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THE EFFECT OF PHYSICAL EXERCISE ON QUALITY OF LIFE DURING PREGNANCY

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3 Faculty of Food Technology, University of Osijek, Croatia

Abstract

Pregnancy is a physiological condition during which a series of morphological and anatomical changes occur. Adaptation to new changes in the body depends on the psychological and physical condition of the patient. One of the many factors that affect the quality of life is physical exercise. Proper exercise prevents certain chronic diseases, reduces pregnancy discomfort, gives a feeling of satisfaction and influences a positive outcome of the pregnancy. The aim of this study was to examine the validity of the preliminary version of the questionnaire, and therefore examine the impact of exercise on the quality of life during pregnancy. The questionnaire involved pregnant women (N=33). All of whom were in their third trimester of pregnancy. The participants voluntarily filled out an anonymous questionnaire. The questionnaire included information about: social and marital status, education, frequency of maternity problems, the type of exercise, as well as the level of training load during pregnancy. High reliability and validity of the survey (0.873) was determined by Cronbach alpha coefficient. Pregnant women (48%) commonly practiced low intensity yoga, up to three times a week. Most of the women (45%) believe that the exercise has a positive impact on their health. A difference of statistical significance was observed between the type of exercise and heart burn (r=0.349; p=0.046), as well as between the type of exercise and body weight (r=0.357; p=0.041). The results of this pilot study show a lower incidence of common maternity symptoms in pregnant women who exercised during pregnancy.

Keywords: Pregnancy, physical exercise, quality of life.
Introduction

In 1948, the World Health Organization (1) was one of the first to define "Quality of life" as "A state of complete physical, mental, and social well-being" (World Health Organization 1948).

Results of previous studies show that moderate physical exercise does not have a negative effect on the course of pregnancy. Also, the results of the study show that pregnant women who exercised, on the recommendation of the American Institute of Obstetrics and Gynecology (ACOG, 2002), suffered less from the usual maternity health issues than sedentary pregnant women. This data shows the importance of exercise, as one of the factors that have a positive impact on the quality of life of pregnant women (2, 3, 4, 5).

By typing keywords: pregnancy and quality of life in PubMed search, you will find 354 scientific research papers. If you add physical exercise to these keywords, you will find the number of papers fall to a mere 15. This data can indicate the research done on this subject among pregnant women is significantly low (1).

As an optimal questionnaire was not found that answers the question what kind of impact does exercise during pregnancy have on the quality of life of pregnant women, a newly designed questionnaire was applied on a voluntary respondent group.

The aim was to find an optimal instrument that would provide significant information about exercise during pregnancy and the impact it has on the quality of life for pregnant women.

Methods

The study included a sample of respondents which included 33 pregnant women whose age ranged from 19 to 39 years. All had singleton and healthy pregnancies. The research was done within the month of September 2014, during which all the pregnant women were in their third trimester.

An optimal survey, that would provide the answer to the problem in research, could not be found in the available scientific sources so a new survey was formed. Based on 30 selected questions, a questionnaire was drawn up in order to supply relevant information on the impact of physical exercise on quality of life during pregnancy.

In one of the health centers in Novi Sad an anonymous survey was carried out voluntarily. The respondents had completed the questionnaire before their psycho-physical preparations class, which are held twice a week in the period before the birth. The survey was returned for further processing immediately after filling.
Attached to this paper are 7 questions relating to the importance of physical exercise during pregnancy. The remaining questions are related to general type information and issues related to the health status of the pregnant women (23 questions). Table 1 shows a form of 14 questions relating to the frequency of the usual maternity ailments (6)

Table 1

Survey Question No. 9 with a note to assess each symptom (pregnancy ailments) from 1 to 5 depending on the frequency of occurrence

<table>
<thead>
<tr>
<th>br.</th>
<th>SIMPTOMS</th>
<th>never</th>
<th>rarely</th>
<th>often</th>
<th>perhaps</th>
<th>always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>headache</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>nausea, vomiting</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>vaginal discharge</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>frequent urination</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>swelling</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>sleep disturbances</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>leg cramps</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>fatigue</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.</td>
<td>shortness of breath</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>heartburn</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td>constipation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12.</td>
<td>hemorrhoids</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13.</td>
<td>clumsiness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14.</td>
<td>light headedness</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Data analysis was performed in SPSS and Excel. Based on the analysis, the validity of the questionnaire was determined by specifying Cronbach alpha coefficient. The questionnaire was corrected in order to increase the validity, a certain percentage and statistical significance was determined between the individual variables.

Results

A satisfactory Cronbach alpha coefficient of 0.873 was obtained by eliminating certain questions in determining the reliability of the survey. The third version of the survey contained 15 selected questions, but the statistical analysis in this study included the first version of the newly formed 30 survey questions.

The results of this study show that of the total number of subjects (N = 33) 48% of them exercised. The respondents mostly practiced yoga. The answers to questions concerning the
training load within a week, show a small extent (up to three times) and low intensity exercise. 
When questioned whether physical exercise has had a positive impact on their psycho-physical condition, 45% of the pregnant women gave an affirmative answer. When adding up the points, (Question 9) a conclusion was made that physically active pregnant women suffered far less from the feeling of nausea, vomiting, swollen legs and cramps, clumsiness, difficulty breathing and heartburn (Table 2).

