based intervention on Social Cognitive Theory, physical activity and sedentary time in Hispanic breast cancer survivors.	89 participants:89 female. No age range provided, mean age of 59.0 years.	USA	Multidimensional: Aerobic, strength and flexibility.	Reported significant increases in physical activity from baseline to follow up, as well as exercise self-efficacy. Social modelling increases correlated with increased moderate and total physical activity time and decreased sedentary time.
Pekmezi et al., 2017. [26]	Investigating the feasibility of a home-based tailored physical activity print programme for African American women living with overweight or obesity.	84 participants:84 female.50–69 years.	USA	Mailing of strategies for increasing physical activity behaviour.	No significant changes in anthropometrics or other fitness related measures. Increase in self report moderate-vigorous physical activity. Cognitive processes, self-efficacy, outcome expectations and family support for physical activity improved slightly for intervention participants and decreased in the control group.
Sasso and Backus, 2013. [27]	Case study investigating a home-based circuit resistance training with spinal cord injury.	44 year old male.	USA	Aerobic and resistance: Circuit resistance training.	The participant lost weight, improved cardiovascular fitness and upper extremity strength increased.
Scott et al., 2019. [39]	Investigating virtual home-based High-intensity Interval Training in people with obesity and increased cardiovascular disease risk.	32 participants:13 male, 19 female. No age range provided, mean age of 36.0 years.	England	Aerobic and resistance: High-intensity Interval Training.	Effective in reducing BMI, body mass, body fat% and visceral fat mass, although this reduction was also present in the other non-home-based interventions.
Taylor et al., 2018[a]. [23]	Investigate the effect of a 6 month random exercise controlled trial on metabolically unhealthy African American women living with obesity.	213 participants: 213 female. 45–65 years.	USA	Aerobic: Walking or slow jogging.	No significant differences in Health Related Quality of Life between all groups. Baseline characteristics were combined with the supervised exercise group and therefore cannot be commented upon.
Watson et al., 2012. [33]	Investigate the use of a virtual coach to increase activity levels in people with overweight and obesity.	70 participants:11 male, 59 female. 20–55 years.	USA	Aerobic and access to virtual coach: Walking.	Step count maintained in intervention group and decreased in control but the difference from baseline to end was not significant. There was a significant difference between intervention and control at all time points.

[a] Represents the inclusion of two published papers regarding the same study, as for which reported separate measures.

male (n = 334). Only one study did not specify the sex split of all the participants [25] and therefore this only applies to 14 out of the 15 programmes included within the review. In total, 542 participants were assigned to a home-based exercise programme of some design, with an average age of 49 years.

4. Discussion

Over the last ten years, there has been a limited number of studies published on home-based exercise programmes specifically for adults living with overweight or obesity. Those available have measured various health outcomes in order to determine the effectiveness of the programme. Whilst this rapid review focussed primarily on those weight related measures, (as identified in Table 2) there were studies that focussed less on the physiological impact of home-based programmes and more on identifying the impact on self-efficacy and social support, which may go on to influence weight related measures in the long term.

4.1. Demographics

Within each individual study that recruited both males and females, there was a similar sample size for each sex. The overall sex difference is as a result of the inclusion of multiple single sex studies in that studies [23,24,26–29] that included only females, which is typical of weight management interventions [30].

All participants were adults aged ≥ 19 years with participant numbers ranging from a single participant case study [27] to a larger trial with 400 participants [31]. Within each individual study, the

included age ranges varied, some studies reported ranges of 30 years between participants and others reported 19 years. The average age of participants assigned to the intervention groups across all 15 studies was 49 years, agreeable to the adult population group and considered 'middle aged' by falling between 40 and 60 years [32]. There is a link between rising age and prevalence of overweight and obesity [13] therefore making it more likely that middle and older age adults would undertake home-based exercise programmes as part of a weight management strategy. This sub population group of older adults (outside of living with overweight and obesity) has already been identified as being at a higher health risk. There is an increased volume of research already conducted into this population group as well as the provision of physical activity guidelines specific to older adults. This may arguably be due to the presence of non-reversible health conditions, contrary to living with overweight and obesity. However, this review shows that home-based exercise programmes for more middle age adults do exist, but in comparison to other population groups, it identifies a need for these programmes to be further developed.

