

INFLUENCE OF PHYSIOTHERAPY ON PHYSIAL ACTIVITY IN PREGNANCY

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Abstract: *Pregnancy is a period of physical and psychological changes aligned with the needs of growing life. The future mother has an important task, to overcome great physical, physical and mental demands. The most adequate means of achieving these requirements is physical activity because it affects the stimulation of the musculoskeletal, cardiovascular and respiratory systems, improves fitness, maintains muscle strength and elasticity, and reduces the risk of overweight, gestational diabetes, preeclampsia, premature birth and postpartum depression. The aim of the work was to examine the impact of kinesitherapy on the level of physical activity in psychophysical preparation for childbirth. A prospective longitudinal study was conducted at the primary level of health care in Montenegro in 2018 (February-August). 34 pregnant women in the third trimester of pregnancy from Herceg Novi (n=29) and Cetinje (n=5) were voluntarily recruited into the research after the approval of the gynecologist-obstetrician. During four weeks, with the supervision of a physiotherapist, kinesitherapy was applied in groups of 4-6 pregnant women. During 8 sessions of 30 minutes, breathing exercises, improvement of circulation, posture, joint mobility and strengthening of weakened muscles were performed. The participants were advised to walk for at least 30 minutes every day. The research instrument was an international questionnaire on physical activity The International Physical Activity Questionnaire (IPAQ-SF). Physical exertion of intensity 3-4 is matched by the modified Borg scale of perceived exertion. The level of physical activity was analyzed at the beginning and two weeks after the end of the preparations for childbirth. Data analysis: age 20-30 years for 63% of participants, 31-40 years for 34%, and over 40 years for 3%. Level of education: 60% have a secondary education, 6% have a higher education, and 34% have a higher education. The initial analysis of the assessment of the level of physical activity was: minimal level of 10 participants, moderate level of 18 participants, and intensive level of 6 participants. The metabolic equivalent increased by 233.03 METmin because its initial value was 1649.82 METminutes and the control 1882.35 METminutes. An improvement in the level of physical activity was observed in seven participants. Pregnant women should be encouraged to prepare prenatally because kinesitherapy will encourage an increase in the level of physical activity.*

Key words: *pregnancy, physical activity, exercise*

Introduction

Pregnancy is a period of great physical and psychological changes destined to meet the needs of a new, growing life. In accordance with these changes, pregnant women should prepare for great and new bodily, physical and mental demands [1].

Physical activity before and during pregnancy is a complex behavior that promotes and improves the health of the mother and fetus [2]. Forty years ago, the American College of Obstetricians and Gynecologists (ACOG) published recommendations regarding physical activity during pregnancy. Since then, physical activity and exercise during pregnancy have become more frequent due to the potential benefits for the health of the pregnant woman and the fetus with minimal risk. Physical activity is used by most pregnant women due to the anatomical, physiological and needs of the fetus, along with the correction of routine habits. Pregnant women with regular pregnancies should be encouraged to do aerobic exercise and conditioning during and after pregnancy [3].

Physical activity refers to all body movements performed by skeletal muscles, in which energy consumption is above basal (work, household chores and leisure activities). Exercise is a planned, structured and repetitive physical activity that improves or maintains physical fitness [4].

Physical activity and exercise have a protective role in the health of pregnant women, develop strength, endurance, stimulate the functioning of the musculoskeletal, cardiovascular, respiratory, endocrine system, affect the general perception of health and emotional status. It reduces the risk of obesity, hypertension, diabetes, cardiovascular diseases and complications during childbirth, has a positive effect on the fetus and improves the reaction to stress in the uterus [5,6,7,8]. Kinesitherapy raises the functional capacity of a pregnant woman to a higher level, increases endurance and muscle strength, improves the general perception of health and prepares the body for labor and delivery. Planned and targeted training of individual muscle groups for higher loads, maintains overall posture and muscle tone, prevents trophic processes, maintains elasticity of ligaments and helps in establishing new motor habits. It increases self-confidence, readiness for the challenges of childbirth and the postpartum period [9].

Healthy pregnant women are recommended to do 150 minutes of weekly moderate-intensity physical activity or to continue their pre-pregnancy level of physical activity, but physical activity recommendations are rarely met, and activity levels tend to decline during pregnancy [10,11, 12,13]. Feasible, reliable and valid measures of physical activity before, during and after pregnancy are helpful in monitoring the effectiveness of health promotion [14].

