

International resistance training recommendations for older adults: Implications for the promotion of healthy aging in Spain


VICENTE ROMO-PÉREZ¹ , ANDIARA SCHWINGEL², WOJTEK CHODZKO-ZAJKO²

¹Faculty of Education and Sport Sciences, University of Vigo, Spain

²Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign, IL, USA

ABSTRACT

Romo-Pérez V, Schwingel A, Chodzko-Zajko W. International resistance training recommendations for older adults: implications for the promotion of healthy aging in Spain. *J. Hum. Sport Exerc.* Vol. 6, No. 4, pp. 639-648, 2011. The publication of the American College of Sport Medicine (ACSM) Position Stand on Physical Activity and Exercise for Older Adults and the release of the US Government Physical Activity Guidelines for Americans have emphasized the need for the development of national guidelines for the promotion of appropriate physical activity levels. Similar efforts are being conducted in many different countries. Due to the rapid aging of the world population, it is important to develop evidence-based recommendations regarding lifestyle activities known to decreased chronic disease and promote functional independence. It is increasing apparent that both aerobic and resistance type of physical activity are needed. The European Union has strongly advised its member states to adopt a series of physical activity recommendations, which have been developed to promote physical activity as a major goal of public health. In Spain several measures are being introduced on this subject. One of the main aspects of this paper is to examine current international guidelines regarding strength training for older adults. Recommendations for future action are included. **Key words:** GUIDELINES RESISTANCE EXERCISE, EUROPE, EXERCISE RECOMMENDATIONS, AGING, ELDERLY PEOPLE.

 **Corresponding author.** University of Vigo. Faculty of Education and Sport Sciences. Campus a Xunqueira s/n, Pontevedra 36005. Spain.

E-mail: vicente@uvigo.es

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INTRODUCTION

In many countries, in the developed and developing world, life expectancy is increasing and the proportion of older adults in the population is growing accordingly. In Spain, during the period 2004-2009, the proportion of individuals 84 years old and older increased by 24.7% (INE, 2011). These demographic changes bring with them challenges for national strategy in the areas of health care and social services. Fortunately, there is growing evidence that old age need not necessarily be accompanied by physical decline and loss of independence. On the contrary there is growing evidence that regular participation in physical activity can improve quality of life and promote independence for people of all ages (Chodzko-Zajko et al., 2009). Regular physical activity among older adults is associated with decreased health care spending (Ackermann et al., 2003; Lee & Buchner, 2008) and a substantial return on a modest initial investment (Sandstrom & Stahle, 2005).

Generally, the older people who are physically active spend less in healthcare. These savings in medical costs realized by society can be reinvested into campaigns for the promotion of physical activity (Martinson, Crain, Pronk, O'Connor, & Maciosek, 2003). It is essential to inform and advise the population about healthy lifestyle choices if we are to enable them to change their behavior to maximize the likelihood of successful aging. For these reasons, many countries have been developing or updating national physical activity guidelines that provide a clear and consistent message to the population. In recent years the attention of national guidelines has focused not only on the benefits of aerobic exercise but also on the advantages of resistance or strength training for older adults (Chodzko-Zajko et al., 2009).

There can be little doubt that a combination of aerobic and resistance exercise delays and/or prevents chronic conditions and disabilities. Unfortunately, many older adults are poorly informed about the types and amount of physical activity that are most beneficial. The publication of national guidelines can provide a clear and unambiguous statement regarding the health benefits of regular physical activity. These statements are of value to both health professionals and members of the general public (de Souza & Luz, 2011). Unfortunately, Spain has yet to develop a comprehensive set of national physical activity guidelines. Furthermore, very little attention has been paid to advising older adults in Spain about the importance of combining aerobic and resistance forms of physical activity.

The absence of official government guidelines in Spain in the area of physical activity does not mean that Spanish researchers have not been interested in studying the health benefits of physical activity. Many Spanish studies have explored the benefits of aerobic and resistance exercise for older persons (Arguelles et al., 2004; Izquierdo et al., 2001; Izquierdo, Hakkinen, Ibanez, et al., 2001; Izquierdo, Hakkinen, Ibanez, Kraemer, & Gorostiaga, 2005; Izquierdo et al., 1999; Izquierdo, Martinez-Ramirez, Larrion, Irujo-Espinosa, & Gomez, 2008). The findings of these studies are highly consistent with other research from around the world that documents profound health benefits accrue from both aerobic and resistance exercise (Chodzko-Zajko et al., 2009).

