

FUNCTIONING, DISABILITY AND EXERCISE IN THE ELDERLY

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SAŽETAK

Starost stanovništva širom sveta je u porastu, tako da postaje sve veći problem u društvu. Održavanje fizičkog i mentalnog zdravlja zajedno sa prevencijom i smanjenjem invaliditeta, posebno kod starije populacije, treba da bude jedan od važnih aspekata kvalitetnog starenja. Stoga, ciljevi zdravstvenih programa treba da budu usmereni na promociju kvalitetnog, aktivnog i zdravog starenja. Stariji pacijenti su obično povezani sa višestrukim komorbiditetima, koje treba multidisciplinarno procenjivati, imajući u vidu potrebe ove grupe pojedinaca. Iako se pretpostavlja da je starenje povezano sa opadanjem funkcionisanja i samim tim smanjenjem funkcionalnog kapaciteta kod starijih osoba, važno je identifikovati faktore koji igraju specifične uloge u zdravom i aktivnom starenju. Posebnu pažnju treba posvetiti i kognitivnom funkcionisanju. Štaviše, starije osobe su u opasnosti, usled životnih navika karakterističnih za neaktivni način života. Uprkos pozitivnim efektima fizičke aktivnosti, posebno u domenu prevencije i odlaganja hroničnih bolesti i stanja, ali i u domenu smanjenja rizika od prerane smrti i u domenu podrške pozitivnom mentalnom zdravlju i zdravom starenju, starija populacija se može suočiti sa preprekama, u smislu ograničenog prostora za bezbedno obavljanje aktivnosti i nedostatka odgovarajućeg znanja o tome kako da se bude aktivan a da se pri tom uzmu u obzir sopstvena fizička ograničenja. Prilikom planiranja i sprovođenja fizičke aktivnosti, posebno kod starije populacije, faktori koje je važno uzeti u obzir uključuju: trajanje, učestalost, intenzitet i režim. Treba naglasiti da programi vežbanja kod starijih osoba treba da uključuju aerobni trening, trening otpora, trening fleksibilnosti i trening ravnoteže.

Ključne reči: stare osobe, funkcionisanje, onesposobljenost, vežbe

ABSTRACT

The age of the population is increasing worldwide and is becoming an emerging problem in society. Maintaining physical as well as mental health, together with preventing and reducing disability, particularly in the older population, should be one of the most important aspects of successful aging. Thus, the goals of health programs should be the promotion of successful, active, and healthy aging. Elderly patients are usually associated with multiple medical conditions, which should be evaluated in a multidisciplinary fashion, bearing in mind the needs of this group of individuals. Even though it is assumed that aging is associated with a decline in functioning and, therefore, with reduced functional capacity in the elderly, it is important to identify the factors which play specific roles in healthy and active aging. Special consideration should be given to cognitive functioning. Furthermore, the elderly are at risk, due to habits characteristic of a sedentary lifestyle. Despite the positive effects of physical activity, particularly in the prevention and delay of chronic diseases and conditions, as well as in reducing the risk of premature death and in supporting positive mental health and healthy aging, the elderly population may face obstacles in terms of limited space for the safe execution of activities and the lack of proper knowledge on how to be active while taking into account one's physical limitations. When planning and implementing a physical activity, especially in the older population, the important factors that need to be considered include duration, frequency, intensity and mode. It should be stressed that exercise programs for the elderly should include aerobic, resistance, flexibility, and balance training.

Keywords: the elderly, functioning, disability, exercise

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UVOD

Starost stanovništva širom sveta je u porastu, tako da postaje sve veći problem u društvu. Tokom pedesetogodišnjeg perioda, između 1900. i 1950. godine, populacija starih ljudi se udvostručila u Sjedinjenim Američkim Državama (SAD), gde su, 1900. godine, ljudi stariji od 65 godina činili 4,1% stanovništva, dok su 1950. godine činili više od 8% stanovništva [1]. Ovaj trend je nastavljen, pa je 2000. godine ovaj procenat bio 12,6%. Procenjuje se da će 2050. godine, u zemljama sa niskim i srednjim primanjima, oko 80% populacije biti starija lica [2]. Pregledni rad koji su objavili Arai i saradnici navodi da su dostignuća u medicini zajedno sa unapređenjima u higijeni i snabdevanju hranom uticali na očekivano trajanje života u Japanu, zemlji sa najdužim očekivanim trajanjem života u svetu [3].