Assessment of energy consumption and level of physical activity during pregnancy enables a better understanding of the pregnant woman's profile and is an adequate way of monitoring exercise by health workers. Identifying the most acceptable way to determine the overall level of physical activity is a challenge, and different methods have advantages and limitations [15]. The questionnaire on the subjective assessment

of the level of physical activity proved to be effective due to the monitoring of daily activities present in the life of pregnant women [4].

The aim of this paper was to assess the impact of kinesitherapy on the level of physical activity during pregnancy during prenatal preparation for childbirth.

Material and methods

At the primary level of health care, a longitudinal prospective study was conducted in Montenegro, in the Health Centers of Herceg Novi and Cetinje, in accordance with all ethical principles. The practice is to include pregnant women in the third trimester of pregnancy in the psychophysical preparation for childbirth, with the approval of the gynecologist-obstetrician. The subjects were informed about the importance of kinesitherapy and recruited directly from the counseling center, which they confirmed with written consent.

The level of physical activity (PA) was examined by The International Physical Activity Questionnaire short form (IPAQ-SF), which assesses the frequency, duration and intensity of physical activity during the week in free time, at home, at work and during transport. Relation to activities of high intensity (lifting heavy loads), moderate intensity (moderate physical effort, carrying light loads, cycling) and walking (walking for work, transport, household, exercise and leisure). Seven structured questions provide individual results for each physical activity in the specified domains. Six questions refer to everyday activities, and the seventh is related to sitting and sedentary habits. The data analysis gives energy expended - Metabolic Equivalent (MET), the total time spent in minutes and the frequency spent in days of physical activity. The volume of activity for walking is 3.3 METs, moderately intense activity 4 METs and high-intensity activity 8 METs. The condition for the analysis is continuous activity of a minimum duration of 10 minutes. The mean MET score for total weekly PA is the result of walking, moderate, and vigorous activity. Individual MET scores are calculated in each domain: $\text{total METminutes/week} = \text{Met-level} \times \text{minutes per day} \times \text{days per week}$, where 1 MET is equivalent to resting energy expenditure. The obtained score represents the amount of energy and the level of physical activity. Accumulation of less than 600 METmin represents a minimum level of PA, moderate activity is 600-1500 METmin (equivalent to daily walking), and high more than 1500 METmin (combination of walking, moderate or high-intensity activity) [16].

Kinesitherapy was focused on controlled breathing, improvement of general condition, improvement of relaxation and strengthening of muscles burdened by pregnancy. It was performed in small groups (4-6 participants) twice a week for 30 minutes for a month. The participants were informed about the importance of exercise and were advised that the daily practice should be a walk for at least 30 minutes. The load level was dosed in accordance with the recommendations for exercise during pregnancy, using a modified Borg rating of perceived exertion (RPE) intensity of three to four.

Data on the level of physical activity were registered before the inclusion of prenatal preparation and two weeks after its completion. They were analyzed using the method

of descriptive statistics, the results were presented tabularly and graphically through the number of cases, percentages, arithmetic mean with standard deviation and range of values. The results are considered statistically significant with a confidence level of 99.95% ($p < 0.05$).

Results and discussion

The participants were healthy pregnant women, monitored by the competent gynecological-obstetrical service, who were approved for psychophysical preparation for childbirth, regardless of age, occupation, education, marital, social status and number of births. In the research conducted from February to July 2018, 34 pregnant women from Herceg Novi ($n=29$) and Cetinje ($n=5$) with a gestational age of 26-28 weeks who met the necessary criteria participated. Socio-demographic variables (age, work status, level of education and marital status) and health characteristics (body mass index-BMI, smoking history and alcohol consumption) were examined.

Socio-demographic characteristics

Table 1. Age structure

	Number	Percent
20 – 30 years	21	63%
31 – 40 years	12	34%
Over 40 years	1	3%
Total	34	100%

The analysis of the age structure showed the age range of 20 - 40 years. Out of the total number of recruits, 21 respondents (63%) are aged 20-30, 12 respondents (34%) are 31-40 years old, and 1 respondent (3%) is over 40 years old. The results ($\chi^2=18.9$; $df=2$) proved to be statistically significant in relation to the age structure. The analysis of marital status is statistically significant ($\chi^2=10.31$; $df=1$), because 27 respondents (77%) live in a married union and 7 respondents (23%) live in a cohabitation.