Table 2

<table>
<thead>
<tr>
<th>SYMPTOMS</th>
<th>sedentary (n =17 )</th>
<th>active (n = 16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. headache</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>2. nausea, vomiting</td>
<td>45</td>
<td>37</td>
</tr>
<tr>
<td>3. vaginal discharge</td>
<td>58</td>
<td>53</td>
</tr>
<tr>
<td>4. frequent urination</td>
<td>62</td>
<td>60</td>
</tr>
<tr>
<td>5. swelling</td>
<td>31</td>
<td>24</td>
</tr>
<tr>
<td>6. sleep disturbances</td>
<td>45</td>
<td>41</td>
</tr>
<tr>
<td>7. leg cramps</td>
<td>35</td>
<td>24</td>
</tr>
<tr>
<td>8. fatigue</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>9. shortness of breath</td>
<td>45</td>
<td>36</td>
</tr>
<tr>
<td>10. heartburn</td>
<td>57</td>
<td>41</td>
</tr>
<tr>
<td>11. constipation</td>
<td>34</td>
<td>36</td>
</tr>
<tr>
<td>12. hemorrhoids</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>13. clumsiness</td>
<td>3</td>
<td>35</td>
</tr>
<tr>
<td>14. light headedness</td>
<td>26</td>
<td>24</td>
</tr>
</tbody>
</table>

* The answer is expressed in points based on the questions set out in Table 1

Statistical analysis of common maternity ailments (14 symptoms) and exercise (type of exercise and training load) resulted in a statistically significant correlation between the type of exercise, and heartburn (r = 0.349; p = 0.046), as well as between the type of exercise and body weight (r = 0.357; p = 0.041).

Discussion

Pregnancy is a physiological condition that carries with it a series of morphological and anatomical changes in the body (1). As pregnancy is a very sensitive period in the life of every woman, it is very important that lifestyle adjustments are made. Pregnancy significantly affects and changes lives of pregnant women. Changes in the quality of life during pregnancy takes
place under the influence of numerous factors (1). Physical exercise can have a positive impact on the course and outcome of pregnancy (7, 8, 9, 10), and therefore it can affect the quality of life for pregnant women (2, 3, 4, 5).

Exercise is scientifically proven to reduce the appearance of certain chronic diseases, such as gestational diabetes, hypertension, obesity, and pre-eclampsia (7). Also, exercise has an impact on reducing the incidence of the usual maternity symptoms, such as fatigue, headaches, hemorrhoids, constipation, dizziness and other symptoms (6).

Exercise has an important role in psycho-physical preparation of pregnant women before delivery. However, group exercises under the supervision of specialized healthcare employees working with pregnant women only starts at the beginning of the third trimester, respectively, in the 27th week of pregnancy. By that time, their bodies undergo a period of adjustment to the changes. The increase in body weight leads to changes in the musculoskeletal system, causing looser ligaments and increases the risk of injury (7). Also, there is a change in the cardiovascular and respiratory system, causing variations in pulse and blood pressure, which may have an impact on the shortness of breath during physical activity (7). Metabolic changes affect the change in body temperature, and can cause dehydration during exercise at high temperatures (7).

As metabolic changes require greater energy consumption, the body must first be prepared. American Institute of Obstetrics and Gynecology advises (ACOG, 2002) that pregnant women who have no diagnosed medical or obstetric complications can exercise under the supervision of a doctor. They also advise that pregnant women who have not previously exercised and been physically active not to initiate new physical activities (7, 8, 9, 10). So that exercise would not lead to adverse effects it is advisable to exercise caution. If pregnant women exercise following the recommendations and guidelines at ACOG, the exercise can have a positive impact on the health of mothers and fetuses (7, 8, 9, 10).

In relation to the recommendations of regular exercise during pregnancy, it can be concluded that the pregnant women in this study meet the recommended minimum exercise on a daily and weekly basis (7, 8, 9, 10). If the results of this study are compared to a study which examined a longer period of time with a greater number of respondents, the information obtained shows that an equal number of pregnant women in both studies were physically active during pregnancy (6). Also, in both of the studies there is lower incidence of common maternity ailments in pregnant women who exercised as compared to sedentary pregnant women (6). On the basis of the link between the maternity ailments and the type of exercise, a significant fact is that exercise during pregnancy has an impact on weight gain and the occurrence of heartburn. This information contributes to the importance of having a customized exercise regime in early pregnancy.

In our country, it is usual that pregnant women prepare to give birth under the supervision of trained midwives. These organized psycho-physical trainings start late, at the beginning of the
third trimester in the 27th week of pregnancy. Until then, you can develop many pregnancy symptoms, including chronic diseases.

The question is, how many pregnant women have the will and available energy for the extra physical load that exercise brings? A women entering pregnancy with already acquired habits of exercise would be easier submitted to physical activity (7, 8, 9, 10). Presentation of the results of the studies and research of this specific population of patients, and further research of the quality of life of physically active pregnant women, could contribute to improve and perfect the model customized workout, as well as improve the quality of life during pregnancy.

The results of this pilot study show a lower incidence of common maternity problems in pregnant women who practiced during pregnancy. Correction of the questionnaire and the analysis of a larger number of subjects would produce significant data demonstrating the importance of exercise during pregnancy and the quality of life for pregnant women.

