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Technical Report

Physical Activity Guidelines in the UK: Review and Recommendations

May 2010

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Suggested Citation:

Bull, FC. and the Expert Working Groups. Physical Activity Guidelines in the U.K.: Review and Recommendations. School of Sport, Exercise and Health Sciences, Loughborough University, May 2010.

Acknowledgements

The British Heart Foundation Centre for Physical Activity and Health would like to extend their thanks to all members of the working groups for their input prior to, during and post the consultation steps. Their expertise and guidance was greatly appreciated. In addition, the contributions and participation by all those who attended the two-day Scientific Meeting in Marlow (October 2009) and participants in the web survey consultation processes is greatly appreciated. Establishing wide engagement in this work and input from a variety of perspectives and stakeholders was an important part of the stepped approach. our thanks go to members of the BHFNC, particularly to Ms Karen Milton for their in kind support and to Charlie Watts for tireless secretarial work and administration support throughout the process. Finally, the funding support from the Department of Health in England, Health Scotland and Welsh Assembly is acknowledged.

Funding for this work was provided by:



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Executive summary

This report describes the process and results of work undertaken to review the current physical activity guidelines in the UK during 2008-2010. The recommendations presented in this report will contribute to the development of new updated UK guidelines on physical activity across the life course reflecting the latest scientific evidence.

Background

In late 2008 and early 2009 the need to review and potentially update the UK physical activity guidelines for adults and children was under discussion following the publication of substantial scientific reviews of evidence and the launch of the new Physical Activity Guidelines for Americans and similar work underway in Canada. Undertaking this project was timely due to a number of significant events taking place in the home countries pertaining to physical activity policy and previously noted differences that exist between the home countries in the current physical activity guidelines.

The anticipated outcome of the review and consultation process was a set of recommendations to guide the drafting of new, updated UK guidelines on physical activity. The resulting recommendations would provide the basis for an editorial team to write a revised set of guidelines. Moreover, the collaborative approach involving the four home countries provided the opportunity to establish consistency in the physical activity guidelines and to combine limited resources and to work in partnership.

Methods

Using a stepped approach and aiming to draw on international expertise and engage stakeholder involvement, the following process was undertaken: three expert advisory working groups comprising leading international and national experts in the field of physical activity were established for Children and Young People, Adults, and Older Adults, respectively; working papers with an initial set of recommendations were drafted; a 2-day scientific consultation meeting was held involving wide stakeholder input from across the UK; a national web based consultation survey was conducted; final review and revisions were considered by the expert working groups. The result of these steps is a final set of recommendations contained in this report.

This piece of work was undertaken alongside complementary working groups addressing sedentary behaviours and physical activity guidelines in early years (<5years). Reports from these other two processes, combined with this report, will provide the basis for writing new evidence informed guidelines on physical activity and sedentary behaviour across the life course for the UK.

Final Recommendations for UK Physical Activity Guidelines

Below are the final recommendations on: A) the need to update the UK physical activity guidelines; the suggested content of physical activity guidelines for young people (B), adults (C) and older adults (C). In addition, recommendations on research gaps, communications and ‘messaging’ as well as other areas in which guidelines are needed are reported (E). These recommendations can be found in the following sections of the report with a supporting rationale.

A. Recommendations on the need to update the UK Guidelines

Children and Young People	It is recommended that there is sufficient scientific evidence to warrant changes to the existing UK guidelines on physical activity for children and young people to be more in-line with the new scientific evidence.
Adults	Although the current scientific evidence does support the health benefits of the volume of activity stated in the current guidelines on physical activity in the UK (namely 5 x 30 minutes of moderate intensity activity per week), it is recommended that the current guidelines should be reviewed and potential refining, clarification and/or extensions should be undertaken to allow a better reflection of the scientific knowledge accumulated since 2004 on the health benefits of physical activity.
Older Adults	It is recommended that the UK should develop physical activity guidelines that provide a clear set of guidance appropriate and tailored for older adult populations.
Consistency across home countries	It is recommended that the physical activity guidelines in all four UK jurisdictions should be harmonized to provide a common set of scientifically and expert informed statements with a common level of detail.

B. Final recommendations on physical activity guidelines for Children and Young People

- Recommendation 1** The UK guidelines on physical activity for children and young people should include a recommendation for physical activity in general, an overall guideline.
- Recommendation 2** The UK guidelines on physical activity for children and young people should recommend “daily physical activity”.
- Recommendation 3** The UK guidelines on physical activity for children and young people should recommend at least 60 minutes of moderate to vigorous physical activity (MVPA) daily.
- Recommendation 4** The UK guidelines for children and young people should include a specific recommendation for vigorous activity ($\geq 6-7$ METS) on at least 3 days a week.
- Recommendation for supporting commentary*
The commentary which accompanies the guidelines should indicate that vigorous intensity activity will form part of the daily 60 minute recommendation for children and young people.
- Recommendation 5** The UK guidelines on physical activity for children and young people should recommend physical activity for the promotion of musculoskeletal health and flexibility at least 3 days per week.
- Recommendation for supporting commentary*
Physical activity undertaken to improve musculoskeletal health can be considered to contribute to the 60 min of MVPA. However, participating in 60 minutes per day of activity which exclusively focuses on musculoskeletal development cannot be considered to be fully achieving the full recommendations, as there is no aerobic component. Many activities (e.g. many sports) combine elements of both aerobic and anaerobic metabolism and can contribute in important ways to both improved cardio-metabolic and musculoskeletal health. It is important to conceptualise children’s physical activity in this holistic way – especially younger children - rather than trying to quantify separate ‘bouts’ of aerobic/anaerobic activity. The merit of developing and maintaining flexibility should also be identified as important
- Recommendation 6** The UK guidelines on physical activity for children and young people should add a statement that additional MVPA beyond 60 minutes and up to several hours a day confers even greater health benefit.
- Recommendation 7** The UK guidelines on physical activity for children and young people should include some explanation to convey that the recommended physical activity is above and *beyond* the light physical activity undertaken in the course of normal daily living (e.g. chores, hygiene, and incidental activity).
- Recommendation 8** The UK guidelines on physical activity for children and young people should include the concept “accumulate” in describing the recommended amount of physical activity.

Recommendation 9 The UK guidelines on physical activity for children and young people should provide a comment for those children and young people with disabilities (as done in Scottish 2003 guidelines) to ensure the guidelines are as inclusive as possible.

Recommendation 10 It is recommended that the UK physical activity guidelines for children and young people do not include a specific guideline on physical activity for healthy weight gain or the maintenance of weight loss in overweight or obese children and young people; it is recommended that this be a high priority area for further research.

Recommendation for supporting commentary

Text should clarify that physical activity is important to prevent weight gain and obesity but that to date there is insufficient evidence to identify the exact amount required for optimal benefit and the issue is complex due to the confounding factors related to dietary intake and healthy weight gain due to healthy development of muscle and bone mass. At the current time, there is insufficient evidence to make a specific physical activity recommendation for either weight loss or weight management in children. Nonetheless, it is well accepted that all physical activity contributes to achieving a healthy energy balance, which in turn determines adiposity status, an important health risk.

Recommendation 11 The UK physical activity guidelines for children and young people should emphasize that the benefits of regular physical activity are considerable and far outweigh the low risks involved in participation.

C. Final recommendations on physical activity guidelines for Adult

Recommendation 1 The UK physical activity guidelines should encourage adults to engage in moderate-intensity aerobic physical activity for at least 150 minutes per week; this physical activity should be spread across the week; and engaging in at least 30 minutes on 5 or more days each week is one example of how this volume can be achieved.

Recommendation 2 The UK guidelines for adults should retain a statement advising that physical activity can be accumulated across multiple bouts throughout the week. Individuals should aim for bouts of at least 10 minutes of moderate intensity activity at a time.

Recommendation 3 The UK physical activity guidelines for adults should recognize that vigorous-intensity activity also provides health benefits for adults, and that 75 minutes of vigorous-intensity activity (also spread across the week) provides comparable health benefits to 150 minutes of moderate-intensity activity.

Recommendation 4 The UK guidelines for adults should recognise that combinations of moderate- and vigorous- intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity.

Recommendation 5

recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week.

Time spent undertaking muscle strengthening activities should be in addition to the primary recommendation of 150 minutes. Although there is currently insufficient evidence to determine an optimal regimen for this muscle strengthening activity, an example of a regimen that has been shown to be beneficial should be included in the explanatory guidance that accompanies the guidelines.

Recommendation for supporting commentary

The commentary which accompanies the UK guidelines should include a statement that stretching and flexibility training may be beneficial.

Recommendation 6

The UK physical activity guidelines for adults should recognise that physical activity has an important role in healthy weight management and body composition.

It is recommended that a separate set of guidelines on weight management, which includes recommendations on altering energy balance by increasing physical activity and decreasing caloric intake through dietary modifications, is required.

Recommendation 7

The UK physical activity guidelines for adults should emphasise the health benefits of activity for those adults who are already overweight or obese. They should indicate that overweight and obese adults achieving the recommended weekly volume of activity (5 x 30/ 150 minutes/week) will gain multiple health benefits even in the absence of reductions in body weight.

Recommendation 8

The UK physical activity guidelines for adults should be supported by commentary that outlines the health benefits derived from the recommended dose of physical activity with a special emphasis on the role of physical activity in aiding the prevention of mental illness (such as depression and dementia) and improving mental well being (such as mood, self-perception and sleep).

Recommendation 9

The UK physical activity guidelines for adults should recognise that those who are least active are most at risk of poor health and increasing their physical activity (even if it does not meet the public health target of 150 minutes of moderate-intensity activity per week) will have health benefits.

Recommendation 10

The UK physical activity guidelines for adults should include a specific statement to recognise that higher volumes of activity (>150 minutes) are associated with even greater health benefits. The accompanying commentary to the guidelines should explain that as volume and intensity of physical activity increase, there are small increases in risk.

Recommendation 11	The UK physical activity guidelines for adults should include a statement clarifying that the risks of ill health from inactivity are very high and outweigh the very low risk of injury from engaging in health promoting physical activity.
Recommendation 12	The UK physical activity guidelines for adults should include a statement to recognize that the physical activity guidelines written for generally healthy adults should be tailored for individuals based upon their needs and abilities, particularly for persons with disabilities and any special health issues.
Recommendation 13	The UK physical activity guidelines for adults do not need to differ for sub populations based on gender or race/ethnicity; however it is noted that the communication strategies and “messaging” of the physical activity guidelines to different sub population may differ to be most effective.

D. Final recommendations on physical activity guidelines for Older Adults

Recommendation 1	engage in moderate-intensity aerobic physical activity for at least 150 minutes per week; this physical activity should be spread across the week; and engaging in at least 30 minutes on 5 or more days each week is one example of how this volume can be achieved.
Recommendation 2	The UK guidelines for older adults should retain a statement advising that physical activity can be accumulated across multiple bouts throughout the week. Individuals should aim for bouts of at least 10 minutes of moderate intensity activity at a time.
Recommendation 3	The UK physical activity guidelines for older adults should recognize that vigorous-intensity activity also provides health benefits for adults, and that 75 minutes of vigorous-intensity activity (also spread across the week) provides comparable health benefits to 150 minutes of moderate-intensity activity.
Recommendation 4	The UK guidelines for older adults should recognise that combinations of moderate- and vigorous- intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity.
Recommendation 5*	The UK physical activity guidelines for older adults should include a recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week. Time spent undertaking muscle strengthening activities should be in addition to the primary recommendation of 150 minutes. Although there is currently insufficient evidence to determine an optimal regimen for this muscle strengthening activity, an example of a regimen that has been shown to be beneficial should be included in

* See also a link to recommendation 15 for older adult on balance

Recommendation for supporting commentary

The commentary which accompanies the UK guidelines should include a statement that stretching and flexibility training may be beneficial.

- Recommendation 6** The UK physical activity guidelines for older adults should recognise that physical activity has an important role in healthy weight management and body composition.
It is recommended that a separate set of guidelines on weight management, which includes recommendations on altering energy balance by increasing physical activity and decreasing caloric intake through dietary modifications, is required.
- Recommendation 7** The UK physical activity guidelines for older adults should emphasise the health benefits of activity for those adults who are already overweight or obese. They should indicate that overweight and obese adults achieving the recommended weekly volume of activity (5 x 30/150 minutes/week) will gain multiple health benefits even in the absence of reductions in body weight.
- Recommendation 8** The UK physical activity guidelines for older adults should be supported by commentary that outlines the health benefits derived from the recommended dose of physical activity with a special emphasis on the role of physical activity in aiding the prevention of mental illness (such as depression and dementia) and improving mental well being (such as mood, self-perception and sleep).
- Recommendation 9** The UK physical activity guidelines for older adults should recognise that those who are least active are most at risk of poor health and increasing their physical activity (even if it does not meet the public health target of 150 minutes of moderate-intensity activity per week) will have health benefits.
- Recommendation 10** The UK physical activity guidelines for older adults should include a specific statement to recognise that higher volumes of activity (>150 minutes) are associated with even greater health benefits. The accompanying commentary to the guidelines should explain that as volume and intensity of physical activity increase, there are small increases in risk.
- Recommendation 11** The UK physical activity guidelines for older adults should include a statement clarifying that the risks of ill health from inactivity are very high and outweigh the very low risk of injury from engaging in health promoting physical activity.
- Recommendation 12** The UK physical activity guidelines for older adults should include a statement to recognize that the physical activity guidelines written for generally healthy adults should be tailored for individuals based upon their needs and abilities, particularly for persons with disabilities and any special health issues.
- Recommendation 13** The UK physical activity guidelines for older adults do not need to differ for sub populations based on gender or race/ethnicity; however

it is noted that the communication strategies and “messaging” of the physical activity guidelines to different sub population may differ to be most effective.

Recommendation 14 The UK physical activity guidelines for older adults should include a specific recommendation that older adults should gradually increase physical activity levels over time. It can be appropriate for inactive older adults with low fitness to first build up to 10 minutes bouts of activity.

Recommendation 15 The UK physical activity guidelines for older adults should include a specific recommendation on the benefits of physical activity involving balance training on two or more days per week for the prevention of falls in those at increased risk of falls.

Recommendation for supporting commentary

The commentary which accompanies the guidelines should acknowledge that although this should be in addition to the primary recommendation of 150 minutes, there should be acknowledgement that some aerobic activities enhance balance (e.g. dancing), and that some movements simultaneously strengthen muscles and improve balance (e.g. Tai Chi exercise).

E. Additional recommendations for the updating of UK physical activity guidelines

Recommendation 1 It is strongly recommended that a comprehensive communication strategy is undertaken for effective dissemination of physical activity guidelines to a variety of audiences across the UK.

Recommendation 2 It is recommended that consultation with relevant agencies/ departments that collect, analyse and report the national physical activity data is undertaken to review the implications of the updated Physical Activity Guidelines for children and young people, adults and older adults.

Recommendation 3 It is recommended that the UK should use objective, time-stamped measurement techniques in population surveillance and the monitoring of trends over time.

Recommendation 4 It is recommended that the UK work in cooperation and collaboration with other countries to standardize data cleaning, reduction and analysis procedures for objective physical activity monitoring devices.

Recommendation 5 It is recommended that the UK work in cooperation and collaboration with other countries to standardize data cleaning, reduction and analysis procedures for objective physical activity monitoring devices.

Recommendation 6

physical activity guidelines for adults and for children and young people with non-communicable disease (e.g. cardiovascular disease, diabetes, cancer, mental health conditions) as a matter of priority.

Recommendation 7

The development of guidelines on sedentary behaviour is a priority, particularly for children and young people. Although beyond the scope of this work due to other complimentary work underway, the findings should be integrated into the physical activity guidelines.

Recommendation 8

Planned reviews (and revisions if necessary) of the UK Physical Activity Guidelines should be completed every 5 years in collaboration and coordination with other jurisdictions (e.g. World Health Organisation, Canada, U.S., Australia and elsewhere).

International collaboration will result in more robust, less costly and scientifically harmonized evidence and interpretation while providing an opportunity for scientific and communication exchange and cross-fertilization.

1. Introduction

This report describes the process and results of work undertaken to review the current physical activity guidelines in the UK. The findings will contribute to the development of new (updated) guidelines reflecting the latest scientific evidence.

The report is structured to provide a short background on why this work was undertaken, the main outputs (this report) and current physical activity guidelines (Section 1). Section 2 presents details of the methods, the scope of work and sources of evidence and who was involved in different phases of the stepped approach. Results of the review phase and the key consultation steps (scientific meeting and national web consultation survey) are presented in Section 3. The final set of recommendations for the drafting of new physical activity guidelines along with a brief rationale based on the latest scientific evidence is provided in Section 4. The final section reports the planned next steps to develop new guidelines in the UK (Section 5). An extensive Appendix provides more details on specific aspects to avoid the main report becoming unnecessarily detailed and unfriendly to the reader.

1.1 Background

In late 2008 and early 2009 interest in the need to review and potentially update the current physical activity guidelines was under discussion within the Department's of Health across the four home countries in the UK. This interest was heightened following the publication of the substantial scientific review undertaken in the USA in December 2008 and the launch of the new *Physical Activity Guidelines for Americans*¹ in January 2009 by the U.S. Department of Health and Human Services.² It was also known that similar work was underway in Canada jointly led by the Canadian Society for Exercise Physiology and Public Health Agency of Canada.

As part of on-going discussions between representatives from the home countries and the British Heart Foundation National Centre for Physical Activity and Health (BHFNC) the need for, methodology, cost, and the potential timing of a review of the UK guidelines was considered. In June 2009 it was agreed that a project should be undertaken to formally review the current physical activity guidelines in England, Scotland, Wales and Northern Ireland.

The primary aim of the work would be to undertake a critical review of the current physical activity guidelines and assess their accuracy and utility for use over the next 3-5 years in light of the most recent scientific evidence. The motive for commencing this work within 2009 was to ensure that the project benefitted from the recent experiences in both the USA and Canada given the scale and scope of their scientific reviews and the opportunity to learn from their approach to the interpretation of the latest evidence into national guidelines addressing the lifespan.

