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ANALIZA INTENZITETA OPTEREĆENJA I POTROŠNJE ENERGIJE KOD PLESAČA REKREATIVACA

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Apstrakt: Učestvovanje u sportskoj rekreaciji postaje sve važnije kako ista ima veliki uticaj na kvalitet ljudskog života; poboljšavajući i opšte zdravlje i fizičko stanje. Ples se ne posmatra samo kao profesionalni sport, nego je među ljudima stekao i značajnu popularnost kao vrsta rekreacije. Istraživanje je sprovedeno na 93 kandidata koji pohađaju časove rekreativnog plesa sa ciljem da se otkrije kakva je intenzivnost fizičkog opterećenja i potrošnje energije kod plesača. Podaci prikupljeni uz pomoć Polar Team2 sistema su korišćeni za direktno poređenje razlika u intenzitetu fizičkog opterećenja i potrošnje energije između suprotnih polova.

Razlike između intenziteta fizičkog opterećenja i potrošnje energije su određene uz pomoć ANOVA metoda. Ukratko, rezultati su pokazali da su statistički značajne razlike najočiglednije u potrošnji energije, između muških i ženskih plesača. Razlike u intenzitetu fizičkog opterećenja između polova nisu pokazale nikakav statistički značaj.

Ključne riječi: ples, rekreativni ples, društveni ples, intenzitet fizičkog opterećenja, potrošnja energije.

Uvod

Potreba za aktivnim provođenjem slobodnog vremena i potreba za bavljenjem rekreativnim aktivnostima su karakteristike stila života savremenog čovjeka, bez obzira na starosnu dob. Štaviše, ljekari su počeli propisivati kretanje za preventivno djelovanje na bolesti čovjeka, ali i za liječenje. Sve veći broj nalaza stručnjaka idu u prilog ideji da se, uprkos, starosti može zadržati visok kvalitet života, da se ostane fleksibilan, pokretljiv i vitak. Redovan fizički angažman i uključenost u rekreativno bavljenje sportom se svrstavaju u jednu od najvažnijih komponenti zdravog načina života odraslih ljudi. Odsustvo ili nedostatak fizičke aktivnosti dovodi do mnogih

THE INTENSITY OF THE PHYSICAL LOAD AND ENERGY EXPENDITURE ANALYSIS OF PARTICIPANTS OF RECREATIONAL DANCING

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Abstract: Engagement in sport recreation is becoming more and more valuable, as it has big impact on people's quality of life; improving both, general health and physical condition. Dancing is not only seen as a professional sport, but it has been gaining significant popularity among people as type of recreation as well. With an aim to find out what intensity of the physical load and energy expenditure represent to its participants, a study based on a sample of 93 candidates of recreational dance classes, has been carried out. Data obtained with the help of the system Polar Team2 was used for direct comparison of differences in intensity of the physical load and energy expenditure between opposite genders.

Differences between the intensity of the physical load and energy expenditure were determined using ANOVA. In summary, results have shown that statistically significant differences were most apparent in energy expenditure between male and female dancers. Differences in the intensity of the physical load between genders did not show any statistical significance.

Key words: dance, recreational dance, social dance, intensity of the physical load, energy expenditure.

INTRODUCTION

The need for having an active leisure time and for practicing recreational activities mark the lifestyle of a modern man, regardless of his/her age. What is more, physicians have started prescribing movement both for prevention of diseases and as a treatment. There are more and more expert reports that support the idea that even in the old age one can maintain high quality of life, flexibility, mobility and a good shape. Regular physical exercise and engagement in recreational sport are deemed to be some of the most important components of adults' healthy lifestyle. The absence or lack of physical activity leads to many degenerative diseases, damage of vital

degenerativnih bolesti, oštećenja vitalnih funkcija i pre-ranog starenja.

Istraživanja su pokazala da ples blagotvorno djeluje na fiziološke, kao i na psihološke sposobnosti i svojstva (Hopkins, Murrah, Hoeger & Rodes, 1990). Za razliku od vježbanja u zatvorenom prostoru na biciklu i trenažera, koji razvijaju uglavnom donji dio tijela, mnogim plesnim aktivnostima može se trenirati cijelo tijelo, a takav trening ima pozitivan uticaj na tonus mišića, kao i aerobne karakteristike pojedinca (Alpert, 2011). Osim uticaja na fiziološke sposobnosti, kreativno izražavanje, poboljšanje socijalizacije i zabave, istraživači su otkrili da ples ima pozitivan uticaj na podizanje raspoloženja, samopouzdanje, blagostanje i povećanje međuljudskih kontakata između odraslih žena (Blackman, Hunter, Hilyer & Harrison, 1988; Estivill, 1995).

Rezultati pokazuju da je ples je odličan oblik tjelesne aktivnosti, u koju se djeca rado uključuju, a posredno utiče na njihovo zdravlje i fizičko stanje (Ignico i Mahon, 1995; Kremenitzer, 1990), na kognitivni i emocionalni razvoj (Brodie i Birtwistle, 1990), a naravno i na razvoj motoričkih sposobnosti. Rani kontakt djece sa plesom indirektno daje dobru osnovu za buduće rekreativno bavljenje različitim plesnim formama.

Proces starenja ima značajan uticaj na promjene u sastavu tijela i psihofizičke karakteristike pojedinca. Starije osobe imaju značajno veći postotak masnog tkiva, smanjenu vrijednosti mišićne mase (Fiatarone-Singh, 2002), smanjenu snagu i izdržljivost mišića (Harridge, Magnusson i Saltin, 1997), lošu ravnotežu (Hsiao-Weckler i Robinovitch, 2007) i smanjenu aerobnu sposobnost (Harridge et al., 1997) u poređenju sa mladima. Dokazano je da plesna rekreativna vježba može kod starijih uveliko poboljšati njihove aerobne sposobnosti, izdržljivost donjeg dijela tijela, snagu i fleksibilnost, ravnotežu i da podstiče nivo fizičke aktivnosti. Bavljenje plesom poboljšava psihičko/mentalno zdravlje pojedinca, djeluje opuštajuće, podstiče samopouzdanje i koordinaciju između mozga i tijela (Keogh, Kilding, Pidgeon, Ashley i Gillis, 2009).

Mjerenje srčanih otkucaja se sve više koristi u različitim sportskim granama i aktivnostima. Brojanje otkucaja srca postaje važna pomoć u okviru kondicione pripreme. Omogućava bolju kontrolu, pravilno doziranje opterećenja i poboljšanje efikasnosti treninga, a posebno, kada je u pitanju trening osnovne i specijalne izdržljivosti (Bračić & Bon, 2010).

Osnovni cilj istraživanja je da se utvrdi postojanje razlike u intenzitetu opterećenja i potrošnji energije kod plesača rekreativnog plesa.

functions and premature aging.