We present data from studies conducted globally, although 8 out of the 15 included programmes were conducted within different states within the United States of America [23,26,27,29,33–36]. One reason may be the increasing number of people living with obesity across the USA [37], increasing the demand for weight management interventions. In particular, those studies that took place in Alabama and Michigan are states where more than 35% of the adults are living with overweight and obesity [38], highlighting a rationale and the need for home-based programmes in these states. At the time of writing, USA has the highest total number of cases and deaths from COVID-19, identifying another country, additional to the UK, with adults living with overweight and obesity that could significantly benefit from a home-based exercise programme to help manage the long term effects of the pandemic.

All studies reported participants to have or be at an increased risk of comorbidities additional to living with overweight or obesity. There were a variety of comorbidities and other health conditions present in some but not consistent across all studies, meaning potential comparison across the studies is more difficult due to varying effects of different health conditions, aside from living with overweight and obesity, that may have impacted the effectiveness of the home-based programme. For example, Prader Willi syndrome [25] or heart failure [36] were identified as a population focus, as of which specific considerations and adaptations would need to be made to accommodate accordingly. These studies were not excluded solely because of the presence of other health conditions in addition to living with overweight and obesity, warranting the tailoring of more specific home-based exercise programmes for people with other health needs.

4.2. Programme characteristics

4.2.1. Programme durations

Programme durations ranged from 12 weeks to [27,33,34,36,39] 6 months, [23–26,40] prompting consideration for the design of future home-based exercise programmes. For some of the studies that showed no effect, this may be due to a shortened programme duration not allowing enough time for any potential effects to occur. However, one of the longer six month programmes was the only study that reported an increase in BMI [26], although not significant. Of the shortest programmes, all the anthropometric measures showed at least a trend for decrease, across all of the measures. Therefore suggesting that programme duration does not necessarily need to be as long as 6 months to show a beneficial effect as a weight management tool.

For the longer duration programmes (often four months or longer), there is an increased risk for reduced adherence and boredom as they may not be as engaging despite the implementation of progress monitoring measures and programme adaptations. This prompts the need to design a home-based exercise programme that is long enough to stimulate positive health changes without resulting in the participants losing interest or motivation to engage fully. This also highlights whether adherence or assigning appropriate effect time would be an important factor to consider when measuring effectiveness of home-based programmes. One way in which to target this potential decreased adherence or risk of monotony may be the introduction of co-designed interventions with participants.

4.2.2. Programme designs

Of the 15 programmes meeting the inclusion criteria, none of them specified the design process of the intervention, specifically whether there was an element of co-designing present. One programme specified the inclusion of goal setting by participants which was guided by members of the research team, but the decision to include goal setting as a part of the intervention was made by the research team not by the participants themselves. Pre-designed and established programmes available within the public domain were used within the home-based interventions. However, these programmes whilst they may be effective, are arguably not population specific, and some may even be deemed inappropriate or even unsafe to this population group. For example, the use of the intense Power 90 Extreme (P90x) programme in adults living with overweight and obesity [34]. This further highlights the need for population specific tailored physical activity, not only for maximising effectiveness but also for participant safety and to meet specific population groups needs [41]. If participants are able to contribute and have an impact on the design of an intervention, specifically targeted towards their population group, they are more likely to engage and have higher adherence.

4.2.3. Overall programme type

The type of exercise prescribed as part of the home-based programmes varied significantly between the studies. Whilst all the programmes were labelled as home-based, arguably accurately or inaccurately, there were variations in the presence of programming domains. Some studies used the Frequency Intensity Type and Time (FITT) principle whereas others replaced these programming tools with materials easily accessed within the public domain [26,31] such as the World Health Organisation physical activity guidelines. This may suggest that participants in studies that received a FITT principle programme, may have received a programme more specifically tailored to their needs as of which would impact engagement and potentially effectiveness.

For the programmes that used the FITT principle, the specific details reported varied significantly between studies, prompting the need for more consistent reporting, potentially with the use of reporting guidelines or templates such as the Consensus for Exercise Reporting Template [42]. However, there is a clear discrepancy regarding what constitutes a home-based exercise programme, which became apparent during screening, prompting the need for further consideration.