Starenju i starosti se može pristupiti sa tačke gledišta mikro nivoa (iskustvo pojedinca) ili tačke gledišta makro nivoa (iskustva starijih pojedinaca unutar društva kao i društvene implikacije starenja populacije) [4]. Održavanje fizičkog ali i mentalnog zdravlja, zajedno sa prevencijom i smanjenjem onesposobljenosti, naročito u starijoj populaciji, trebalo bi da bude jedan od najvažnijih aspekata kvalitetnog starenja [4]. Stoga, ciljevi zdravstvenih programa treba da budu usmereni na promovisanje kvalitetnog, aktivnog i zdravog starenja [5].

FAKTORI POVEZANI SA STARENJEM I ZDRAVIM STARENJEM

Postoje brojni faktori koji su povezani sa povećanim starenjem populacije: Među njima su i produženo očekivano trajanje života i smanjenje stope plodnosti u populaciji [6]. Takođe, postoje faktori koji utiču na zdravo starenje. Na takve faktore je potrebno usredsrediti posebnu pažnju i promovisati ih na takav način da se dopre do svih nivoa društva. Ovo treba učiniti putem odgovarajućih obrazovnih programa. Rasna pripadnost, materijalni status, i obrazovanje se smatraju društvenim faktorima koji potencijalno mogu uticati na zdravo starenje. U poslednje vreme, proučavaju se i drugi faktori, uključujući tu i naselja u kojima ljudi žive kao i različite vrste sistema, npr. zdravstveni sistem [7]. U studiji koju su objavili Liu i Su, navodi se da obrazovni i materijalni status, zdravstveno ponašanje i učešće u društvenom životu takođe mogu biti faktori koji predviđaju zdravo starenje [8]. Među zdravstvenim ponašanjima, fizička aktivnost i način ishrane su veoma značajni [9,10]. Ustanovljeno je da fizička aktivnost ima brojne povoljne efekte, uključujući i prevenciju padova, sarkopenije, osteoporoze, i kognitivnog oštećenja [9]. Ishrana se može smatrati potencijalno promenljivim faktorom u prevenciji bolesti vezanih za starost [10]. Ovo jasno ukazuje na to da je kvalitetno starenje multidimenzionalno, te da je

INTRODUCTION

The age of the population is increasing worldwide and is becoming an emerging problem in society. During the 50-year period between 1900 and 1950, the elderly population doubled in number in the United States of America (USA) – people over the age of 65 years comprised 4.1% of the US population in 1900 and more than 8% of the US population in 1950 [1]. This trend continued, and in 2000 the percentage was 12.6%. It is estimated that in 2050, around 80% of the population of low and middle-income countries will be older people [2]. The review by Arai et al. states that developments in medicine together with improvement in hygiene and food supply have influenced life expectancy in Japan, which is the country with the longest life expectancy in the world [3].

Aging and old age can be approached from the micro-level perspective (individual experience) and the macro-level perspective (experience of older individuals within the society as well as societal implications of population aging) [4]. Maintaining physical as well as mental health, together with preventing and reducing disability, particularly in the older population, should be one of the most important aspects of successful aging [4]. Thus, the goals of health programs should be the promotion of successful, active, and healthy aging [5].

FACTORS ASSOCIATED WITH AGING AND HEALTHY AGING

There are numerous factors associated with the increased age of the population. Among them are increased life expectancy and the decreasing fertility rate in the population [6]. Additionally, there are factors that influence healthy aging. Such factors should be given special attention and they need to be promoted in such a way as to reach every level of society. This should be done through appropriate educational programs. Race, income, and education are considered to be social factors that may potentially influence healthy aging. Recently, other social factors have also been studied, including neighborhoods and different systems, such as the healthcare system [7]. In the study by Liu and Su, the authors state that educational and economic status, health behavior, and social participation may also be factors predicting healthy aging [8]. Among health behaviors, physical activity and diet are very important [9,10]. It has been established that physical activity has numerous favorable effects, including the prevention of falls, sarcopenia, osteoporosis, and cognitive impairment [9]. Diet might be considered as a potential modifiable factor in preventing age-related diseases [10]. This clearly demonstrates

povezano sa fizičkim, društvenim, psihološkim i duhovnim aspektima pojedinca, ali i sa socijalnim aspektima, kao što su kultura i sredina u kojoj pojedinac živi [11].