Commencing this project was timely due to a number of significant events taking place in the UK. Specifically, in February 2009 the English Government launched the new physical activity national action plan *Be active Be healthy*.³ It was noted during the process of preparation and in the report itself that the last major government statement on the amount of activity required for health benefits was in the 2004 report *At Least Five a Week*.⁴ In Scotland, a five year review of their national strategy *Lets Get Scotland More Active*⁵ was near completion and the Scottish data sets on physical activity were being reviewed. Both of these agendas presented a potential opportunity to re state or update the Scottish physical activity guidelines. In Wales, a review of physical activity work undertaken under the policy *Climbing Higher Next Steps*^{6, 7} was underway and a new draft strategic plan was under development with plans for a launch in 2010.

Taking all these factors together, there was sufficient interest, opportunity and relevance for the existing physical activity guidelines across the four home countries to be reviewed. It was agreed that there was substantial merit for this work to be undertaken as a national collaboration, for the first time. It was anticipated that the outcome might be some changes to the current guidelines, confirmation and restatement of some elements of the existing guidelines and, most importantly, the opportunity to establish consistency across the four home countries.

1.2 Outputs

The output of the review will be a Technical Report (*this report*) providing a set of evidence based recommendations on what changes should be considered to update the UK physical activity guidelines. It is intended that the Technical Report will provide sufficient detail to assist in the final writing of a set of national guidelines and provide interested stakeholders with a record of the development process.

1.3 Overview of existing physical activity guidelines in the UK

Although at first glance there appears to be a great deal of similarity between the current physical activity guidelines in the four home countries in the UK, a closer inspection of the actual wording reveals some ambiguities. There are differences in the scope, wording and the level of detail given for the different age groups. A broad summary outlining the core concepts in each guidelines is provided in Figure 1 below, taken from the recent 2009 Annual Chief Medical Officer's (CMO) Report.⁴ It shows, in general, a focus on 60 minutes of physical activity for children, a focus on 30 minutes of activity for adults and older adults, and an absence ("not specified") of any guidelines for early years age group. Notable differences are seen in comparison with two selected international examples. Australia is one of the few countries that has progressed physical activity guidelines for early years.⁸ In the USA, there has been a shift in the focus of the headline statement to stating the total volume of activity recommended per week, namely 150 minutes, and also additional new recommendations on vigorous intensity activity and strength activities are now provided.² This is in contrast to many countries, including the UK, which to date have stated their main guideline message as a composite of details on both frequency and duration (e.g. '5x30').

Table 1 shows a more detailed comparison of the key headline physical activity guidelines across the home countries. This table shows the variation in wordings used which have quite significant consequences when the task of reporting national prevalence data against them is considered. Note for example, in England it states "on 5 or more days of the week" where as in Scotland it states "on most days of the week." The approach a statistician will take to analyse these statements is therefore likely to be different and this will compromise the comparability of the data.

Table 5: Comparison of current minimum recommendations on physical activity in different countries

	Early years	For children of school age, moderate intensity activity:	For young adults, moderate intensity activity:	For older adults, moderate intensity activity:
England	Not specified	For 60 minutes each day	For 30 minutes five times a week	For 30 minutes five times a week
Scotland	Not specified	For 60 minutes on most days of the week	For 30 minutes on most days of the week	For 30 minutes on most days of the week + Three bouts of strength and balance exercises per week
Wales	Not specified	For 60 minutes five times a week	For 30 minutes five times a week	For 30 minutes five times a week
Northern Ireland	Not specified	For 60 minutes each day	For 30 minutes five times a week	For 30 minutes five times a week
United States	Not specified	For 60 minutes each day	For 150 minutes each week or 75 minutes of vigorous activity each week + Strength activities two days per week	For 150 minutes each week or 75 minutes of vigorous activity each week + Strength activities two days per week
Australia	Draft guidelines under consultation	For 60 minutes each day	For 30 minutes on most days of the week	For 30 minutes on most days of the week

Source: A variety of official guidance from the respective governments

Source: The 2009 Annual report of the Chief Medical Officer (page 26)⁹

Figure 1. Summary of physical activity guidelines in UK, Australia and USA

It is noted that the ‘headline’ guidelines extracted and presented in Table 1 are all located within larger documents which contain supporting and explanatory statements. In some cases additional aspects of physical activity are outlined for more than one age group. This approach may reflect the strength of evidence at the time of writing or just be a consequence of the report format and requirements. Nonetheless, currently in the UK there is inconsistency between the home countries in the wording of guidelines statements, a lack of clarity around issues such as vigorous intensity activity, strength training, balance and flexibility. Furthermore, there are notable gaps in guidelines on physical activity for early years and specific stand alone guidelines for older adults.

Table 1. Comparison of key ‘headline’ physical activity guidelines across the four home countries in the UK

	Children	Adults	Older Adults
England⁴	<p>A total of at least 60 minutes of at least moderate-intensity physical activity each day</p> <p>At least twice a week this should include activities to improve bone health, muscle strength, an flexibility</p>	<p>A total of at least 30 minutes of at least moderate-intensity physical activity a day, on 5 or more days a week.</p> <p>The recommended levels of activity can be achieved either by doing all the daily activity in one session or through several shorter bouts of 10 mins or more. The activity can be lifestyle activity or structured exercise or sport or a combination of these</p>	<p>The recommendations for adults are also appropriate for older people.</p> <p>Older adults should take particular care to keep moving and retain their mobility through daily activity. Additional, specific activities that promote improved strength, coordination and balance are particularly beneficial for older people</p>
Scotland⁵	<p>At least 60 minutes of moderate activity on most days of the week</p>	<p>At least 30 minutes of moderate physical activity on most days of the week</p>	<p>At least 30 minutes of moderate activity on most days of the week.</p> <p>3 x activities per week of strength and balance exercises is also recommended</p>
Wales⁶	<p>60 minutes of moderate intensity physical activity on at least 5 days of the week</p> <p>5 x 60 minutes of physical activity per week</p>	<p>30 minutes of moderate intensity on at least 5 days a week</p> <p>5 x 30 minutes of physical activity per week</p>	<p>Not specified in ‘Climbing Higher’</p>
Northern Ireland⁴	<p>A total of at least 60 minutes of at least moderate-intensity physical activity each day</p> <p>At least twice a week this should include activities to improve bone health, muscle strength, an flexibility</p>	<p>A total of at least 30 minutes of at least moderate-intensity physical activity a day, on 5 or more days a week.</p> <p>The recommended levels of activity can be achieved either by doing all the daily activity in one session or through several shorter bouts of 10 mins or more. The activity can be lifestyle activity or structured exercise or sport or a combination of these</p>	<p>The recommendations for adults are also appropriate for older people.</p> <p>Older adults should take particular care to keep moving and retain their mobility through daily activity.</p> <p>Additional, specific activities that promote improved strength, coordination and balance are particularly beneficial for older people</p>

2. Methodology

2.1 Overview of the Process

In April 2009, following a period of discussions between representatives from the Departments of Health from the four home countries and interested stakeholders, a Physical Activity Guidelines Coordinating Group was formed to commence a review of the current physical activity guidelines in the UK. After consideration of various approaches and an assessment of the available opportunities that could support such work, a stepped approach was agreed and adopted. A summary of the key steps is shown in Figure 2.

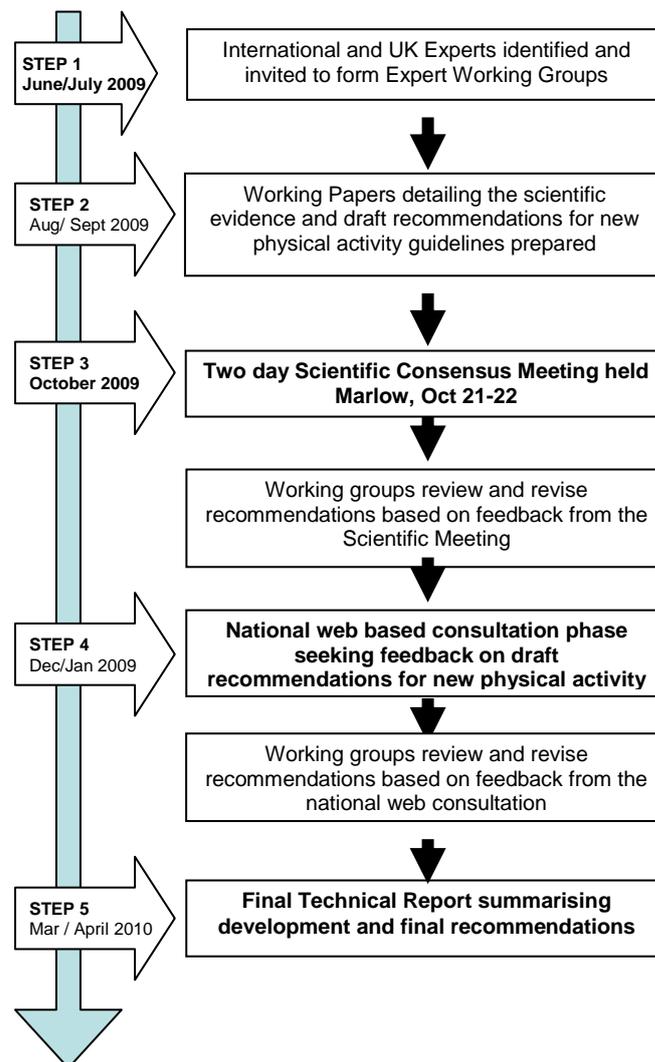


Figure 2. Flow chart of developmental steps for the review of physical activity guidelines in the UK

2.2 Step 1: Expert Working Groups and Scope of Work (June-July 2009)

The first step involved forming expert advisory working groups comprising leading international and national experts in the field of physical activity, with a particular focus on expertise covering the epidemiological evidence on health benefits of physical activity. Three international experts were invited to join the groups due to their recent involvement in the development of national physical activity guidelines in the United States and Canada. Their involvement provided direct links to the recent experiences and lessons learnt in these countries, and furthermore, the invited experts were lead authors of relevant final reports. Leading experts from across the UK were identified and invited to join the expert working parties organised by expertise across specific age groups, fully acknowledging cross over of interest and relevant scientific knowledge. Three groups of five persons were formed and the membership is shown in Table 2 for Children and Young People, Adults, and Older Adults, respectively.

The scope of work for each working group included undertaking a review of the existing physical activity guidelines in the UK and the development of a draft set of suggested changes based on the latest available scientific evidence. Changes might include additional guidelines, modifications to current wording, deletions or clarifications to the existing guidelines. Each group was chaired by Professor Fiona Bull (Loughborough University).

To assist in limiting the scope of work to a manageable scale and the time available, the focus was on developing recommendations on new physical activity guidelines for the prevention of disease and excluded consideration of the role of physical activity in the treatment of those with pre existing disease. To further assist the focus and efficiency of the required work, a set of key questions was drafted by the Guidelines Coordinating Group and these formed the structure of the working paper produced by each working group. Key questions were based on the issues identified by the government representatives and are shown in Table 3. As the list of questions was not exhaustive, the working parties were encouraged to provide any additional comments on any other important issues pertaining to the evidence and physical activity guideline development. During the work of the expert groups, questions were revised and reordered thus the set of working papers do not follow exactly the same format.

Table 2. Membership of Expert Working Groups

Children & Young People Expert Working Group Membership	
Professor Mark Tremblay	Healthy Active Living and Obesity Research, Department of Pediatrics, University of Ottawa, Canada.
Professor Stuart Biddle	School of Sport, Exercise and Health Sciences, Loughborough University, UK.
Professor Chris Riddoch	School for Health, University of Bath, UK.
Professor John Reilly	Division of Developmental Medicine, University of Glasgow, UK.
Professor Gareth Stratton *	Sport and Exercise Sciences, Liverpool John Moores University, UK.
Professor Fiona Bull	School of Sport, Exercise and Health Sciences, Loughborough University, UK.
Adult Expert Working Group Membership	
Professor Bill Haskell	Stanford Prevention Research Center, Stanford University School of Medicine, USA.
Professor Nanette Mutrie	Department of Sport, Culture And The Arts, University of Strathclyde, UK.
Professor Marie Murphy	School of Sports Studies, University of Ulster. Northern Ireland, UK.
Professor Nick Wareham	MRC Epidemiology Unit, Institute of Metabolic Science, University of Cambridge, UK.
Dr Charlie Foster *	BHF Health Promotion Research Group, University of Oxford, UK.
Professor Fiona Bull	School of Sport, Exercise and Health Sciences, Loughborough University, UK.
Older Adults Expert Working Group	
Professor David Buchner	Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign, USA.
Professor Ken Fox	Department of Exercise, Nutrition and Health Sciences, University of Bristol, UK.
Dr Dawn Skelton	School of Health, Glasgow Caledonian University, Glasgow, UK.
Dr Richard Ferguson	School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, UK
Dr Jo Doust *	Faculty of Education and Sport, University of Brighton, UK.
Professor Fiona Bull	School of Sport, Exercise and Health Sciences, Loughborough University, UK

* Member joined the working groups at step 3

Sources of scientific evidence

As previously introduced, one of the drivers for this project was the opportunity to capitalise on the recent scientific review work. Specifically, in December 2008 the US Government released the final scientific report from a comprehensive 2-year review process on the health benefits of physical activity.¹ This review was undertaken as part of the US Governments' approach to the development of the first national guidelines on physical activity for Americans.² In addition, similar and complimentary review work was near completion in Canada and had been undertaken for the same purpose, the updating of the Canadian guidelines on physical activity.¹⁰

¹¹ In the UK, a set of reviews had been completed in 2007 under the auspices of the British Association of Sport and Exercise Sciences (BASES) and a final manuscript was underdevelopment. Across these substantive scientific review processes the available evidence on the relationship between physical activity and health outcomes or risk factors had been synthesized. The health outcomes included:

- cardio-respiratory fitness (e.g. aerobic fitness)
- musculo-skeletal fitness (e.g. muscular strength, muscular endurance)
- cardiovascular disease risk (e.g. high cholesterol/triglycerides, high blood pressure, carotid intima-media thickness, inflammatory markers)
- metabolic disease (e.g. metabolic syndrome, fasting insulin, fasting glucose, glycosylated haemoglobin)
- body composition, weight gain and obesity (e.g. BMI, waist circumference, visceral adiposity)
- bone health (e.g. low bone mineral density, incidence of fracture)
- mental health (e.g. depression, stress, anxiety, academic achievement and cognition, performance, self-esteem)
- risk of injury (e.g. minor and major sports injuries).

Given this set of recent work, aimed at exactly the same purpose, it was deemed unnecessary to undertake a full review of the primary literature. Instead, a set of key reviews documents were identified and agreed to be the primary sources of evidence underpinning the UK review work.

The key sources were:

1. Physical Activity Guidelines Advisory Committee Report, 2008 from the Physical Activity Guidelines Advisory Committee formed by the U.S. Department of Health and Human Services;
2. Scientific reviews undertaken as part of the Canadian Physical Activity Guidelines review process;
3. The review papers (unpublished) undertaken as part of the British Association of Sport and Exercise Sciences (BASES) consensus process; and
4. Where needed, individual high quality review papers or individual study papers reporting on relevant issues not covered in the US, Canadian or BASES review process.

2.3 Step 2: Preparation of working papers and draft recommendations (August – September 2009)

The three working parties adopted the same, stepped approach to the development of their working papers and responses to the key questions. The international expert in each group was asked to lead the preparation of the first draft, drawing on their expert knowledge of the science and recent international review processes. These first drafts were circulated to all other members and several teleconferences were held to review the scientific evidence and draft recommendations. At this stage the adults and older adult working parties joined and agreed to produce one joint working paper due to the relevant overlap in science and overlap in likely recommendations for the two age groups. It was fully acknowledged that specific differences may be required in the final set of recommendations for physical activity guidelines for older adults and these points would be reviewed and highlighted at a later step. It was also at this stage that the children and young people group confirmed that their scope of work was to address children aged 5 years and up due to other complimentary work commencing addressing < 5 years (more details reported below). The key questions addressed by the working groups are shown in Tables 3 and 4.

Table 3. Key questions used to guide the Expert Working Groups: Children and young people

Children and Young People	
1	Does the scientific evidence continue to support the current PA guidelines for the [<i>children and young people</i>] population group?
2	Based on the current evidence what, if any, modifications to the current Physical Activity Guidelines should be considered? In particular, please make recommendations on any modifications to the stated characteristics of how physical activity can be undertaken and accumulated for optimal prevention of chronic disease?
3	Please comment specifically on the available evidence related to the accumulation of physical activity in multiple short periods. Please comment on i) whether this is relevant for the optimal health message and ii) whether it is or is not appropriate for any specific health conditions?
4	Is there sufficient evidence / knowledge of the risks associated with physical activity, particularly in early years to inform an analysis of the risks versus benefits of the physical activity guidelines?
5	If the evidence points to a revision of the current guidelines, are the advantages of making such a change likely to outweigh the disadvantages (for example confusion amongst healthcare practitioners still relatively unfamiliar with the 2004 Guidelines)?
6	Do physical activity guidelines need to be modified to specifically address weight loss or maintenance of weight loss for children and young people?

- 7 Do Physical Activity Guidelines need to be modified for young people with disabilities and for young people with chronic disease?
- 8 Data Limitations and Implications for Surveillance
- 9 Please comment on the need for a coherent comprehensive communication strategy to disseminate the Physical Activity Guidelines to a variety of audiences (including education sector, health sector and others).
- 10 What is the appropriate summary guideline for healthcare practitioners, as a basis for communicating brief advice on physical activity to patients aged 5-19 years and their parents?