References


THE INFLUENCE OF DANCING AND GAME CONTENTS ON PRESCHOOLERS’ MOTOR ENGAGEMENT

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²Faculty of Sport and Physical Education, University of Belgrade, Serbia

Abstract

The goal of this study was to examine the influence of dancing and game contents on preschoolers’ motor engagement in each phase, as well as total engagement in directed motor activities. The study was realized in the first term of 2014/2015 school year. 12 activities with dancing contents and 12 activities with moving games were monitored. The duration of directed motor activity phases was as follows: the first A phase (introductory) – five minutes, the first B phase (preparatory) – five minutes, the second phase (main) – fifteen minutes and the third phase (final) – five minutes. The time of the activity (engagement) was measured by random choice of one of the children, who was monitored during the directed activity. The observed child did not know that he/she was an object of measurement. Data processing included descriptive statistics and t-test for small independent samples. The parameters of descriptive statistics indicate longer engagement of children in the first A phase, the third phase and total engagement with dancing contents. Game contents influenced higher engagement in the first B phase and the second phase. Game contents influenced statistically significant difference in relation to dancing contents in the third phase. The total engagement with the dancing contents was 725 seconds, with game contents 707 seconds. The t-test does not indicate statistically significant difference between dancing and game contents in terms of preschoolers’ total engagement. The results indicate that the activities with dancing and game contents are very useful in working with preschoolers.

Keywords: dance, game, engagement, directed motor activity, preschoolers
Introduction

Preschool education is the first level of basic education in educational system and it is necessary to make it available to all children. For preschoolers pedagogical work in educational institutions (preschools) is planned and realized depending on preschoolers’ age.

The basis of the programme of preschool education for children aged three to seven which starts from a child as a physical, noetic, social and affective human being that is active in the process of upbringing, was established in 1996, and started in 1997/1998 school year. As the basis of the programme the unique and whole concept was worked out in two models – model A and model B.

Buncic (2005) compared the effects of physical education, realized in experimental groups according to the model A and model B, for three years and the effects of physical education in control group which was not included in institutional physical education programme before experimental treatment. The best effects in the development of general motor abilities for children were for children for whom the physical education was realized by the model A.

Physical activity represents one of the most important factors for proper growth and development of a young organism. Physical education takes important place between determined activities, which is organized through different forms of work, for example: directed activities, morning exercises, picnics, walks in nature, free activities etc. Physical education as planned and creative activity with clearly defined goals starts in institutional education of the Republic of Serbia with preschool education, and it ends with secondary education. The interest for the effects of physical education is significant for the profession of the tutor because mostly woman do this job in our country.

There is an attitude in EU countries that well trained teachers who work in appropriate (fair) conditions, the most important precondition of high quality education. Preschool education is a valuable investment in future. Enough assets must be supplied in the education budget. The states have to make an effort in order to secure equality and work with all children especially for those in inadequate surroundings and children with special needs.

Most cited things about the problem of weakness of physical education are the following: insufficiently organized and planned work with preschoolers, smaller possibility of educators to realize complex tasks of physical education and uneven and very often insufficient material conditions of preschools for the realization of physical education.

Physical activity of youngsters is not at the satisfying level by its quantity and even less by intensity. The situation is especially alarming in urban areas. Physical activity of preschoolers is important because of integral development aspect, biological and health aspect and educational aspect (Djordjic, 2002).
Inefficiency of physical education is primarily manifested in weak influence on transformation of motor abilities, because of the small density of exercising, i.e., short active time of exercising (Markovic and Ignjatovic, 2015). The research indicates that boys are more active than girls (Hinkley et al., 2007). Bigger engagement is seen in primary school age (Markovic and Ignjatovic, 2015) and secondary school age, as well as higher sport technical knowledge (Sekeljic et al., 2013).

Apart from games which represent basic means in work with preschoolers, dancing activities are also applied (theme dancing, dancing with music, Serbian folk dances, dances of other peoples and disco dance).

Dancing themes are always with music. Music has positive effects and it influences psychologically during hard training (Mohammadzadeh et al., 2008). Positive effects of exercising with music on maximal consumption of oxygen and variables of general coordination and coordination in rhythm indicate practical application of exercising with music with the goal of proper dosage and realization of the aim and task of physical education (Alpert et al., 1990; Mandaric, 2001; Stanisic et al., 2008) as a significant improvements in strength, flexibility and balance (Kostic et al., 2002).

The idea for this work came from the research of Jankovic (2013), in which it was stated that children are motorically engaged 17.07 minutes during activity Markovic and Ignjatovic (2015) in which for certain boys the engagement was higher than 50% of absolute time and it was 15.26 minutes.

This research had an aim to research the influence of dancing and game contents on motor engagement of preschoolers during each phase, as well as the total engagement on directed motor activities.

**Methods**

This research was realized in preschool “Decja Radost” in Svilajnac in the first term of 2014/2015 school year. In this institution preschool age children are included in preschool education with the programme of half day and whole day stay, according to model A (Markovic and Sekeljic, 2008). In order to determine the influence of different contents on motor engagement of children in phases and total engagement 12 activities with dancing and contents and 12 activities with game contents were monitored.