Table 2. Work status

	Number	Percent
Yes	18	54%
No	16	46%
Total	34	100%

Table 2 shows the work status of the examined sample: 18 respondents (54%) are employed, and 16 respondents (46%) are not employed ($\chi^2=0.26$; $df=1$).

Table 3. Professional education

	Number	Percent
Medium school education	20	60%
High school education	2	6%
Faculty education	12	34%
Total	34	100%

The analysis of data on the level of qualifications (result $\chi^2=15.4$; $df=2$) showed that 20 respondents (60%) had a medium school education, 2 respondents (6%) high school education, and 12 respondents (34%) had a faculty education.

Table 4. BMI

	BMIa	BMIb
Valid	34	34
	0	0
N	25,9488	27,4144
Missing	0,70394	0,71584
	25,8750	27,0000
Mean	21,00a	25,00
	4,10466	4,17404
Std. Error of Mean Median	16,848	17,423
Mode	18,00	18,00
	19,00	21,00
Std. Deviation Variance Range Minimum	37,00	39,00
Maximum Sum	882,26	932,09
25	22,9225	24,0000
Percentiles 50	25,8750	27,0000
75	28,5500	30,1175

Comparative assessment of initial and follow-up analysis of body mass index (BMI) showed minimal deviations. The average value of the initial BMI measurement was 25.95 kg/m², and the control measurement was 27.41 25 kg/m². A slight increase in BMI was noticeable, which was expected considering the gestational period of our sample during the research.

Table 5. Habits

	Yes	No
Cigarettes	4	30
Alcohol	0	34
Total	4	34

Table 5 shows the habits. 13.6% of respondents (n=4) have the habit of smoking cigarettes, and 86.4% (n=30) do not, and none of the respondents consumes alcohol. These data are important indicators of care for the fetus and one's own health, and indicate a high level of health awareness of the examined sample.

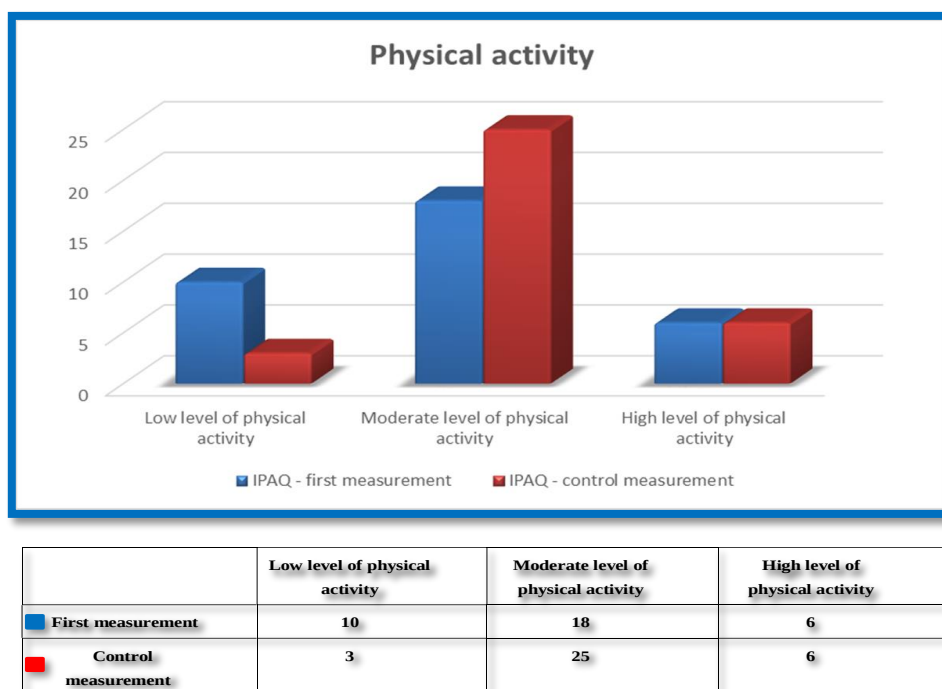


Figure 1. Comparison of the intensity of physical activity before and after kinesitherapy

T test (IPAQ SF1, $T=5.62$) and (IPAQ SF2, $T=6.18$) ($df=33$) did not show statistical significance in comparing the level of physical activity of the first and control measurements, but considering the increase in physical activity in during the control measurement, a positive effect of the kinesitherapy program can be observed.