Table 4. Key questions used to guide the Expert Working Groups: Adults and older adults

Adults and Older Adults	
1	Does the scientific evidence continue to support the current Physical Activity Guidelines for adults and older adults?
2	Based on the current evidence on volume, intensity, duration and frequency of activity and their impact on health and disease, what modifications to existing UK guidelines are warranted?
3	Is there any evidence that being very sedentary puts person at highest risk? If possible, please clarify the definition of 'sedentary' and provide any indication of the amount (quantity) and specify the health outcomes that are covered by this evidence?
4	Is the evidence sufficient to support a separate guideline for muscle-strengthening activity, a separate guideline for flexibility activities, and/or a separate guideline for balance activities? If so, what should be considered and should these guidelines differ for adults and older adults?
5	Based on the current scientific evidence, how should the Physical Activity Guidelines address physical activity and weight management?
6	Based on the current scientific evidence, how should the Physical Activity Guidelines address physical activity preventive mental health benefits?
7	Does the scientific evidence on the health benefits of physical activity suggest that Physical Activity Guidelines should vary for women and men or for different population groups based on race, ethnicity?
8	How applicable are the any proposed changes to the current UK Physical Activity Guidelines for adults with disability?
9	Is there sufficient evidence to require separate Physical Activity Guidelines for older adults?
10	Is there sufficient evidence / knowledge of the risks associated with physical activity to inform a statement on the risks versus benefits of the Physical Activity Guidelines?

- 11 Please comment on the need for a coherent comprehensive communication strategy to disseminate Physical Activity Guidelines to a variety of audiences (including education sector, health sector and others).
 - 12 What, if any, are the implications of adopting any of the proposed changes to the current UK Physical Activity Guidelines on the data collected and how it is used and presented as part of ongoing population health monitoring and surveillance systems?
 - 13 Would adoption of the proposed modifications to current UK Physical Activity Guidelines influence the difficulty of meeting Physical Activity Guidelines compared to the current Physical Activity Guidelines for insufficiently active adults?
- What is the appropriate summary guideline for healthcare practitioners, as a basis for communicating brief advice on physical activity to patients

2.4 Step 3: Scientific Consultation Meeting (October 2009)

To allow for wider input from the scientific community and to communicate more widely the process underway to develop new physical activity guidelines in the UK, a two day scientific consensus meeting was held in Marlow. Convened by the BHFNC, delegates included leading physical activity and health academics, key stakeholders and interested parties.

The aim of the Consultation Meeting was to review the working papers produced by each group, discuss the draft recommendations and underpinning scientific evidence and receive feedback on any potential revisions to the recommendations as well as comments and suggestions on the communication strategy for the final guidelines.

To facilitate discussions, the working papers and draft recommendations were circulated in advance to attending delegates and the international expert presented the findings in the opening plenary forum. The remainder of the meeting was structured to provide a mix of opportunities for plenary discussion and debate as well as breakout sessions for each age group across the two days. An outline of the meeting schedule along with a delegate list is in Appendix 1 and 2, respectively. It is noted that the delegate list reflects only those able to attend as many of those invited, particularly those with academic teaching duties, were unable to attend.

2.5 Step 4: National Consultation via web survey

In addition to holding a Consultation Meeting, and due to the necessary limitation on delegate numbers, a national consultation process using a web based platform was developed and conducted by the BHFNC. The aim was to provide another opportunity for the wider scientific community, stakeholders and interested parties to have input into the potential content of revised physical activity guidelines in the UK.

Using the feedback obtained during the Consultation Meeting the initial recommendations for each age group were reviewed and revised by each working group. This produced an updated set of recommendations for each age group and these were posted for national consultation for a period of five weeks (3 December 2009 – 8 January 2010). In addition to the recommendations, a set of very preliminary draft guidelines, referred to as ‘summary statements’ was also posted for comment. The summary statements represented a first attempt at taking the essential content of each recommendation and formulating how they may look as a set of guidelines.

Participants in the web-based survey were asked to rate the level of agreement with each of the recommendations and could provide comments, along with citation to supporting scientific evidence, on any changes to the wording or intent of any recommendation. This approach was replicated for the summary statements. In addition, respondents could provide comments on plans for a communications (dissemination) strategy for the final guidelines and highlight areas in need of more research.

2.6 Step 5: Final set of recommendations

Feedback received from the national web consultation step was collated and summarised by the BHFNC and a brief report was drafted for each working group. The reports were circulated for review and discussion by each of the expert working groups. The final outcome from the working groups was a final set of recommendations on the updating of physical activity guidelines in the UK.

In addition to the recommendations, feedback was collated and summarised to provide a short list of identified research gaps. All comments received via the web consultation on issues relating to the communications strategy, “messaging” and dissemination plans were collated and summarised by the BHFNC. These findings are reported in Section 4.5.

2.7 Concurrent work on Early Years (0-59 months) and Sedentary Behaviours

During the development of physical activity guidelines for children and young people, adults and older adults, the need for similar review work addressing very young children (early years, birth-age of school entry) and the need to consider guidelines on reducing sedentary behaviours was acknowledged. Complementary work was commissioned by the Department of Health and two working groups were established. The groups were asked to develop a case for development of guidelines for early years and secondly, a review of the evidence on health affects of sedentary behaviours. The latter work was commissioned as part of the Government’s wider activities addressing obesity. The membership of both groups is shown in Table 5.

Both the early years and sedentary and obesity working groups undertook review work concurrently to the physical activity guidelines project summarised above. There were direct links between these projects. Specifically, the working group on early years attended and presented at the Consultation Meeting and held a break out session during the programme. In addition, a short informal summary of the work undertaken to date reviewing sedentary behaviours was provided to the delegates by the chair of the working party.

Other aspects of the development work were also combined; for example, the working paper and draft recommendations from the early years working group was included in the national web consultation phase alongside the other three age groups. At a later date, the same web platform was used again by the sedentary behaviours and obesity working group to conduct a similar national web consultation during January 2010. Finally, both groups held national stakeholder meetings in February 2010 to gain further input and feedback on their draft recommendations.

The progress and links between the development of new physical activity guidelines and this wider set of work is shown in Figure 3. The schema shows that all three projects are due to present final reports around March/April 2010. In addition, as the work of all three groups has progressed, a clear pathway linking the report and final outputs has been formulated. This includes the setting up of an editorial writing group to lead on the final writing of guidelines for all age groups. Also, the plans for a combined home country Chief Medical Officer (CMO) Report were formulated and, if achieved would lead to, for the first time, consistent guidelines on physical activity (and potentially sedentary behaviours) in England, Scotland, Wales and Northern Ireland. The timelines for the intended pathway are shown in Figure 3.

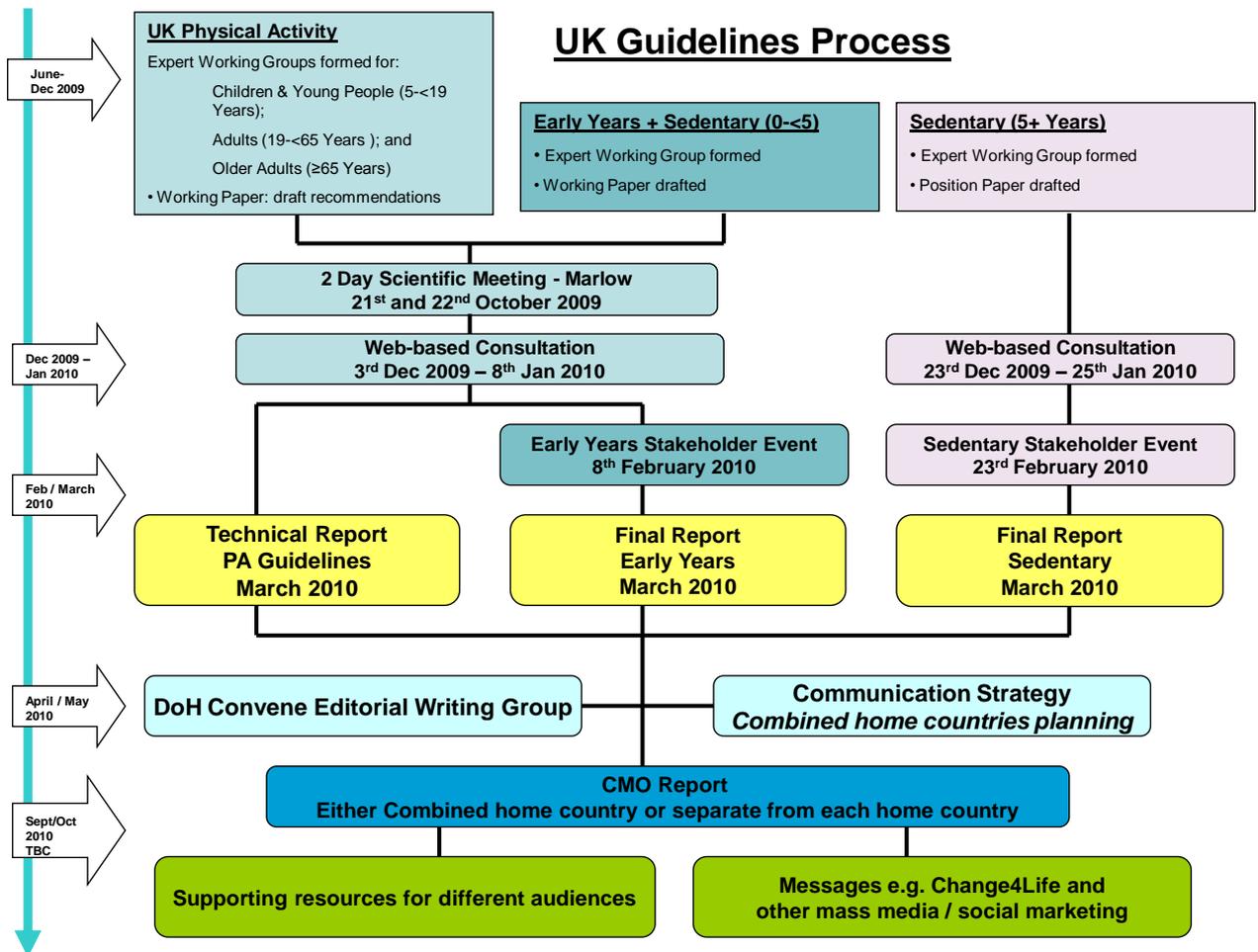


Figure 3. Schematic overview of the physical activity guideline development and related work

Table 5. Membership of Early Years and Sedentary Expert Working Groups

Expert Working Group on Early Years (<5 years)	
Professor John Reilly	Division of Developmental Medicine, University of Glasgow, UK.
Professor Len Almond	Advisor, British Heart Foundation National Centre, Loughborough University, UK.
Dr Greet Cardon	Department of Movement and Sports Sciences, Ghent University
Associate Professor Antony Okely	Faculty of Education, Child Obesity Research Centre University of Wollongong, Australia.
Liz Prosser	Department of Health Cross Government Obesity Unit (Delivery Manager – Physical Activity), UK.
John Hubbard	Department of Health Cross Government Obesity Unit (Children & Early Years Lead), UK.

Expert Working Group on Sedentary and Obesity	
Professor Stuart Biddle	School of Sport, Exercise and Health Sciences, Loughborough University, UK.
Dr Ulf Ekelund	MRC Epidemiology Unit, Cambridge, UK.
Nick Cavill	Cavill Associates & University of Oxford, UK.
Dr Trish Gorely	School of Sport, Exercise and Health Sciences, Loughborough University, UK.
Professor Mark Griffiths	School of Social Sciences, Nottingham Trent University, UK.
Dr Russ Jago	Department of Exercise, Nutrition and Health Sciences, University of Bristol, UK.
Professor Jean-Michel Oppert	Nutritional Epidemiology Unit, Pitie-Salpetriere Hospital, Paris, France.
Dr Monique Raats	Department of Psychology, University of Surrey, UK.
Dr Jo Salmon	School of Exercise and Nutrition Sciences, Deakin University, Australia.
Professor Gareth Stratton	School of Sport and Exercise Sciences, Liverpool John Moores University, UK.
Dr German Vicente-Rodriguez	School of Sport Sciences, University of Zaragoza, Spain.
Dr Bryony Butland	Department of Health Cross Government Obesity Unit (Knowledge & Evidence), UK.
Liz Prosser	Department of Health Cross Government Obesity Unit (Delivery Manager – Physical Activity), UK.
Debra Richardson	Department of Health Cross Government Obesity Unit (Programme Manager), UK.

3. Results of the consultation (steps 3 and 4)

This section reports on the scientific meeting and the national web consultation and presents the final set of recommendations for consideration in the writing of new physical activity guidelines for the UK. A summary supporting case for each recommendation is provided drawing on the scientific evidence, much of which is taken from the working papers prepared by the expert working groups and updated to reflect the discussion and decisions made during Steps 3-5 of the review process.

3.1 Summary of scientific consultation meeting

In total fifty physical activity and health academics and health professionals attended the two day scientific meeting held in Marlow 21-22 October 2009. Opening plenary presentations from each working group provided an overview of the developments in the scientific evidence base supporting physical activity and the prevention of disease. In addition each presentation outlined the draft recommendations developed by the expert working groups proposing a set of changes and amendments for consideration in the process of updating the UK physical activity guidelines. Presentations highlighted the likely key issues for debate and the full set of draft recommendations was available in the working papers and circulated to delegates prior to the meeting.

The primary agenda for the remaining sessions on Day 1 and sessions in the morning of Day 2 was further scientific discussion on the evidence base. The delegates were asked to focus on how any new evidence could and should be interpreted within the context of potentially making changes to the current physical activity guidelines in the UK. Each recommendation from the working papers was systematically considered to allow further explanation, to obtain others views, and to capture any suggested revisions to the wording. The set of recommendations aimed to state clearly what might be added, changed or deleted in the existing guidelines. A Session Chair was identified for each age group: Professor Gareth Stratton (Children and Young People); Dr Charlie Foster (Adults) and Professor Jo Doust (Older Adults). Each chair facilitated the discussions inviting members of the expert working groups to comment and assist where needed. The Chair (or representative) presented a summary of group discussions, with any revisions to the recommendations, to the whole meeting in the final plenary session on Day 2.

In addition to the group discussion sessions, comment cards were made available on the tables for delegates to post questions to the organisers and experts for consideration. Throughout the meeting every effort was made to allow for delegate interaction, discussion and deliberation on key issues and suggestions on the final set of recommendations. Real time revisions were made to the wording of the recommendations as sessions progressed reflecting the interactive nature of the meeting.

The final closing session on Day 2 included a presentation of the revised set of recommendations, by age group, along with an indication of any outstanding issues that remained unresolved. In addition, an outline of the proposed next steps in the guidelines process was presented. This included: a short presentation on the needs for and plans around developing a communication strategy for the dissemination of the new physical activity guidelines; an outline of plans underway for a national web-based consultation phase; and efforts underway to secure publication of the new physical activity guidelines as a joint CMO Report in 2010.

The final facilitated Q&A session in the closing plenary allowed delegates to ask further questions on the proposed development steps, ways and mechanisms for their ongoing involvement, as well as further commentary on the need for and challenges facing the communications agenda. The two day meeting closed with final thanks to the work of the organisers, the national and international members of the expert working groups and attending delegates.

Reflection on the scientific consultation meeting by BHFNC identified several themes that were evident throughout the two days:

1. **The value of involving the international experts:** the contribution of the three international experts extended beyond just their individual scientific knowledge of the large evidence base, which was very clearly evident, to include their knowledge of the latest review level evidence and their willingness to clarify the science and respond to challenging questions from other scientists and delegates. The international experts also brought valuable recent experience in interpreting the complex, and often incomplete science, into summary statements for the purpose of national guidelines on physical activity for disease prevention;

2. **The value of involving the wider scientific community and interested stakeholders:** the inclusion of a face-to-face meeting, extended across two days, allowed for productive in-depth and extensive discussion of the scientific evidence base; it also allowed for more detailed communication of and engagement with the process of developing the new guidelines and the wider set of work underway. This is likely to pay dividends as the project moves towards the final outcome of new physical activity guidelines and when wider dissemination and adoption within the scientific and professional communities is required;
3. **The value of the background working papers:** these provided a useful and efficient starting point for the Consultation Meeting and interactions and involvement of the wider scientific community in the UK and interested stakeholders;
4. **The need for, yet difficulty in, separating the tasks of developing the scientific summary statements and the task of creating a communication strategy and associated ‘communication messages’:** although the opening plenary attempted to make a clear distinction between these two related but different tasks, the discussions during the meeting frequently moved between the two agendas. It was very evident that there was great interest in both aspects however, as time was limited, a greater focus was necessarily directed and frequently re-directed back towards resolving the scientific basis for a set of proposed modifications to the current UK physical activity guidelines;
5. **The value of including delegates from the communications field and representatives from government:** the participation of government communications representatives was important as they were able to hear first-hand the discussion of the science and thus the origins of the statements and develop a understanding of the often nuanced changes that were being proposed; in addition the communication experts were able to commence preliminary discussions and start collaborative planning for the development of a communications strategy for dissemination of the final guidelines.

3.2 Feedback from the national web consultation phase

A national web consultation was undertaken for a five week period over December 2009 - January 2010. The consultation was open to any interested stakeholder by a simple registration process and was widely promoted through a variety of channels, including the BHFNC website, home country government websites, and key stakeholder websites (for example

National Heart Forum and BASES). In addition, e-alerts were sent to various audiences such as university academics, practitioner networks, other scientists and key organisations.

In total 712 professionals registered for the web consultation and 146 completed at least one consultation. A total of 31 respondents completed consultations on all 4 age groups. The adult population group received the highest number of participants (n=87 respondents), followed by Children and Young People (n=72 respondents) and Older Adults (n=66). The majority of respondents completing the consultation were ‘health practitioners’ (38%), followed by responders from the government (27%) and the academic sector (22%).

Respondents were asked to rate their agreement with each recommendation on a 1-5 scale with 1 being ‘strongly agree’, and 5 ‘strongly disagree’ and to provide additional comments or suggestions on the underpinning scientific evidence. In addition, two other sections of the web consultation sought comments on the communications agenda for the physical activity guidelines and an opportunity to identify any relevant research gaps. A more detailed summary of the feedback from the web consultation is available from the BHFNC website [www.bhfactive.org.uk] however a summary of the key findings is presented below by age group.

Please note that the draft recommendations (and their numbered order) were specific to this step of the developmental process. To view the list of recommendations posted for the web consultation for each age group, please see Appendices 2-4. Also note, that the final set of recommendations reported in the next section of this report *do not* correspond to the numbered recommendations in this section and the graphs below.