Researches have shown that dancing has a positive effect on physiological as well as psychological abilities and attributes (Hopkins, Murrah, Hoeger & Rodes, 1990). Unlike exercising in closed spaces on stationary bicycles and treadmills which mostly develop the lower part of the body, many dance activities can train the whole body, and such training has a positive effect on muscle tone as well as on aerobic characteristics of a person (Alpert, 2011). Apart from the influence on physiological abilities, creative expression, improvement of socialization and pastime, researchers have discovered that dance has a positive effect on mood, self-esteem, well-being and the increase of interpersonal relations among adult women (Blackman, Hunter, Hilyer & Harrison, 1988; Estivill, 1995).

The results have shown that dancing is an excellent form of physical activity in which children gladly participate, and it indirectly impacts their health and physical condition (Ignico & Mahon, 1995; Kremenitzer, 1990), their cognitive and emotional development (Brodie & Birtwistle, 1990), and of course, development of motor skills. Children's early exposure to dancing gives them a good basis for the future recreational engagement in different dance forms.

The aging process has a significant influence on changes in the body composition and psychophysical characteristics of an individual. Older persons have significantly higher percentage of body fat, decreased muscle mass value (Fiatarone-Singh, 2002), decreased muscle strength and endurance (Harridge, Magnusson & Saltin, 1997), poor balance (Hsiao-Weckler & Robinovitch, 2007) and lower aerobic ability (Harridge et al., 1997) as compared to the young. It has been proven that recreational exercising through dance can greatly improve older people's aerobic abilities, endurance of the lower part of the body, strength and flexibility, balance and that it increases the level of physical activity. Dancing improves psychological/mental health of an individual, it is relaxing, and it boosts self-confidence and coordination between the brain and the body (Keogh, Kilding, Pidgeon, Ashley & Gillis, 2009).

Heart rate measuring is increasingly used in different sport branches and activities. The heart rate measuring has become an important aid in training. It enables better control, correct dosing of the physical load, and improvement of the training effectiveness (Bračić & Bon, 2010).

The main goal of the research has been to determine the existence of a statistically significant difference in the intensity of the physical load and energy expenditure among dancers of recreational dance.

METOD RADA

Uzorak ispitanika

Uzorak predstavlja 93 ispitanika oba pola (46 muških i 47 ženskih). Prosječna starost ispitanika muškog pola je 49,9 godina, ženskog pola 46,7 godina, a prosječna starost cijele grupe ispitanika je 48,3 godina. Ispitanici su pohađali tzv. plesno veće društvenog plesa, koje uključuje 8 plesova (valcer, ča ča ča, disco hustle, samba, džajv, bečki valcer, brzi fokstrot, blues), a prisustvovali su na časovima u plesnoj školi jednom sedmično.

Uzorak varijabli

U ovom istraživanju varijable su bile: intenzitet opterećenja (srčana frekvencija, otk/min) i potrošnja energije (kcal). Svaka od njih je dobijena ili izračunata posebno za svakog ispitanika.

Opis istraživanja

Istraživanje je provedeno u tri plesne škole u Sloveniji, jednoj u Novoj Gorici, drugoj u Ljubljani i trećoj u Slovenj Gradecu. Dakle, istraživanje je sprovedeno među ispitanicima, koji su se bavili istom vrstom plesa, plesali na istu muziku s istim tempom, ali pod okriljem raznih učitelja. Svaki nastavnik je po slobodnom izboru odabrao različite korake i koreografije i to je jedina varijabla koja je mogla biti ista na svim mjestima. Koreografija po sebi može uticati na intenzitet plesanja, ali uprkos različitim koracima, kada je u pitanju rekreativni nivo plesa, može se ustvrditi da ne postoje velike razlike u intenzitetu vježbanja.

Kako bi se osigurali što približniji uslovi kod ispitanika iz različitih mjesta u Sloveniji unaprijed je pripremljena muzika, na koju su plesali ispitanici. Išlo se od jednostavnih ka složenijim plesovima. Počelo se sa engleskim valcerom, nastavilo sa bluzom, ča ča ča, bečkim valcerom, disco hustlom, sambom i brzim fokstrotom. Dužina muzike je 2 minuta i 30 sekundi. CD je snimljen tako da ste uvijek išla dva ista plesa zaredom, prvi ples je išao sporijim tempom, a drugi bržim tempom izvođenja. Pauza između plesova iznosila je deset sekundi. Prije početka testiranja, ispitanici su popunili upitnik sa sljedećim podacima: ime i prezime, datum rođenja, pol, tjelesna težina, tjelesna visina, vrsta plesne rekreacije i redovnost vježbanja i eventualne zdravstvene tegobe (na osnovu čega je zaključeno da li su svi ispitanici bili zdravi).

Mjerenje je vršeno na redovnim treninzima plesa. Svaki trening se sastojao od 20 minuta pripremnog dijela, 60 minuta rekreativnog vježbanja sa pauzama

METHOD

Research sample

The research sample consisted of 93 participants of both sexes (46 males and 47 females). The average age for males was 49.9 years and for females was 46.7 years, while the average age for the whole group was 48.3 years. The participants attended so called dance evening of social dance which included 8 dances (waltz, cha cha cha, disco hustle, samba, jive, Viennese waltz, quickstep, and blues), and they also attended dance school classes once a week.

Variables sampling

In this research the variables have been: the intensity of the physical load (heart rate, beat/min) and energy expenditure (kcal). Each of these has been gotten or calculated separately for each participant.

Research description

The research has been carried out in three dance schools in Slovenia; one is in Nova Gorica, another in Ljubljana, and the third one in Slovenj Gradec. Therefore, the research has been carried out among participants who train the same kind of dance, dance to the same music with the same rhythm, but who are under the guidance of different coaches. Each coach has freely chosen different steps and choreographies and that is one variable that could not be the same among the schools. Choreography in itself can influence the intensity of dancing; however, in spite of different dance steps, and in regards to the recreational level of dancing, it can be affirmed that there are no big differences in the intensity of exercising.

In order to ensure as similar conditions as possible for the participants in different places of Slovenia, the music that participants danced to was prepared in advance. They started with easier dances moving toward more complex dances. The opening dance was English waltz, followed by blues, cha cha cha, Viennese waltz, disco hustle, samba and quickstep. The duration of music was 2 minutes and 30 seconds. The CD was recorded so that there was a sequence of two of the same dances in a row: the first dance had a slower rhythm while the second dance had a faster rhythm. The break between dances was ten seconds. Before the start of testing, the participants had filled in a questionnaire with the following data: first and last name, date of birth, sex, body weight, body height, the type of dance recreation and frequency of exercising, and possible health problems (on which basis was concluded that all the participants were healthy).