The time of the activity (engagement) was measured by random choice of one of the children and its monitoring by the measurer during directed activity. In the processing of data apart from descriptive statistics, t-test was applied for small independent samples. Certain phases of directed motor activities are structured with the following absolute duration: the first A phase
(introductory) – five minutes, the first B phase (preparatory) – five minutes, the second phase (main) – fifteen minutes and the third phase (final) – five minutes.

**Results**

By the insight in the Table 1 we can see that the values of duration of motor engagement by phases and total engagement are in relatively possible and expected limits.

**Table 1.** Descriptive parameters for certain phases of directed activities in relation to dancing contents

<table>
<thead>
<tr>
<th>Phases</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Sd</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory (I A phase)</td>
<td>69</td>
<td>213</td>
<td>156.75</td>
<td>48.60</td>
<td>-.480</td>
<td>-1.190</td>
</tr>
<tr>
<td>Preparatory (I B phase)</td>
<td>102</td>
<td>201</td>
<td>137.91</td>
<td>29.37</td>
<td>1.203</td>
<td>1.154</td>
</tr>
<tr>
<td>Main phase</td>
<td>264</td>
<td>480</td>
<td>355.75</td>
<td>60.71</td>
<td>.543</td>
<td>.804</td>
</tr>
<tr>
<td>Final phase</td>
<td>24</td>
<td>135</td>
<td>74.41</td>
<td>38.18</td>
<td>.162</td>
<td>-1.434</td>
</tr>
<tr>
<td>Total motor engagement</td>
<td>605</td>
<td>892</td>
<td>724.83</td>
<td>100.12</td>
<td>.488</td>
<td>-1.181</td>
</tr>
</tbody>
</table>

For the first A phase (introductory) active time of exercising with dancing contents is 156.75 seconds, and with game contents it is 123.58 seconds. The difference of 33.17 seconds is in favor of dancing contents. For the first B phase (preparatory) game contents influenced average longer motor engagement in relation to dancing contents with 17.09 seconds. In the main phase of activity, average motor engagement with dancing contents is 355.75 seconds, and with game contents 378.58 seconds. The difference of 22.83 seconds is in favor of game contents.
Table 2. Descriptive parameters for certain phases of directed activity in relation to game contents

<table>
<thead>
<tr>
<th>Phases</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Sd</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory (I A phase)</td>
<td>61.00</td>
<td>167.00</td>
<td>123.58</td>
<td>34.07</td>
<td>-.729</td>
<td>-.213</td>
</tr>
<tr>
<td>Preparatory (I B phase)</td>
<td>90.00</td>
<td>242.00</td>
<td>155.00</td>
<td>14.28</td>
<td>.436</td>
<td>-1.081</td>
</tr>
<tr>
<td>Main phase</td>
<td>279.00</td>
<td>484.00</td>
<td>376.58</td>
<td>62.14</td>
<td>.037</td>
<td>-.925</td>
</tr>
<tr>
<td>Final phase</td>
<td>26.00</td>
<td>81.00</td>
<td>49.75</td>
<td>18.02</td>
<td>.353</td>
<td>-.473</td>
</tr>
<tr>
<td>Total motor engagement</td>
<td>522.00</td>
<td>842.00</td>
<td>706.91</td>
<td>91.70</td>
<td>-.389</td>
<td>1.232</td>
</tr>
</tbody>
</table>

The difference of 24.66 seconds in final phase was acquired by dancing contents in relation to game contents. A bit longer time of total motor engagement on activities from only 17.92 seconds was achieved with dancing contents. Standard deviation with the value of 60.71 seconds for dancing and 62.14 seconds for game contents is the biggest in the main phases of the activity. The difference of minimal and maximal values is close and at dancing contents it is 216 seconds, and for game contents it is 205 seconds (Table 1 and Table 2).

All the results are normally distributed, with the value of skewness in interval from 1 to +1, except the results of B phase for dancing contents. Kurtosis is in the results for all phases, as well as for the whole motor engagement with dancing and game contents, less than three, which indicates that the results are homogeneous and that the curve is leptokurtic.

Table 3. Significance of differences of duration of motor engagement by phases and total motor engagement in relation to contents

<table>
<thead>
<tr>
<th>Phases</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory (I A phase)</td>
<td>1.936</td>
<td>22</td>
<td>.066</td>
</tr>
<tr>
<td>Preparatory (I B phase)</td>
<td>-1.028</td>
<td>22</td>
<td>.315</td>
</tr>
<tr>
<td>Main phase</td>
<td>-0.910</td>
<td>22</td>
<td>.372</td>
</tr>
<tr>
<td>Final phase</td>
<td>2.023</td>
<td>22</td>
<td>.055</td>
</tr>
<tr>
<td>Total motor engagement</td>
<td>.457</td>
<td>22</td>
<td>.652</td>
</tr>
</tbody>
</table>

The values of t-test indicate that in the introductory first A phase of directed motor activity there is no statistically significant difference of duration of motor engagement in relation
to dancing and game contents. The achieved level of statistical significance is $p=0.066$. Statistically significant difference was not stated in the preparatory phase of the activity. The level of statistical significance is $p=0.315$. In the main phase the level of statistical significance is $p=0.372$ indicates that there are no differences in duration of motor engagement in relation to contents. Statistically significant differences do not exist even in the final phase of directed motor activity ($p=0.055$) Minimal differences in the total motor engagement of 17.92 seconds in favor of dancing contents were not sufficient for influencing statistically significant differences ($p=652$).