3.2.1 Children and young people recommendations

Twenty draft recommendations were put forward for comment addressing Physical Activity Guidelines for children and young people (see Appendix 3). Figure 4 shows the level of agreement across the recommendations. The results show that 80% or more of respondents “agreed” or “strongly agreed” with 18 of the twenty recommendations. The recommendation that guidelines should state ‘daily physical activity’ (recommendation #2) received the highest level of agreement (100%). However, there was less support for the recommendation suggesting that new physical activity guidelines should include guidance on weight management for children and young people (recommendation #11).

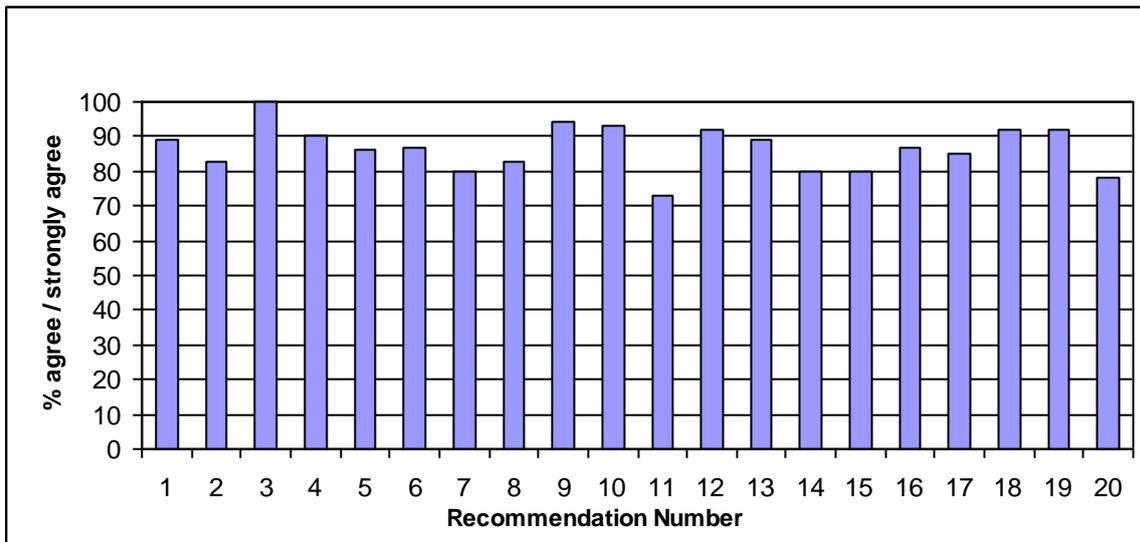


Figure 4. Agreement with the draft recommendations for children and young people

Recommendation #2, suggested that children and young people should be recommended to undertake 60 minutes of physical activity each day, attracted a large volume of comments. Some respondents indicated that attaining this level of activity may be too difficult, particularly for the most inactive children and young people. It was suggested that this recommendation should be lowered for the most sedentary and that a progressive ‘build-up’ to a total of 60 minutes should be encouraged. Several comments suggested that it may be necessary to provide examples of the types of activity and in what settings children and young people could achieve these physical activity recommendations.

Respondents suggested that some of the terms used in the recommendations required clarification or definition. For example, it was suggested that “vigorous intensity activity” needed explaining, and that this should be done without using the metric of ‘METS’ which was viewed as too technical. Other terms were also identified as requiring a clear definition and these included “musculoskeletal health” and “flexibility.”

In terms of musculoskeletal health and flexibility, recommendation #4 stated that children should take part in activities which promoted these aspects of health on at least three days of the week. Some respondents felt that clarification was needed on whether this activity should be ‘over and above’ the 60 minutes of activity every day (recommendation #5) or whether these activities can form part of the total of 60 minutes. Some respondents suggested that further guidance is needed on the types of activities which should be undertaken to improve musculoskeletal health and flexibility.

Although there was general agreement with the science underpinning the principle of ‘accumulation’ (recommendation #8), questions were raised over whether the final guideline should specify a minimum duration for individual bouts, for example, ten minutes. Also, some respondents felt that “accumulation” was an inappropriate term and alternative terminology, such as “add up” were suggested.

Many comments referred that the guidelines need to use plain English and that this was essential when communicating the physical activity guidelines to a wider audience. This is a good point with which most would agree, however the frequency of the remark suggests that many responders to the web survey were confused about the purpose of the draft ‘recommendations’. As was perhaps explained more clearly at the Marlow consultation meeting, the purpose of these recommendations was to state what changes should or could be made to the current guidelines, and not present draft physical activity guidelines themselves. The web consultation did seek comments on what should be suggested to the final drafting team and how the existing guidelines might be changed based on the most recent scientific evidence. It was not specifically concerned with refining (or ‘wordsmithing’) of the recommendations for use with a variety of audiences. It is evident across all age groups that many responders to the web consultation viewed the draft recommendations as a draft of the final physical activity guidelines statements themselves.

There was some controversy as to whether the recommendations for children and young people need to address the risks of being physically active. Respondents suggested that the risks and safety issues associated with physical activity should be presented in some format in the final guidelines so that parents and/or carers can put appropriate controls in place. It was however emphasised that participation in physical activity should be presented as very low risk to avoid undue concern and a reluctance to allow children to be physically active. Achieving the correct balance of these two issues is important.

3.2.2 Adult recommendations

Seventeen draft recommendations were available for comment addressing Physical Activity Guidelines in adult populations (for a list of recommendations see Appendix 4). The level of support (“agreement”) for each recommendation is shown in Figure 5.

Over 80% of respondents “agreed” or “strongly agreed” with 13 of the 17 recommendations. There was least support for Recommendation #17 which stated that any statement on the

sedentary behaviours was deferred due to other concurrent work. This most likely indicates a very strong interest in the importance of sedentary behaviours, a consequence of recent growth in scientific publications on this issue that have raised awareness of the relationship between sedentary activities and health risks. As previously mentioned, the scope of this review work excluded sedentary behaviours because a major review of primary evidence was already underway.

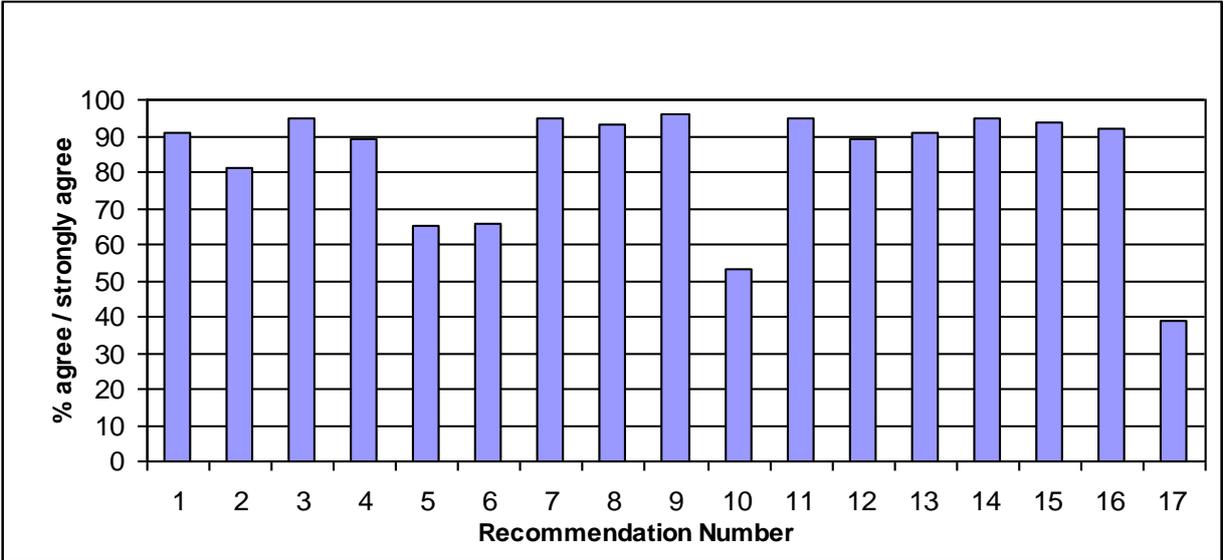


Figure 5. Agreement with the draft recommendations for the adult population

The recommendations on strength training (recommendation #5), flexibility (recommendation #6) and dose-response (recommendation #10) received lower levels of support. A large number of respondents commented on the recommendation that the physical activity guidelines should encourage strength training activity “in addition” to the recommended 150 minutes of aerobic activity (recommendation #1). An inconsistency between recommendations was highlighted if no details were provided on what type of strength training activities should be undertaken and for what duration. If there is insufficient evidence to provide these specific details, then it was considered by some that there was insufficient evidence for inclusion of strength training activity in the final physical activity guidelines. Other comments highlighted that the inclusion of the additional domain of activity (strength training), added complexity to the overall physical activity ‘messages’ that would be given to the general population. This was viewed with some concern given the overall levels of participation in physical activity levels equivalent to the recommendation of 150 minutes are low in the UK. Respondents questioned the merit of asking for even more activity given these low rates of participation.

Recommendation #6 suggested that physical activity guidelines should highlight the benefits of stretching activities to improve flexibility, but stopped short of specifying the exact details of how much and how often and what type of activities should be included. Feedback on this recommendation was very similar to the above (recommendation #5), namely, if there is insufficient evidence to provide these specific details, then there is insufficient evidence to include a statement on flexibility in the final physical activity guidelines. Again, the additional complexity that this issue could potentially add to the final physical activity guidelines was expressed as a concern. Overall, the feedback from the web consultation suggest that any statements on the health benefits of strength training and flexibility should be positioned as secondary and less important than the primary message to adults of undertaking at least 150 minutes of aerobic activity per week.

The greatest number of comments on the adult recommendations was in relation to recommendation #10 which also scored the second lowest level of agreement (53%). This recommendation suggested that the final physical activity guidelines should specifically state that higher volumes of activity (that is more than 150 minutes/week) is associated with additional benefits “but at a somewhat decreasing benefit.” The latter part of this phrase provoked the most reaction. All comments on this issue called for the phrase “at a somewhat decreasing benefit” to be removed. Although many of the respondents agreed with the science that a greater volume of activity was associated with greater health benefits, they questioned the strength of the evidence on a levelling-out or plateau at the higher-end of the dose-response relationship. Moreover, it was suggested that using this phrase might de-motivate adults. It was suggested that in general, at the population level, we are trying to encourage adults to be as active as possible and that any focus on the potential levelling-out of health benefits beyond a certain level of activity could be counter-productive.

Similar to the feedback received on the children and young people and older adult population groups, respondents emphasised the need to define technical and potentially confusing terms such as ‘moderate’ and ‘vigorous’ intensity activities and it was suggested that these definitions focus on heart rate and/or breathing as opposed to using the metric of METS. Other comments highlighted the need to provide examples of moderate and vigorous intensity activities and in line with much of the feedback focused on the ‘messaging’ and communication issues there was a call for the use of plain English.

One of the more significant changes to the current physical activity guidelines was outlined in recommendation #1, namely the shift to a statement of total volume rather than a statement of a specific frequency and duration (such as “5 x 30”). It was anticipated this would receive a lot of comment as it was discussed at length during the scientific meeting in Step 3. Many of the responses expressed the concern that stating “150 minutes” of activity may be perceived as “too much” or “daunting.” It was also considered to be potentially a harder concept to grasp than the previous message of ‘5 x 30’ minutes. It was suggested that the final guidelines should explicitly highlight that the 150 minutes of activity should be spread across the week to avoid or at least minimise the interpretation that the 150 minutes can and should be undertaken in one continuous bout.

Currently the UK guidelines do not clearly address the benefits of vigorous intensity activity and recommendation #2 suggested this situation be changed. Respondents to this recommendation expressed concern that this would add complexity to the guidelines and it was confusing to understand the statement that vigorous activity required less time (75 minutes). For this reason, some respondents felt that the updated guidelines should only focus on moderate intensity activity.

Although there was general support for the concept of accumulation (Recommendation #4), respondents questioned the strength of the evidence base underpinning this recommendation, and specifically, the statement of a minimum duration of 10 minute bouts. Other feedback pointed out the contradiction that might result in stating both a minimum of 10 minutes and on the other hand recommending that all physical activity is beneficial. There was however very strong support for the final guidelines to have strong emphasis on ‘progression’ and ‘building-up activity levels gradually’, particularly for the most sedentary adults. Finding the correct balance between these two issues will be a key task in the final writing of the new physical activity guidelines.

3.2.3 Older adult recommendations

Twenty draft recommendations were prepared addressing Physical Activity Guidelines in Older Adult populations (for a list of recommendations see Appendix 5). The level of support (“agreement”) for each recommendation is shown in Figure 6. Over 80% of respondents “agreed” or “strongly agreed” with 17 of the 20 recommendations. Lower scores on agreement were received for the recommendation on sedentary behaviour (#20), which was deferred due

to concurrent work as previously mentioned, and the specification of greater benefits from higher volume of activity but at “a somewhat decreasing rate” (recommendation #13). Similar to the feedback received in the adult population section, respondents felt the latter part of the statement should be deleted to avoid confusion and de motivating adults about the merit of being as active as possible.

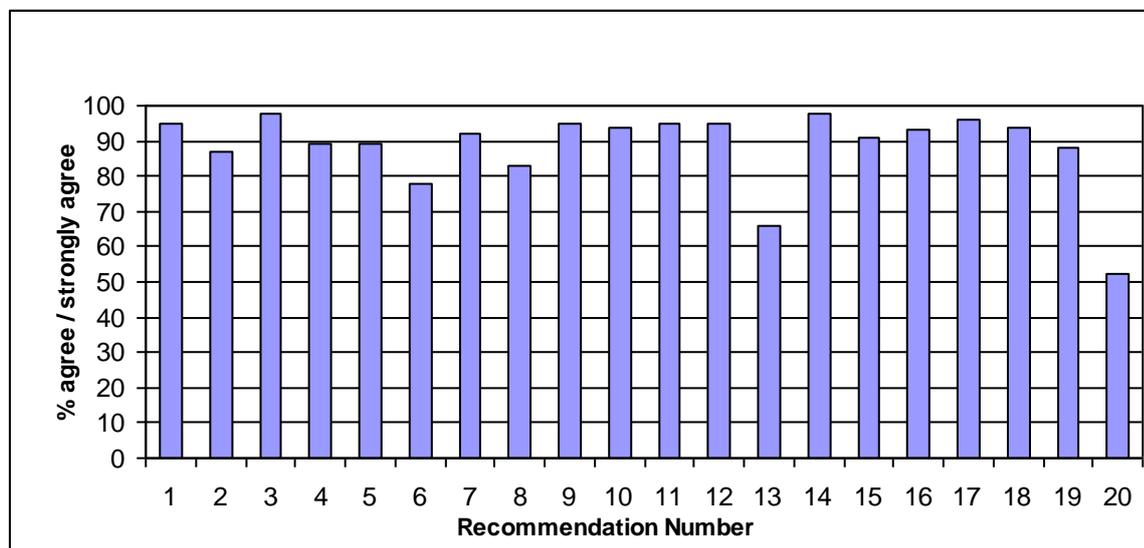


Figure 6. Agreement with the draft recommendations for older adults

Feedback called for the term ‘physical activity’ to be defined in the guidelines and the accompanying materials aimed at the older adult population. Moreover, respondents also felt that the different types of physical activities which the older adult population group should undertake and which are sufficient to be classified as ‘moderate intensity’ should be clearly stated as they are likely to be different activities than those illustrated in guidelines for the adult population. In addition, feedback suggested that the guidelines should promote light intensity activity and lifestyle-related activities (such as stair climbing) in addition to moderate-intensity activity.

There was some controversy over the recommendation that new physical activity guidelines for older adults should include vigorous intensity activity (recommendation #2). Some respondents were concerned that higher intensity physical activity is inappropriate for older adults, while in direct contrast, other feedback supported the inclusion of vigorous intensity activity and welcomed the acknowledgement that many older adults are very capable of undertaking higher intensity activity. Recognising the difference in individual ability and recommending that older adults start slowly and build-up gradually was strongly endorsed in the feedback received via

the web consultation. It was also suggested that the final guidelines should include examples of the types of activities which older adults can undertake in order to meet the suggested physical activity levels, including both indoor and outdoor pursuits.

Similar to the feedback received in the adult section, respondents suggested adopting recommendation #1 but expressed caution that using the term “150 minutes” may be perceived as “daunting” and “unachievable” by older adults. Also, that phrased as “150 minutes” it may not be as easy to comprehend by the intended audience as the current guidelines message of “5 x 30.”

Quite a large number of comments were received in response to recommendation # 4 which addressed the accumulation issue and states that only bouts of ten minutes or more are sufficient to contribute to the 150 minute target. In general, the respondents recognised the limitations in the current scientific evidence and felt that the final guidelines should aim to motivate older adults to take part in any physical activity regardless of the type or duration of activity.

Recommendation #6 states that the new guidelines should specify that older adults should undertake muscle strengthening activities involving major muscle groups on two or more days of the week. Feedback requested the provision of examples on what types of activities should be included and that appropriate training regimes should also be provided. In other words, there should be more specificity in the details. Similar suggestions were made in response to recommendation #7 on balance training and recommendation #8 on physical activity to improve and maintain flexibility. Several comments did question the strength of evidence supporting the inclusion of any statement in the final recommendations on physical activity and flexibility. In particular, one concern pointed to the importance of avoiding any inconsistencies in the amount of evidence used to make any statements. One issue which was raised unique to the older adult population group was the importance of including the promotion of group based activity. Alongside support for recommendation #14 which refers to the mental health benefits, the social health benefits afforded from participation in physical activity should be emphasized in the new physical activity guidelines. One respondent suggested that this should be tied with recommending exercising in a group where all these benefits can be developed; it was suggested that this was a particularly important issue for the older adult population. In addition, comments suggested that the final physical activity guidelines for older adults should provide

examples of how to access appropriately supervised activity, whereby the risks of taking part in physical activity are recognised and appropriate actions are put in place to effectively manage the risks.

