

SUBSTANTIATION OF TIME PERIODS OF INFORMATION TECHNOLOGIES' APPLICATION IN MINI-FOOTBALL TRAININGS OF UNIVERSITIES' FIRST AND SECOND YEAR GIRL STUDENTS

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Abstract. *Purpose:* substantiation of optimal time periods for girl students' active perception of learning material from electronic manual of mini-football. *Material:* in first stage 1st year girl students (n=22), participated; in second stage – 2nd year girl students (n=21). We determined time periods of manual material optimal perception by girl students. Indicators were registered with system "Polar Team System" and device for measurement of quasi-stationary cortex potential. *Results:* it was found that learning process is the most effective for 1st year girl students, if material is demonstrated during 20 minutes. 2nd year girl students perceive material the most effectively during 25 minutes. We determined quantitative indicators of heart beats rate, quasi-stationary potential of cortex and energy losses, which reflect girl students organism's reaction to mental loads. *Conclusions:* we substantiated time periods, during which it is necessary to apply computer means of learning in girl students' out of class trainings.

Key words: informational, computer, manual, pulse, reaction, girl students.

Introduction

At modern stage of higher education development application of information technologies has been becoming still more wide spread [2, 6, 10]. With it multimedia computer manuals, application of which substantially increase quality of material mastering, [1, 5, 8]; effectiveness of training of different sport games' techniques and tactic [3, 4, 7] are of certain interest. Among such works there are researches, devoted to mini-football [5, 17]. In some researches technology of electronic manuals' application for junior football players was grounded [5, 16]. In other researches the need in the following was described:

- Consideration of kinesthesia state in conditions of accuracy of differentiation of football players' muscular efforts [12];
- Consideration of training loads' correlation during competition period [20];
- Improvement of control over development of ball techniques' fulfillment quickness [13];
- Consideration of speed-power and explosive power influence on sportsmen's fitness [19];
- Formation of football players' ability to orient in conditions of complex motor functioning [18].

It was found that problem of modern information technologies' application in system of students' physical education system has been worked out insufficiently. On example of mini-football there were nearly no appropriate researches [9]. In our previous publications we noted that one of promising directions of girl students' health improvement was application of information technologies in out-of-class mini football trainings [9]. In other our researches it was shown the following:

- Possibility of application of specific and non specific mini football means' optimal correlation [22];
- Consideration of psychological factors in physical education classes [21, 23];
- Directions of youth's physical condition, physical development, physical fitness monitoring [24].

The mentioned above conditioned conduct of our own experimental researches.

Hypothesis of the research: it was assumed that study of heart beats rate parameters, quasi-stationary cortex potential and energy losses permitted to substantiate time periods of active multimedia manuals material perception by 1st and 2nd year girl students.

The purpose of the research: to conduct experiment for substantiation of time periods, during which 1st and 2nd year girl students master electronic manuals' material in the best way that ensure effectiveness of mini-football training.

Material and methods

Participants: in first stage 1st year girl students (n=22), participated; in second stage – 2nd years girl students (n=21). All girl students did not practiced mini-football before entering university. Every girl student gave written consent for participation in experiment.

Organization of the research: experiment took 4 months. At first stage we determined time periods of manual material's perception by 1st year girl students by topics: principles of selection, learning and training. At second stage we substantiated optimal time periods of work with multimedia manual for 2nd year girl students. These girl students already had one year mini-football experience. At every stage of the research we conducted 28 lessons in computer class room, each of them 45 minutes duration. Every lesson was divided into nine segments, 5 minutes each. During every of these segments we registered girl students' indicators, which reflected their reaction to material of manual. The indicators were registered with "Polar Team System" and device for measurement of quasi-stationary cortex potential. The following indicators were registered: heart beats rate, parameters of quasi-stationary cortex potentials, energy losses. By the idea of the research we mainly used materials of second chapter "Principles of football techniques' training" and third chapter "principles of game tactic training". Besides, the girl students were offered to pass testing after mastering certain portion of material.

Statistical analysis: statistical processing of material was realized on the base of Statistics 10.0 programs. Confidence of differences between samples' indicators was checked with Student's t-criterion (value was considered to be statistically significant at $p < 0.05$).

Results of the researches

In table 1 we present indicators of 1st year girl students in 68 cases. From table 1 it is seen that the highest indicators of information perception from electronic manual activity were registered in first 20 minutes of classes. Parameters of pulse frequency, quasi-stationary cortex potential and energy losses point at activation of girl students' workability just in this time period. During first 20 minutes, in every 5 minutes of classes we registered the highest value of heart beats rate ($84.7 \pm 1.3 \text{ bpm}^{-1}$), quasi-stationary cortex potential ($61.7 \pm 0.59 \text{ conv.un.}$) and energy losses ($13.5 \pm 0.21 \text{ kcal.}$). Every next 15 minutes of looking through learning material were followed by insufficient reduction of the studied parameters.