There is now strong evidence that resistance exercise training (RET) provides multiple benefits for older persons. It decreases the likelihood of sarcopenia (Doherty, 2003; Evans, 1995; Frontera et al., 2000; Peterson, Rhea, Sen, & Gordon, 2010; Roubenoff & Hughes, 2000; Visvanathan & Chapman, 2010), has a positive influence on bone mass (Asikainen, Kukkonen-Harjula, & Miilunpalo, 2004; Leite, Prestes, Pereira, Shiguemoto, & Perez, 2010; Mazzeo & Tanaka, 2001), is an important factor in maintaining functional independence (Bean et al., 2010; Bean et al., 2009; Frontera, 2006; Frontera et al., 2008) and it is correlated with a decreased risk of falls (Fiatarone-Singh et al., 2008; Frontera et al., 2000; Lloyd et al., 2008, 2009).

The purpose of this paper is to summarize existing guidelines regarding resistance exercise for older adults with the goal of developing a set of recommendations to be adopted by national and regional government agencies.

METHODS

The resistance exercise training (RET) recommendations of the following countries and associations were analyzed: United Kingdom, USA, Canada, Australia, South Africa, Japan, ACSM (American College of Sports Medicine) and the WHO (World Health Organization). In addition we consulted relevant meta-analyses on the topic published in the last five years in the fields of the resistance training in older adults (Nicola, 2011; Steib, 2010) including studies of the effect of RET on bone mass (James, Duffield, & Carroll, 2010; James & Carroll, 2006, 2009) and physical independence (Peterson, Rhea, Sen, & Gordon, 2010).

In total we analyzed 73 papers on RET. These studies explored the influence of RET on improvements in body composition, strength and muscle morphology. In addition, we analyzed 45 papers about strength training and bone, and an additional 23 papers on the relationship of strength training and disability. Each of these studies were analyzed in order to calculate the mean, maximum and minimum values of the following variables: a) days in a week, b) number of exercises, c) sets, d) repetitions and e) intensity.

RESULTS

The following initiatives have been developed by national governments and/or non-governmental organizations such as the American College of Sports Medicine (ACSM) and the World Health Organization (WHO):

a) The Canadian Health Agency – Center for Health Promotion and the Canadian Society for Exercise Physiology (CSEP). In 1995 the above agencies began to cooperate in the development of physical activity guidelines the first of which were published in 1998. In 1999, whilst the International Year of the Older Adults was taking place, the *Canada's Physical Activity Guide to Healthy Active Living for Older Adults* was published. Two guides were published, one for children between 6-9 years old was published and another for individuals between 10-14 years old, which was called *Canada's Physical Activity Guide for Youth*.

An important contribution to the development of guidelines for older people in Canada was provided by the Active Living Coalition for Older Adults (ALCOA). The Canadian guidelines were officially approved by the Federal-Provincial-Territorial Ministers and upwards of 100 national organizations (Sharratt, 2007). In 2006 a process to update the guidelines began. A commission of experts in the fields of physiology, social psychology, marketing, epidemiology and physical activity developed the protocols of the new guidelines. In January 2011 the new guidelines for the Canadians were launched. Regarding individuals over 65 years of age, three fundamental issues were addressed: a) the relation between physical activity and functional independence, b) the volume and intensity of physical activity needed for improved functioning, and c) an increased focus of the dose of physical activity needed for specific outcomes. The Canadian guidelines provide specific recommendations for both aerobic and resistance exercise (Tremblay et al., 2011a, 2011b).

The last version of the Canadian recommendations (Tremblay et al., 2011b) recommends that individuals do muscular and bone strengthening exercises, including activities that exercise the main muscular groups. Regarding the frequency, the recommendation strongly advises to practice this activity at least twice per week.