Of the 13 studies that primarily detailed at least one element of the FITT principle to design and implement the home-based exercise programmes, 12 of these reported the primary mode of physical activity to be aerobic or to include an aerobic element such as static cycling and walking (as shown in Table 2). However, it would be inaccurate to comment that an aerobic component was essential for a programme to be effective as a weight management tool specifically within this review, because of the presence of multiple other variables. This is not to say that aerobically based programmes are not effective, just that they may not be instrumental to the success of a home-based programme and not all of these 12 programmes reported a significant effect in their progress measures.

Of the programmes that included a resistance training component [25,27,29,34,36,39,40] either solely or as part of a multicomponent programme, there were discrepancies in programme effectiveness, so again it would be inaccurate to suggest that the inclusion of resistance exercises are solely responsible for the effectiveness of a programme on weight management. Some of the studies that utilised resistance

exercises did report a weight loss or reduction in BMI, however, the study that was comprised solely of resistance exercises [25] did not report a significant reduction in body mass. This suggests a combination of exercise modes would prove to be more effective for weight reduction. Whilst solely resistance exercise may not have as a profound effect on direct weight management outcomes, it could still influence other outcomes such as enjoyment and adherence to programmes.

Only two studies [29,40] specifically mentioned the prescription of a home-based exercise programme that focussed on or included a flexibility component. This mode of exercise is not the primary type purposed for weight management however, it is stated within the physical activity guidelines as a focus, particularly for older adults of which the population age range for these two studies would be considered at the older age of the adult classification.

The limited number of programmes that implemented a flexibility or resistance training component may be due to the additional considerations necessary to ensure safety with reduced supervision when undertaking arguably more complex and specialist modes of exercise at home. Whilst the research and knowledge from the designer of the home-based programme would aim to ensure it was safe, the notion of the programme being 'home-based' significantly reduces the possibility for face to face supervision in comparison to programmes that are undertaken as part of a class or within a clinical or community setting. Therefore, the risk of injury or extenuating circumstances that may result from improper technique would be significantly higher, particularly with this population group that are at a higher health risk due to overweight and obesity and related comorbidities.

Resistance based programmes undertaken within the home environment often rely on more specialist equipment and specific knowledge (from both the programme designer and participant) to be undertaken effectively and safely. It is speculated that aerobic exercise is easier for individuals to undertake in their own home-based environment due to more general knowledge and understanding of this mode of exercise in comparison to resistance or flexibility exercises. In an effort to tackle this discrepancy, some studies did include information and demonstration sessions as part of the programme, in an effort to increase the safety, confidence and treatment fidelity. However, by making this information and demonstration session a regular occurrence, it would change the programme from being purely home-based and open it to external social variables that may influence the effectiveness and engagement within the exercise programme.

Two papers solely provided guidelines as their home-based exercise programme, six studies reported a single mode home-based programme and seven studies reported multi-component home-based programmes. However, within the multimodal section, the seven programmes prescribed different combinations of exercise types, there was not a consistent combination of aerobic, resistance and/or flexibility exercises across the seven. The type of training prescribed as part of the home-based programmes may also have an impact on exercise enjoyment and adherence as different people have varying preferences when it comes to the type of exercise that they wish to engage in. However, with all the exercise or physical activity needing to be home-based, there isn't the biggest scope for variation, specifically regarding the location of an exercise programme. For example, being limited to a true definition of home-based, this factor itself will vary between people. Those without access to a garden may find it more difficult physically and psychologically to undertake exercise at home due to a lack of space suitable for their exercise preferences. Time may also be a factor to consider in the type of exercise programme undertaken. Those with other responsibilities such as childcare or household duties may not be able to prioritise engaging in physical activity because other activities have to take priority.

In regards to level of supervision, because these programmes were home-based the level of in person supervision would have been very minimal if even present at all. None of the programmes included within this rapid review were described as being fully supervised, arguably because the home environment makes this more difficult. A select number of studies did include a virtual platform or provided adherence monitoring materials, such as diaries, which may be described as a minimal level of supervision however, it would not replace the presence of a professional supervising individuals that are undertaking the programme in real time.