**Discussion**

By the analysis of minimal and maximal values of dancing contents it can be seen that for minimal value of motor engagement in the first A phase in relation to absolute time of duration of the first A phase the use is only 23.0%, and for maximal value it is 71.0%. For the first B phase the difference is smaller and minimal use is 34.0%, and maximal is 67.0%. The situation is worrying by the insight in minimal percentual use of only 29.33% and maximal of 53.33% in the main phase of engagement with the dancing contents of 12.48 minutes (40.26%) and maximal engagement was 14.86 minutes (49.53%).

For dancing contents minimal values of motor engagement in the first A phase in relation to absolute time of the duration of the first A phase is only 27.00%, and for maximal value it is 55.66%. For the first B phase minimal engagement is 30.00%, and maximal 80.66%. The situation is very worrying by the insight in minimal percentual engagement of only 31.00% and maximal of 53.77% in the main phase. The smallest engagement in relation to absolute duration in the final phase, where the minimal engagement is only 8.66%, and maximal 27.00%.

The smallest motor engagement for dancing contents (24.80%) and game contents (16.58%) is in the final phase of directed activity. Insufficient engagement can be explained by not respecting of time articulation of certain phases, so that very often the main phase is connected with final phase and in this way the tasks of the final phase are not realized.

The highest motor engagement with dancing contents after the phase A (introductory is for the first phase B (preparatory), where the average time of engagement 62.08%, and maximally 76.66%. For game contents the highest motor engagement is in the first B phase (preparatory), where the average motor engagement is 51.66%. Satisfying motor engagement in the first A and the first B phase is conditioned by frontal form of work, in which children together with their educator perform natural forms of movement, and then complex exercises of forming. The thing that encourages is the attitude of teachers about the more complex preparation of locomotors apparatus of exercises of shaping for dancing and game contents.

Small motor engagement in the main phase of directed activity is 39.52 for dancing and 49.06 for game contents can be explained by the choice of the activity item, method, insufficient
application of methodical-organization forms, big number of children in a group, inadequate material and spatial conditions, insufficient number of equipment and theoretical and practical knowledge of the educators who perform planned activities.

Total motor engagement of 12.48 minutes (40.26%) with dancing and 11.78 minutes (39.27%) with game contents is insufficient for correct growth and development of a young organism. A small quantity of theoretical and sport technical knowledge do not lead to accepting of physical education, but influence disinterest for the contents of physical education teaching in older primary school and secondary school grades (Sekeljic et al., 2013) Mesaros Zivkov and Markov (2008) recommend the engagement of physical education teacher, as an expert consultant and in immediate work with preschoolers, and for educators organizing of seminars.

The goal of this work was to research the influence of dancing and game contents on motor engagement of preschoolers during each phase as well as the total engagement in directed motor activities. 12 activities with dancing contents and 12 activities with game contents were monitored. Descriptive indicators show that average longer active time of exercising in the first phase A, final and total motor engagement on activities with dancing contents. Dancing contents influenced longer motor engagement in the first B phase and main B phase of directed activity. The values of t-test for small independent samples indicate that small descriptive differences did not influence statistically significant differences in all phases of activities in relation to motor engagement.

The general statement indicates that in the work with preschoolers both dancing and game contents can be equally used with adequate material – spatial and teaching facilities and careful and responsible preparation of the educator for each activity.

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THE METRIC CHARACTERISTICS OF SPECIFIC SPEED AND AGILITY TESTS IN YOUTH SOCCER PLAYERS

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Abstract
The subject of this study are metric characteristics of specific football tests. 27 football players chronological age of 13-15 years, apropos categories of elder pioneers from HNK Cibalia Vinkovci, Croatia. The participants had to go through specific tests with the ball: 20 m sprint, zig-zag, slalom, and 9-3-6-3-9 test. We can conclude that all four variables are highly reliable. The homogeneity of the measuring instrument is good (20 ml) and excellent (zig-zag L, slalom L, 93639 L), and results of skewness and kurtosis further show good sensibility of the measuring instrument, with the exception 20 m L2 variable, which is positive asymmetrically distributed and elongated. The correlation of particles with first main component, which is second condition for homogeneity of the measuring instrument, points on high homogeneity of all tests. Regular distribution of all test implies on satisfactory reception of all four tests for assessing the speed and agility. The factor analysis has given one significant component and the amount of explained variance and size of characteristic valuables are high, so we could confirm also factorial validity of tests. The results of the variance analysis (ANOVA) conclude that the tests are pragmatically valid, and they distinguish players from different playing lines.