Successful intervention for PA requires an understanding of PA levels during pregnancy and its correlates. PA tends to decrease during pregnancy compared to the pre-pregnancy period [17,18]. A moderate level of PA is recommended during pregnancy, and the percentage of pregnant women who achieve this level of PA varies from 11% to 66%, which is a consequence of differences in population characteristics and assessment during the gestational period [18,19,20]. The results of previous studies on the association between demographic characteristics, health and PA during pregnancy vary [21,22]. Higher level of education, higher income, employment and higher PA before pregnancy associated with higher level of PA and multiple and unpleasant symptoms of pregnancy with lower level of PA while the effect of BMI on PA is mixed [23,24].

Table 6. One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
IPAQ1	5,620	33	0,000	1649,82	1052,54	2247,11
IPAQ2	6,189	33	0,000	1882,35	1263,61	2501,09

Lü et al. (2021) claim that as pregnancy progresses, the level of FA increases with a significant increase in the number of pregnant women reaching the recommended level. From 32.72% of respondents in early pregnancy, the level of physical activity increased to 55.25% in middle and late pregnancy [26]. Part of pregnant women (11%) who reach the recommended level of PA remains at a low level, while a significant part of them increases the recommended level in the first trimester (53.8%) and third trimester (61.4%) [27]. Our research correlates with these researches because exercise in the third trimester and a positive attitude towards exercise influenced an increase in the level of physical activity of our sample, but some studies confirm that physical activity can decrease or remain unchanged as pregnancy progresses [28,29]. An increased level of activity during pregnancy is associated with the progression of pregnancy, a decrease in the fear of miscarriage and unpleasant symptoms of pregnancy because all these symptoms are gradually alleviated and thus contribute to the restoration or increase of physical activity in late pregnancy [29]. The most dominant form of activity is jogging, and the emphasis of this traditional concept is walking without strain, running and jumping [18,25,29]. Physiotherapy contributes to total energy expenditure in pregnancy and exercise habits before pregnancy are correlated with the level of physical activity during pregnancy [28,29]. Pregnant women who are moderately physically active at the beginning of pregnancy have a greater tendency to achieve a more advanced level in late pregnancy, which is in favor of good habits that are beneficial in the long term because adapted exercise has positive benefits for the pregnant woman, pregnancy, fetus, childbirth and functioning in physical and psychological sphere [30].

Conclusion

Pregnant women should be motivated for physical activity, and kinesitherapy in prenatal preparation for childbirth increases the functional capacities of the pregnant woman and affects the increase in the level of physical activity, which was confirmed by this research. Physical activity is useful due to its contribution to the promotion of health and a healthy lifestyle, and it is recommended to introduce a kinesitherapy program according to the health and condition of the pregnant woman with a media campaign about its importance.