Measuring took place during regular training sessions. Each training session consisted of 20 minutes of prepara-

od 10 sekundi između pojedinih plesova i na kraju 15 minuta opuštanja. Na taj način je obezbjeđen visok intenzitet vježbanja, prema kojem se svaki ispitanik prilagođavao, shodno sopstvenim mogućnostima i sposobnostima.

Ispitanici su mjereni sistemom Polar Team2, gdje su podaci prikupljeni u realnom vremenu na centralnom računaru, a svaki od plesača je imao svoj mjerač otkucaja srca. Sistem je zasnovan na principu telemetrije. Jak odašiljač, koji je smješten na odgovarajućem pojasi, prenosi podatke o vrijednosti srčane frekvencije do stacioniranog prijemnika (antene), putem bluetooth tehnologije, pri čemu je maksimalan domet antene 100 metara. Takođe, je prije početka mjerenja u računaru određeno pet zona srčane frekvencije: 0-60%, 60-70%, 70-80%, 80-90% i 90-100% od maksimalnih otkucaja. Osim prosječnih vrijednosti otkucaja srca u istraživanju bilo je značajno utvrditi koliko su energetske zahtjevni rekreativni časovi plesa i koliko su vježbači aktivni sa energetskog stanovišta. Za mjerenje potrošnje energije, izražene u kcal, korišten je takođe Polar Team2 sistem, koji je jedan od najpreciznijih instrumenata kalorijske potrošnje na tržištu. Izračunati broj kalorija se zasniva na parametrima tjelesne težine, visine, dobi, pola, maksimalnog broja otkucaja srca i intenziteta vježbanja. Polar Team2 sistem za svakog pojedinca nakon završetka vježbanja računa broj kalorija, ovisno o unesenim varijablama. Dobijeni rezultati su korišteni za upoređivanje potrošnje energije kod obje grupe ispitanika (muški i ženski).

Metode obrade podataka

Za statističku analizu korišten je statistički paket SPSS. Za potrebe istraživanja, izračunate su aritmetička sredina i standardno odstupanje za obje varijable posebno kod muških i posebno kod ženskih ispitanika i primijenjena je univarijantna analiza varijanse (ANOVA), kako bi se utvrdilo jesu li razlike koje se javljaju između različitih varijabli statistički značajne ili ne.

REZULTATI I DISKUSIJA

Po završenom mjerenju dobijeni su sljedeći podaci: prosječna vrijednost srčane frekvence kod svih ispitanika, maksimalan broj otkucaja srca za svakog ispitanika, broj otkucaja srca tokom vježbanja za svakog ispitanika izražen u procentima i potrošnju energije u toku treninga.

Važan faktor za izračunavanje i upoređivanje intenziteta opterećenja plesača predstavlja prosječan broj otkucaja srca tokom trenazne jedinice. Polar Team 2 sistem šalje podatke prijemniku o trenutnom broju otkucaja srca

60 minutes of recreational exercising with 10 second breaks between specific dances, and in the end there was a 15 minute relaxation period. This was to ensure the high intensity of exercising and each participant adjusted himself/herself to it according to their own abilities and skills.

The participants were measured with the Polar Team2 system, with the data being collected in the real time on the central computer, and each dancer had his/her own device for measuring heart rate. The system is based on the principle of telemetry. A strong transmitter, which was placed at the appropriate belt, was transmitting the data regarding the heart rate value to the stationary receiver (antenna) via Bluetooth technology, with the maximum range of the antenna being 100 meters. Additionally, before the start of measuring, five heart rate zones were set in a computer: 0-60%, 60-70%, 70-80%, 80-90% and 90-100% of a maximum heart rate. Apart from the average heart rate values, it was important to determine how demanding were the recreational dancing classes and how active were the participants in terms of energy. The Polar Team2 system, one of the most precise instruments for measuring burned calories on the market, was also utilized for measuring the energy expenditure expressed in kcal. The number of calculated calories is based on these parameters: body weight, height, age, sex, maximum heart rate and intensity of exercising. The Polar Team2 system counted calories for each individual after the training session depending on the entered variables. The results were used for a comparison of the energy expenditure in both groups of participants (males and females).

Methodology of data analysis

A software package SPSS was used for the statistical analysis. For the research purposes, the arithmetic mean and standard deviation for both variables was calculated separately for male and female participants and univariate analysis of variance (ANOVA) was applied, so as to determine whether the differences that appear among different variables are statistically significant.

RESULTS AND DISCUSSION

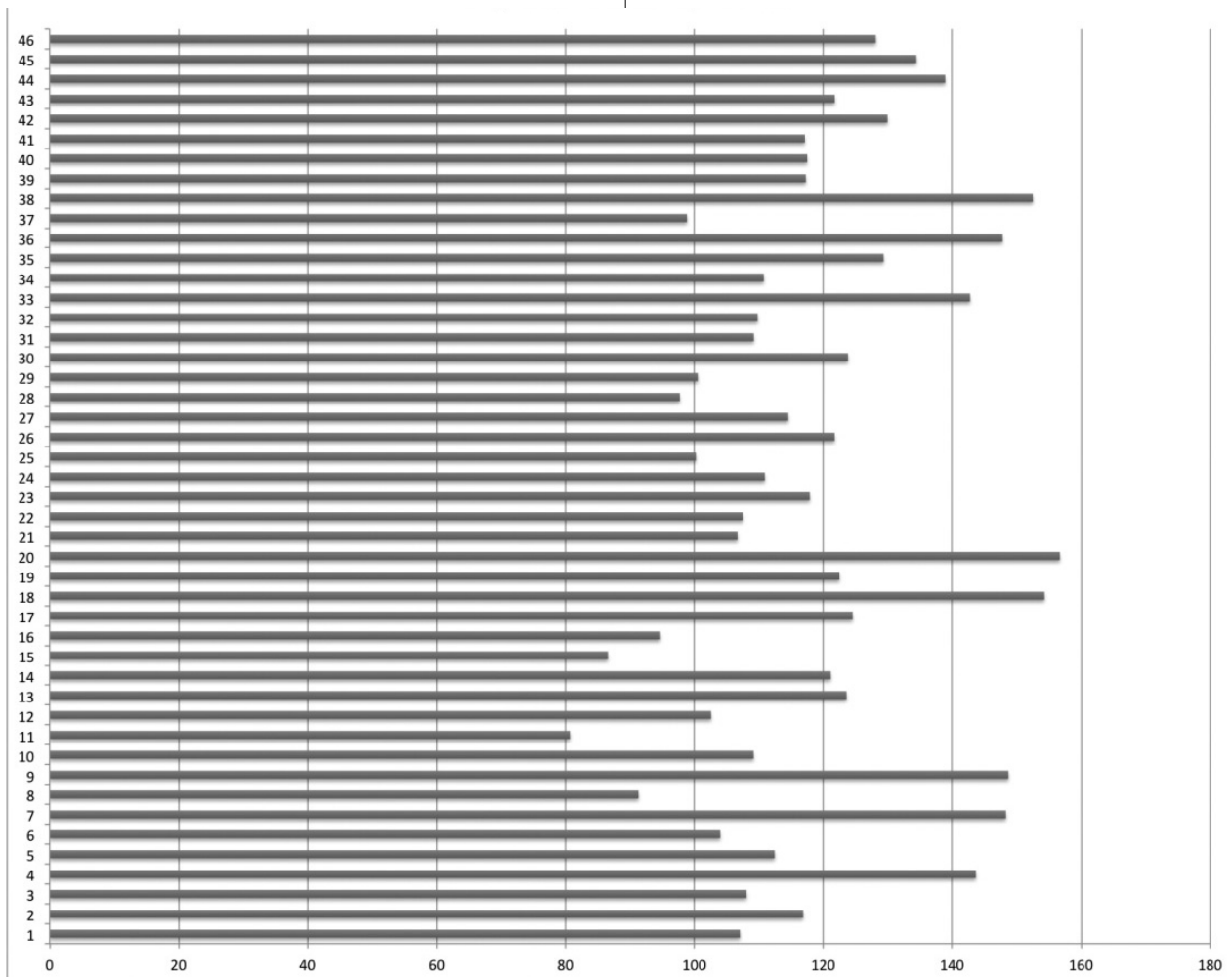
After measuring, the following data were collected: the average value of heart rate in all participants, the maximum heart rate for each participant, the number of heartbeats during exercising for each participant expressed in percentages and energy expenditure during a training session.