From 5th to 10th minutes heart beats rate was $81.5 \pm 1.31 \text{ bpm}^{-1}$, parameters of quasi-stationary cortex potential – $60.8 \pm 0.54 \text{ conv.un.}$ and energy losses – $13.1 \pm 0.19 \text{ kcal.}$

Table 1. Characteristics of heart beats rate, quasi-stationary cortex potential and energy losses of 1st year girl students, registered during mastering multimedia manual's material

Time periods, min.	Dynamic of parameters, reflecting activity of information perception by 1 st years girl students					
	Heart beats rate, bpm^{-1} (n=68)		Quasi-stationary cortex potential, conv.un. (n=68)		Energy losses, kcal. (n=68)	
	\bar{X}	m	\bar{X}	m	\bar{X}	m
0 – 5	84.7	1.34	61.7	0.59	13.5	0.21
5 – 10	81.5	1.31	60.8	0.54	13.1	0.19
10 – 15	80.9	1.29	59.9	0.51	12.4	0.17
15 – 20	79.7	1.27	58.5	0.48	11.9	0.16
20 – 25	70.5	1.24	41.3	0.40	8.4	0.14
25 – 30	68.3	1.23	40.6	0.39	7.7	0.13
30 – 35	67.9	1.15	39.4	0.37	6.9	0.12
35 – 40	67.6	1.18	38.9	0.35	5.6	0.11
40 – 45	67.4	1.11	38.4	0.34	5.5	0.10

Time period from 10th to 15th minutes was characterized by the following: heart beats rate – 80.9±1.29 bpm⁻¹, quasi-stationary cortex potential – 59.9±0.51 conv.un., energy losses – 12.4±0.17 kcal. From 15th to 20th minutes we registered the following values: heart beats rate – 79.7±1.27 bpm⁻¹, quasi-stationary cortex potential – 58.5±0.48 conv.un., energy losses – 11.9±0.16 kcal. From 20th minute we observed sharp confident reduction (p<0.05) of indicators of psychic workability resources' mobilization and mental activity of 1st year girl students. I.e. time period from 20th to 25th minutes was characterized by the following parameters: heart beats rate – 70.5±1.24 bpm⁻¹, quasi-stationary cortex potential – 41.3±0.40 conv.un., energy losses – 8.4±0.14 kcal. In time period from 25th to 30th minutes indicators of heart beats rate were 68.3±1.23 bpm⁻¹, quasi-stationary cortex potential – 40.6±0.39 conv.un. and energy losses – 7.7±0.13 kcal. From 30th to 35th minutes we registered the following: heart beats rate – 67.9±1.15 bpm⁻¹, quasi-stationary cortex potential – 39.4±0.37 conv.un. and energy losses – 6.9±0.12 kcal. Time period from 35th to 40th minutes was characterized by the following: heart beats rate – 67.6±1.18 bpm⁻¹, quasi-stationary cortex potential – 38.9±0.35 conv.un., energy losses – 5.6±0.11 kcal. As we can see in table 1 the highest decrease of pulse, quasi-stationary cortex potential and energy losses was observed during last five minutes of work in computer class. It witnesses about weakening of their ability to master electronic manual's material. For example, during the mentioned time period we registered the following indicators: heart beats rate – 67.4±1.11 bpm⁻¹, quasi-stationary cortex potential – 38.4±0.34 conv.un., energy losses – 5.5±0.1 kcal.

Results of the research point that the most optimal time period for application of multimedia manuals for 1st year girl students' mini-football training is first 20 minutes of classes.

The second stage of experiment envisaged analogous researches. They involved 21 girl students of 2nd year, who already had one year experience³⁴ of mini football training. In table 2 we present results of 2nd year girl students in 64 cases. In the process of one-year experiment we determined that 2nd year girl students perceive computer manual's material most actively during first 256 minutes of lesson in computer class room. Activation of their mental workability just in this time period is witnessed by registered quantitative indicators of pulse frequency, quasi-stationary cortex potential and energy losses. For example, during first five minutes of looking through learning material heart beats rate was, in average, 84.5±1.37 bpm⁻¹, quasi-stationary cortex potential – 62.4±1.05 conv.un., energy losses – 13.8±0.22 kcal.

Table 2. Characteristics of heart beats rate, quasi-stationary cortex potential and energy losses of 2nd year girl students, registered during mastering multimedia manual's material

Time periods, min.	Dynamic of parameters, reflecting activity of information perception by 1 st years girl students					
	Heart beats rate, bpm ⁻¹ (n=68)		Quasi-stationary cortex potential, conv.un. (n=68)		Energy losses, kcal. (n=68)	
	\bar{X}	m	\bar{X}	m	\bar{X}	m
0 – 5	84.5	1.37	62.4	1.05	13.8	0.22
5 – 10	81.0	1.33	61.3	0.57	13.3	0.20
10 – 15	79.8	1.25	60.8	0.55	12.5	0.19
15 – 20	79.3	1.23	60.2	0.51	12.0	0.18
20 – 25	78.9	1.20	59.4	0.47	11.0	0.17
25 – 30	69.0	1.19	40.9	0.37	7.8	0.14
30 – 35	68.7	1.15	39.5	0.36	7.0	0.13
35 – 40	67.3	1.12	39.0	0.34	5.4	0.12
40 – 45	67.1	1.09	38.9	0.31	5.2	0.11