References

- [1] Soma-Pillay P, Nelson-Piercy C, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. *Cardiovasc J Afr*. 2016 Mar-Apr;27(2):89-94.
- [2] Harrison CL, Thompson RG, Teede HJ, Lombard CB. Measuring physical activity during pregnancy. *Int J Behav Nutr Phys Act*. 2011 Mar 21;8:19.
- [3] ACOG Committee Opinion No. 650: Physical Activity and Exercise During Pregnancy and the Postpartum Period. *Obstet Gynecol*. 2015 Dec;126(6):e135-e142.
- [4] Miranda LA, de Moura ACR, Kasawara KT, Surita FG, Moreira MA, do Nascimento SL. Exercise and Physical Activity Levels and Associated Factors Among High-Risk Pregnant Women. *Rev Bras Ginecol Obstet*. 2022 Apr;44(4):360-368.
- [5] Mottola MF, Davenport MH, Ruchat SM, Davies GA, Poitras V, Gray C, et al. No. 367-2019 Canadian guideline for physical activity throughout pregnancy. *J Obstet Gynaecol Can*.
- [6] Kanaley JA, Colberg SR, Corcoran MH, Malin SK, Rodriguez NR, Crespo CJ, Kirwan JP, Zierath JR. Exercise/Physical Activity in Individuals with Type 2 Diabetes: A Consensus Statement from the American College of Sports Medicine. *Med Sci Sports Exerc*. 2022 Feb 1;54(2):353-368.
- [7] Barakat R, Perales M, Garatachea N, Ruiz JR, Lucia A. Exercise during pregnancy. A narrative review asking: what do we know? *Br J Sports Med*. 2015 Nov;49(21):1377-81.
- [8] Radisavljević M, Srbija Ljiljana Antić Lj, Milićev S., Kinesitherapy as a function of psychophysical preparation of pregnant women for childbirth sport - Science and Practice, Vol. 6, № 1&2, 2016, str. 87-98 UDK 615.825-055.26
- [9] Lee R, Thain S, Tan LK, Teo T, Tan KH; IPRAMHO Exercise in Pregnancy Committee. Asia-Pacific consensus on physical activity and exercise in pregnancy and the postpartum period. *BMJ Open Sport Exerc Med*. 2021 May 17;7(2):e000967.
- [10] Physical Activity Guidelines For Australian Adults. [cited 2023 March 28] Available from: <https://www.health.gov.au/topics/physical-activity-and-exercise/physical-activity-and-exercise-guidelines-for-all-australians>
- [11] World Health Organization. WHO guidelines approved by the guidelines review committee. Global recommendations on physical activity for health. Geneva, Switzerland: World Health Organization; 2010.
- [12] World Health Organization. Global physical activity questionnaire (GPAQ) analysis guide. [cited 2023 April 08] Available from: https://www.who.int/ncds/surveillance/steps/resources/GPAQ_Analysis_Guide.pdf.
- [13] Hayes L, et al. Change in level of physical activity during pregnancy in obese women: findings from the UPBEAT pilot trial. *BMC Pregnancy Childbirth*. 2015;15:52.
- [14] Ko YL, Chen CP, Lin PC. Physical activities during pregnancy and type of delivery in nulliparae. *Eur J Sport Sci*. 2016;16:374–80.
- [15] Hallal PC, et al. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet*. 2012;380(9838):247–57.
- [16] International Physical Activity Questionnaire - Short Form [cited 2018 Aug 19] Available from: <https://youthrex.com/wp-content/uploads/2019/10/IPAQ-TM.pdf>
- [17] Coll CV, Domingues MR, Gonçalves H, Bertoldi AD. Perceived barriers to leisure-time physical activity during pregnancy: A References review of quantitative and qualitative evidence. *J Sci Med Sport*. 2017 Jan;20(1):17-25.

- [18] Padmapriya N, Shen L, Soh SE, Shen Z, Kwek K, Godfrey KM, et al. Physical activity and sedentary behavior patterns before and during pregnancy in a multi-ethnic sample of Asian Women in Singapore. *Matern Child Health J.* 2015;19:2523–35.
- [19] Pearce EE, Evenson KR, Downs DS, Steckler A. Strategies to promote physical activity during pregnancy: a systematic review of intervention evidence. *Am J Lifestyle Med.*
- [20] Zhang Y, Dong S, Zuo J, Hu X, Zhang H, Zhao Y. Physical activity level of urban pregnant women in Tianjin, China: a cross-sectional study. *PLoS ONE.* 2014;9:e109624.
- [21] Ribeiro CP, Milanez H. Knowledge, attitude and practice of women in Campinas, Sao Paulo, Brazil with respect to physical exercise in pregnancy: a descriptive study. *Reprod Health.* 2011;8:31.
- [22] Redmond ML, Dong F, Frazier LM. Does the extended parallel process model fear appeal theory explain fears and barriers to prenatal physical activity? *Womens Health Issues.* 2015;25:149–54.
- [23] Haakstad LA, Voldner N, Bø K. Stages of change model for participation in physical activity during pregnancy. *J Pregnancy.* 2013;2013:193170.
- [24] Downs DS, Devlin CA, Rhodes RE. The Power of Believing: salient belief predictors of exercise behavior in normal weight, overweight, and obese pregnant women. *J Phys Act Health.* 2015;12:1168–76.
- [25] Lü Y, Feng Y, Ma S, Jiang Y, Ma L. Changes in physical activity across pregnancy among Chinese women: a longitudinal cohort study. *BMC Womens Health.* 2021 Jun 6;21(1):236.
- [26] Rial-Vázquez J, Vila-Farinas A, Varela-Lema L, Santiago-Pérez MI, Rey-Brandariz J, Candal-Pedreira C, Pérez-Ríos M. Actividad física en el embarazo y puerperio: prevalencia y recomendaciones de los profesionales sanitarios [Physical activity during pregnancy and postpartum: prevalence and healthcare professionals recommendations]. *Aten Primaria.* 2023 Mar 29;55(5):102607. Spanish.
- [27] Xiang M, Zhang J, Liang H, Zhang Z, Konishi M, Hu H, et al. Physical activity and dietary intake among Chinese pregnant women: an observational study. *BMC Pregnancy Childbirth.* 2019;19:295.
- [28] Garland M, Wilbur J, Semanik P, Fogg L. Correlates of physical activity during pregnancy: a systematic review with implications for evidence-based practice. *Worldviews Evid Based Nurs.* 2019;16:310–8.
- [29] Gaston A, Cramp A. Exercise during pregnancy: a review of patterns and determinants. *J Sci Med Sport.* 2011;14:299–305.
- [30] Ogurlić R, Vukićević A. Uticaj psihofizičke pripreme na zdravlje trudnice, Proceedings of the 1th Scientific conference SANUS 2022; 2022 Jun; 3-4; Prijedor, Bosnia and Herzegovina p. 190-198