The important factor for calculation and comparison of intensity of the physical load among dancers is the average number of heartbeats per one training unit.

svake sekunde, tako da se u ovom istraživanju, mjerenjem dobilo 3600 podataka o trenutnom broju otkucaja srca. Zbog tako velikog broja dobijenih podataka, prosječni broj otkucaja srca tokom vježbanja je vrlo dobro definisan.

Dobijeni podaci pokazuju da postignute maksimalne postignute vrijednosti otkucaja srca nisu povezane sa radnim opterećenjem. Uprkos različitim individualnim vrijednostima maksimalnog broja otkucaja srca za muškarce i žene, prosječni broj otkucaja srca je u priličnoj mjeri sličan. Muškarci su u prosjeku imali vrijednosti 119 otkucaja u minuti ($118,8 \pm 18,9$), a žene 121 otkucaj u minuti ($120,9 \pm 15,2$). Gledano u cjelini, prosječne vrijednosti otkucaja srca praktično se ne razlikuju. Navedene vrijednosti su grafički predstavljene (grafikon 1 i grafikon 2).

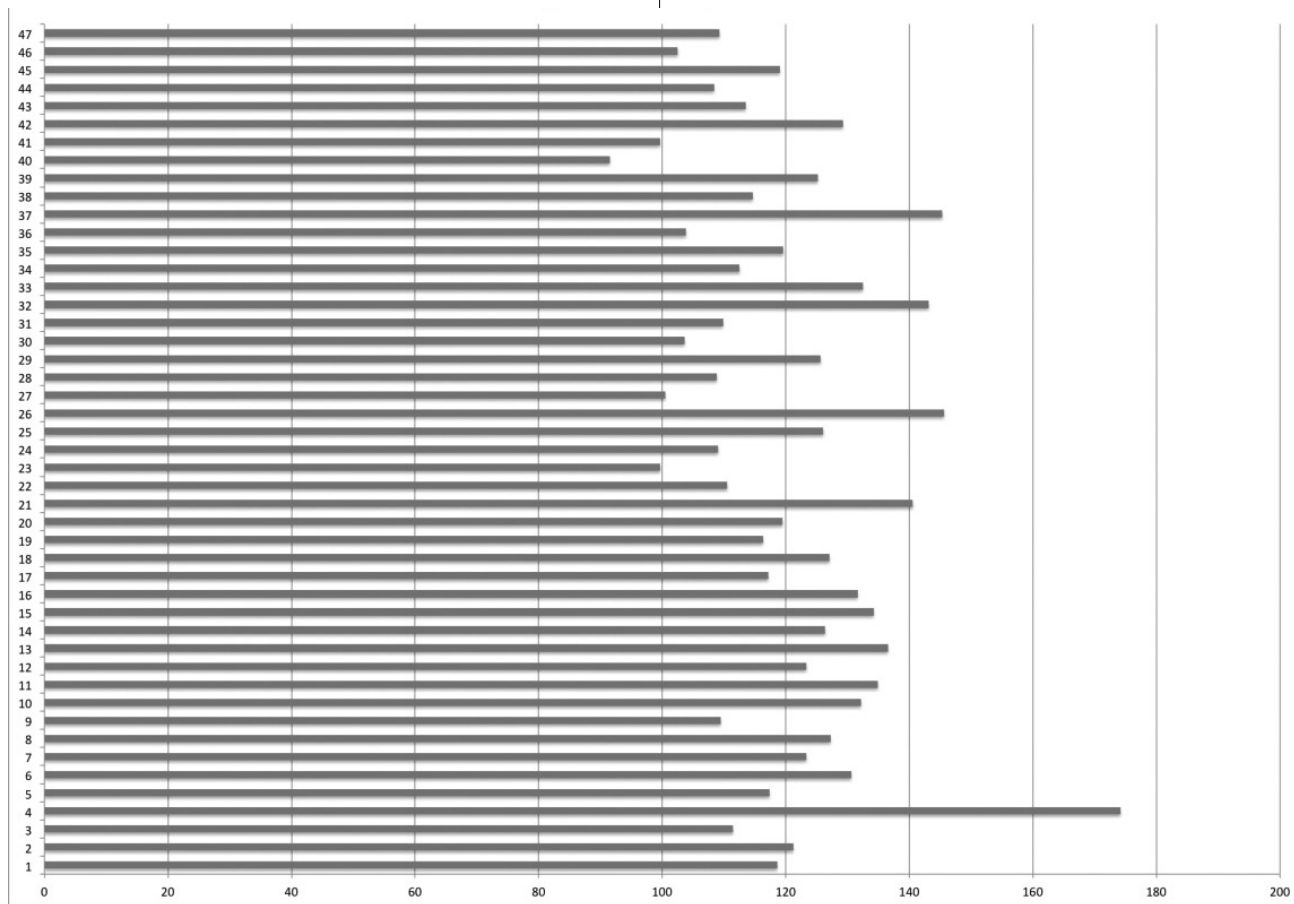
Grafikon 1. Prosječni broj otkucaja srca svakog pojedinca - plesači



The Polar Team2 system sends data to the receiver about the current number of heartbeats every second; therefore, this research resulted in 3600 data about the current heartbeats. Due to the large amount of data, the average heart rate during exercising is very well defined.