Table 1. Recommendations about muscular resistance exercise in the elderly people.

Country/Org.	Year	Exercises	D/wk	Set	Rep
Canada	2011	Major muscle group	2		
WHO	2010	Major muscle group	2		
United States	2008	Major muscle group	2	2-3	8-12
UK	2008	8-10 exercises	2		10-15
Australia	2006	4 exercises in the upper part, 4 lower part	2		
Japan	1999	8-10 exercises involving the major muscle groups	2-3	A minimum 1 set	10-15
ACSM/AHA	2007	8-10 exercise -Major muscle group	At least 2		8-12
South Africa	2000		2	2-3	8-15

Country/Org: Country or Organization; *Year:* Year of the guideline; *Exercise:* Number of exercises and characteristics; *D/wk:* Days per week; *Set:* Number of sets; *Rep:* Number of repetitions; *WHO:* World Health Organization; *UK:* United Kingdom; *ACSM:* American College of Sports Medicine; *AHA:* American Heart Association.

b) In the USA, one of the first set of physical activity recommendations was developed by the American College of Sports Medicine (ACSM). In 1978, a committee developed recommendations with regard to the quantity and the type of exercise necessary to improve the physical fitness and functional performance (ACSM, 1978). In 1995, the Centers for Disease Control and Prevention and the American College of Sports Medicine jointly developed a revised set of physical activity guidelines (Drinkwater, Grimston, Raab-Cullen, & Snow-Harter, 1995; Pate et al. 1995; Pollock et al., 1998). The new guidelines recommended that adults should carry out 30 minutes or more of moderate intensity physical activity on a daily basis and RET activities should involve the major muscular groups, with the number of exercises between 8 and 10 (Nelson et al., 2007, Haskell et al., 2007).

More recently, the U.S. Department of Health & Human Services (USDHHS) of the Federal Government issued its first-ever Physical Activity Guidelines for Americans. They describe the types and amounts of physical activity that offer substantial health benefits to all Americans regardless of age (USDHHS, 2008). In 2008, the National Institute of Aging, issued a comparable set of recommendations regarding physical activity for the older adults. In addition to aerobic or cardiovascular exercise, specific resistance training recommendations were provided. RET activities should involve the major muscular groups and it is recommended that they should be practiced for two or more times per week. The guidelines propose a total of 2 or 3 sets with a minimum of 8 to 12 repetitions.

c) A number of guidelines and recommendations have been developed in Australia. One of the first was published in 1999 and reprinted in 2006 (Sims, Hill, Hunt, & Haralambous, 2009) by the Department of Health and Ageing of the Australian Government. This guide stresses that it is never too late to start physical activity. Five basic recommendations are suggested: a) the older individual should be active on a daily basis in as many ways as possible, incorporating strength, flexibility and balance activities. b) 30 minutes per day of physical activity is recommended c) exercise intensity should be increased progressively d) physical activity should be viewed as an opportunity, not an inconvenience. e) When possible, it is valuable to include periods of vigorous intensity activity. The guide suggests several types of RET, proposing four for the lower body and four for the upper body. Two or three sets of 10-12 repetitions are recommended using free weights, RET machines, elastic bands or body weight for resistance (Australian Government, 2006).

d) The World Health Organization (WHO), aware of the importance of physical activity as a public health strategy (WHO, 2009), recommends at least 30 minutes of moderate physical activity five days

per week or 20 minutes of intense physical activity during three days per week. It is important that physical activity is performed for bouts of at least 10 consecutive minutes. In addition, the WHO recommends RET two or three days per week. It is important to highlight that in the year 2010, the WHO published a sets of recommendations in which resistance is included (WHO, 2010a). These recommendations propose that muscular strengthening activities should be done at least twice a week, with a special attention to the main muscular groups (WHO, 2010b).

e) The Japanese Physical Activity Guidelines were developed by the Japanese Ministry of Health and Welfare. The goal of the guidelines was the maintenance and improvement of independence of older people. The guidelines suggest some activities that can be performed at home (Ohta, Tabata, & Mochizuki, 1999). Japan's society is aging rapidly and there is a national need to promote physical independence (Kato, Kawakami, & Ohta, 2006). The Japanese Guidelines recommend that RET begin at a low intensity level and increase in intensity every two to four weeks (Ohta et al., 1999).