UTICAJ KINEZITERAPIJE NA FIZIČKU AKTIVNOST U TRUDNOĆI

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Sažetak: Trudnoća je period fizičkih i psihičkih promjena usklađenih potrebama narastajućeg života. Buduća majka ima važan zadatak, savladati velike tjelesne, fizičke i umne zahtjeve. Najadekvatnije sredstvo u ostvarivanju tih zahtjeva je fizička aktivnost jer utiče na stimulaciju muskuloskeletnog, kardiovaskularnog i respiratornog sistema, poboljšava kondiciju, održava mišićnu snagu i elastičnost, a smanjuje rizik od prekomjerne težine, gestacijskog dijabetesa, preeklampsije, prevremenog porođaja i postporođajne depresije. Cilj rada bio je ispitati uticaj kineziterapije na nivo fizičke aktivnosti u psihofizičkoj pripremi za porođaj. Sprovedena je prospektivna longitudinalna studija na primarmon nivou zdravstvene zaštite u Crnoj Gori 2018. godine (februar-avgust). U istraživanje su po odobrenju ginekologa-akušera, dobrovoljno regrutovane 34 trudnice trećeg trimestra trudnoće iz Herceg Novog (n=29) i Cetinja (n=5). Tokom četiri nedelje, uz nadzor fizioterapeuta primjenjena je kineziterapiju u grupama od 4-6 trudnica. Kroz 8 sesija od 30 minuta izvođene su vježbe disanja, poboljšanja cirkulacije, posture, mobilnosti zglobova i jačanja oslabljenih mišića. Učesnicama je savjetovano svakodnevno pješaćenje u trajanju minimum 30 minuta. Istraživački instrument bio je međunarodni upitnik o fizičkoj aktivnosti eng. The International Physical Activity Questionnaire (IPAQ-SF). Fizičko opterećenje intenziteta 3-4 usklađeno je modifikovanom Borgovom skalom percipiranog napora. Nivo fizičke aktivnosti analiziran je početkom i dvije nedjelje po završetku priprema za porođaj. Analiza podataka: starosna dob 20-30 godina kod 63% učesnica, 31 - 40 godina kod 34%, a iznad 40 godina kod 3%. Step en obrazovanja: 60% ima srednju stručnu spremu, 6% višu, a 34% visoku stručnu spremu. Početna analiza procjene nivoa fizičke aktivnosti iznosila je: minimalan nivo 10 učesnica, umjeren 18 učesnica, a intezivan 6 učesnica. Metabolički ekvivalent povećan je za 233,03 METmin jer je njegova početna vrijednost iznosila 1649,82 METminuta a kontrolna 1882,35 METminuta. Zapaženo je poboljšanje nivoa fizičke aktivnosti kod sedam učesnica. Trudnice treba podsticati na prenatalnu pripremu jer kineziterapija podstiče povećanje nivo fizičke aktivnosti.

Ključne riječi: trudnoća, fizička aktivnost, vježbanje