STARENJE I KOMORBIDITETI

Kod starijih pacijenata je obično prisutno više zdravstvenih problema, koje treba proceniti multidisciplinarnim pristupom, imajući u vidu potrebe ove grupacije pacijenata. Značaj ranog otkrivanja i blagovremenog lečenja istovremeno prisutnih oboljenja i stanja, naročito kod starijih osoba, odnosi se na činjenicu da su komorbiditeti, sami po sebi, povezani sa složenim medicinskim tretmanom, nepovoljnijim zdravstvenim ishodima i uvećanim troškovima po zdravstveni sistem, što može predstavljati značajno opterećenje [12].

Komorbiditeti mogu biti povezani sa samim procesom starenja, usled produženog očekivanog trajanja života i, usled toga, produženog izlaganja brojnim faktorima rizika [13]. Do sada su opisani brojni komorbiditeti, u koje spadaju kardio-vaskularna oboljenja (uključujući hipertenziju, srčanu insuficijenciju, stabilnu anginu pektoris, i druga kardio-vaskularna oboljenja), dijabetes, hronična opstruktivna bolest pluća (HOBP), osteoartritis, delirijum, slabljenje čula, te druga oboljenja i stanja [13,14]. U svojoj studiji, Fan i saradnici navode da su dva najčešće istovremeno prisutna stanja hipertenzija i dislipidemija, dok su tri stanja najčešće prisutna u isto vreme hipertenzija, dislipidemija i dijabetes [14].

FUNKCIONISANJE KOD STARIH OSOBA

Iako je pretpostavka da je starenje povezano sa funkcionalnim propadanjem, a samim tim i sa smanjenjem funkcionalnih kapaciteta starih lica, važno je identifikovati faktore koji igraju određene uloge u zdravom i aktivnom starenju. Utvrđeno je da funkcionalni kapacitet predstavlja jedan od vitalnih pokazatelja zdravstvenog stanja u populaciji starih lica, te da je tesno povezan sa kvalitetom života u ovoj grupaciji [15]. Funkcionalno oštećenje može biti na pojedinačnom nivou (nemogućnost nezavisnog obavljanja svakodnevnih aktivnosti i gubitak samostalnosti) i na nivou populacije [15].

Potrebno je obratiti posebnu pažnju na funkcionisanje na kognitivnom nivou. Prethodno je uočeno da se opadanje kognitivne funkcije može uočiti kod starijih lica, te da je kognitivna sposobnost povezana sa brojnim varijablama, među kojima su socioekonomski faktori, zdravstveno stanje, društveni kapital i zdravstveno ponašanje [16]. Takođe, opadanje kognitivne funkcije može se povezati sa demencijom, upotrebom lekova, promenama raspoloženja i drugim činiocima [17].

Među najproučavanijim aspektima fizičke kondicije i funkcije jesu telesna konstitucija i kardio-vaskularna utreniranost [18]. Stoga, promene u mišićnoj i koštanoj masi

that successful aging is multidimensional and is linked to physical, social, psychological and spiritual aspects of the individual, as well as to the cultural and environmental aspects of the society [11].

AGING AND COMORBIDITIES

Elderly patients are usually associated with multiple medical conditions, which should be evaluated in a multidisciplinary fashion, bearing in mind the needs of this group of individuals. The importance of early detection and timely treatment of comorbid conditions, particularly in the elderly, relates to the fact that comorbidity itself is associated with complex medical management, less favorable health outcomes, and increased healthcare costs that could represent a significant burden [12].

Comorbidities can be associated with the aging process itself, due to increased life expectancy and, therefore, prolonged exposure to numerous risk factors [13]. So far, numerous comorbidities have been described, some of them being cardiovascular diseases (including hypertension, heart failure, stable angina, and other cardiovascular conditions), diabetes, chronic obstructive pulmonary disease (COPD), osteoarthritis, delirium, sensory impairment, and other diseases and conditions [13,14]. In their study, Fan et al. state that the two most frequent conditions present at the same time are hypertension and dyslipidemia, while the three most frequent conditions present simultaneously are hypertension, dyslipidemia, and diabetes [14].

