Iranian Journal of Educational Sociology

(Interdisciplinary Journal of Education)
Available online at: http://www.iase-idje.ir/
Volume 6, Number 3, September 2023

The Providing a model for improving the Physiological Performance of Human Resources, based on the Biorhythm Cycle in Educational - Therapeutic Centers

Tayebeh Yousefi[1], Masoud Ahmadi*[2], Rahman Qaffari[3]

1. PhD student, Department of Public Decision-Making and Policy Orientation, Islamic Azad University, Sari, Iran
2. Assistant Professor, Department of Public Administration, Faculty of Humanities, Islamic Azad University, Sari Branch, Sari, Iran (Corresponding Author).
3. Assistant Professor, Department of Public Administration, Faculty of Humanities, Islamic Azad University, Sari Branch, Sari, Iran.

Article history:
Received date: 2023/09/03
Review date: 2023/10/27
Accepted date: 2023/11/08

Keywords:
Human Resources, Physiological Function, Biorhythm Cycle, Educational-Medical Centers.

Purpose: The purpose of this study is to design a model to improve the physiological performance of human resources, based on the biorhythm cycle in educational and medical centers.

Methodology: the combined research method is based on exploratory mixed research (qualitative - quantitative). Statistical population in the qualitative section of a group of experts including professors in the field of organizational behavior management in universities and higher education centers, Vice Chancellor for Management Development and Resources of Medical Universities and experts on physiological performance and biorhythm cycle and in the quantitative section; The staff in rotation of Imam Khomeini Educational and Medical Center in Sari consisted of 820 nurses, midwives, paramedics, services, laboratory and radiology; In the qualitative part, using the snowball method to achieve theoretical saturation, in-depth interviews were conducted with 20 experts, and in the quantitative part, to measure the model, a researcher-made questionnaire with relative class sampling method was used among 264 people. was distributed. To determine the validity and reliability in the qualitative stage, the necessary tests, including acceptability and capability, are used, and in the quantitative stage, the validity of the 74-item questionnaire by face and content method (CVR and CVI range for items between 0.6 to 0.1, 0.85 and 0.1, respectively) and its reliability by Cronbach's alpha method by 83% of the cases Confirmed. Data were analyzed in qualitative stage with grounded theory technique with MAXqda2018 software and in quantitative stage with structural equations (heuristic and confirmatory factor analysis) with SPSS and AMOS software.

Finding: The results of the qualitative part indicate that the physiological performance model of human resources, based on the biorhythm cycle has 16 dimensions in terms of causal conditions (working conditions, demographic characteristics and individual conditions), contextual conditions (organizational structure, motivation of managers and employees and intelligence Ethical), intervention conditions (culture building, teamwork and organizational and non-organizational challenges), strategy (training and awareness, biorhythm cycle planning and performance management) and outcome (job performance improvement, physiological performance of human resources and improvement Organizational performance) has been.

Conclusion: The results of the quantitative section showed that all dimensions of the research model were confirmed.

Please cite this article as: Yousefi, T., Ahmadi, M., & Qaffari, R. (2023). The Providing a model for improving the Physiological Performance of Human Resources, based on the Biorhythm Cycle in Educational-Therapeutic Centers, **Iranian Journal of Educational Sociology.** 6(3): 74-89.

1. Corresponding Author: m.ahmadi4502@gmail.com

[DOI: 10.61186/ijes.6.3.74]

1. Introduction

Biorhythm is the study of the rhythmic body patterns of human beings. The theory of biorhythms posits that your body has four primary rhythms and cycles: emotional, intellectual, physical, and intuitive. Each period lasts a specific duration and continues periodically throughout your life. If each period is plotted as a function of time, the resulting functions would appear sinusoidal. Biorhythm is one of the newest topics in the field of cognitive ergonomics recognition, enabling managers to significantly reduce natural accidents arising from daily work and seemingly inexplicable errors by understanding the physical, mental, and spiritual aspects (Shirazian, 2016). Work, occupying a major part of human life, engages individuals both physically and mentally, while the tumultuous world of business exerts immense pressures on business owners (Shimazu, Schaufeli, Kamiyama, & Kawakami, 2015). A person's biorhythm reflects all their physical, emotional, and mental characteristics on different days of their life. Considering these indices in various work situations can facilitate the achievement of organizational goals more efficiently and swiftly (Rabiei & Khataminia, 2011). Thus, understanding and applying this theory can play a significant role in performance improvement, and managers can use this new phenomenon and its software applications in their organizations (Talaei-Zavareh, 2010). In today's advanced organizations, human resource planning considers the biorhythms of employees. Progressive organizations pay special attention to organizational research in the fields of biorhythm for organizational benefits. However, there is still a long way to go in unveiling all aspects of biorhythm and its impact on organizational behaviors and performances. Examining the influence of employees' biorhythms on job performance is crucial and should be investigated to prevent issues and enhance performance. The involvement in work environments and dedication of a significant portion of daily time to work and mental preoccupations about work activities result in individuals voluntarily dedicating much time to work-related activities (Balducci, Avanzi, Consiglio, Fraccaroli, & Schaufeli, 2017), often without adequate rest and leisure, leading to considerable stress and physical and psychological issues, referred to as work addiction or biorhythm (Moldovan, Anghel, Roxana, & Liviu, 2017). In fact, the main issue of research is that the phenomenon of biorhythm leads to physical and psychological problems for service organization employees with sensitive responsibilities, such as hospital staff, neglecting themselves and their families, with the potential impact on physiological performance being of utmost importance. Statistics show that the biorhythm management model is one of the fundamental issues under discussion, playing a decisive role in the opinions of scholars and researchers in the management field (Radu, Larisa, Cassandra, Cordin, & Dan, 2017). According to Sniehotta and Zohar (2008), biorhythm is defined by the degree of three components: work engagement, intrinsic inclination towards work, and enjoyment from work. Workaholics have a high degree of work engagement, intense inclination towards work but do not derive much pleasure from it. In contrast, work enthusiasts engage with their work but enjoy it and do not have an excessive compulsion towards it (Shimazu et al., 2015). Biorhythm can have various effects on the physical and psychological health of individuals, their families, and colleagues, with the most common consequences relating to high levels of job stress and work-family conflict (Radu et al., 2017).