f) The United Kingdom published physical activity recommendations for each segment of the population (Bull & the Expert Working, 2010). Because the UK guidelines were published by a foundation, this guide is not considered strictly governmental. The guidelines recommend that RET be practiced at least twice a week, with the number of exercises approximating between 8 and 10, with around 10 or 15 repetitions (British Heart Foundation, 2008).

g) The South African guidelines (Department of Health South Africa, 2000) were published in 2000 and they urge a minimum of two weekly sessions of RET, with two sets of 8 to 15 repetitions.

A summary of these various guidelines appears in the Table 1. The weekly frequency for RET varies from two to three days, as does the number of sets and repetitions. In the majority of the guidelines it is mentioned that the exercises should focus in the main muscular groups, and the number of exercises is kept between 8 and 10.

A summary of the data is presented in Table 2.

Table 2. Variables of the muscular resistance exercise.

Studied blocks	Days per week ^a			Exercises ^b			Sets ^c			Repetitions ^c			Intensity ^d		
	Mn	Mx	M	Mn	Mx	M	Mn	Mx	M	Mn	Mx	M	Mn	Mx	M
Strength training in the elderly (James & Carroll, 2006; Nicola, 2011; Steib, 2010)	2	3	2.6	6	12	8.3	2	3	2.9	6	14	8.9	60%	80%	71.4%
Strength training and bone (James & Carroll, 2006; James, Duffield, & Carroll, S., 2010; James & Carroll, 2009)	2	5	2.9	4	9	7.9	1	4	2.7	6	15	9.5	70%	85%	76.7%
Strength training in order to avoid the physical incapacity (Peterson et al., 2010)	1	3	2.7	5	16	8.3	1	6	2.5	2	20	10	40%	85%	70%

Mn: Minimum; Mx: Maximum; M: Mean; Exercises: Number of exercises.

^{a,b,c,d}Independent variables: Days per week, Number of exercises, Number of sets, Number of repetitions and intensity.

DISCUSSION AND CONCLUSIONS

The aim of this paper is to provide an overview of international recommendations related to physical activity and resistance exercise for older adults. Numerous government and organizational guidelines have been summarized and it is clear that there is strong evidence for the health benefits of regular physical activity (Chodzko-Zajko et al., 2009; Tremblay et al., 2011b; Warburton, Nicol, & Bredin, 2006). Although the strength of the evidence varies from excellent to more modest, the overall consensus is that there is sufficient evidence to recommend both aerobic and resistance training on a regular basis (Chodzko-Zajko et al., 2009). With respect to RET, there are some discrepancies regarding the frequency, number of exercises, sets, repetitions and intensity needed to maximize the health benefit (Caserotti, Aagaard, & Puggaard, 2008; Hass, Feigenbaum, & Franklin, 2001).

It is important to note that most RET guidelines recommend exercising the major muscle groups, including the quadriceps, gluteus, hamstrings, pectorals, dorsal, biceps and triceps. This recommendation is consequent with the scientific literature and the major national (Bull & the Expert Working, 2010; Chodzko-Zajko et al., 2009; Australian Government, 2006; Ohta et al., 1999). The vast majority of the guidelines suggest RET be performed at least twice a week. Several studies about the strength training state that these exercises should be performed in alternate days, starting with a rate of 2 or 3 days per week (Campos et al., 2002; Kraemer et al., 2002; Kraemer & Ratamess, 2004). However, the intensity is a fairly controversial subject (Queiroz, Kanegusuku, & Forjaz, 2010), thus it may be better to exercise in a prudent way with intensities of about 40% (Kraemer et al., 2002).

Overall, the analyzed evidence suggest the following recommendations, a) perform muscular strength exercises 2-3 times per week in alternate days, b) resistance exercises should focus on the main muscular groups, c) 2-3 sets of 8 repetitions for each exercise should be performed; d) individuals should start with an intensity of approximately 40% and should increase intensity as appropriate.

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