It was found that just the mentioned average quantitative indicators of 2nd year girl students were the highest during all experiment. At the same time, during every first 25 minutes of classes we did not register confident differences ($p < 0.05$) between studied parameters in adjacent time periods. It was determined that rather high mobilization level of psychic workability was observed during first 5 minutes and during following 20 minutes of every lesson. For example, from 5th to 10th minutes of lesson we registered the following: heart beats rate – $81.0 \pm 1.33 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $61.3 \pm 0.57 \text{ conv.un.}$, energy losses – $13.3 \pm 0.20 \text{ kcal}$. Time period from 10th to 15th minute was characterized by insufficient reduction of heart beats rate ($79.8 \pm 1.25 \text{ bpm}^{-1}$), quasi-stationary cortex potential ($60.8 \pm 0.55 \text{ conv.un.}$) and energy losses ($12.5 \pm 0.19 \text{ kcal}$). In time period from 15th to 20th minutes we also registered insignificant worsening of information perception's activity: heart beats rate - $79.3 \pm 1.23 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $60.2 \pm 0.51 \text{ conv.un.}$, energy losses – $12.0 \pm 0.18 \text{ kcal}$. The same tendency was registered in period from 20th to 25th minutes: heart beats rate – $78.9 \pm 1.20 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $59.4 \pm 0.47 \text{ conv.un.}$ and energy losses – $11.0 \pm 0.17 \text{ kcal}$. Starting from 25th minute we observed sharp reduction ($p < 0.05$) of 2nd year girl students' mental workability. Time period from 25th to 30th minutes was characterized by the following indicators: heart beats rate – $69.0 \pm 1.19 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $40.9 \pm 0.37 \text{ conv.un.}$, energy losses – $7.8 \pm 0.14 \text{ kcal}$. From 30th to 35th minutes we registered the following parameters: heart beats rate – $68.7 \pm 1.15 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $39.5 \pm 0.36 \text{ conv.un.}$, energy losses – $7.0 \pm 0.13 \text{ kcal}$. From 35th to 40th the values were as follows: heart beats rate – $67.3 \pm 1.12 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $39.0 \pm 0.34 \text{ conv.un.}$ and energy losses – $5.4 \pm 0.12 \text{ kcal}$. By results of the conducted experiment the highest reduction of activity of information perception by girl students was found in last five minutes of work with manual: heart beats rate – $67.1 \pm 1.09 \text{ bpm}^{-1}$, quasi-stationary cortex potential – $38.9 \pm 0.31 \text{ conv.un.}$ and energy losses – $5.2 \pm 0.11 \text{ kcal}$.

Analysis of the research's materials (2nd year girl students) showed that the highest effectiveness of mini-football training with the help of electronic manuals is ensured during 25 minutes. Just in this period of time there is activation of mental workability of girl students with one year experience of mini-football practicing that is proved by registered indicators of heart beats rate, quasi-stationary cortex potential and energy losses.

Discussion

In our opinion demand in substantiation of certain technology of electronic manuals application in training of 1st and 2nd year girl students to mini football has already been formed. Existence of such demand is conditioned by a number of factors. First: application of manuals ensures qualitative demonstration of new techniques [11, 14, and 15]. Thus, in the process of looking though girls students acquire idea about some or another technique and realization of visual perception is ensured [7, 10]. In condition of parallel application of other method (method of ideomotor training, when seen exercise is "processed" in thoughts before its fulfillment) the quality of training process significantly increases. Second: on this basis more effective mastering of knowledge by students is stipulated. Because it is of common knowledge that qualitative theoretical training is one of factors of effective sport training in general [16].

There is another factor, connected with application of informational technologies. It conditions studying of girl students organism's reactions to mental loads. It is of common knowledge that up to the present time only fragmentary researches of activity of information perception from computer manuals have been fulfilled [1, 5]. With it, it is also known that registration and application of appropriate characteristics permit to ensure individual approach in trainings' planning and conditions effectiveness of training process's control [7, 9].

Separately it should be noted that existence of the determined time periods for application of multimedia manuals in the process of girl students' training to mini-football is conditioned by age characteristics of girls' psyche. This fact is proved also by other researches [4, 9].

Conclusions

1. Analysis of literature sources, questioning of leading coaches, sportsmen, teachers and students showed that the problem of modern information technologies' application in system of students' physical education has been worked out only fragmentary. One of ways of this problem solution is determination of optimal time periods for computer manuals' usage in out-of-class trainings that can ensure higher effectiveness of girl students' training to mini-football.

2. Pedagogic experiment permitted to find optimal time periods of multimedia learning means' application by girl students. For example, it was determined that 1st year girl students the most actively perceive material of electronic manuals during 20 minutes and 2nd year girl students – during 25 minutes.

3. Materials of the research permitted to substantiate quantitative indicators of heart beats rate, quasi-stationary cortex potential and energy losses, which reflect reaction of girl students' organism to mental loads in work with electronic manual. Such indicators can be used for control over effectiveness of computer learning means' application in mini-football trainings.

The prospects of further researches shall be connected with substantiation of volumes of information technologies' application in annual cycle of university girl students' mini-football trainings.

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