4.2.4. BMI

Nine studies used BMI to ascertain changes in weight status. Whilst the use of BMI as a weight classification tool is continually debated, specifically for use with the general population group, BMI as an indicator of general health would be considered acceptable. The measure is more accessible and understood, as of which is important for individuals to engage and adhere to exercise programmes as a result of an ability to recognise and understand the health benefits of undertaking a home-based exercise programme.

With reference to Table 3, four of these studies [31,35,39,43] reported a significant decrease in BMI over the intervention period. All but one of the studies reported a decrease in this measure, but not all were deemed significant reductions. Of the study that did report an increase [26] this was only an increase of 0.02 kg/m^2 over the 6 month period, and the home-based programme consisted of mailing out materials already available in the public domain rather than following a FITT principle for intervention prescription.

4.2.5. Body mass

In regards to body mass, this was the second most popular progress measure used with eight studies reporting the use of this tool for programme effectiveness. Across all of these eight, body mass (kg) readings were shown to have decreased on average, although as similar to BMI, not all the reductions in mass were significant. With reference to Table 3, of the eight studies that reported this progress measure, only two reported the requirement of participants to fast overnight before this measure was taken. The recording and reporting of this measure in a population group of adults living with overweight and obesity should be more consistent and provides direction for future inclusion of these measures in other programmes. Overall, this measure does however suggest that home-based exercise programmes are effective as a weight loss tool for adults living with overweight and obesity.

4.2.6. Waist circumference

Three studies recorded and reported measures of waist circumference pre and post intervention. With reference to Table 3, only one of the studies reported a significant decrease in waist circumference [31] as a result of the home-based programme, with one study reporting a very small increase, as of which may be attributed to other contributing variables, in this case it was the presence of absence of family history of cancer. Reporting of this measure by the three studies was detailed precisely, and these results provide a basis for the use of this progress measure for the effectiveness for adults living with overweight and obesity in future home-based programme studies.

4.2.7. Body fat percentage

Four studies reported changes in body fat percentage over the duration of the programme, all of which were decreases and three studies reported these as being significant. Whilst this measure may not be considered as accessible as BMI or body weight, it may be a more accurate way to measure body composition changes that are more representative of the true effect of an exercise programme on weight reduction. Three of the studies reporting this measure detailed how the method: two used DXA and the remainder used bioelectrical impedance analysis, providing two potential methods that could be used in future home-based programmes for measuring programme effectiveness.

4.2.8. Visceral fat mass

Only one study reported visceral fat mass [39], but the method was

Table 3
Summary of extracted anthropometric data from the 15 studies included within the rapid review.

