

## Research on Information Feedback Regulation System of Basketball Training Based on ANT Dynamic Theory

Yun Wang<sup>1</sup>, Guimin Dai<sup>2</sup>

<sup>1</sup>Faculty of Sports Training, Hebei Institute of Physical Education, Shijiazhuang, China  
w\_angyun@126.com

<sup>2</sup>Faculty of Sports Art, Hebei Institute of Media, Shijiazhuang, China

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**Abstract.** The basketball training is a long-term process of repeatedly. If you can master the feedback information the training process in time and make adjustment of the sports and sports exercise intensity, it can greatly improve the basketball training effect and reduce training investment and increase the economic benefit of sports training. This paper establishes ANT dynamic metabolic model according to the body metabolism of ANT theory in the basketball training process and establishes training control information system model according to feedback control principle of the generalized linear system. This paper monitors the ANT dynamic metabolic process of project jogging, touch line, layup and physical confrontation in the process of basketball training. This paper uses professional drawing software-origin to process data chart obtains the parameters optimization of the same sport after information control system regulation which realizes the automation control of information in basketball movement process. Finally, this paper summarizes the drawback of the system which provides the theoretical basis for the development of basketball training.

### Introduction

Due to the basketball movement is the movement of heated confrontation, and basketball training process is a complicated and repeatedly process. If the intensity of training exercise and sport is too small, it can not reach the training effect. If the amount of exercise is too big, it can cause the muscle fatigue damage. Choosing a suitable method to determine the basketball training exercise and strength is the expectation of basketball coaches[1]. This paper develops a basketball training information control system which can monitor dynamic metabolic process of biological metabolism ANT of basketball player in the training process real-timely to adjust training programs and training exercise and sport intensity[2,3]. The first part of this paper introduces the dynamic model based on ANT metabolic process and information feedback control system based on the generalized linear system and gives the flow chart. The second part of this paper test the model and give the contrast table of training parameters optimization before and after[4,5]. It summarizes the system deficiency through the data analysis and provides a theoretical reference for the construction of basketball training information control system.

### The feedback control system model of basketball training information control based on ANT

In the basketball training process and with the movement, the ANT metabolic process of internal body is a dynamic balance process[6-8]. It can be used to measure the response of body on the input of motion signal, and the amount of ANT metabolism can measure movement effect and extent of body muscle organs to the movement. This valuable information can provide the reference to coaches after information feedback and adjust basketball training and sports training.

First, assuming that in basketball training process, ANT which participates in the metabolism and did not attends the metabolism is a random variable. Assuming that the mount of ANT which participates in the metabolism in time  $x$  is  $T$ , and the actual metabolism is  $T$ . The ANT enters into the working state new is  $u$ . And assuming that the probability of  $T=t$  is  $R(x)$ , so the number of ANT which new entry and stop working can be represented as[9]:

$$R_n(x)(1 - u\Delta x - \frac{t}{u}\Delta x) \quad (1)$$

Metabolic number is  $t-1$ , and the number which starts to metabolize is:

$$R_{n-1}(x)u\Delta x \quad (2)$$

When  $\Delta x \rightarrow 0$ , the probability of the occurrence of two or more than two metabolic state changes is zero, and we can get difference equation[10]:

$$R_n(x + \Delta x) = R_n(x)(1 - u\Delta x - \frac{t}{u}\Delta x) + R_{n-1}(x)u\Delta x \quad (3)$$

So we can set the partial differential equation as:

$$\frac{dR_n(x)}{dx} = -(u + \frac{t}{u})R_n(x) + R_{n-1}(x)u \quad (4)$$

We can define the generalized basketball training information system as follows[11]:

$$\begin{cases} Et = Dt + Fu + Qa \\ A = va \\ f = Bt + Pa \end{cases} \quad (5)$$

T is time control vector, and u is input estimation parameter, and f is error vector value, and E is result, DQABP is coefficient matrix, and we can get information feedback controller as[12]:

$$U = gt + ma \quad (6)$$

We can get the basketball training information control system which is shown in Figure 1.