Keywords: metric characteristics, speed and agility.
SKILL-BASED CONDITIONING TRAINING IN YOUNG FEMALE VOLLEYBALL PLAYERS: IMPACT ON POWER AND CHANGE OF DIRECTION SPEED

Running head: Skill-based conditioning in volleyball

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Abstract
Skill-based training has been developed in order to combine the skill and conditioning elements in a coordinated approach. Our aim was to determine the effects of skill based conditioning training on power and COD speed in youth female volleyball players. Sixteen young female volleyball athletes (15±2 years) consented to participate in lower-body power and COD speed testing. Players were involved in six weeks skill-based conditioning training during in-season. There were no significant differences between pretraining and posttraining for Block jump and Spike jump. Moreover, there were no significant (p > 0.05) improvements in Standing broad jump also. However, compared with pretraining, there was a significant improvement in COD speed tests. Training induced significant (p ≤ 0.05) improvements in 9-3-6-3-9 test (p<0.001) and Side steps 10x4.5 m (p<0.001). In conclusion, skill-based conditioning training appears to have stronger effects in improving COD speed compared to lower body power young female volleyball players. Volleyball coaches could use this information in the process of planning the in-season training.

Key words: game-based, athletes, effects, volleyball
Introduction

Volleyball is an intermittent sport that requires players to compete in frequent short bouts of high-intensity exercise, followed by periods of low-intensity activity (Gabbett, et al., 2006). However, while well-developed physiological capacities are important for team sports, athletes are also required to have well-developed technical skill and decision-making ability.

Young players often find it hard to support the traditional fitness training, because of a lack of enjoyment and experience with this type of exercise (Wall & Côt, 2007). In recent years, an approach called skill-based training has been developed in order to combine the skill and conditioning elements in a coordinated approach (Gabbett, 2002; Gabbet, 2003; Gamble, 2004; Nurmekivi et al., 2002; Sassi, Reilly, & Impellizzeri, 2004). It is an important consideration to optimize skill development in volleyball while still obtaining appropriate conditioning levels. In order to expose players to the intensity, decision making, speed and skill execution required in the competition setting, practice sessions need to replicate actual game events and phases of play. Small-sided games, as a part of skill-based training are a popular training method used to replicate technical skills and tactical awareness, whilst also representing the physiological demands typical of a competitive match (Gabbett et al., 2009). According to Sampaio et al., (2009) decrease in space and number of players in game allow greater self-recreation of players and greater intervention in game.

The use of skill-based conditioning games as training drills allows the simulation of movement patterns of team sports, while maintaining a competitive environment in which athletes must perform under pressure and fatigue (Gabbett, 2002). Skill-based conditioning training offers an additional challenge to team-sport athletes which is not present in non-skill related conditioning activities (Farrow, Pyne, & Gabbett, 2008).

Studies have assessed the specificity of skill-based conditioning in a limited number of team sports (e.g., volleyball, soccer, rugby league, and rugby union). Gabbet (2008) showed that skill-based conditioning games that simulate the physiological demands of competition in junior elite volleyball players offer a specific training stimulus. Gabbett, et al., (2006) have concluded that skill-based volleyball training improves speed and agility performance, spiking, setting, passing accuracy, spiking and passing technique, but has little effect on the physiological and anthropometric characteristics of players. They also stated that skill-based training programs should be supplemented with an appropriate amount of energy system training to enhance the physiological and anthropometric characteristics of talented junior volleyball players. Trajković, Milanović, Sporis, Milić & Stanković (2012) examined the effects of pre-season game based conditioning training in semi-professional volleyball players. The authors stated that selected program does not offer a sufficient stimulus for semi-professional volleyball players due to the fact that there were no significant differences between pretraining and posttraining for lower-body muscular power and agility.

According to author’s findings and experience, skill-based training could be a part of training programs in younger volleyball players where the intensity of training is not as high as in professional and elite volleyball players. However, studies investigating the effectiveness of
game-based training in female volleyball are limited. Therefore, more research is needed in order to confirm this theory. The aim of our research is to determine the effects of skill based conditioning training on power and COD speed in youth female volleyball players.

Methods

Sixteen young female volleyball athletes consented to participate in lower-body power and COD speed testing, and the procedures involved in the study were in accordance with and approved by institutional ethics. Descriptive characteristics are presented in Table 1. All the participants provided written consent after being informed of the test protocol. The protocol of the study was approved by the Ethical Committee of the Faculty of sport and physical education, University of Nis, and according to the revised Declaration of Helsinki. Each player had at least 4 years of training experience, corresponding to 2-hour training sessions, and at least 1 competition per week.

Table 1. Descriptive characteristics of the subjects*

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>Training experience (y)</th>
<th>Body height (cm)</th>
<th>Body weight (kg)</th>
<th>Standing reach height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15±2</td>
<td>4±1</td>
<td>1.74 ± 0.08</td>
<td>61±3</td>
<td>222±8.48</td>
</tr>
</tbody>
</table>

*Data are reported as mean ± SD.

This study was designed to address the question of how skill-based conditioning training on affect jumping ability and COD speed gains, after a 6-week training program. Jumping ability, and COD speed test performance tests were performed before and after training program. The initial tests were completed on one day as part of a regular testing program. Before the initiation of the training program subjects were instructed about the proper execution of all the exercises that were to be done during the training period. None of the subjects had performed any strength or jump training before. They were instructed to avoid any strenuous physical activity during the experiment and to maintain their dietary habits for the whole duration of the study.