The data show that the expressed maximum heart rate values are not related to the work load. Despite the differences among individual values of maximum heart-beat rate for males and females, the average heartbeat rate is fairly equal. Men had on average 119 heartbeats per minute (118.8 ± 18.9), while women had 121 heartbeats per minute (120.9 ± 15.2). Generally looking, the average heart rate values are virtually identical. The mentioned values are represented via diagrams (diagram 1 and diagram 2).

Diagram 1. The average heartbeat of each individual for male dancers

Grafikon 2. *Prosječni broj otkucaja srca svakog pojedinca – plesačice***Diagram 2.** *The average heartbeat of each individual for female dancers*

Na osnovu dobijenih rezultata, može se zaključiti da većina dobijenih vrijednosti spada u područje umjerenog i srednjeg intenziteta (petostepena podjela po Karpuljku, 2003). Rezultati u grafikonima 3 i 4 pokazuju da 68,4% (65 ispitanika) vježba u rasponu 60% -80% od svog maksimalnog opterećenja, njih 15,8% od izvodi vježbe sa manje od 60% svog maksimalnog opterećenja, 13,7% vježba u rasponu između 80% -90% od maksimalnog opterećenja, a 2,1%, su u najvišoj zoni, koja predstavlja 90% -100% od maksimalnog opterećenja. Rezultati ukazuju da je ples na rekreativnom nivou dovoljno zahtjevan oblik vježbanja koji intenzivno utiče na tijelo vježbača i time pomaže u očuvanju i unapređenju pripremljenosti tijela uopšte. Štaviše, predstavlja idealno sredstvo za održavanje odgovarajuće tjelesne težine i dobar način za razvoj aerobnih sposobnosti.

On the basis of the compiled data, it can be concluded that the majority of recorded values belong to the moderate and medium intensity range (the five zone division according to Karpuljko, 2003). The results shown in diagrams 3 and 4 demonstrate that 68.4% of the participants (65 of them) exercise within the 60% - 80% range of their maximum load, 15.8% of them exercise with less than 60% of their maximum load, 13.7% exercise within the range between 80% - 90% of their maximum load, and 2.1% are in the highest zone which represents 90% - 100% percent of the maximum load. The results show that recreational dancing is a fairly demanding form of exercising which has an intense impact on the body of an exerciser, and consequently it helps body maintenance, development and fitness in general. What is more, it is an ideal instrument for the maintenance of the appropriate body weight and a good method for development of aerobic abilities.

Grafikon 3. Broj vježbača po trenažnim zonama (muški, ženski, svi ispitanici)

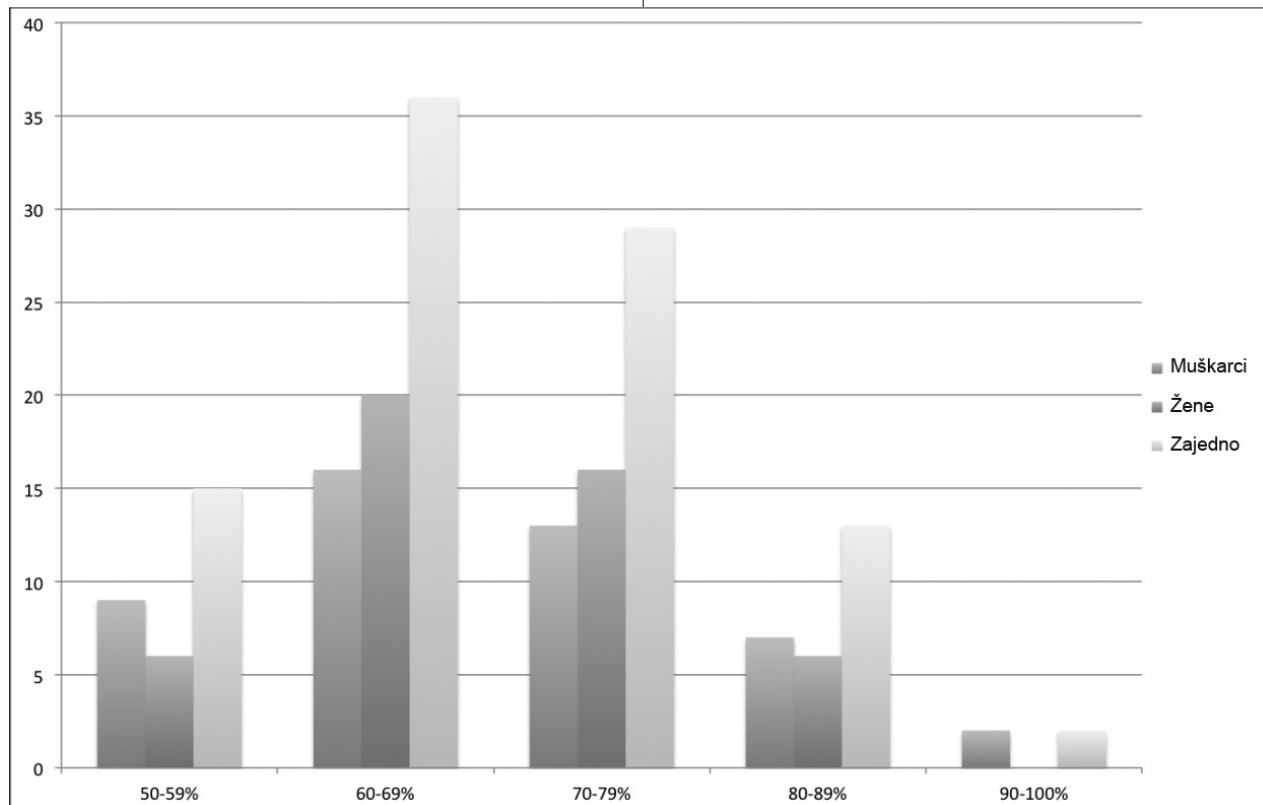


Diagram 3. Distribution of exercisers among the training zones (male, female, entire sample)

Grafikon 4. Najveći nivo opterećenja vježbanja u procentima za ukupan uzorak ispitanika