FUNCTIONING IN THE ELDERLY

Even though it is assumed that aging is associated with a decline in functioning and, therefore, with reduced functional capacity in the elderly, it is important to identify the factors which play specific roles in healthy and active aging. It has been noted that functional capacity presents one of the vital indicators of health status in the elderly population and relates closely to the quality of life in this group of individuals [15]. Functional impairment can be on the individual level (inability to perform everyday activities independently and personal autonomy loss) and on the populational level [15].

Special consideration should be given to cognitive functioning. It has been previously noted that cognitive decline can be detected in older individuals and that cognitive performance is associated with numerous variables, which include socioeconomic factors, health status, social capital, and health behavior [16]. Additionally, cognitive decline might be associated with dementia, medication use, mood shifts, and other [17].

kao i u mišićno-skeletnoj i neuromotornoj funkciji mogu biti povezane sa funkcionalnim propadanjem [18] kod starih lica, što vodi do različitih stepena onesposobljenosti.

ONESPOSABLJENOST I STARA LICA

Povećanje udela starih lica u sveukupnoj populaciji, na svetskom nivou, povećanje funkcionalne onesposobljenosti, kao i povećanje socijalnih, medicinskih i ekonomskih opterećenja, postaje sve relevantnije i relevantnije. Važan aspekt onesposobljenosti jeste da ona može biti dinamična tokom vremena, napredujući do težeg oblika.

Prema definiciji Svetske zdravstvene organizacije (SZO), staračka onesposobljenost jeste poteškoća u obavljanju jedne ili više aktivnosti osnovne brige o sebi ili svakodnevnih fizičkih aktivnosti (SFA) ili poteškoća u obavljanju jedne ili više svakodnevnih instrumentalnih aktivnosti (SIA) [19]. Finski centar za interdisciplinarnu gerontologiju Univerziteta Jyväskylä (engl. *Finnish Centre for Interdisciplinary Gerontology of the University of Jyväskylä*) definiše onesposobljenost kao jaz između sposobnosti neke osobe i zahteva koje pred tu osobu postavlja okruženje [20]. Štaviše, procenjuje se da otprilike svaka peta osoba stara 70 godina i više, te svaka druga osoba starosti 85 godina i više prijavljuje poteškoće u obavljanju svakodnevnih fizičkih aktivnosti, uključujući tu i kupanje, oblačenje, odlazak u toalet, održavanje lične higijene, kontinenciju, obedovanje, i prebacivanje iz stolice u krevet [19,20]. Treba napomenuti da su poteškoće pri obavljanju svakodnevnih instrumentalnih aktivnosti takođe uobičajene, uključujući tu i upotrebu telefona, aktivnosti u domaćinstvu, pranje i sušenje veša, korišćenje javnog prevoza, uzimanje lekova, i vođenje finansija [20]. Značaj ranog otkrivanja postojeće onesposobljenosti u populaciji starih, kao i uvođenja programa prevencije, u vezi je sa činjenicom da onesposobljenost, sama po sebi, povećava zavisnost onesposobljenog lica od drugih kao i rizik od prevremene smrti, istovremeno umanjujući kvalitet života onesposobljenog lica.

Onesposobljenost može biti povezana sa smanjenom mobilnošću, što uključuje poteškoće u hodaњу, penjanju uz stepenice, i premeštanju iz stolice u krevet, iz kreveta u stolicu i sl.; može se odnositi na sopstvenu negu, što uključuje poteškoće u obavljanju aktivnosti koje se odnose na uzimanje obroka, oblačenje, odlazak u toalet, održavanje lične higijene, i kupanje; može se odnositi i na aktivnosti u domaćinstvu, što uključuje poteškoće u pripremi obroka, nabavci namirnica, obavljanju kućnih poslova, vožnji, uzimanju lekova, upotrebi telefona, i raspolaganju novcem [21].

U populaciji starih, postoje određeni faktori rizika u vezi sa onesposobljenošću, koje je potrebno identifikovati. Mogu se grupisati kao nepromenljivi faktori rizika (starost, pol i genetski faktori) i promenljivi faktori

Among the most studied health related aspects of physical fitness and function are body composition and cardiovascular fitness [18]. Muscle and bone mass as well as musculoskeletal and neuromotor function changes might be associated with functional decline [18] in the elderly, leading to various degrees of disability.