The players underwent physical tests assessment in an indoor stadium. During the testing, the air temperature ranged from 22°C to 25°C. Testing began at 10 am and finished by 1 pm. None of the participants had been injured 6 months before the initial testing as well as during the training program. There was no supplement addition to the diet of the players. Measurements were taken on Monday morning because the athletes had rested during the weekend. The testing session began with anthropometric measurements. The players were then instructed to assess lower-body muscular power and COD speed tests. Up to 3 trials were given on each jump, with a 1-minute rest between jump test trials. The participants were all tested during the in- season. Typical practice warm-up was completed before the testing sessions. This warm-up included 10 minutes of general activity (walk, jog, light stretching), followed by 10 minutes of dynamic activity that
increased in speed and intensity, followed by 3 to 5 minutes of rest before beginning the testing session. The players were encouraged to perform static stretching between trials. Body height and body weight were measured according to the instructions of the International Biological Program – IBP. Body height was measured with a GPM anthropometer (Siber&Hegner, Zurich, Switzerland) to the nearest 0.1cm. Body weight was obtained by TANITA BC 540 (TANITA Corp., Arlington Heights, IL) to the nearest 0.1kg.

**Measures**

*Spike and block jump performances*

For the standing reach, while wearing their normal volleyball footwear, players were requested to stand with their feet flat on the ground, extend their arm and hand, and mark the standing reach height while standing 90° to a wall. Players were encouraged to fully extend their dominant arm to displace the highest vane possible to determine their maximum standing reach height. The measurement of the standing reach height allowed for a calculation of the relative jump heights on each of the jumping tasks (absolute jump height (cm) – standing reach height (cm) = relative jump height) (Sheppard et al, 2009).

*Spike (SJ) and block (BLJ)* jump performances for volleyball players depend heavily on the height at which these skills are performed above the net and are determined by not only the capacity of the athlete to raise vertically his center of gravity, but also his stature and standing reach. In this particular case, specific tests would provide a further understanding of the training-induced adaptation. For the SJ, the standing reach was determined as the maximal distance between the fingertip of the attack hand and the ground, while standing 90° to a wall. The SJ was measured from a running lead (2- or 3-step approach) by using a basketball backboard marked with lines 1 cm apart. For the BLJ, the standing reach was determined as the maximal distance between fingertips of the block hands and the ground, while facing the wall. The BLJ jumps started from a standing position with the hands at shoulder level and arms raised from the start position without extra swing. All tests used the same observer who was situated on a volleyball referee stand placed 2 m from the backboard. Both jumps were recorded as the best of the 3 attempts (Stanganelli, Dourado, Oncken, Mançan, da Costa, 2008).

The standing broad jump was used for assessing the explosive power of the lower limbs. The players were instructed to stand behind a line and jump as far as possible—allowing arm and leg countermovement. The distance was measured from behind the line to the back of the heels at landing.

*Change of direction speed (COD speed)*

*Sprint 9-3-6-3-9 m.* The players started after the signal and ran 9m from starting line to the first line (the lines were white, 3 m long, and 5 cm wide). Having touched the line with one foot, they made either an 180 left or right turn. All the following turns had to be made in the same direction. The players then ran 3 m to second line, made another 180 turn, and ran 6 m forward.
Then, they made another 180 turn and ran another 3m forward, before making the final turn and running the final 9 m to the finish line.

**10 x 4.5 m Lateral Shuffle Test.** The Edgren Side-Step Test has used solely shuffling movements (Chu, Shiner, 2006; Harman, Pandorf, 2000; Tomchuk, 2011) and is a prominent field test. However, some tests differed from the original test and have reported their own versions (Chu, Shiner, 2006; Tomchuk, 2011.). It appears to be no consistent procedures for the ESST. The lateral shuffle test in this study was modified and ESST was chosen because it is the only test consisting entirely of lateral movements (Brughelli, Cronin, Levin, Chaouachi, 2008). The Lateral shuffle test used a 4.5 m distance with lines marked on both sides. The participants started the test straddling one of the lines. They moved laterally and crossed the last line before changing directions. The participants shuffled continuously for ten times. Participants were instructed not to cross their feet during the duration of the test, and a trial was discarded if a participant crossed his or her feet.

**Training program**

One cycle of six weeks was analyzed in in-season (2014). The schedule of the performed in-season beach volleyball training is shown in Table 2. The goals of the in-season conditioning were to increase the intensity of sport-specific training, and attention was given to volleyball skills and movement. None of the players was performing any additional resistance or aerobic training outside of the 3 volleyball training sessions. The duration of training sessions was recorded, with sessions typically lasting 80-100 min. For this purpose skill based exercise were selected based on previous experience and according to performance analysis in volleyball studies. After warm up, in the first part of sessions players were involved in technical drills and after that they were divided in smaller groups (2 vs. 2, 3 vs. 3) practising on smaller courts. In the end, players played a 4 vs. 4, 6 vs. 6 games, with constant changes where the winning team would always stay on the court. Although the duration of each individual rally in this drills was not controlled by the coach, total duration of the drill can be recorded to assist in inter and intra-session planning.
Table 2. Training sessions of skill based conditioning training program

| Goal: in-season volleyball program |
|Sessions 1–18 (Monday-Wednesday-Friday) |
|Exercises|
|Warm up| General activity + specific warm up with the ball (25 min)|
|Instructional drills for technique| 20 min of drills that include low intensity movement and combine volleyball technique. Two drills were performed with 2 minute break between. |
|2 vs. 2, 3 vs. 3, 4 vs. 4, 6 vs. 6| Small-sided (3 vs. 3, 4 vs.4) games where the volleyball court was separated in two smaller (9 x 4.5 m) courts. Competition drills (2 vs. 2) with the majority of free balls to each side thrown by the coach. Teams rotate depending of the scoring. After one team reaches 15 points players take two minute break (40 min). Competition drills (6 vs. 6) with the majority of free balls to each side thrown by the coach. Teams rotate depending of the scoring. |
|Stretching| 5 minutes of stretching for the muscle groups mainly involved in sessions|