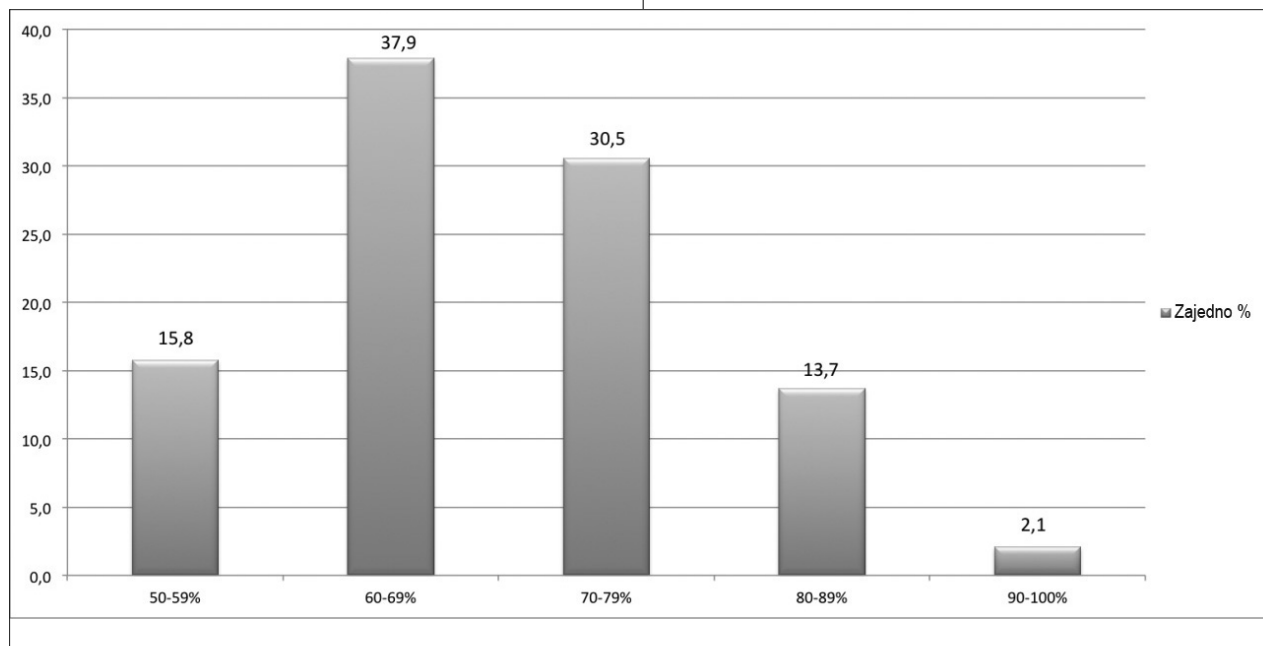


Diagram 4. The highest level of exercising load expressed in percentages for the entire sample of participants

Kada je u pitanju potrošnja energije za vrijeme rekreativnog bavljenja plesom, razlike između apsolutnih vrijednosti su znatno izraženije nego kod prosječnog broja otkucaja srca. Žene su za sat vremena plesanja u prosjeku potrošile 579 kcal± 166 kcal (grafikon 6), dok su muškarci u istom razdoblju potrošili 769 kcal ± 296 kcal

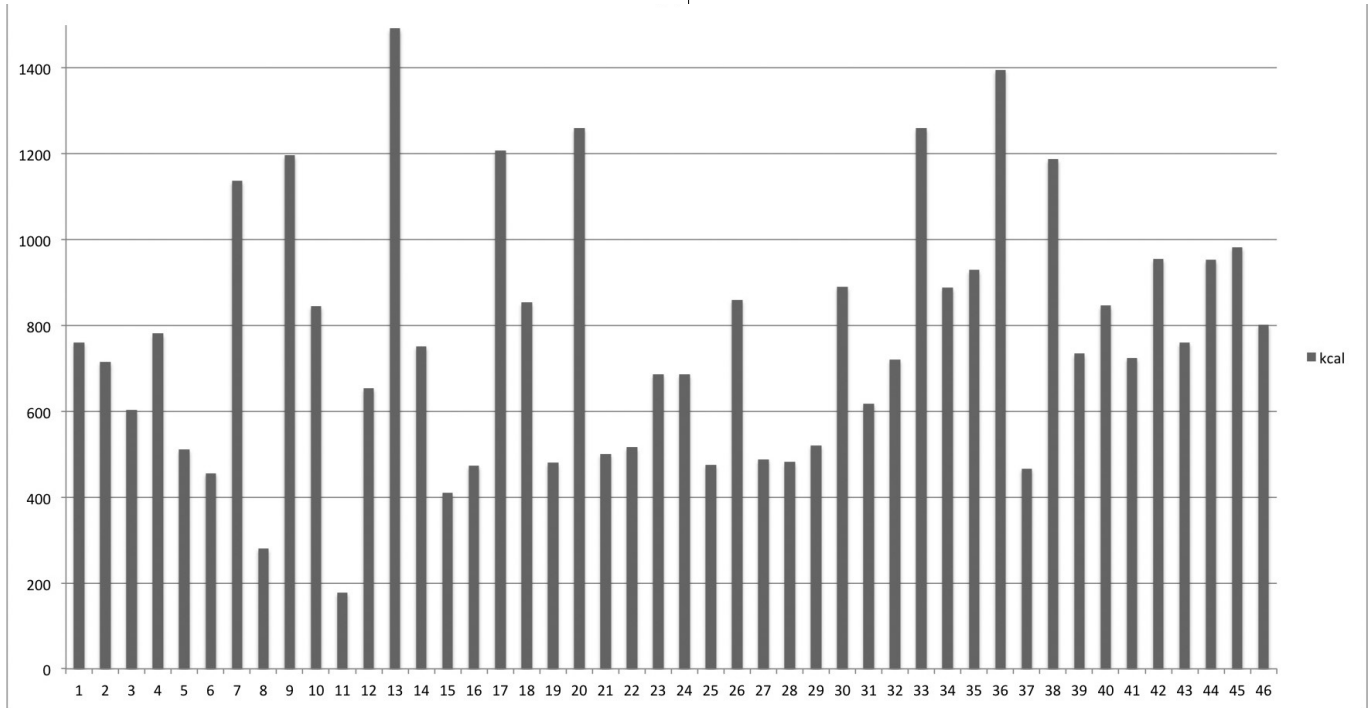
When it comes to the energy expenditure during the time of recreational dance engagement, the differences between absolute values are considerably more pronounced than with the average heartbeat. Women spent 579 kcal± 166 kcal on average (diagram 6) in one hour of dancing, during which time men spent 769 kcal ± 296

(grafikon 5), što je 33% više nego kod ženskih ispitanika.

kcal (diagram 5), which is 33% more than women.