DISABILITY AND THE ELDERLY

The increase in the proportion of the elderly in the overall population worldwide, the increase in functional disability, as well as in the social, medical, and economic burden, are becoming more and more relevant. An important aspect of disability is that it can be dynamic over time, progressing to a more severe state.

According to the World Health Organization (WHO), old age disability can be defined as difficulty in performing one or more basic self-care tasks or physical activities of daily living (PADL) or difficulty in performing one or more instrumental activities of daily living (IADL) [19]. The Finnish Centre for Interdisciplinary Gerontology of the University of Jyväskylä defines disability as a mismatch between a person's abilities and environmental requirements [20]. Furthermore, it is estimated that approximately every fifth individual aged 70 years and above and every second individual aged 85 years and above reports a difficulty in performing PADLs, including bathing, dressing, going to the toilet, maintaining personal hygiene, maintaining bowel and bladder control, feeding, and transferring from chair to bed [19,20]. It should also be mentioned that IADL difficulties are common, including the use of the phone, housekeeping, doing the laundry, using public transportation, taking medication, and finance handling [20]. The importance of the early detection of existing disability in the elderly population, as well as the introduction of preventive programs, has to do with the fact that disability itself increases dependency on others, as well as the risk of premature death, at the same time reducing a person's quality of life.

Disability can be related to reduced mobility, which includes difficulty walking, climbing stairs, and performing transfers; it can be related to self-care, which includes difficulty in performing activities related to eating, getting dressed, going to the toilet, maintaining personal hygiene, and bathing; it can also be related to household activities, which includes difficulty in preparing meals, shopping for groceries, performing housework, driving, taking medication, using the telephone, and managing money [21].

There are certain risk factors of disability in the elderly population that should be identified. They can be categorized as non-modifiable risk factors (age, gender,

rizika, koji se mogu dalje podeliti na faktore koji se odnose na pojedinca (bolesti povezane sa starosnim dobom, nepovoljna zdravstvena ponašanja, funkcionalna ograničenja, i sl.) i karakteristike okruženja [20].

Pokazano je da demencija kod stanovništva Japana, posebno kod ljudi starijih od 75 godina, predstavlja najčešći uzrok funkcionalne onesposobljenosti, nevezano od pola [22]. Slični rezultati su dobijeni u studiji urađenoj na švedskom stanovništvu [23]. Oštećenje vida i/ili sluha takođe doprinose pojavi onesposobljenosti kod starije populacije. Kod onih sa oslabljenim vidom, uz potencijalne poteškoće u obavljanju svakodnevnih aktivnosti, povećana je i incidencija padova, društvene izolacije i zavisnosti od drugih [24]. Oštećenje sluha može uticati na govor i čujenje, što samim tim ima uticaja na socijalizaciju osoba sa oslabljenim sluhom [24].

FIZIČKA AKTIVNOST I REKREACIJA

Smatra se da je fizička neaktivnost četvrti po redu vodeći faktor globalnog mortaliteta i značajan faktor rizika za razvoj nezaraznih bolesti i hroničnih stanja, kao i za uvećanje telesne mase [25]. Stara lica su pod rizikom da steknu navike karakteristične za neaktivni način života, pri čemu se raspon fizičke neaktivnosti kod osoba starijih od 55 godina u Evropi kreće od 5% u Švedskoj do 29% u Portugalu [26]. Uprkos pozitivnim efektima fizičke aktivnosti, posebno u prevenciji i odlaganju hroničnih bolesti i stanja, kao i u smanjenju rizika od prevremene smrti i u podršci pozitivnom mentalnom zdravlju i zdravom starenju, populacija starih može biti suočena sa preprekama, u smislu ograničenog prostora za bezbedno izvođenje aktivnosti, kao i nedostatka odgovarajućeg znanja o tome kako biti aktivan, istovremeno uzimajući u obzir sopstvena fizička ograničenja [27,28].