3.2.4 Results from web consultation on draft summary statements

Section B of the web consultation presented, for each age group, a set of summary statements that attempted to operationalise the set of draft recommendations presented. Where appropriate, these statements brought together related text or issues from across recommendations into a shorter set of statements. In essence, these summary statements could be viewed as the first ‘preliminary draft’ of the potential new physical activity guidelines. The draft summary statements presented in the web consultation for each age group are also presented in Appendices 3-5.

Far fewer comments were received in response to the draft summary statements in part because of the substantial overlap in content with the previous recommendations. After all, they were in fact essentially the same content presented in a different way. Most of the comments received duplicated the information provided in response to the draft set of recommendations.

Overall, the responses to the children and young people summary statements were positive and this is consistent with the generally high level of agreement and support towards the draft recommendations. Several comments reinforced the need to provide examples of the types of activities that constitute vigorous- and moderate- intensity activity. Furthermore, clarification on whether muscle strengthening and flexibility can contribute to achieving the 60 minutes a day, or whether these activities should be undertaken ‘in addition’ to the primary recommendation of 60 minutes of activity daily was identified. Again, the issue of ‘accumulation’ received comments and several respondents questioned the need to include the specification of ‘up to several hours of moderate intensity physical activity on a daily basis’. These respondents felt that expanding on the ‘60 minutes a day’ would be counterproductive and may de-motivate inactive children and young people or their parents / carers. It was also commented that providing a lower a minimum threshold of 30 minutes daily physical activity for inactive children may be counterproductive unless a reference is provided to this being viewed as only a starting point towards achieving the primary recommendation of 60 minutes of activity daily.

One new suggestion provided in this section of the web consultation called for different statements of duration for different age groups. Specifically, it was suggested that the final guidelines could recommend that children aged 5-12 years should aim for up to 90 minutes of moderate intensity physical activity daily and young people aged 13years+ should aim to achieve 60 minutes per day. It was viewed that taking this approach would “mirror that taken in Canada.” A cross check with the actual Canadian guidelines reveals that they recommend that children and youth should increase their current levels of activity by 30 minutes and over several months lead up to the accumulation of at least 90 minutes of physical activity each day.

Finally, there were repeated calls for the use of plain English, avoidance of complex terms, provision of definitions in addition to providing examples of the different settings and contexts in which children and young people can achieve the recommended amount of physical activity.

The summary statements on physical activity for adults received the most feedback. Respondents reiterated that the presentation of “150 minutes” of physical activity may be perceived as unattainable and off-putting to inactive populations, especially when indicating that overweight or obese adults should aim to achieve additional amounts of activity (>150 minutes). It was suggested that providing more than one example of how the 150 minute recommendation could be accumulated (e.g. 2 x 75 minutes, 5 x 30 minutes) may be beneficial, especially for engaging inactive populations. It was also suggested, that caution is needed to ensure consistency in the ‘messaging’ and the communication of the final guidelines to avoid confusion. One respondent commented that it would be useful to include examples of the health benefits of physical activity, particularly those that would be gained by achieving physical activity levels above and beyond the 150 minute recommendation.

Clarification was needed on whether strength training can contribute to achieving the ‘150 minutes’, or whether strength training activities was required ‘in addition’ to the primary recommendation of 150 minutes of activity per week. Respondents suggested inserting the word ‘aerobic’ to distinguish the ‘150 minute’ recommendation from strength training activities. Respondents disputed the inclusion of a statement on flexibility due to uncertainty surrounding the type and duration required to benefit health. Again comments called for definitions and examples of the types of activities that constitute moderate- and vigorous-intensity activity, especially for concept of combining moderate- and vigorous- intensity activities to achieve the recommended volume of activity. The need to use plain English and avoid the use of complex terminology and sentences was a frequently repeated comment.

Feedback on the summary statement for the older adult population reflected those already mentioned above from the adult population; more specifically comments called for the use of plain English and providing further clarity through the use of examples to define moderate and vigorous intensity activity. In addition, respondents raised concerns that a shift to 150 minutes per week may lead to confusion for both professionals and the public as the 5x30 message is only just starting to be well recognised. Furthermore, comments again pointed to the potential for '150 minutes' to be perceived as daunting or simply unattainable for some older adults and the need to focus on "some activity being better than none" was thought to more helpful to engage older adults into some form of activity.

There were conflicting views on the examples used for strength training activities with both positive and negative comments received. Several respondents felt that 'heavy gardening' was not appropriate and suggested the use of more functional activities, such as stair climbing and 'sit to stand'. Furthermore, and consistent with the feedback received for the adult population, the inclusion of flexibility was questioned due to the lack of detail on type and duration of activity.

Respondents challenged the plausibility of older adults achieving additional amounts of physical activity beyond the 150 minute recommendation given the current low levels of participation; and again as with the adult population, it was felt that further explanation was required on the plateau of health benefits at the high end of the dose-response relationship. Respondents felt that this statement may be confusing and de-motivating.

Other feedback suggested that the specific statements on physical activity and weight management and falls prevention should be applied to all older adults, not just those at risk. Also, the final guidelines should emphasise the social benefits of physical activity for older adults and the role this plays in maintaining and improving mental well-being.

3.2.5 Results from the web consultation on communications agenda

As previously mentioned there was considerable interest during the two day Scientific Meeting in the issues associated with the final drafting of the physical activity guidelines, the specific wording used, and the development of associated "messages" that would be used to communicate the guidelines to different audiences as part of dissemination. This strong interest was also reflected in the responses received via the web consultation. Section C of the

consultation invited comments on these issues and a summary of the key points is provided below in bullet point format, by each age group.

Communication Issues: Children and Young People

- A wide range of communication channels should be used for dissemination and suggestions included schools, parents, GP's and community clubs.
- A number of priority target audiences should be identified, and these should include lower socio-economic groups, those with higher health inequalities, and young parents.
- The use of clear, simple language is paramount to ensure that the guidelines are easily understood by all target audiences.
- Key terms such as 'vigorous intensity' should be defined and supported by a range of examples.
- The communications strategy should include child friendly resources to help children and young people make informed decisions about their own physical activity choices.

Communication Issues: Adults

- Dissemination of the guidelines should occur through a wide range of professionals in a variety of settings including primary health care and workplaces.
- Communication of new guidelines should target adults who are sedentary, overweight or obese or have a learning disability.
- Preparation of one, simple message for physical activity and avoidance of complexities of including possible combinations of vigorous and moderate intensity activity in headline guideline.
- Use of a range of communication methods to improve the clarity and impact of revised guideline, such as TV, reports and media campaigns.

Communication Issues: Older Adults

- Key organisations such as Age Concern should be engaged in the dissemination and communication of the guidelines, along with health professionals and other related services including care homes.
- Older adults living alone or in socially disadvantaged were identified as being priority target audiences for the communication of new guidelines as well as those with chronic conditions or disabilities.
- Use of clear, simple language and easy to read font size was recommended so that the guidelines can be easily understood by all target audiences.

- The focus should be on ‘5 x 30’ physical activity message because the ‘150 minute’ message may be too confusing and daunting for the older adult population.

3.2.6 Results on consultation on research gaps

In addition to seeking comments on the communication agenda, Section C of the web consultation provided an opportunity to identify any research gaps that, if addressed, would help in the future development of guidelines on physical activity. One of the most frequently reported research gaps was in the area of the economic assessment of the cost benefits of physical activity. This was reported as a gap in the evidence pertaining to all three population age groups.

Research Gaps: Children and young people

Research gaps for this population group focused on the following areas:

- The value of exercise as an outdoor activity;
- Measurement techniques for physical activity in different contexts;
- Physical activity and maintenance of a healthy weight; and
- Engaging adolescent girls in physical activity.

Research Gaps: Adults

Research gaps for this population group focused on the following areas:

- The health benefits in response to different frequency of sessions/week with volume held constant
- The type and duration of muscle strengthening activities;
- The impact of sedentary behaviour on adult health;
- The relationship between physical activity and maintaining a healthy weight; and
- Frequency and duration of flexibility for adults.

Research Gaps: Older adults

Research gaps identified for the older adult population included all those made for the adult population and in addition the following population specific suggestions:

- Socio-environmental determinants of physical activity participation older adults who live in institutions and those living in rural areas;
- The benefits of a long term exercise referral programme; and
- Effective promotion and targeting of physical activity for older adults.

4. Final recommendations for the updating of Physical Activity Guidelines in the UK

This section is presented in seven parts. Firstly the recommendation by the three working groups to consider the merit of updating the existing UK physical activity guidelines is presented in Section 4.1. Given the strong agreement in the need for this work, Sections 4.2, 4.3, and 4.4 present the final set of recommendations to guide the drafting of new physical activity guidelines for children and young people, adults, and older adult population, respectively. A brief supporting rationale based on the scientific evidence is provided to support the final recommendations made for each group. This report, however, does not attempt to provide a full summary of all the available science as this task was undertaken recently and comprehensively reported in the outputs from the USA and Canadian physical activity guidelines processes.^{1, 12-15}

Section 4.5 and 4.6 report on the considerations by the expert working groups and consultation discussions on issues related to communications (and messages) and population surveillance. Lastly, section 4.7 presents a number of additional recommendations related to physical activity guidelines that the expert working groups and consensus meeting recommend should be considered in the UK.

4.1 Recommendation on the need to update the current physical activity guidelines

Each working group was asked to consider the question of how much merit there was in updating the current set of physical activity guidelines in use in the four home countries. Specifically they were asked to review how well the current guidelines reflected the most recent scientific evidence on health benefits of physical activity across the life course.

Recommendation for: Children and Young People	It is recommended that there is sufficient scientific evidence to warrant changes to the existing UK guidelines on physical activity for children and young people to be more in-line with the new scientific evidence.
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Supporting case for the above recommendation

The final recommendation of the children and young people expert working group is that based on their review and wide consultation, modifications to the current UK guidelines on physical

activity for children and young people should be undertaken. Although the existing guidelines are not *wrong* in light of the latest scientific reviews, they are incomplete, lack clarity and in some cases lack precision. The set of recommendations on what changes should be made and what final guidance should recommend, in most cases, reflects the need for additional clarification or extensions to what presently exists. It is suggested that positioning the new guidelines in this light will minimise the disruption or confusion that may occur in professional and community audiences.

Recommendation for: Adult population Although the current scientific evidence does support the health benefits of the volume of activity stated in the current guidelines on physical activity in the UK (namely 5 x 30 minutes of moderate intensity activity per week), it is recommended that the current guidelines should be reviewed and potential refining, clarification and/or extensions should be undertaken to allow a better reflection of the scientific knowledge accumulated since 2004 on the health benefits of physical activity.

Supporting case for the above recommendation

The overall consensus from the adult working was that the scientific evidence continues to support the main elements of the current physical activity guidelines, which in each of the home countries, fundamentally refer to the benefits of ‘aerobic’ physical activity and states a quantification of the duration, intensity and frequency of activity required for health benefits in a concise statement. However, it was agreed that since their endorsement in the CMO Report “Five times a week”⁴ in 2004 the scientific evidence base has grown. Thus, given new evidence, and the emergence of new and broader guidelines in the USA and Canada, along with the absence of specific guidelines for older adults in the UK, it is recommended that some refining and/or extensions should be undertaken to the adult physical activity guidelines to better reflect and provide clarification of the current scientific knowledge since 2004.

Recommendation for: Older Adults It is recommended that the UK should develop physical activity guidelines that provide a clear set of guidance appropriate and tailored for older adult populations.

Supporting case for the above recommendation

The older adult working group and the consensus from the consultation meeting agreed that the existing physical activity guidelines in the UK are specific to the adult population and that although it is implied that they are appropriate for the older adult population as well, there is no

specific or tailored guidance. Yet, the older adult population is becoming a larger sector of the overall UK population and they suffer from greater levels of disease, disability, are vulnerable to falls and injury, and have lower levels of physical activity and physical function and higher levels of mental illness than any other age sector of the population. In addition, life circumstances are different with fewer in regular employment. It is therefore recommended that a separate set of guidelines tailored to the older adult population are required and timely.

Recommendation for: Consistency across home countries	It is recommended that the physical activity guidelines in all four UK jurisdictions should be harmonized to provide a common set of scientifically and expert informed statements with a common level of detail.
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All expert working groups, as well as the general consensus from the scientific meeting and web consultation process confirmed that there would be great advantage in using the opportunity of reviewing and updating the physical activity guidelines to introduce consistency across the four home countries.

4.2 Final Recommendations for new physical activity guidelines: Children and young people

A total of 11 recommendations are made to guide the final writing of updated physical activity guidelines for children and young people in the UK. These recommendations are presented below with supporting rationale.

Recommendation 1	The UK guidelines on physical activity for children and young people should include a recommendation for physical activity in general, an overall guideline.
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Recommendation 2	The UK guidelines on physical activity for children and young people should recommend “daily physical activity”.
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Recommendation 3	The UK guidelines on physical activity for children and young people should recommend at least 60 minutes of moderate to vigorous physical activity (MVPA) daily.
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Supporting case for the above recommendations

Because children and young people are growing and developing, it is prudent and well supported in the literature that updated UK physical activity guidelines should include a general overarching statement supporting participation in physical activity, recreational activities, sports, physical education and active play for all children and young people. This has

been adopted elsewhere.^{2,16-18} Significant health promoting benefits have been proven for cardiorespiratory health and fitness and strength and bone health. Therefore the updated guidelines should specifically endorse activities that promote vigorous intensity physical activity as well as activities that will develop and maintain musculoskeletal fitness (i.e. strength, bone health and flexibility). The physical activities in which children and young people engage vary with age and therefore developmentally appropriate activities are essential and should be promoted in the guidelines.¹⁹ This approach is evident in recent international guidelines for young people elsewhere and should be adopted in the UK. (e.g., in USA, Canada and Australia)^{2, 12, 16}

Although there is considerable interest in knowing exactly how frequently children and young people should be active, the current evidence on any definitive number of days is equivocal and there is no clear evidence of any threshold.¹² This is in part because much of the research as studied the volume rather than the distribution of physical activity. There is, for example, no evidence that missing one day (or two or three days) in a week has any measureable negative effect on health. Therefore, given the available knowledge and similar to several other areas of physical activity recommendations, the general position is one of ‘more is better.’ Internationally, physical activity guidelines have chosen to recommend children and young people should be physically active everyday (daily).^{1, 12, 13, 18-20} The recommendation of physical activity “daily” aims to promote a pattern of regular physical activity as an integral component of daily living and to keep communications and ‘messaging’ to different audiences simple, thus most guidelines elsewhere have opted for this approach. It is therefore recommended the UK guidelines retain the *per day* recommendations for children and young people.

Recent international reviews have all concluded that the appropriate physical activity intensity target for public health benefits in children and young people is moderate to vigorous intensity physical activity.^{1, 12, 18, 21} This in part reflects that the vast majority of research has focussed on this intensity level of activity. In children and young people this is typically defined as ≥ 3 -4 METS. The intensity recommendation in all existing guidelines in the UK is already in line with this position and should be continued.

Although there is strong agreement on a recommendation of ‘at least 60 minutes’ of moderate intensity it is worth noting that exactly how this is stated does vary. In Canada, they have opted to state in their recommendation “an average of at least 60 minutes per day” to recognise that

there is no definitive science on this issue.¹² More research is called for to address this question. It is also recognised that achieving at least 60 minutes per day may be a challenge for the most inactive children and young people. Therefore, in Canada their recommendations state that for very inactive young people, even 30 minutes of daily activity will provide benefits and may serve as ‘stepping stone’ to higher levels of activity.^{12, 13, 18} This incremental approach to increasing levels of physical activity should be conveyed in new UK guidelines.

Recommendation 4 The UK guidelines for children and young people should include a specific recommendation for vigorous activity ($\geq 6-7$ METS) on at least 3 days a week.

Recommendation for supporting commentary

The commentary which accompanies the guidelines should indicate that vigorous intensity activity will form part of the daily 60 minute recommendation for children and young people.

Supporting case for the above recommendation

The scientific evidence for most health outcomes supports a dose-response relationship such that, an increase in activity intensity (and/or increases in activity duration and/or frequency) yields additional health benefits.^{1, 12, 18} It is also well recognised that different health outcomes may require different overload intensities. For some health outcomes, high levels of sustained activity (as in higher intensity) may be required, for example to improve cardio-respiratory fitness. For other benefits, such as mental health, moderate-intensity physical activity may achieve significant benefits. Thus, the most recent reviews from America and Canada conclude that an additional specific recommendation for vigorous activity ($\geq 6-7$ METS) on at least 3 days a week should also be included in young people guidelines because additional and sometimes separate health benefits accrue from more vigorous-intensity activity.^{1, 12, 13}

There is, however, insufficient evidence on the health benefits associated with specific durations of vigorous activity, therefore an appropriate specific prescription for the bout length of vigorous-intensity activity for young people is currently not available in the literature. The available evidence on the duration of vigorous activity suggests that, in general, more and longer bouts are associated with greater health outcomes^{1, 12, 13} and this is consistent with the basic exercise physiology principles of progression overload and adaptation. Further research on temporal patterning of physical activity is encouraged.

Recommendation 5 The UK guidelines on physical activity for children and young people should recommend physical activity for the promotion of musculoskeletal health and flexibility at least 3 days per week.