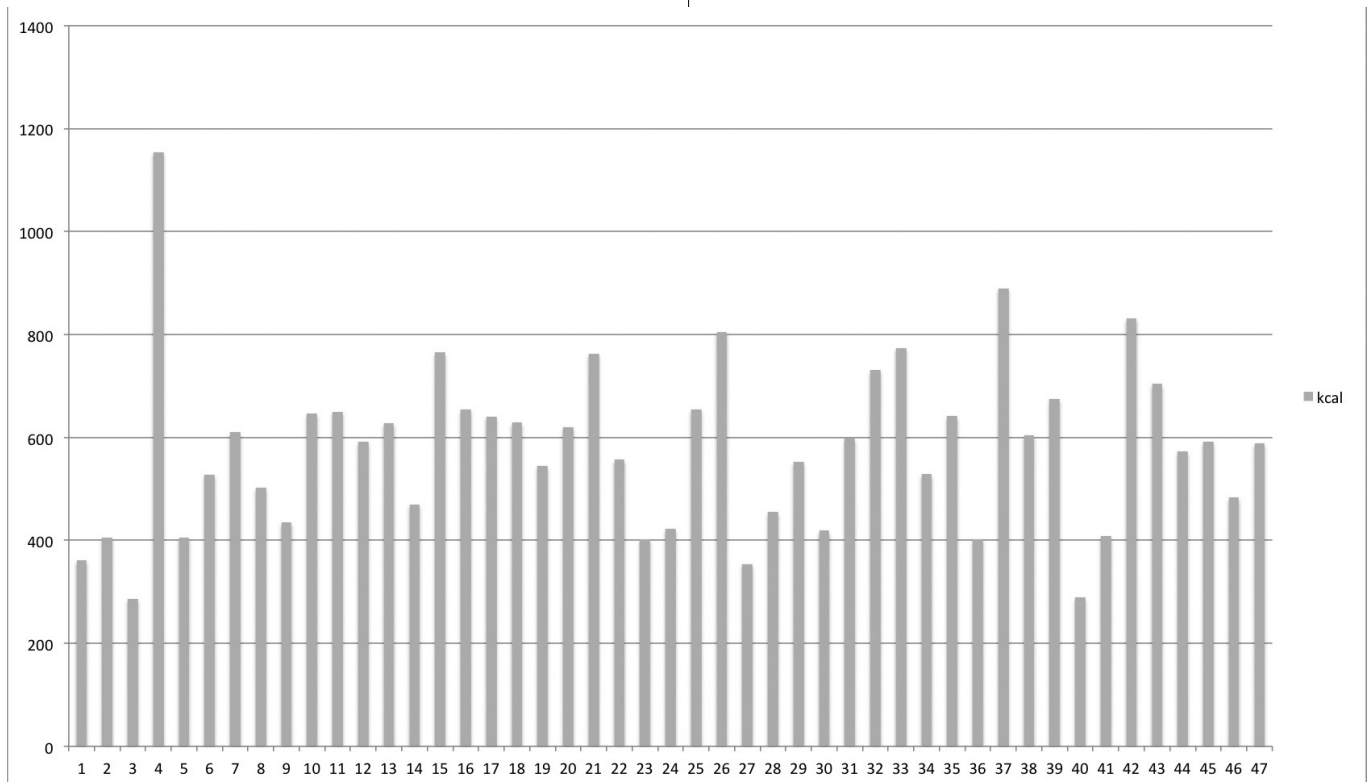
Grafikon 5. Potrošnja energije u kcal za muškarce (jedna trenažna jedinica)

Diagram 5. The energy expenditure in kcal for men (one training unit)



Grafikon 6. Potrošnja energije u kcal za žene (jedna trenažna jedinica)

Diagram 6. The energy expenditure in kcal for women (one training unit)



Zanimalo nas je jesu li te razlike, koje su bile očigledne u apsolutnim iznosima intenziteta opterećenja i potrošnji energije i statistički značajne? Rezultati prikazani u Tabeli 1 pokazuju da, u intenzitetu opterećenju između plesača i plesačica nema statistički značajnih razlika, dok je kod potrošnje energije vidljiva statistički značajna razlika.

Tabela 1. Rezultati jednosmjerne analize varijanse- ANOVA

	Muški / Men (N=46)		Ženski / Women (N=47)		F	p(F)
	Aritmetička sredina / / Arithmetic mean	Standardno odstupanje / / Standard deviation	Aritmetička sredina / / Arithmetic mean	Standardno odstupanje / / Standard deviation		
srčani otkucaj (udarci/min) / / Heartbeat (beat/min)	118,81	18,58	120,90	15,20	0,359	,554
potrošnja energije (Kcal) / / Energy expenditure (Kcal)	769,13	296,48	579,36	166,43	14,568	,000*

(Legenda: F= odnos, p(F)= nivo statističke značajnosti F odnosa, *= statistički značajna razlika na nivou 5% greške)

Kada je u pitanju potrošnja energije, mora se imati na umu da na istu utiče više faktora: sastav, pol i starost (predstavljaju bazalni metabolizam), te prehrambeni faktor i tjelesna aktivnost. Potrošnja energije za bazalni metabolizam je poprilično konstantna. Bazalni metabolizam predstavlja 60-75% svih potrebnih kalorija u jednom danu (Mayo Clinic, 2011).

Istraživanje mjernim sistemom Polar Team 2 je bilo prvo u oblasti rekreativnog plesa u Sloveniji. Dobijeni podaci pokazali su da je rekreativni ples sa stanovišta opterećenja i potrošnje energije znatno složenije područje, nego što to izgleda na prvi pogled. Razlog za to može se pripisati složenoj strukturi kretanja u plesu i različitim plesnim stilovima i plesnim koreografijama, jer svaki ples na svoj način traži drugačiji intenzitet pojedinca u plesu.

Do danas nije bilo puno istraživanja za mjerenje opterećenja i potrošnje energije kod plesača. Univerzitet u Wisconsinu, u slučaju istraživanja rekreativnog plesa zumba je ustanovio da se vježbanjem postiže prosječno 154 otkucaja u minuti, što je činilo 79% od maksimalnog broja otkucaja srca. Mjerenja u ovom istraživanju su pokazala da je kod rekreativnih plesača prosječna vrijednost otkucaja srca u značajnoj mjeri manja (120 otkucaja u minuti), što je razumljivo, s obzirom na različitost ove dvije plesne aktivnosti.

Veća odstupanja su prikazana i u potrošnji energije. Istraživanje na Univerzitetu u Wisconsinu govori o prosječnoj potrošnji 570 kcal, iz Adelphi Sveučilišta

We were interested whether those differences, which were apparent in the absolute values of load intensity and energy expenditure, were statistically significant. The results shown in Table 1 demonstrate that the intensity of load between female and male dancers is not statistically significant, while there is a statistically significant difference when it comes to the energy expenditure.