Prilikom planiranja i sprovođenja fizičke aktivnosti, posebno kod starije populacije, faktori koje je važno uzeti u obzir uključuju: trajanje, učestalost, intenzitet i režim [29]. Prema smernicama koje se tiču fizičke aktivnosti i neaktivnog ponašanja, koje je objavila SZO 2020. godine, preporučuje se da osobe od 65 godina i starije treba da sprovedu fizičke aktivnosti odnosno vežbe umerenog intenziteta u trajanju od 150 – 300 minuta, ili fizičke aktivnosti jačeg intenziteta u trajanju od 75 – 150 minuta, ili da sprovedu ekvivalentnu kombinaciju ove dve vrste aktivnosti, svake sedmice, te da da treba da rade vežbe za jačanje mišića dva ili više puta nedeljno [30]. Kopenhaško saopštenje o konsenzusu na temu fizičke aktivnosti i starenja iz 2019. godine (engl. *Copenhagen Consensus statement 2019: physical activity and ageing*) navodi da sve više naučnih dokaza ide u prilog tome da se pozitivni efekti kod starijih ljudi mogu postići pri manjem volumenu i nižem intenzitetu fizičke aktivnosti nego što se postiže

and genetic factors) and modifiable risk factors, which can be subdivided into factors related to the individual (age-related diseases, unfavorable health behaviors, functional limitations, etc.) and characteristics of the environment [20].

It has been shown that dementia in the Japanese population, particularly in those above 75 years of life, is the most frequent cause of functional disability, irrespective of gender [22]. Similar findings were obtained in a study on the Swedish population [23]. Vision and/or hearing impairment also contribute to the presence of disability in the older population. Those with impaired vision, aside from potential difficulties in performing everyday tasks, have a higher incidence of falls, social isolation, and dependency on others [24]. Talking and hearing may be affected in those with hearing impairment, which, therefore, has an impact on socialization [24].

PHYSICAL ACTIVITY AND EXERCISE

Physical inactivity is considered to be the fourth leading risk factor for global mortality and an important risk factor for the development of non-communicable diseases and chronic conditions, as well as for increase in body weight [25]. The elderly are at risk of developing habits characteristic of a sedentary lifestyle, with a range of physical inactivity in individuals above the age of 55 years in Europe spanning from 5% in Sweden to 29% in Portugal [26]. Despite the positive effects of physical activity, particularly in the prevention and delay of chronic diseases and conditions, as well as in reducing the risk of premature death and in supporting positive mental health and healthy aging, the elderly population may face obstacles in terms of limited space for the safe execution of activities and the lack of proper knowledge on how to be active while taking into account one's physical limitations [27,28].

When planning and implementing a physical activity, especially in the older population, the important factors that need to be considered include duration, frequency, intensity and mode [29]. According to the WHO 2020 guidelines regarding physical activity and sedentary behavior, it is recommended that individuals 65 years of age and above should be involved in 150 – 300 minutes of moderate-intensity exercise or 75 – 150 minutes of vigorous-intensity physical activity or an equivalent combination of these two, each week, and should perform muscle strengthening exercises twice or more times a week [30]. The *Copenhagen Consensus statement 2019: physical activity and ageing* states that emerging evidence suggests that beneficial effects can be achieved for older adults at a lower volume and lower intensity of physical activity than the recommended 150 minutes of moderate to

preporučenim umerenim do jakim intenzitetom fizičke aktivnosti u trajanju od 150 minuta sedmično [31]. Potrebno je naglasiti da programi vežbanja za stare treba da uključuju aerobni trening, vežbe otpornosti, vežbe fleksibilnosti-pokretljivosti i vežbe ravnoteže [32].

AEROBNI TRENING

Populacija starih lica povezuje se sa opadanjem kardiorespiratornog kapaciteta, što je, pre svega, povezano sa opadanjem maksimalnog minutnog volumena srca i promenama u arteriovenskoj razlici pritiska [33]. Aerobni trening može da modifikuje ovakve promene podsticanjem centralnih i perifernih adaptacija [33]. U ove modifikacije spadaju smanjenje srčane frekvencije u mirovanju kao i tokom submaksimalne fizičke aktivnosti, manja povećanja u krvnom pritisku, poboljšanje dejstva insulina na nivou celog organizma i smanjenje koncentracije lipida u plazmi [32].