Recommendation for supporting commentary

Physical activity undertaken to improve musculoskeletal health can be considered to contribute to the 60 min of MVPA. However, participating in 60 minutes per day of activity which exclusively focuses on musculoskeletal development cannot be considered to be fully achieving the full recommendations, as there is no aerobic component. Many activities (e.g. many sports) combine elements of both aerobic and anaerobic metabolism and can contribute in important ways to both improved cardio-metabolic and musculoskeletal health. It is important to conceptualise children's physical activity in this holistic way – especially younger children – rather than trying to quantify separate 'bouts' of aerobic/anaerobic activity. The merit of developing and maintaining flexibility should also be identified as important

Supporting case for the above recommendation

The majority of studies to date have focussed on the health benefits of moderate– vigorous intensity physical activity, much of which is aerobic. However there is a smaller but growing body of science on the importance and health benefits of strength building activities and bone health in young people. Both the US and Canadian scientific reviews included this component and both conclude that significant health promoting benefits have been shown for strength and bone health. Evidence from 5 review papers was considered in the US review on musculoskeletal health and overall the studies show benefits from programs of 8-12 week duration involving 2-3 sessions per week.¹ Although it was noted that the optimal combination of mode, intensity, volume and duration were not known (and that more research is needed), overall it was considered that the risks associated with the recommending participation in activities to increase strength are negligible. Bone-loading physical activity increases bone mineral content and density. The US review concluded that targeted weight-loading activities that simultaneously influence muscular strength are effective.¹ They recommended 3 times a week, consistent with the recommendation on strength training. There is very little evidence on the health benefits and risks associated with activities to develop and main flexibility, and it does not appear to have been a separate focus in the US or Canadian reviews. Maintaining flexibility is widely accepted to be advantageous and specifically helpful in injury prevention. It is therefore recommended that the revised UK guidelines recommend physical activities to

develop and maintain musculoskeletal health and bone health at least 3 days per week and those activities to maintain flexibility are endorsed.

Recommendation 6 The UK guidelines on physical activity for children and young people should add a statement that additional MVPA beyond 60 minutes and up to several hours a day confers even greater health benefit.

Supporting case for the above recommendation

The scientific evidence for most health outcomes supports a dose-response relationship such that, an increase in activity intensity (and/or increases in activity duration and/or frequency) yields additional health benefits. Thus, all of the most recent physical activity guidelines for young people recommend *at least* 60 minutes of physical activity daily. The scientific evidence clearly shows significant and meaningful health benefits from this level of activity, and more activity is typically associated with even greater benefits. It is recommended that the UK guidelines convey that ‘more is better’ to encourage young people to exceed the 60 minutes. It is noted that the Canadian guidelines go further and encourage young people to add another 30 minutes and thus aim to achieve a total of 90 mins daily.^{12, 13}

Recommendation 7 The UK guidelines on physical activity for children and young people should include some explanation to convey that the recommended physical activity is above and *beyond* the light physical activity undertaken in the course of normal daily living (e.g. chores, hygiene, and incidental activity).

Supporting case for the above recommendation

A common concern with contemporary physical activity guidelines has been the potential for miss interpretation of the amount of activity required. For example, it is possible that some people might interpret the guidelines to be stating the total cumulative amount of physical activity required per day, yet the research informing the guidelines is actually based on *additional* physical activity over and above that associated with normal daily living. Such a misinterpretation may lead to very active children and young people becoming less active. To avoid this unintended consequence, it was considered to be important that the new UK guidelines convey that the recommended 60 minutes of physical activity is above and beyond the light activity undertaken in the course of normal daily living. In the US recommendation it is specifically communicated that the focus was on “physical activity *beyond baseline*.”²

Recommendation 8 The UK guidelines on physical activity for children and young people should include the concept “accumulate” in describing the recommended amount of physical activity.

Supporting case for the above recommendation

Controlled intervention studies on physical activity with differing bout durations with children and young people do not exist. Children in particular are sporadically active and achieve their physical activity throughout the day, in varying bout durations and activities of varying intensities.²² In the absence of any clear evidence to inform a statement on minimum bout duration, the Canadian review proposed to include the term “accumulate” but does not ascribe recommended bout duration.^{12, 13} In contrast, the recent American guidelines do not use the term “accumulate.”² It is recommended that the inclusion of the concept of accumulation in the UK guidelines is appropriate because the studies included in the various scientific reviews include a variety of exposures, including those where physical activity was accumulated in bouts of various durations (and intensities). Moreover, taking this position for the UK guidelines also conveys that the physical activity does not need to be accomplished in one single bout, which may be overwhelming and discouraging to some children and young people, parents and carers. It is noted that the issues of a minimum bout length does require further research.

Recommendation 9 The UK guidelines on physical activity for children and young people should provide a comment for those children and young people with disabilities (as done in Scottish 2003 guidelines) to ensure the guidelines are as inclusive as possible.

Supporting case for the above recommendation

Many children and young people have physical, emotional, mental and/or intellectual disabilities or challenges. The background scientific material reviewed for this report did not specifically review the available evidence in this area and the array of different disabilities makes generalizations very difficult. Nevertheless, most children and young people with disabilities would benefit from the physical activity and it was agreed that the recommendations for physical activity guidelines in the UK made in this report would be broadly applicable. Specific types of activities may require adaptation to individual needs and abilities and safety concerns must be addressed. Appropriate communication should include children and young people with disabilities as their participation in physical activity is important for optimal population health benefit.

Recommendation 10

children and young people do not include a specific guideline on physical activity for healthy weight gain or the maintenance of weight loss in overweight or obese children and young people; it is recommended that this be a high priority area for further research.

Recommendation for supporting commentary

Text should clarify that physical activity is important to prevent weight gain and obesity but that to date there is insufficient evidence to identify the exact amount required for optimal benefit and the issue is complex due to the confounding factors related to dietary intake and healthy weight gain due to healthy development of muscle and bone mass. At the current time, there is insufficient evidence to make a specific physical activity recommendation for either weight loss or weight management in children. Nonetheless, it is well accepted that all physical activity contributes to achieving a healthy energy balance, which in turn determines adiposity status, an important health risk.

Supporting case for the above recommendation(s)

Given the increasing prevalence of overweight and obesity in the UK and elsewhere there is a strong interest in the role of physical activity and healthy weight management, particularly within the context of the prevention of obesity in young people. The scientific report for the U.S. Guidelines specifically investigated the evidence regarding physical activity for decreasing adiposity in overweight or obese children.¹ Although many observational and experimental studies demonstrated desirable changes with increased physical activity, the results were equivocal and no specific physical activity recommendations for weight loss (or the maintenance of weight loss) in children and young people were stated.¹ Similarly, the Canadian review concluded also that there is insufficient evidence to provide any clear statement on a specific amount of physical activity required to prevent obesity.¹²

The science in this field is recognised as highly complex. Several reviews report that there are many children who engage in 60 minutes of MVPA each day yet childhood obesity continues to rise. Possible explanations for this include: measurement studies (e.g. self-report) over-estimate what children are actually doing;²³ because of an excess of energy intake over expenditure, even if expenditure is high; or because although significant health benefits accrue from this level of activity it remains too low for a certain segment of children given contemporary lifestyles. The recent US scientific report reviewed the evidence regarding the volume of physical activity required for decreasing adiposity in overweight or obese children

and concluded that although many studies demonstrated desirable changes with increased physical activity, the results were equivocal and no specific physical activity recommendations for weight loss (or the maintenance of weight loss) in children and young people are available.¹ Given the high prevalence of childhood obesity, this is an important area for further study. It is therefore recommended that the UK guidelines do not include a specific guideline on physical activity for healthy weight gain or the maintenance of weight loss in overweight but that supporting text should endorse the importance of physical activity in achieving a healthy energy balance. Moreover, it is recommended that this be a high priority area for further research.

Recommendation 11 The UK physical activity guidelines for children and young people should emphasize that the benefits of regular physical activity are considerable and far outweigh the low risks involved in participation.

Supporting case for the above recommendation

While the health benefits of physical activity have been systematically documented the reporting of risks has been much less systematic. For example, it is not common practice for physical activity intervention studies to systematically report adverse events and it often occurs only when there are adverse events or injuries (e.g. studies do not report that no injuries occurred during the intervention) so the available evidence may be biased. With respect to the physical activity and injury literature, the Canadian systematic review identified that most of the published information is limited to groups of participants that have all been injured or groups of participants comprised entirely of athletes (e.g., football players, ballet dancers).¹³

In Australia, the background scientific papers to the guidelines noted that *“like most activities in life, participation in exercise or physical activity is not without risk. In the physical activity and sport domains, some of the most commonly studied risks include musculoskeletal injury, negative psychological conditions (stress, burnout, and staleness), and risks to reproductive health. Notably, these negative outcomes mostly occur in children and adolescents participating in intensive competitive sport.”*²⁰ The final Australian guidelines clearly state that benefits outweigh potential risks.

In the US, the scientific report concluded that the benefits of regular physical activity outweighed the inherent risk of an adverse event. However, they also noted that *“still, adverse events are common even if usually not severe and are an impediment to widespread*

participation in regular physical activity. Awareness of the types and causes of activity-associated adverse events can be helpful. Selection of low risk activities and prudent behavior while doing any activity can minimize the frequency and severity of adverse events and maximize the benefits of regular physical activity.”¹ Therefore safety aspects of participation in physical activity should always be promoted (e.g. progressive overload, activities matched with abilities, protective equipment, safe environments).

Although specific research examining the risks associated with the existing guidelines is lacking, it is reasonable to conclude that the benefits of responsible participation in physical activity outweigh the inherent risks involved. It is therefore recommended that this is clearly stated in the revised UK guidelines.

4.3 Final recommendations for physical activity guidelines: Adult population

Thirteen specific recommendations were agreed upon to guide the final drafting of new adult physical activity guidelines in the UK. These same 13 recommendations were identified and agreed to be applicable to the development of physical activity guidelines aimed at older adults, along with two additional older adult specific recommendations. Below the 13 recommendations are presented along with a brief supporting rationale. Section 4.4 presents the two additional recommendations for older adults.

Recommendation 1 The UK physical activity guidelines should encourage adults to engage in moderate-intensity aerobic physical activity for at least 150 minutes per week; this physical activity should be spread across the week; and engaging in at least 30 minutes on 5 or more days each week is one example of how this volume can be achieved.

Supporting case for the above recommendation

The cumulative body of scientific evidence continues to support the strong dose response relationship and benefits of physical activity across a wide range of non communicable diseases. For chronic disease prevention and health promotion, the data from a large number of studies evaluating a wide variety of health outcomes in diverse populations generally supports a recommendation for adults of ≥ 150 minutes/week of moderate intensity physical activity (which is approximately equivalent to 500-1000 MET-minutes/week of moderate and/or vigorous intensity activity).¹ This volume is equivalent to the current ‘headline’ guideline in the UK of “5x30” as outlined in 2004.⁴ A key finding in the US scientific review was the continued support for the importance of *total volume* of aerobic activity of at least moderate-intensity (that is ≥ 3 METs) plays in achieving health benefits.¹ The evidence indicates that

achieving an adequate volume of moderate or vigorous intensity activity (MVPA) appears to be more important for a composite of health benefits than does any one specific mode of activity (e.g., walking, swimming, cycling), its intensity (assessed or expressed in absolute or relative terms) or the session frequency (number of days/week).^{1, 24}

The US scientific review concluded that the evidence remains unclear on how the health benefits, or health risks, of activity are affected by the number of days of activity.¹ For example, the report concludes that there is insufficient evidence on whether the health benefits of moderate-intensity activity for 50 minutes on three days each week differed from that of 30 minutes on five days each week. Although there is a need for more scientific studies on this issue, there is evidence that at least some of the health benefits are likely to result from acute, relatively brief responses to the aerobic exercise session.²⁵ Examples of this type of response include the acute improvement in insulin-mediated glucose utilization in persons with abnormal glucose metabolism,²⁶ the acute reduction in systemic arterial blood pressure in persons with elevated blood pressure,²⁷ and the decrease in plasma triglyceride concentration in men with hypertriglyceridemia when bouts of aerobic exercise are performed daily.²⁸ In addition, other published data indicate that various measures of mental or psychological health, such as depression, are improved for a limited time in response to one or several bouts of exercise. These changes appear to last for hours, and not usually days, thus leading to an apparent advantage of undertaking daily exercise sessions. On balance, therefore, the body of evidence supports recommending that physical activity is performed frequently across the week and this is the position stated in the US guidelines. It is recommended that new UK guidelines should affirm that aerobic activity should be “spread throughout the week” and that engaging in at least 30 minutes of moderate-intensity activity on 5 or more days per week is a highly appropriate way to obtain at least 150 minutes a week of activity.

Currently, the UK guidelines vary in how the recommended frequency of activity is reported. In England the guidelines state “at least five days” whilst in Scotland the guidelines state “on most days” thus implying (technically) at least four days, but likely, in practice, this is intended to mean at least 5 days to be consistent with elsewhere. It is recommended that the updated UK guidelines provide common and consistent statement across the UK.

There is some evidence to show that the amount (or volume) of moderate-intensity activity required for different health benefits does vary. A number of good quality, prospective observational studies show that rates of all-cause mortality²⁹, CVD mortality,³⁰ development of

type 2 diabetes,³¹ and depression³² are significantly lower in adults reporting a volume of 120-150 minutes per week of moderate-intensity activity,¹ while significantly lower rates of colon cancer,³³ breast cancer,³⁴ and obesity³⁵ occur at 180-300 minutes per week of moderate intensity activity. To date, no country has adopted national guidelines on physical activity that attempt to reflect these differences in volume, due in large part, to the complexity and potential confusion that multiple recommendations about physical activity for different health gains would create. Therefore, it is recommended that the UK retain a single ‘dose’ of activity as the primary guideline and that the guidelines reflect the amount required for optimal health benefits and prevention of disease.

The above position was taken in the US physical activity guidelines and was reached after consideration of an extensive scientific review on the effect of physical activity on all the key physical and mental health end points. The ‘headline’ recommendation for US adults is to aim for “at least 150 minutes/week of moderate intensity activity” and examples are provided on how this can be achieved (e.g. via five sessions of 30 minutes was used to illustrate as the first of several examples).² In the current UK guidelines there is no explicit statement on total volume of activity although ‘150 minutes’ of moderate-intensity physical activity per week is implied by the core statement of ‘5 x 30 minutes’ per week. It is worth noting that there was considerable debate during the consensus meeting about the merits of an apparent change from “5 x 30” to “150 minutes” guideline in the UK. Those in favour argued that it is well supported by the scientific evidence that volume is important and there was no scientific evidence to support or refute that breaking this down into five bouts of 30 minutes is better or worse than other combinations which involve spreading the activity across the week. Conversely, it was argued that “5 x 30” was a well accepted way to accomplish the volume of activity, it is the current ‘headline’ recommendation and the most common communication message around physical activity. Concern was expressed that changing it would be potentially confusing to both the adult community and other professional groups. The common ground in this debate was that it was possible for the revised UK guidelines to incorporate the “150 minutes” total volume statement *and* retain the “5x30” message by using it as one (primary) example.

It is worth noting that there are still very few studies in adult populations that systematically evaluate health benefits in response to different frequencies of activity sessions per week with the volume of activity (session duration x intensity x frequency) held reasonably constant. This

research gap limits the ability to answer key questions about the ideal combination of frequency and duration of activity sessions.

Recommendation 2 The UK guidelines for adults should retain a statement advising that physical activity can be accumulated across multiple bouts throughout the week. Individuals should aim for bouts of at least 10 minutes of moderate intensity activity at a time.

Supporting case for the above recommendation

Internationally, there is considerable interest in scientific evidence on the benefits of shorter bouts of physical activity, perhaps because of the practical appeal it would have to the general public. Currently, almost all national guidelines since the mid 1990s have guidelines that include a reference to the accumulation of ≥ 30 minutes/day of moderate intensity activity by performing bouts of at least 10 minutes throughout the day, based on the 1995 report by the CDC and ACSM and included in the 1996 US Surgeon General's report.^{36, 37} Although these early guidelines were based on a fairly limited evidence base the evidence continues to support this position. A recent review of data from about 16 experimental studies indicate that shorter bouts can increase aerobic fitness, reduce fatness, and to a lesser extent improve blood pressure and blood lipids to the same extent as the same volume of exercise performed in longer continuous bouts.³⁸ This review included studies that addressed selected fitness parameters, fatness measures and biomarkers with multiple bouts of 10-15 minute activity sessions (total of 30-40 minutes/day) to one 30-40 minute session/day.³⁸

Both the US and Canadian reviews^{1,13} reached the same conclusion therefore it is recommended that the updated UK guidelines retain a statement about accumulation of the recommended dose of activity in bouts of at least 10 minutes duration.

It is noted that shorter bouts are likely to be easier to achieve for many adults and thus may help in achieving the recommended levels of physical activity. This may be particularly important for adults, and notably older adults who may do little structured exercise but who may wish to achieve the recommendations through daily walking. Although there is now more evidence on which to base this position, it is well recognised that additional research is still needed to better understand the concept of accumulation and the specific health benefits.

Recommendation 3 The UK physical activity guidelines for adults should recognize that vigorous-intensity activity also provides health benefits for adults, and that 75 minutes of vigorous-intensity activity (also spread across the week) provides comparable health benefits to 150 minutes of moderate-intensity activity.

Recommendation 4 The UK guidelines for adults should recognise that combinations of moderate- and vigorous- intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity.

Supporting case for the above recommendations

Current UK physical activity guidelines emphasize moderate-intensity activity with no direct (or headline) recommendation on vigorous-intensity physical activity. In England and Northern Ireland, the guidelines state “at least moderate intensity activity”. This phrasing is ambiguous as it suggests that vigorous-intensity activity might be included. The Scottish and Welsh guidelines recommend “moderate intensity” and make no reference to vigorous intensity. This contrasts with other international examples, where the role of vigorous intensity activity has been retained in one way or another over the past decade or so. For example, the 1996 Surgeon General’s Report stated “prior vigorous physical activity recommendations still applied” referring primarily to the ACSM recommendations of 60-90 minutes of vigorous intensity activity/week (3 x 20 or 3 x 30 minutes/week) as providing health benefits.³⁷ More recent recommendations by ACSM and the American Heart Association included vigorous intensity activity by including ‘ ≥ 20 minutes 3 x week’ as well as their recommendation on moderate intensity activity³⁹ and this is also the position taken by the US and Canadian guidelines.