Table 1. Results of one way analysis of variance- ANOVA

	Muški / Men (N=46)		Ženski / Women (N=47)		F	p(F)
	Aritmetička sredina / / Arithmetic mean	Standardno odstupanje / / Standard deviation	Aritmetička sredina / / Arithmetic mean	Standardno odstupanje / / Standard deviation		
srčani otkucaj (udarci/min) / / Heartbeat (beat/min)	118,81	18,58	120,90	15,20	0,359	,554
potrošnja energije (Kcal) / / Energy expenditure (Kcal)	769,13	296,48	579,36	166,43	14,568	,000*

(Legend: F= relationship, p(F)= level of statistical significance of F relationship, *= statistically significant difference at the level of 5% error)

As for the energy expenditure, one has to have in mind that it is influenced by several factors: composition, sex and age (these represent the basal metabolism), the nutritional factor and body activity. The energy expenditure is fairly constant for the basal metabolism. The basal metabolism accounts for about 60 – 75% of all the necessary calories in one day (Mayo Clinic, 2011).

The research that utilized the Polar Team 2 system was the first such in the area of recreational dance in Slovenia. The compiled data showed that there is more complexity in recreational dance than meets the eye when one is observing the physical load and energy expenditure in it. This might be due to the complex movement structure in dancing and different dance styles and choreographies, because each dance requires different intensity from an individual.

So far, there has not been much research dealing with measuring of dancers' physical load and energy expenditure. In a research of recreational Zumba dance from the University of Wisconsin, it has been established that exercising brings the heart rate to 154 heartbeats per minute, which was 79% of the maximum heartbeat. In this research, measurements have shown that recreational dancers have a notably lower average heartbeat value (120 heartbeats per minute), which is understandable considering the difference between these two dancing activities.

Larger discrepancies have been noticed also when it comes to the energy expenditure. The research from the University of Wisconsin marked that the average expendi-

396-444 kcal, a ispitanici u ovom istraživanju 783 kcal, sve za sat vremena treninga. Takve razlike dijelom se mogu objasniti time što se radi o različitim vrstama plesa odnosno rekreativnog plesa, koji se ne izvode u istom tempu (intenzitetu) i varijacijama u plesnim koreografijama, ali i razlikama u starosti ispitanika. Osim toga, i sam intenzitet u velikoj mjeri ovisi o učitelju plesa - koliko je on u stanju motivirati vježbače.

U istraživanju potrošnje energija plesača društvenih plesova u okviru istraživanja na Mayo Clinici, dobijeni su podaci da je potrošnja 400-800 kcal za sat vremena vježbanja, ovisno uglavnom o stilu plesa koji se obavlja. Rezultati u ovom istraživanju su pokazali da su plesači prosječno potrošili 769 kcal / sat, plesačice 579 kcal / sat, odnosno za cjelokupan uzorak ispitanika prosječno 674 kcal / sat, što se slaže sa rezultatima iz klinike Mayo.

Do različitih rezultata je došao Vaszily (2005). Naime, on je ustanovio da je prosječna potrošnja energije u 265 kcal / sat, što je znatno manje od gore navedenih istraživanja. S obzirom na činjenicu da nije bilo moguće dobiti dovoljno precizne informacije o izvršenom mjerenju, razlike se mogu se tumačiti na više načina. Ispitanici u ovom istraživanju su aktivno plesali tokom cijelog sata, što i nije uvijek praksa u rekreativnim društvenim plesovima. Sam proces učenja u rekreativnim plesovima prati često mirovanje. Takođe, ovi rezultati se odnose na jednu starosnu grupu i trebalo bi isto istraživanje ponoviti sa drugim uzrastom.

ZAKLJUČAK

Istraživanje je sprovedeno sa ciljem bio da se utvrdi postojanje statistički značajne razlike u intenzitetu trenažnog opterećenja i potrošnji energije kod plesača i plesačica rekreativnog plesa. Univarijatnom analizom varijanse (ANOVA) utvrđeno je da razlike u intenzitetu opterećenja plesača i plesačica rekreativaca nisu statistički značajne, dok je kod potrošnje energije utvrđena statistička značajnost na nivou $p = .00$. Na osnovu dobijenih rezultata može se zaključiti da je rekreativni ples sa stanovišta intenziteta opterećenja i potrošnje energije znatno složenije područje, nego što to izgleda na prvi pogled. Takođe, dobijeni rezultati se podudaraju sa nekim rezultatima dosadašnjih istraživanja, ali i daju veliki značaj primjeni Polar Team 2 sistema kao mjernog uređaja, koji se pokazao kao precizan, pouzdan i jednostavan za upotrebu. Ovo istraživanje dalo je veliku količinu podataka i na osnovu dobijenih rezultata omogućena je objektivna komparacija s raznim drugim oblicima sportske rekreacije u Sloveniji i šire, te na taj način je stvorena pretpo-

ture was 570 kcal, while in a research from Adelphi University it was 396 – 444 kcal, and the participants of this research spent 783 kcal during one hour of training. These differences can be partly explained by the fact that those are different types of dance, i.e. recreational dance, which are not performed in the same rhythm and with the same variations, and also by the differences in age of the participants. In addition, the intensity itself greatly depends on a dance coach – to what extent he/she is able to motivate dancers.

In a research performed at Mayo Clinic about dancers' energy expenditure in social dances, the obtained data showed the expenditure of 400-800 kcal per one hour of exercising, depending on the style of dancing in question. The results in this research showed that the male dancers spent 769 kcal/hour on average, while the female dancers spent 579 kcal/hour, with the total for the entire sample of participants being 674 kcal/hour, which is in agreement with the Mayo Clinic results.

Vaszily (2005) got different results. Namely, he found that the average energy expenditure was 265 kcal/hour, which is significantly less than what the previously mentioned pieces of research got. Considering the fact that there was no possibility of getting the sufficiently accurate information about the advancement of measurement, the differences can be interpreted in several ways. The participants in this research danced actively during the whole hour, which is not always common in recreational social dances. The process of learning in recreational dances involves frequent resting periods. Additionally, these results apply to one age group and the same research should be repeated with another age group.

CONCLUSION

the research has been carried out with the aim of determining the existence of statistically significant difference in the intensity of training load and the energy expenditure with female and male dancers of recreational dance. The univariate analysis of variance (ANOVA) showed that the differences between male and female dancers in the intensity of the physical load are not statistically significant, while in regards to the energy expenditure there was a statistically significant difference at the level of $p = .00$. Based on the results, it can be concluded that recreational dance is much more complex than meets the eye when one is observing the physical load and energy expenditure in it. Furthermore, the results correlate with some of the results of the previous research, and also give a great importance to the application of the Polar Team2 system as a measuring device which proved to be

stavka za daljnja istraživanja. Dobijeni rezultati mogu se koristiti u programiranju treninga rekreativnog plesa.

precise, reliable and easy to use. This research produced a large amount of data and the obtained results enabled an objective comparison with other forms of sports recreation in Slovenia and in a wider region, thus creating a platform for further research. The compiled data may be used in programming of the recreational dance training.

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