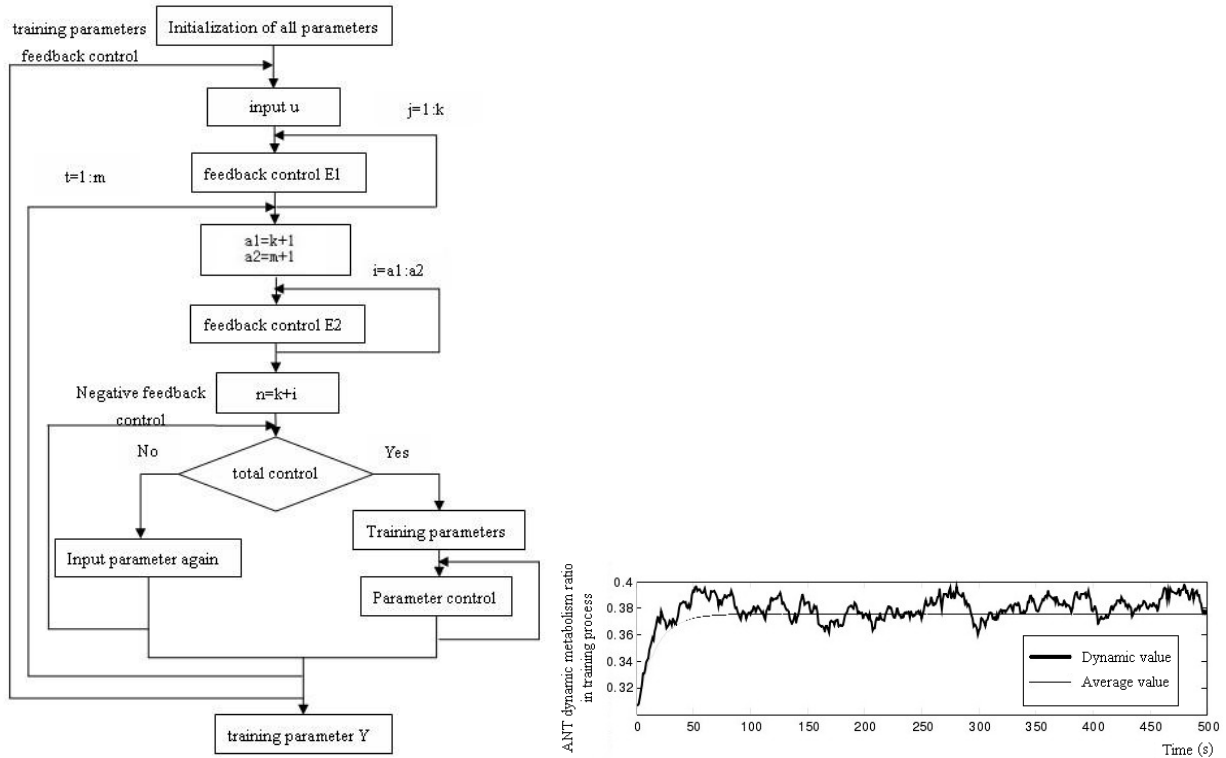


Figure 1. Schematic diagram of basketball training information control system Figure2 ANT dynamic metabolism ratio of jogging training

The parameter u is the quantity of ANT into the work state of the mitochondria cell modules in the basketball training process and through the electron monitoring and in the unit time. In the process of information feedback we can set u value which is the initial assessment shown in the following Table 1.

According to the setting of standard parameters, we can calculate ANT dynamic metabolism ratio of the basketball training process which can determine the training and sports strength in the training process.

TABLE I. ESTIMATION OF DYNAMIC SIMULATION U VALUE

u1	u2	u3	u4	u5
$9.02 \times 10^6$	$10.13 \times 10^6$	$11.25 \times 10^6$	$13.08 \times 10^6$	$9.75 \times 10^6$
u6	u7	u8	u9	u10
$15.36 \times 10^6$	$9.86 \times 10^6$	$12.53 \times 10^6$	$17.25 \times 10^6$	$16.13 \times 10^6$

## Effect analysis on information control system of basketball training

Through the first part of the basketball control information system model, we can test the ANT metabolic changes in basketball training process. Through the electron microscope scanning, we can monitor the number of ANT which participate into the metabolism and then react it to information control system for the calculation and get the latest training effect parameter after the optimization of the parameters[13]. Origin is powerful professional drawing software. We can use the Origin to drawn the result data of a lot of times for observation.

First of all, we can confirm training programs and physical activities of basketball preliminary which is shown in Table 2.

TABLE II. THE PRELIMINARY SURE TABLE OF BASKETBALL TRAINING SPORTS AND SPORTS STRENGTH

training programs	the number before fifty seconds	total number of 500 seconds
jogging	5 rings	40
touch line	10	80
layup	5	45
Against the body	8	50

Table 2 is basketball project and basketball training exercise parameter according to former basketball training experience. In the training process we can monitor and get jogging ANT metabolic change curve which is shown in Figure 2.