There is substantial scientific evidence showing vigorous-intensity physical activity (≥ 6 METs) brings significant increased benefits for some fitness and health outcomes.⁴⁰⁻⁴² Data from both prospective observational studies and experimental studies demonstrate a strong and quite consistent dose response for activity intensity and cardio-respiratory fitness.^{43, 44} Given this, the US guidelines have taken a very clear and direct position and now state that “for substantial health benefits, adults should do at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic

physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Aerobic activity should be performed in episodes of at least 10 minutes, and preferably, it should be spread throughout the week.”² The calculation of the duration (minutes) is based on the MET value of vigorous activity being estimated and averaged to be about double that of moderate intensity activity and therefore about half the time is required to achieve a similar volume and health benefits. The US Guidelines also demonstrates the idea of combining different types (intensity) of activity by showing how vigorous-intensity and moderate-intensity activity can be combined to achieve weekly recommendations. This has been done in other national guidelines, such as Finland and Switzerland.

It is worth noting that vigorous intensity activity is rarely achieved by approximately 80% of the UK population (and even fewer older adults).³ Furthermore, vigorous intensity activity introduces further motivational challenges to people who are not used to this intensity level of exercise or who prefer less vigorous forms of activity, such as dance or walking.⁴⁵ Undertaking vigorous intensity activity may also heighten risk of injury.^{46, 47} Conversely, a sector of the UK population may prefer vigorous-intensity activity as a means of achieving all or some of their weekly requirements because the energy expenditure of vigorous activity is greater than that of moderate-intensity activity, thus fewer minutes are required to obtain health benefits equivalent to those of 150 minutes of moderate-intensity activity. Besides increased benefits of vigorous activity, it provides a more efficient alternative to moderate intensity activity for those who might prefer it.

It is therefore recommended that the UK physical activity guidelines for adults (and older adults) should specifically recognize that vigorous-intensity activity also provides health benefits for adults, and that 75 minutes of vigorous-intensity activity (also spread across the week) provides comparable health benefits to 150 minutes of moderate-intensity activity. The UK guidelines and/or supporting materials should indicate to adults the benefits and possibilities of combinations of moderate and vigorous intensity activities as an acceptable way to achieve the total weekly recommended volume of activity.

Recommendation 5 The UK physical activity guidelines for adults should include a recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week.

Time spent undertaking muscle strengthening activities should be in addition to the primary recommendation of 150 minutes. Although there is currently insufficient evidence to determine an optimal regimen for this muscle strengthening activity, an example of a regimen that has been shown to be beneficial should be included in the explanatory guidance that accompanies the guidelines.

Recommendation for supporting commentary

The commentary which accompanies the UK guidelines should include a statement that stretching and flexibility training may be beneficial.

Supporting case for the above recommendation

Current adult physical activity guidelines in England, Scotland, Wales and Northern Ireland do not contain specific guidelines for muscle strengthening activities. This is one area where there have been more notable scientific developments in the evidence in recent years. There is now a strong and growing scientific evidence base on the health benefits of muscle strengthening activities in adults, and especially for older adults.¹ This includes the benefits of enhancing muscle strength and muscle power and the consequent improvements or maintenance of functional ability and reduction in falls, the stimulation of bone formation and reduction in bone loss.^{48, 49} The recent US guidelines for both adults and older adults include a specific recommendation on these components of fitness, stating “performing muscle strengthening activities using the major muscles of the body at least twice each week.” Furthermore, the recent ACSM Position Stand for Older Adults⁵⁰ also recommends progressive weight training program or weight bearing calisthenics (8–10 exercises involving the major muscle groups of 8–12 repetitions each), stair climbing, and other strengthening activities that use the major muscle groups at least 2 days/week and between moderate- (5–6) and vigorous- (7–8) intensity on a scale of 0 to 10. There is, therefore, sufficient scientific evidence to support a new UK physical activity guideline recommending muscle strengthening activity for adults and older adults.

The types of activities that can be performed for progressive muscle strengthening activities should involve the major muscle groups of the body and be undertaken on two or more days

per week. For example, for adults strengthening activities might include weight training machines or free weights; for frailer older adults, these activities might include weight bearing activities such as ‘sit to stands’, or use of resistance bands or ankle weights.

Although there is great interest in the growing body of evidence on the role of physical activity in maintaining and improving balance and the potential to reduce the risk of falls, there is insufficient evidence to support a ‘headline’ recommendation on the role or amount of activity required for balance in the general adult population. This is not the case for the prevention of falls in older adult population, and this evidence is presented in the following section on older adult populations.

The specific health benefits of flexibility activities are unclear although it is generally considered that flexibility activity maintains the range of motion necessary for daily activities and physical activity. Adults need adequate flexibility to perform physical activity therefore adults, and older adults in particular, should perform activities that maintain or increase flexibility. However in the absence of sufficient evidence to state a frequency and duration of necessary activity to improve flexibility and reduce specific health outcomes, it is recommended that updated guidelines on physical activity in the UK acknowledge the benefits of maintaining flexibility but do not state a ‘headline’ recommendation for adult populations.

To assist in the writing of this, it is recommended that the UK guidelines are modified along the lines of ‘*Adults, especially older adults, should perform activities that maintain or improve flexibility on two or more days per week. These activities could include static stretches or working through the full range of movement during exercise or physical activity.*’

Recommendation 6 The UK physical activity guidelines for adults should recognise that physical activity has an important role in healthy weight management and body composition.

It is recommended that a separate set of guidelines on weight management, which includes recommendations on altering energy balance by increasing physical activity and decreasing caloric intake through dietary modifications, is required.

Recommendation 7 The UK physical activity guidelines for adults should emphasise the health benefits of activity for those adults who are already overweight or obese. They should indicate that overweight and obese adults achieving the recommended weekly volume of activity (5 x 30/ 150 minutes/week) will gain multiple health benefits even in the absence of reductions in body weight.

Supporting case for the above recommendations

It is well accepted that physical activity is a key component of daily energy expenditure and therefore plays an important role in weight management, but also that any recommendations regarding weight maintenance and weight loss must take into account energy intake as well as energy expenditure.¹ There is evidence from many studies showing that physical activity results in modest weight loss, particularly from fat and helps maintain lean tissue, thus improving body composition. Even in the absence of weight loss, there is evidence to suggest that physical activity brings health benefits and a reduction in risk of a range of diseases including heart disease, diabetes, and some cancers.⁵¹ It is therefore recommended that new UK guidelines on physical activity recognise that physical activity has an important role in healthy weight management and body composition. However, as weight status is a result of the balance between energy intake and energy expenditure at an individual level, this makes it difficult to determine the amount of activity required for weight management at a population level. Evidence indicates that weight loss will best be achieved by a combination of reduced energy intake (caloric restriction) and increased energy expenditure (physical activity).^{52, 53} It is therefore recommended that new guidelines on physical activity do not attempt to state a required amount of activity for weight loss because this necessarily requires a statement on the management of calorie intake and caloric expenditure to managing body weight. The development work required for such a recommendation was beyond the scope of this project. It is however recommended that a separate set of guidelines on weight management, which includes recommendations on altering energy balance by increasing physical activity and decreasing caloric intake through dietary modifications should be developed in the UK.

It is important to note, however, that there is sufficient scientific evidence to suggest that physical activity has an important role to play in the prevention of further health complications among the overweight and obese. Thus, the dose of '5 x 30' or 150 mins per week is likely to be helpful for maintaining weight for many in the population and is a suitable initial target for overweight and obese individuals. The role of physical activity in weight maintenance and weight loss is particularly difficult given the media coverage and health concerns around overweight and obesity. One approach that might be taken to the communications of physical activity guidelines is to recommend that all adults first aim to achieve the public health target of moderate intensity activity per week. Once this level of activity is reached and sustained, if

body weight is in a desirable range, the focus should be on maintaining the current program. However, if body weight is above a desirable target, then the focus should be to develop a weight loss plan that includes some combination of decreased caloric intake and/or a further increase in caloric expenditure.

Recommendation 8 The UK physical activity guidelines for adults should be supported by commentary that outlines the health benefits derived from the recommended dose of physical activity with a special emphasis on the role of physical activity in aiding the prevention of mental illness (such as depression and dementia) and improving mental well being (such as mood, self-perception and sleep).

Supporting case for the above recommendation(s)

Since 2004 the body of scientific evidence on mental health benefits of physical activity has continued to grow and broadly falls into the categories: the prevention (and treatment) of mental disease and dysfunction; and the benefits for enhancement of psychological well-being in the absence of mental illness. This work addressed the evidence on physical activity for preventative and enhancement of psychological well being.

The US scientific review concluded that there was strong scientific evidence, in the form of prospective cohort studies, showing that regular physical activity reduces risk of depressive illness in adults and older adults.¹ Fox and Mutrie conducted a review for BASES and also reached the same conclusion.^{21, 32} The evidence base for prevention (and treatment) of anxiety disorders is weaker than that for depression. Although Fox and Mutrie concluded that overall there was currently insufficient evidence to draw conclusions about physical activity and the prevention of anxiety disorders, the US review found that the available evidence from a small number of studies supported both a preventative and symptom reducing role for physical activity with regard to anxiety disorders.¹

In addition to the evidence on depression and anxiety, results from over 40 studies with adults from late middle age into older age, showed that physical activity is associated with a substantially reduced risk of cognitive decline, cognitive impairment, dementia and Alzheimer's disease. There is reasonable evidence of a dose-response effect for depressive illness, but insufficient evidence of a dose-response effect for cognitive decline, dementia and Alzheimer's disease as most of these studies compared inactive with active populations.³²

Other areas of investigation include physical activity and sleep, self esteem and fatigue. The US review concluded that there were moderate levels of evidence that physical activity improves sleep quality and substantial evidence that physical activity improves self-perceptions and to a lesser extent self-esteem, reduces state and trait anxiety, improves mood and decreases feelings of fatigue. This evidence provided scientific support for the enhancement of psychological well being resulting from physical activity.¹ Therefore, although there is a lack of evidence to guide the precise amounts of activity required for some of the mental health benefits, there is sufficient evidence to show that physical activity undertaken in volumes similar to ‘5 x 30’ are effective in preventing mental illness and cognitive decline and in enhancing psychological well being. It is recommended that the UK guidelines on physical activity should make a clear statement in recognition of this evidence.

Recommendation 9 The UK physical activity guidelines for adults should recognise that those who are least active are most at risk of poor health and increasing their physical activity (even if it does not meet the public health target of 150 minutes of moderate-intensity activity per week) will have health benefits.

Recommendation 10 The UK physical activity guidelines for adults should include a specific statement to recognise that higher volumes of activity (>150 minutes) are associated with even greater health benefits. The accompanying commentary to the guidelines should explain that as volume and intensity of physical activity increase, there are small increases in risk.

Supporting case for the above recommendations

For both adults and older adults, there is strong evidence of a dose-response relationship between volume of activity and the health benefits of activity.^{1, 13, 21} This holds true for both ends of the activity continuum. More activity (greater volume) has greater health benefits, although higher volumes or intensity of activity may carry increased risks of injury. However, compared to inactivity, even low volumes of activity below the public health recommended dose, provides some health benefits.¹ This highlights the importance of avoiding inactivity and is relevant to all adults, particularly for older adults. Older adults frequently have low fitness or functional capacity, chronic health conditions, and serious limitations to undertaking activity. In such adults, there is strong evidence that regular physical activity has preventive benefits and reduces the risk of new chronic conditions. Those who are not able to engage in the equivalent of 150 minutes of moderate-intensity activity per week, should not be discouraged

and should be guided to be as active as their fitness and physical limitations allow. These concepts should be included in the revised UK physical activity guidelines.

Recommendation 11 The UK physical activity guidelines for adults should include a statement clarifying that the risks of ill health from inactivity are very high and outweigh the very low risk of injury from engaging in health promoting physical activity.

Supporting case for the above recommendation

The US review included a comprehensive review on selected adverse events associated with physical activity and addressed questions related to what types of injuries are common, what types of activities cause injury, what individuals are at risk of sudden adverse cardiac events, what factors influence risk of musculoskeletal injury and do the benefits of activity outweigh the risks?¹ Overall, the review concluded that the benefits of physical activity clearly outweighed the risks. However, it did note that adverse events, like musculoskeletal injury, even if not severe are quite common and can be an impediment to the adoption of increased physical activity by some adults and older adults. Studies have evaluated the net benefit to risk for some specific conditions. For example, estimates of the extent that physical activity reduce (all cause) premature mortality necessarily reflect both the risks (e.g. risk of sudden death) and benefits of activity. Estimates of the effect of physical activity on functional ability in older adults reflect both the mechanisms by which physical activity improves ability (e.g. better fitness), and the mechanisms by which physical activity reduces ability (e.g. musculoskeletal injuries).

There are many determinants of the risk for adverse events during physical activity. The US review considered the evidence and concluded that the type of physical activity is related with differing levels of risk. Activities such as walking, dancing, gardening, swimming and golf had very low injury risk, while contact and collision sports have relatively high injury rates.¹ Furthermore, as the volume of activity increases, the risk of an adverse event also increases especially musculoskeletal injury. Injury rates at the volume and intensity of activity frequently recommended (150 minutes/week of moderate intensity activity) have not been frequently documented but appear to be low. The risk of injury is directly related to the magnitude of increase in the amount or intensity of activity performed (rate of increase). Small increases in amount and/or intensity followed by a few days of no increase appears to facilitate favourable adaptation with a low risk of injury. It is therefore recommended that physical activity

guidelines should recommend that the session duration and frequency is increased before increasing intensity.

The risk of musculoskeletal injury during physical activity in people who are regularly active is proportional to the volume of activity they perform. That is, the more time spent being physically active and/or the higher the intensity the activity the more likely an activity-related injury will occur. However, some studies have indicated that while risk during regular activity is higher in more active people, their overall risk of injury is somewhat less than for inactive persons because they are less likely to be injured in other setting such as around the home. This appears to especially be the case for older adults who are at increased risk of injuries.

Factors associated with increased risk were also reviewed in the US report. Low level of activity and fitness, previous injury, quality and appropriateness of equipment (including use of protective gear or equipment) and the safety of the environment were highlighted.¹ Prudent attention to these factors was recommended.

In summary, the benefits of moderate-intensity physical activity clearly outweigh the risks. There is sufficient evidence for guidelines on how to reduce adverse events due to activity, particularly guidelines advising adults that any increases in volume or intensity of activity should be done gradually over time, appropriate activities should be selected and appropriate attention to safety should be recommended. It is recommended that these aspects are conveyed clearly in the revised UK physical activity guidelines.

Recommendation 12 The UK physical activity guidelines for adults should include a statement to recognize that the physical activity guidelines written for generally healthy adults should be tailored for individuals based upon their needs and abilities, particularly for persons with disabilities and any special health issues.

Supporting case for the above recommendation

Overall there is substantially less research on the health and performance benefits derived from physical activity by persons with disabilities and this limits our knowledge of the generalizability of physical activity guidelines. Much of the scientific literature has not focused on evaluating the health benefits of physical activity for persons with disabilities but rather on establishing what dose of activity is needed as a therapy for these groups.

Nonetheless, moderate to strong evidence exists for improvements in walking speed and walking distance in patients with stroke, multiple sclerosis and intellectual disabilities. Quite strong evidence indicates that resistance exercise training improves muscular strength in persons with such conditions as stroke, multiple sclerosis, cerebral palsy, spinal cord injury and intellectual disability. Limited data from experimental studies indicate that increases in aerobic exercise improve cardiorespiratory fitness in individuals with lower limb loss, multiple sclerosis, stroke, spinal cord injury and mental illness. While there is suggestive evidence of benefit for such outcomes as flexibility, atherogenic lipids, bone mineral density and quality of life, the data are still very preliminary. For the majority of the studies reviewed involving persons with disabilities, the exercise regimen frequently followed was that currently recommended for adults or older adults— aerobic exercise of 30-60 minutes, 3 to 5 days per week at moderate intensity and resistance training with 1 or 2 sets of 8-12 reps using appropriate muscle groups 2-3 times per week (intensity adjusted for the individual’s capacity). Data comparing various doses of exercise in a single study in persons with disabilities are not available. Most participants had a pre-participation medical evaluation and medical adverse event rates were low and did not differ between exercise program participants and non-exercise controls.

Based on the evidence presented in the US and Canadian reviews,^{1, 13} the physical activity guidelines for generally healthy adults can be applied to persons with disabilities emphasizing that they need to be adjusted for each individual based on that person’s exercise capacity and any special health/risk issues.

Recommendation 13 The UK physical activity guidelines for adults do not need to differ for sub populations based on gender or race/ethnicity; however it is noted that the communication strategies and “messaging” of the physical activity guidelines to different sub population may differ to be most effective.

Supporting case for the above recommendation

Over the past decade or so a large number of aerobic physical activity and health studies have been conducted with women or men only as subjects. The results of these studies consistently demonstrate that overall there are no consistent differences in the relationship between physical activity and health for men and women. The least active or least fit of both sexes frequently have the highest risk of disease, with lower and lower risk observed as greater amounts of physical activity are reported. In some studies it appears that women benefit more than men

from similar amounts of aerobic activity and this is likely accounted for by the lower baseline activity of women in these populations. Men and women also appear to respond in a similar manner to resistance exercise in terms of increases in muscle strength and bone health. This comparison is less well developed than for aerobic exercise because of fewer comparison studies. These similar responses for men and women to increased activity occur despite men on average having higher aerobic capacity and greater muscle strength than women. Because of these differences, the results of exercise training studies are more similar between men and women when relative intensity (e.g., % max HR reserve, % 1 rep. max) rather than absolute intensity is used.

Very few prospective observational or experimental studies have directly compared the health effects of similar activity profiles on adults of different races or ethnicities. In the few studies making such comparisons no systematic differences have been reported between race/ethnicity. A vast majority of subjects in large prospective observational studies that have provided much of the data supporting the role of higher amounts of activity in chronic disease prevention and health promotion have been non-Hispanic white. However, in the relatively few studies that have included large populations of adults from other races or ethnicities the relationship between aerobic activity and health outcomes appears to be similar to that reported for non-Hispanic white men and women. More research is needed to better understand if any important difference exists for outcomes such as weight loss and metabolic disorders that are exceptionally prevalent in some race/ethnic populations.