Tokom aerobnog treninga, veliki mišići tela vrše ritmične pokrete u dužem vremenskom periodu, pri čemu se energija koristi putem oksidativnog metabolizma [32]. Mogu se uzeti u obzir sledeće aerobne vežbe kod starijih osoba: hodanje, hodanje na traci, penjanje uz stepenice, vežbanje na sobnom biciklu [33], uz individualno osmišljene modalitete koji uzimaju u obzir afinitete, fizičke kapacitete i komorbiditete određenog starog lica. Na primer, licima sa bolom u krstima ili sa lošom ravnotežom može se sugerisati vežbanje na ležećem sobnom biciklu [32].

TRENING OTPORNOSTI

Trening otpornosti (otpora) koristan je kod starih lica koja su izuzetno krhka [33]. Ova vrsta treninga poboljšava mišićnu masu, snagu i funkciju, a uključuje statične (izometrijske) i dinamične (koncentrične i ekscentrične) vrste vežbi [32]. Takođe, ova vrsta treninga pospešuje neurološku adaptaciju (međumišićna i unarmišićna koordinacija) [34] i unapređuje gustinu kostiju i metaboličko zdravlje [35]. Nadalje, vežbe otpornosti se koriste u terapiji različitih simptoma i stanja, koja uključuju osteoporozu i degenerativna oboljenja zglobova, ali i druga stanja i tegobe [34]. Za stara lica sa prisutnim bolom, preporučuju se izometrijske vežbe za jačanje, dok se kod onih sa lošom ravnotežom i stanjima koja mogu ograničavati sposobnost nošenja tereta, savetuje sprovođenje treninga otpornosti u vodi [32].

TRENING FLEKSIBILNOSTI-POKRETLJIVOSTI

Postoji hipoteza koja kaže da fleksibilnost odnosno opseg pokreta (engl. *range of motion* – ROM) u zglobu ili grupi zglobova opada nakon 70. godine, naročito kod žena [32]. Značajan pad pokretljivosti kukova i rame-nih zglobova u populaciji starih iznad 70 godina zapažen je u studiji koju su sprovedli Statokostas i saradnici

vigorous intensity physical activity [31]. It should be stressed that exercise programs for the elderly should include aerobic, resistance, flexibility, and balance training [32].

AEROBIC TRAINING

The elderly population is associated with a decline in cardiorespiratory capacity, which is associated primarily with a decline in maximal cardiac output and changes in arteriovenous difference [33]. Aerobic training can modulate such alterations by inducing central and peripheral adaptations [33]. Such modulations are lowering of the heart rate at rest and during submaximal exercise, smaller increases in blood pressure, whole body insulin action improvement, and plasma lipid concentration reduction [32].

During aerobic exercise, large muscles of the body rhythmically move for sustained periods of time and energy is used through the oxidative metabolism [32]. The following aerobic exercises in the elderly can be considered: walking, treadmill walking, climbing stairs, stationary cycling [33], with individually designed modalities that take into consideration the preferences, physical capacities, and comorbidities of the elderly individual. For example, those with lower back pain or poor balance may be advised stationary recumbent cycling [32].

RESISTANCE TRAINING

Resistance training is beneficial for the elderly who are severely frail [33]. This type of training improves muscle mass, strength, and function, and includes static (isometric) and dynamic (concentric and eccentric) types of exercises [32]. Additionally, this type of training promotes neuronal adaptation (intermuscular and intramuscular coordination) [34] and improves bone density and metabolic health [35]. Furthermore, resistance training is used in the treatment of various symptoms and conditions, including but not limited to, osteoporosis and degenerative joint disorders [34]. For elderly adults with existing pain, isometric strengthening exercises are advised, while for those with poor balance and conditions that may limit weight bearing activity, aquatic resistance exercises are advised [32].

FLEXIBILITY TRAINING

It has been hypothesized that flexibility or range of motion (ROM) in a joint or group of joints declines after the age of 70 years, especially in women [32]. Significant decline in the flexibility of hip and shoulder joints in the population of adults aged above 70 years was observed in a study by Stathokostas et al. [36]. In the elderly population, the goal of flexibility training

[36]. U populaciji starih, cilj programa za trening fleksibilnosti jeste unapređenje opsega pokreta u grupama mišića i tetiva, kako bi se omogućilo staroj osobi da sprovodi svakodnevne funkcionalne aktivnosti [37]. Vežbe pokretljivosti koje mogu da unaprede opseg pokreta uključuju: dinamičko istežanje, statičko istežanje, proprioceptivnu neuromišićnu stabilizaciju (engl. *proprioceptive neuromuscular facilitation* – PNF) i balističke metode, koje se ne preporučuju pri svakodnevnom vežbanju [32].