Study and reference no.	Body mass index (kg/m^2)			Body mass (kg unless otherwise stated)			Waist Circumference (cm)			Body fat (%)		
	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change
Besnier et al., 2015 [28]	33.0 ± 3.3	31.6	-1.4 (CI −2 to −0.9)	86.1 ± 11.5	82.6	-3.5(CI −5.0 to −2.1)				46.7 ± 3.6	44.0	-2.7(CI −3.6 to −1.8)
Blackford et al., 2016 [31]	29.55 ± 6.93	29.35 ± 7.00	-0.20[a]	85.20 ± 22.60	84.50 ± 23.70	-0.70[a]	102.67 ± 13.58	100.56 ± 13.84	-2.11[a]	40.20 ± 11.70	38.70 ± 11.35	-1.50[a]
Capodaglio et al., 2011 [25]	43.04 ± 7.43	42.57 ± 4.92	-0.47									
Chen et al., 2015 (MetS) [43]	30.2 ± 1.2	29.5 ± 1.3	-0.7[a]				91.8 ± 2.3	90.0 ± 2.7	-1.8			
Dash et al., 2018[b] (No family history) [24]							108.08 ± 12.23	108.37	+ 0.29 ± 1.35			
Dash et al., 2018[b] (Family history) [24]							111.66 ± 14.25	110.2	-1.46 ± 1.41			
Fukuoka et al., 2015 [35]	32.2 ± 5.6	30.0	-2.2 ± 2.2[a]	86.2 ± 18.5	80.0	-6.2 ± 5.9[a]						
Gary et al., 2011 [36]												
Höchsmann et al., 2019 [40]										39 (IQR 35–43)	36.3	-2.7 ± 2.5[a]
Holtz et al., 2014 (BodyMedia Fit) [34]						-2.65lbs[a]						
Holtz et al., 2014 (P90x) [34]						-2.47lbs						
Holtz et al., 2014 (SparkPeople) [34]						-4.43lbs[a]						
Labrunée et al., 2012 [45]	39.3 ± 9.9	37.1 ± 8.2	-2.2	106.9 ± 26.4	100.9 ± 23.0	-6.0						
Mama et al., 2015 [29]												
Pekmezi et al., 2017 [26]	32.4 ± 5.2	32.5 ± 4.7	+ 0.02 ± 1.29	85.1 ± 15.2	85.6 ± 13.9	-0.01 ± 3.23						
Sasso and Backus, 2013 [27]	37.5	36.7	-0.8(2% BW)	129	126	-3.0(2% BW)						
Scott et al., 2019 [39]	35.9	35.4	-0.5[a]	101.5	100.2	-1.3[a]				40.1	38.4	-1.7[a]
Taylor et al., 2018[b] [23]												
Watson et al., 2012 [33]	30.15	29.90	-0.25									

[a] Denotes significant change report.
[b] Represents the inclusion of two published papers regarding the same study, as for which reported separate measures.

not specified. The study that did report visceral fat mass showed a significant reduction in the measure pre and post programme (−111.1 g) therefore prompting the question as to why this wasn't used by other studies also. Factors such as the necessary tools and equipment along with time may have had an impact on the popularity and consistent use of this measure across the other 14 studies. Whilst this may not be as widely understood by the general public, it provides detailed and useful information for researchers that can contribute towards determining the effectiveness of a home-based exercise programme on the chosen population group.

4.2.9. Blood pressure

Only five studies measured and reported resting blood pressure readings pre and post programme. As shown in Table 4, of the studies that did report blood pressure readings, two were reported as significant, but all reported a decrease (systolic, diastolic and mean arterial) from pre to post programme. Two of the five studies detailed the use of a sphygmomanometer and four reported that this measure was taken after a period of rest, as of which this period of time varied from 5 min up to 20 min. These results highlight that home-based exercise programmes do reduce blood pressure in adults living with overweight and obesity which is a positive health outcome that can occur independent of any weight loss.

4.2.10. Other progress measures

Whilst more psychological measures may not necessarily be classed as a progress measure for weight maintenance, it would be important to recognise that these measures may still have an impact on the effectiveness of home-based exercise programmes. However, of the studies that did report on behaviour change measures [23,26,29,34] there were no significant differences found. One study did report that the qualitative needs identified by participants reflected the themes that corresponded with the components of the interventions that comprised the home-based programmes as of which were, social support, objective monitoring and structured activity [34]. One other study did report increases in physical activity over time as a result of participating in an intervention that increased social support and social modelling, again providing direction for the development of home-based exercise programmes [29]. Whilst these factors aren't necessarily directly related to weight management, they may have influence over variables such as engagement and adherence, as of which will go on to contribute towards the effectiveness of a home-based exercise programme and therefore would be another consideration in the design of a home-based exercise programme for adults living with overweight and obesity.

To the author's knowledge, this rapid review represents a novel investigation in the reporting and interpretation of home-based exercise programmes specific to adults living with overweight and obesity, which has become an imposed means of physical activity due to government restrictions as a result of COVID-19. Even with the recent introduction of vaccines, the influence of this pandemic will still be present for many years and attention must turn to the longer term health impacts of those affected, which evidence suggests will be a higher proportion of those living with overweight and obesity.

A clear strength of the review is that the search plan and data extraction methods were rigorous and overseen by an information scientist. Two researchers independently screening article abstracts and titles, this is not a process commonly reflected in other rapid reviews across academic literature and therefore we can be sure that the studies included within this rapid review provide a basis for further development of home-based exercise programmes.