Based on the results of published studies there is no scientific basis for providing different physical activity guidelines for men or women or for adults of different race/ethnicities. However, implementation plans for effective programs and policies aimed at increasing habitual activity will very likely need to take sex, race/ethnicity and culture into consideration.

4.4 Final recommendations for physical activity guidelines: Older adult population

The previous section presented 13 recommendations for the drafting of revised UK Guidelines on physical activity for the adult population. All 13 recommendations were agreed to be applicable to the development of UK Guidelines on physical activity for older adult populations. Each was considered to be an accurate and evidence-based recommendation for physical activity and older adults. The list of 13 recommendations is reproduced below, now stated specifically with the population '*older adults*.' An additional two recommendations were

identified as important for new UK guidelines for older adults and these are also presented followed by a brief supporting rationale.

Table 6. Recommendations for drafting UK guidelines on physical activity for older adults

Recommendation 1	The UK physical activity guidelines should encourage older adults to engage in moderate-intensity aerobic physical activity for at least 150 minutes per week; this physical activity should be spread across the week; and engaging in at least 30 minutes on 5 or more days each week is one example of how this volume can be achieved.
Recommendation 2	The UK guidelines for older adults should retain a statement advising that physical activity can be accumulated across multiple bouts throughout the week. Individuals should aim for bouts of at least 10 minutes of moderate intensity activity at a time.
Recommendation 3	The UK physical activity guidelines for older adults should recognize that vigorous-intensity activity also provides health benefits for adults, and that 75 minutes of vigorous-intensity activity (also spread across the week) provides comparable health benefits to 150 minutes of moderate-intensity activity.
Recommendation 4	The UK guidelines for older adults should recognise that combinations of moderate- and vigorous- intensity activities can provide health benefits and this represents another way of achieving the recommended target volume of activity.
Recommendation 5*	The UK physical activity guidelines for older adults should include a recommendation to undertake muscle strengthening activities involving the major muscle groups of the body on two or more days per week. Time spent undertaking muscle strengthening activities should be in addition to the primary recommendation of 150 minutes. Although there is currently insufficient evidence to determine an optimal regimen for this muscle strengthening activity, an example of a regimen that has been shown to be beneficial should be included in the explanatory guidance that accompanies the guidelines.
* See also a link to recommendation 15 for older adult on balance	<p><i>Recommendation for supporting commentary</i> <i>The commentary which accompanies the UK guidelines should include a statement that stretching and flexibility training may be beneficial.</i></p>
Recommendation 6	The UK physical activity guidelines for older adults should recognise that physical activity has an important role in healthy weight management and body composition. It is recommended that a separate set of guidelines on weight management, which includes recommendations on altering energy balance by increasing physical activity and decreasing caloric intake through dietary modifications, is required.

- Recommendation 7** The UK physical activity guidelines for older adults should emphasise the health benefits of activity for those adults who are already overweight or obese. They should indicate that overweight and obese adults achieving the recommended weekly volume of activity (5 x 30/150 minutes/week) will gain multiple health benefits even in the absence of reductions in body weight.
- Recommendation 8** The UK physical activity guidelines for older adults should be supported by commentary that outlines the health benefits derived from the recommended dose of physical activity with a special emphasis on the role of physical activity in aiding the prevention of mental illness (such as depression and dementia) and improving mental well being (such as mood, self-perception and sleep).
- Recommendation 9** The UK physical activity guidelines for older adults should recognise that those who are least active are most at risk of poor health and increasing their physical activity (even if it does not meet the public health target of 150 minutes of moderate-intensity activity per week) will have health benefits.
- Recommendation 10** The UK physical activity guidelines for older adults should include a specific statement to recognise that higher volumes of activity (>150 minutes) are associated with even greater health benefits. The accompanying commentary to the guidelines should explain that as volume and intensity of physical activity increase, there are small increases in risk.
- Recommendation 11** The UK physical activity guidelines for older adults should include a statement clarifying that the risks of ill health from inactivity are very high and outweigh the very low risk of injury from engaging in health promoting physical activity.
- Recommendation 12** The UK physical activity guidelines for older adults should include a statement to recognize that the physical activity guidelines written for generally healthy adults should be tailored for individuals based upon their needs and abilities, particularly for persons with disabilities and any special health issues.
- Recommendation 13** The UK physical activity guidelines for older adults do not need to differ for sub populations based on gender or race/ethnicity; however it is noted that the communication strategies and “messaging” of the physical activity guidelines to different sub population may differ to be most effective.

In addition to the above, two additional recommendations are proposed specific to older adult populations.

Recommendation 14 The UK physical activity guidelines for older adults should include a specific recommendation that older adults should gradually increase physical activity levels over time. It can be appropriate for inactive older adults with low fitness to first build up to 10 minutes bouts of activity.

Supporting case for the above recommendations

As previously reported (Section 4.3), the available scientific literature supports physical activity guidelines including the concept of ‘accumulation’ or the building up of 30 minutes of moderate intensity through multiple shorter bouts. Moreover, it was noted that shorter bouts are likely to be easier to achieve for many adults, and particularly older adults, and thus may help in achieving the recommended levels of physical activity. Older adults are less likely to undertake formal ‘exercise’ but they may achieve recommendations through daily walking. This additional recommendation is important for the prevention of adverse events and to reduce the risk of injury in older adults.

Recommendation 15 The UK physical activity guidelines for older adults should include a specific recommendation on the benefits of physical activity involving balance training on two or more days per week for the prevention of falls in those at increased risk of falls.

The commentary which accompanies the guidelines should acknowledge that although this should be in addition to the primary recommendation of 150 minutes, there should be acknowledgement that some aerobic activities enhance balance (e.g. dancing), and that some movements simultaneously strengthen muscles and improve

Supporting case for the above recommendation

In recent years there has been an accumulation of evidence showing that balance impairment increases the risk of falling in community-dwelling older adults. This includes evidence from a meta-analysis of 44 trials with over 9000 participants, and the results suggest that older adults should challenge their balance and mobility through a wide variety of activities under different environmental challenges in order to reduce their risk of falls.⁵⁴ Currently, the guidelines for England, Scotland, Wales and Northern Ireland do not contain specific guidelines for balance activities. As with the muscle strengthening activities, the current guidelines in England and Northern Ireland contain statements only suggesting that “activities *that promote improved... balance are particularly beneficial...for people of all ages*” and in Scotland it states that “*for*

all adults from about the age of 55, including those who are frail, three sessions a week of balance exercises is recommended”.

The primary sources of evidence used for this review all conclude there is now sufficient evidence to support new UK guideline on physical activity for older adults to improve balance, mobility and falls prevention.^{1, 13, 21} The US guidelines have included this as a new component since 1995 and it specifically states that “to reduce risk of injury from falls, community-dwelling older adults with substantial risk of falls should perform exercises that maintain or improve balance.”² Examples of activities that challenge (develop) balance and could be used as illustrations include Tai Chi, bowls, dancing, balance ball work. For frailer older adults, activities that challenge balance might include exercise sessions that have changes of direction, changes of level, turns, and single leg stands.

Although the review by Sherrington⁵⁴ concluded that balance exercises are important even in those adults not at high risk of fall, the final majority consensus from this process was to recommend that the revised UK guidelines should specifically target older adults at risk of falls.

4.5 Recommendation on the need for communication strategy to disseminate the Physical Activity Guidelines

It is strongly recommended that a comprehensive communication strategy is undertaken for effective dissemination of physical activity guidelines to a variety of audiences across the UK.

Each expert working group discussed the need for a communication plan to help translate the final guideline statements into appropriate communication ‘messages’ and the importance of a plan for national dissemination to different audiences. Research in the social marketing field would suggest that a comprehensive social marketing and communications plan in conjunction with a release (or re-release) of physical activity guidelines is required to have the desired impact. It is therefore recommended that each of the home countries should have a comprehensive communication strategy for the final physical activity guidelines. It was widely agreed that it was insufficient to develop new guidelines, without plans for effective dissemination and implementation.

The importance of a comprehensive communication strategy is evident from the experience of efforts to communicate physical activity guidelines in the 1990’s in the USA. The 1993 CDC/ACSM guideline “*All adults should accumulate at least 30 minutes of moderate-intensity*

activity on most, preferably all, days of the week” was purposely terse to facilitate dissemination. However, it soon became clear that the general public struggled to understand it despite scientist believing it was short and clear. In particular, the meaning of terms such as “moderate-intensity” and “physical activity” were unclear to the general population. The latter term was seen for some to be so broad that it caused confusion about what activities counted toward meeting the guideline. Also, very few people understood that this moderate intensity guideline was in addition to an existing guideline on vigorous intensity activity. Recognizing the need to better develop and implement comprehensive communication strategies, CDC sponsored an international conference on the topic of communication held in Whistler, Canada in 2001. During the recent updating of the Canadian guidelines the issue of communications and ‘messaging’ was central to the development process. The need for a communication strategy and ‘messaging’ component was well recognised and a review paper on the topic was commissioned.⁵⁵

Similarly, in the US the Department of Health and Human Services (DHHS) regarded the communications strategy as extremely important part of their guidelines process. Again, communication experts were recruited relatively early in the process so that some members could attend the scientific consultation meetings. Both physical activity scientists and communication experts were integral part of the final drafting of the *2008 Physical Activity Guidelines for Americans*.² The communications experts specifically focussed on crafting and organizing the guidelines in a manner to facilitate dissemination and, because there is a major commitment to reducing health disparities, materials appropriate for diverse audiences were required. Focus groups were used to refine the communication strategies and specific messages that would be used to disseminate the guidelines to the public. The components of the communication plan for the US physical activity guidelines included:

1. Print and web materials for the public which summarized key aspects of the guidelines;
2. A tool kit for organizations whose mission included promoting physical activity;
3. A partnership network;
4. Press releases and launch/dissemination events.

It was noted during the discussions in this process that dissemination is particularly challenging for physical activity guidelines aimed at young people because of the multiple settings and multiple people who control and influence their environments and behaviours. However, yet again, examples are available from overseas. In Canada, a series of physical activity guides

designed for children and youth are supported by guides for families and teachers.⁵⁶⁻⁶¹ Some assessments have been performed on Canada's Physical Activity Guides and suggest a comprehensive dissemination and communication plan is important for the guides to have the desired impact.^{62, 63} It is recommended that the UK process benefit from the approach and recent experiences from Canada and the USA and elsewhere.

4.6 Implications of changing the current guidelines on population health monitoring and surveillance systems

It is recommended that consultation with relevant agencies/departments that collect, analyse and report the national physical activity data is undertaken to review the implications of the updated Physical Activity Guidelines for children and young people, adults and older adults.

It is recognised that a core function of public health surveillance and monitoring systems is to assess and track trends over time in population health indicators. In many countries the health indicator selected for physical activity is the percent of people who engage in 'recommended amounts' of activity. It is noted that if the primary (or 'headline') physical activity guidelines in the UK are changed, then the methods used to assess this indicator may likely require some modification. It is also important that new or revised UK guidelines are stated in a way that is clear to interpret to avoid ambiguity and uncertainty on the exact interpretation for data analyses.

Difficulties have been experienced elsewhere. For example, in the USA the 1993/95 CDC/ACSM guideline specified that moderate-intensity physical activity should be done on "most, preferably all, days of the week." This wording created some problems for the BRFSS surveillance systems as technically "most days" of the week is four or more days. Yet the supporting text of the guidelines suggested "5 or more days" was a better interpretation. It was also questioned as to whether the surveillance systems should separately report the percent of people who obtain activity on seven days given that daily activity is might be viewed as 'preferable.' In the US, it was eventually decided that adults needed to report activity on five or more days a week to be classified as meeting the moderate-intensity activity recommendation, and that it was not essential to track the percent of people active on all days each week.

Other examples of the difficulties involved in monitoring physical activity and the computation of the physical activity indicators are: whether to count only minutes reported that are greater than 10 minutes; whether to include, and if so how, vigorous-intensity activities; and what

domains of activity (work, transport, domestic) are accepted. In addition to these issues, the set of final recommendations in this report have additional implications for the UK. Specifically, if revised guidelines introduce recommendations on other types of activity (e.g., muscle strengthening activity, balance training, sitting time), a decision must be made as to the definition of the leading health indicator for physical activity. For example, to classify a person as “meeting physical activity guidelines,” is it sufficient only to meet an aerobic guideline or must a person also meet the muscle strengthening guideline (e.g. do muscle strengthening activities on at least two days each week)? Moreover, if the UK chooses to modify the primary recommendation on aerobic activity to focus on the total volume (e.g. at least 150 minutes) then the focus on the number of days (historically a focus on 5 day) could be dropped. These decisions have major implications for those collecting and presenting the national data sets.

Introduction of any changes to the current guidelines is likely to have at least some implications requiring some changes to current methods used to report prevalence and trend data on physical activity. To date, there are no internationally accepted standards on these issues and this has led to great difficulty undertaking between country comparisons. Each country faces these same issues when their national guidelines are reviewed. It is known that any change in assessment or analysis methods will discontinue/break longitudinal trend data from a surveillance system. This is unavoidable although mechanisms for building in a transition and methods for data harmonization are possible and should be considered. The final drafting of the guidelines should consider the impact of introducing any modification on current methods of collecting and reporting national indicators. Of great importance, is adequate consultation with those agencies and departments that collect, analyse and report the national health data across the home countries. Documentation associated with any revised physical activity guideline should, where possible, outline the implications and preferably directions for physical activity surveillance in the UK.

Recommendation	It is recommended that the UK should use objective, time-stamped measurement techniques in population surveillance and the monitoring of trends over time.
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Recommendation	It is recommended that the UK work in cooperation and collaboration with other countries to standardize data cleaning, reduction and analysis procedures for objective physical activity monitoring devices.
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There are well known limitations with the use of self report measures as part of the national monitoring systems for physical activity and new developments include the introduction of objective measures. These methods have been tested on large scale in USA, France, Sweden and Western Australia and most recently in the UK.⁶⁴⁻⁶⁶ It is recommended that the UK continue to explore the feasibility of objective measures and work collaboratively with other countries to advance these methods. Another related issue is the need to standardize data cleaning, reduction and analysis procedures to allow for comparison between populations and over time. It is recommended that the future developments in the UK should be guided by the findings from the recent workshop on objective monitoring standardization (<http://conference.novaresearch.com/OMPA/index.cfm>) and consider collaboration with others to further advance this important work.

4.7 Additional recommendations on guideline development

Recommendation It is recommended that the UK should establish a process to develop physical activity guidelines for adults and for children and young people with non-communicable disease (e.g. cardiovascular disease, diabetes, cancer, mental health conditions) as a matter of priority.

Supporting case for the above recommendation

There was very strong support by both the working groups and in the feedback collected during the consultation process that future work should include the development of physical activity guidelines for adults and young people with existing disease (e.g. secondary and tertiary prevention). Physical activity is indicated in the treatment of many non-communicable diseases and chronic conditions and there is already a well established body of evidence. It is therefore timely to follow this guidelines development process with a similar agenda addressing guidelines on physical activity for the treatment of chronic disease. The potential benefit of specific public health and clinical guidelines for physical activity for those with chronic conditions is substantial given the acceleration in paediatric conditions exacerbated by sedentary living and the aging population.

Recommendation The development of guidelines on sedentary behaviour is a priority, particularly for children and young people. Although beyond the scope of this work due to other complimentary work underway, the findings should be integrated into the physical activity guidelines.

There was strong support across the expert working groups, particularly the working group on children and young people, as well as from the Consultation meetings and web survey that the issues of sedentary behaviours should be addressed within the context of physical activity guidelines. This was already recognised as an important area and a complimentary working party was established by the Department of Health led by Professor Stuart Biddle to review the literature. It was therefore to some extent frustrating, particularly during the 2-day scientific meeting that the processes were not more aligned. Nonetheless, all delegates were made aware of the ongoing work and the plans for a consultation meeting on the evidence on sedentary behaviours (which was subsequently undertaken in February 2010).

Recommendation Planned reviews (and revisions if necessary) of the UK Physical Activity Guidelines should be completed every 5 years in collaboration and coordination with other jurisdictions (e.g. World Health Organisation, Canada, U.S., Australia and elsewhere).
International collaboration will result in more robust, less costly and scientifically harmonized evidence and interpretation while providing an opportunity for scientific and communication exchange and cross-fertilization.

It is recommended that the UK physical activity guidelines should have a regular review process and timelines. Given this piece of work has established collaboration across the home countries this should be continued in the future. In recognition of the fact that the scientific evidence does not change rapidly, that the review process requires a substantial investment of resources and draws on a relatively small scientific community to assist, and that there is considerable international interest in establishing and updating guidelines on physical activity, it is recommended that the UK engage where possible with international collaborations to forward this agenda.

5. Next steps

Following completion of the review of scientific evidence drawing upon key recent international reviews, and the UK wide consultation process, the steps remaining for the completion of the process of updating the UK guidelines on physical activity will be led by the relevant government agencies. This report, along with the reports on physical activity in early years and sedentary behaviours will be considered by the respective government representatives in each of the four home countries with a view to identifying and planning the final release of new guidelines. At the time of writing, these steps included plans for a joint Chief Medical Officers report on Physical Activity. Preliminary contact with the relevant CMO offices has been made and a proposal for a report and the launch of new guidelines under the auspices of the CMO offices is under review.

The final writing of the revised physical activity guidelines for the UK is likely to be undertaken by a small editorial team drawing on the recommendations made in this report and based on the primary sources of scientific evidence.^{1, 13, 21} The editorial writing group is likely to comprise representatives from the review work undertaken for this report, experts from the sedentary and early years working groups, communication experts, and government representatives. Where possible and relevant the editorial groups is likely to draw on the recent international experiences from Canada and elsewhere with particular interest in the development of communication strategies,⁶³ ‘messages’ and ‘messaging’⁵⁵ and evaluation.

The timelines for the remaining steps and the launch of the new UK physical activity guidelines will be determined by the formation of the editorial writing group and the processes required for a CMO publication. It is highly desirable that this work, and the launch of new UK guidelines on physical activity is completed within 2010 or early 2011 to maintain the currency of the scientific evidence.

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