TRENING RAVNOTEŽE

U populaciji starih lica, dolazi do opadanja kontrole ravnoteže, što utiče na sposobnost pojedinca da se kreće i nezavisno funkcioniše [38]. Stoga, oštećena ravnoteža kod ove grupacije može predstavljati ozbiljan rizik za padove [38]. Prilikom obavljanja svakodневnih aktivnosti, i statička i dinamička ravnoteža su podložne promenama [39]. Stoga se ravnoteža oslanja na pravilno funkcionisanje čula vida, kao i vestibularnog, proprioceptivnog i čula dodira, uz adekvatno funkcionisanje nervno-mišićnog sistema [39]. Preporučene vežbe uključuju progresivno teže položaje tela, dinamičke pokrete, opterećivanje posturalnih mišićnih grupa i redukciju senzornih inputa (stajanje sa zatvorenim očima) [32]. Primeri ovih vežbi uključuju: tandem hodanje, stajanje na jednoj nozi, prekoračivanje predmeta, lagano penjanje uz stepenice i silaženje niz stepenice, okretanje, održavanje ravnoteže u vozilu u pokretu [33].

ZAKLJUČAK

Populacija starih predstavlja fragilnu grupaciju kod koje su povećani izgledi da će doći do funkcionalnog propadanja u obavljanju svakodnevних aktivnosti, što na kraju umanjuje njihovu samostalnost i povećava potrebu za staranje o ovim licima, na nivou porodice i na nivou zajednice. Posebnu pažnju treba posvetiti višestrukom morbiditetu i povećanim potrebama ovih osoba, kako bi se prevenirala prevremena smrt, smanjio broj hospitalizacija, te promovisale navike pozitivnog načina života i zdravog starenja. Stoga su od velikog značaja mere prevencije koje se sprovode u zdravstvenim centrima i na nivou zajednice. Obrazovni programi i podizanje svesti o uticaju zdravstvenih navika, od vitalnog su značaja za populaciju starih, dok su blagovremena identifikacija komorbiditeta i funkcionalnog propadanja, kao i multidisciplinarni pristup, značajni za postizanje povoljnijeg ishoda u lečenju i praćenju ove populacije. Najzad, zdrava i aktivna populacija starih lica predstavlja manje opterećenje za medicinski sistem i društvenu zajednicu.

Sukob interesa: Nije prijavljen.

programs is to improve ROM in the muscle-tendon groups, so as to enable the individual to perform functional everyday activities [37]. The flexibility exercises that can improve ROM include dynamic stretching, static stretching, proprioceptive neuromuscular facilitation, and ballistic methods, which are usually not recommended for everyday exercise [32].

BALANCE TRAINING

In the elderly population, there is a decline in balance control, which affects the individual's ability to move and function independently [38]. Thus, impaired balance might be a major risk for falls in this population group [38]. When performing everyday activities, both static and dynamic balance are susceptible to change [39]. Therefore, balance relies on the proper functioning of the visual, vestibular, proprioceptive and tactile senses along with an adequate functioning of the neuromuscular system [39]. The recommended exercises include progressively difficult postures, dynamic movement, stressing postural muscle groups, and sensory input reduction (standing with eyes closed) [32]. Examples of exercises include tandem walking, standing on one leg, stepping over objects, climbing slowly up and down steps, turning, maintaining balance in a moving vehicle [33].

CONCLUSION

The elderly population presents a fragile group of individuals with an increased likelihood of functional decline in performing everyday activities, which ultimately reduces their independence and increases the need for the care of these individuals, at the family and community levels. Special attention should be focused on multimorbidity and the increased needs of these individuals, in order to prevent premature death, reduce hospitalizations, and favor positive lifestyle habits and healthy aging. Therefore, preventive measures, implemented at healthcare centers and at the level of the community, are of great importance. Educational programs and awareness raising regarding the impact of health habits are vital in the elderly population, while the timely identification of comorbidities and functional deterioration, as well as a multidisciplinary approach are important for achieving a more favorable outcome in the treatment and follow-up of this population. Finally, a healthy and active elderly population poses a lesser burden to the medical system and the community.

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