We recognise that not conducting a quality appraisal or risk of bias of the included studies may impact the robustness of this review. However, this rapid review was conducted to explore the current status and availability of home-based exercise programmes for adults living with overweight and obesity. Conducting a quality appraisal may have eliminated more studies from an already limited number of interventions, with a scarcity of RCTs, meeting the inclusion criteria. This in itself demonstrates the need for more high quality studies.

Considering the search parameters, there is a relatively small sample size, although this strengthens the case for more studies on home-based exercise programmes specific for adults living with overweight and obesity. Studies not published in English and those outside of the last 10 years will have influenced the findings and interpretation. However, the authors wanted to keep the research current.

Whilst the heterogeneity of the studies limits the authors in making direct comparisons between the included interventions, it highlights the lack of consistency and identifies a need for further research that investigates the impact of larger scale, home-based exercise programmes on adults living with overweight and obesity to inform systematic reviews with meta-analyses.

Undertaking this review has highlighted inaccuracies in the reporting of exercise and physical activity programmes. Many papers recognised the cost reduction in performing home-based exercise programmes however did not then detail the cost of the intervention delivered through the study, These inconsistencies have raised questions regarding the reporting of exercise programmes, what actually constitutes home-based exercise, and how they should be defined. Whilst some authors have previously attempted to define it [44], the recent COVID-19 pandemic and subsequent imposed restrictions, would mean that home-based exercise would be considered to be in the place of residence or immediate surroundings such as the garden or driveway. However, many studies categorise home-based exercise as any exercise that takes place outside of the place of prescription or even in a community setting with other individuals as part of a group exercise class. We believe this inaccurate reporting of 'home-based exercise' is prone to other influences than if the exercise was undertaken in a true home-based environment. This lack of consistency calls for an accurate definition of the term home-based, universally applied across literature within the research area. The inconsistencies in defining a true home-based environment will be addressed through a planned Delphi study as a natural progression from this rapid review.

As a direction for future research, this rapid review demonstrates that when designing a home-based exercise programme for people living with overweight and obesity, it is necessary to make considerations further than just the impact of body weight on the ability to engage fully with the programmes. It may also be useful to investigate effective

Table 4
Summary of extracted blood pressure data from included studies that reported the measure.

Study and reference no.	Mean arterial pressure (mm Hg)					
	Pre	Post	Change	Pre	Post	Change
Dash et al., 2018 (Family history) (24)	98.9 ± 11.6	98.8	-0.1 ± 2.4[a]			
Dash et al., 2018 (No family history) (24)	102.2 ± 11.7	103.9	-1.7 ± 2.1			
	Systolic blood pressure (mm Hg)			**Diastolic blood pressure (mm Hg)**		
Blackford et al., 2016 (31)	138.5 ± 14.1	133.3 ± 14.9	-5.2[a]	87.2 ± 9.0	84.9 ± 9.2	-2.3
Chen et al., 2015 (MetS) (43)	129.9 ± 2.8	121.7 ± 2.5	-8.2	82.4 ± 2.1	79.7 ± 2.0	-2.7
Fukuoka et al., 2015 (35)	125.7 ± 13.8	121.1 ± 11.1	-4.6	79.6 ± 9.7	73.7 ± 7.9	-5.9
Höchsmann et al., 2019 (40)	136 ± 14	133 ± 15	-3.0	88 ± 8	85 ± 8	-3.0

[a] Denotes significant change reported.

methods for prescribing and undertaking more complex or technically based exercises that allow them to be undertaken in a safe but effective manner so that the benefits of different types of exercise can still be received but purely within a home-based setting. As a by-product, this variety may also aid in engagement and enjoyment of the programmes whilst still adhering to what would be classified as home-based.

This rapid review has identified that there is a lack of published, evidence-based population specific home-based programmes for adults living with overweight and obesity, the need for which has been highlighted by the recent COVID-19 pandemic. It has provided a platform to gather and condense relevant information regarding the availability of evidence and effectiveness of home-based exercise programmes and provide direction for the future development of home-based programmes for adults living with overweight and obesity.

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Declaration of Competing Interest

The authors declare no conflicts of interest.

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