Data analysis was performed using the Statistical Package for Social Sciences (v13.0, SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated for all the experimental data. In addition, the Kolmogorov–Smirnov test of the normality of distribution was calculated for all variables before the analysis. Changes in the lower-body muscular power and COD speed of players over the training period were compared using t-tests. The level of significance was set at \( p \leq 0.05 \) and all data are reported as means ± SD.

Results

Lower-body muscular power
The changes in Block jump, Spike jump and Standing broad jump are shown in Table 3. There were no significant differences (\( p > 0.05 \)) between pretraining and posttraining for Block jump (\( p=0.25 \)) and Spike jump (\( p=0.65 \)). In addition, there was no significant (\( p > 0.05 \)) improvement in Standing broad jump also.
Table 3. Lower-body muscular power and COD speed of young female volleyball players before and after 6 weeks of training

<table>
<thead>
<tr>
<th>Test</th>
<th>Initial</th>
<th>Final</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block jump</td>
<td>38.46 ± 3.79</td>
<td>39.64 ± 4.031</td>
<td>0.25</td>
</tr>
<tr>
<td>Spike jump</td>
<td>44.19 ± 4.89</td>
<td>44.77 ± 5.019</td>
<td>0.65</td>
</tr>
<tr>
<td>Standing broad jump</td>
<td>201.93 ± 2.93</td>
<td>203.21 ± 2.73</td>
<td>0.08</td>
</tr>
<tr>
<td>9-3-6-3-9 agility test</td>
<td>9.95 ± 0.49</td>
<td>9.38 ± 0.52</td>
<td>0.001*</td>
</tr>
<tr>
<td>10 x 4.5 m Lateral Shuffle Test</td>
<td>16.20 ± 1.09</td>
<td>15.30 ± 0.93</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

* Significant difference p < 0.05 between initial and final testing

COD speed

Compared with pretraining, there was a significant (p ≤ 0.05) improvement in COD speed tests (Table 3). Training induced significant (p ≤ 0.05) improvements in 9-3-6-3-9 COD speed test (p<0.001) and Side steps 10x4.5 m (p<0.001).

Discussion

This study investigated the effect of a skill-based volleyball training program on the measurements of power and COD speed in young female volleyball players. A significant improvement in COD speed was observed. However, there were no significant differences between pretraining and posttraining for lower-body muscular power.

In our study, results for Block jump and Spike jump test showed there were no significant difference between groups pre- to post-training (p > 0.05). In similar studies with young male subjects Gabbett et al. (2006) have concluded that skill-based volleyball training improves speed and agility performance, spiking, setting, passing accuracy, spiking and passing technique, but has little effect on the physiological and anthropometric characteristics of players. In addition, Gabbett (2008) stated that skill-based conditioning games have induced improvements in speed, vertical jump, spike jump, agility, upper-body muscular power, and estimated maximal aerobic power. Our results are similar to results found in Gabbett (2008) study. It has been suggested that traditional technical training, which uses blocked practice, provides greater short-term improvements (Shea & Morgan, 1979). However, using random practice could have longer-term performance benefits (Gabbett, 2008).

Significant improvements were found in COD speed tests. These findings are in line with the previous authors who reported significant decreases in time during agility tests following training (Gabbett2008, Gortsila, Theos, Nesic, & Maridaki, 2013). Gortsila, et al. (2013) showed in their study that training on sand surface could be a useful and effective tool for improving agility in prepubescent female volleyball players. Aforementioned authors stated that the instability of the sand surface could be one of the explanations which contributed to the improvements of balance, which in turn improved agility. Less powerful spiking in female
volleyball compared to male could contribute significantly to the improvement in COD speed. Moreover, rallies in female volleyball are longer with many defensive actions during which players sprint, change direction, shuffle.

The results of this study indicate that there were no significant improvements in jumping performance. However, COD speed tests showed improvement in post testing compared to pre testing following a 6 week of skill-based conditioning training program. It cannot be concluded that young female volleyball players develop distinctive performance characteristics at this age and level. Therefore, more studies must be conducted in order to better understand this kind of training in female volleyball players and its’ effects. In conclusion, skill-based conditioning training appears to have stronger effects in improving COD speed compared to lower body power young female volleyball players. Volleyball coaches could use this information in the process of planning the pre and in-season training. In this way, the training will be more specific and the transfer of training effects to game efficiency will be faster. Many coaches do not use the approach described in this article to the training process because they fear of insufficient stimulus that skill-based training could have in volleyball. However, this kind of study could provide practical application for coaches and sport researchers.

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