From Figure 2 we can see that the ANT dynamic metabolism ratio of training process increase at the beginning, and become more and more stable after about fifty seconds which is coincide with the ANT theory metabolism data in the movement process[14]. We can draw the ANT dynamic metabolic process of four sports using Origin software which is shown in Figure 3.

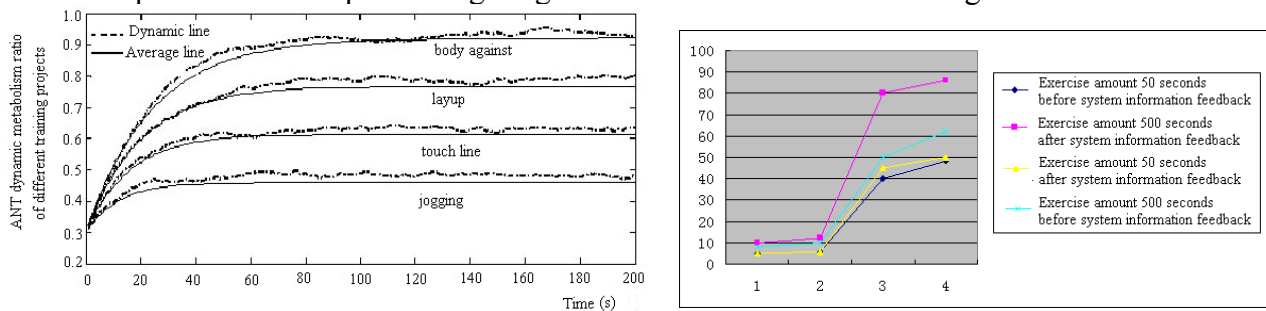


Figure3. ANT dynamic metabolic processes of four sports Figure4.Exercises and sport intensity control chart after information feedbacks

Through the Figure 3, we can observe that at the beginning of four sports the ANT metabolic rate is relatively small, and become more and more stable after metabolism about fifty seconds. The number of ANT jogging dynamic metabolism is the fewest; and the ANT dynamic metabolism in the process of body against is the strongest[15]. The number of ANT metabolism in dynamic metabolic processes is higher than experience number. We can substitute this information into training control system and get optimization data such as Table 3 and Figure 4 through the feedback control:

TABLE III. THE EXERCISES AND SPORT INTENSITY CONTROL AFTER INFORMATION FEEDBACK

training programs	the number before fifty seconds	total number of 500 seconds
jogging	6 rings	48
touch line	12	86
layup	6	50
Against the body	10	62

Through the feedback control of basketball training information control system, we can find that when the basketball sports' condition is constant, physical activity before and after basketball information system control is change. The physical activity is increasing first fifty seconds and the five hundred seconds of information feedback which corresponding to the theory of the number of metabolism ANT time in the graph is higher than the theoretical value which explain reliability and stability of the system.

## The deficiency of information control system

In the case analysis of the second part of the basketball training information control system, we can find the information control system operation results of this paper is consistent with actual conditions which proves the stability and effectiveness of information control system. But there are also many deficiencies in the system.

(1) supervision of feedback regulation

The information control system feedback control of this paper is only involves four projects which will inevitably cause the adaptability of different project systems. The future research should increase the monitoring strength of feedback control, and monitors more sports training projects and ANT feedbacks of athletes in training process.

#### (2) Innovation of basketball sports

The information system inspection items of this paper are created based on past experiences which have no innovation on basketball projects and no research on the effect of the system on the basis of the innovation project which has some limitations of new system identification.

#### (3)The effect evaluation of training information system

Training information system has not yet set up a comprehensive performance evaluation system. So there is no further inspection of the comprehensive stability and effect of system.

## Conclusion

This paper established the basketball training information control system based on the ANT metabolic process of basketball training process and the theory of generalized linear information control system. It given ANT dynamic metabolic mathematical model and generalized linear system matrix model in the first part of this paper and established the basketball training information control system flow chart through the model and been tested in the second part. In the inspection process, it compared the actual training ANT monitoring dynamic metabolic value and experience value and got the final training parameters optimization by substituted the results into information control system. Origin chart analysis can find that the training exercise after optimized was slightly increased than before which is corresponding with the ANT metabolism. Research on the basketball training information control system research related to the quality and effect of basketball training. We should further analyze and research the better, faster and more stable information control algorithm.

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