The study by Mahdavi et al. (2020) on the physiological suitability of employees in facilities, services, and law enforcement to their jobs, indicates the unsuitability of some bodily compositions, poor physical fitness, and a mismatch between individual capabilities and job requirements. Research by Shokri and Kargarbideh (2019) on biorhythm and its importance in the organization suggests the potential effect of biorhythm as a source of different behaviors on the interactive relationships of employees, the selection of the correct leadership style in the organization, and the effectiveness and growth of organizational excellence. Taheri et al. (2018)'s study on the impact of yoga based on biological biorhythm theory on balance and selective attention in elderly women showed significant improvements in static and dynamic balance after the intervention. Additionally, indices related to selective attention, including average reaction time and appropriate responses to stimuli, showed significant positive change. Darabpour (2015) in a study titled "Biorhythm Management and Decision-Making," demonstrated that considering this theory leads to positive outcomes such as increased

[DOI: 10.61186/ijes.6.3.74]

quality and quantity of products, reduced waste and work-related accidents, improved organizational relationships, more rational and logical decision-making, among other benefits.

Ayiar and Sukumaran (2021) in their research on circadian rhythm and its effects on physiology, showed that therapeutic interventions can improve the impact of an individual's biorhythm on physiological performance. Su (2020) in a study on human biorhythmic movement based on the cosine model, proposed a new method of calculating the biological rhythm of an athlete and provided a mathematical model to objectively and quantitatively describe the biological data characteristics. Kanikowska, Sato, and Vitowski (2015) concluded in their research titled "Use of Daily and Seasonal Biorhythms for Obesity in Humans" that environmental conditions affect seasonal and daily biorhythms and that daily biorhythms are additionally controlled by internal molecular oscillators or body clocks. Alterations in clock genes in organisms and disruption of normal human daily rhythm (such as shift work and sleep deprivation) lead to metabolic dysregulation, contributing to weight gain. Milic et al. (2014) in a study on the success of school employees, biorhythm, and sleepiness during the day in Osijek, Croatia, showed that employees had different shifts (school starting at 7 AM or 1 PM and 8 AM or 2 PM, alternating weekly). Using the Epworth Sleepiness Scale and the morningness-eveningness questionnaire, participants were evaluated. Early chronotypes were characteristic of employees with earlier school start times, but no significant difference in daytime sleepiness was observed compared to those starting school later.

The current research aims to explore and interpret the biorhythm cycle of rotational staff in Imam Khomeini Hospital, Sari, to determine the impact of the biorhythm cycle on physiological performance. Thus, this study addresses and designs a model to improve the physiological performance of human resources based on the biorhythm cycle in educational and healthcare centers.

2. Methodology

The research methodology employed was a mixed approach, specifically an exploratory mixed-methods design (qualitative-quantitative). The study population, in the qualitative section, included 1. Academic experts (professors in the field of Organizational Behavior Management at universities and higher education institutions), 2. Organizational experts (officials at the Vice-Chancellery for Management Development and Resources at Medical Sciences Universities), and 3. Specialists and experts in the field of physiological performance and biorhythm cycles.

The criteria for expertise included a thorough understanding of ergonomics and physiological performance, knowledge of biorhythm cycle management, and familiarity with human resources management conditions at Medical Sciences Universities.

For qualitative sampling, a spectrum of key informants in the field of "Improving Physiological Performance of Human Resources based on the Biorhythm Cycle" was selected using the "snowball" sampling method. Ultimately, 20 experts were selected using this technique until theoretical saturation was achieved.

The quantitative study population comprised rotational shift workers at the Imam Khomeini (Rah) Educational-Therapeutic Center in Sari, including nurses, midwives, nursing assistants, service workers, laboratory and radiology staff, totaling 820 individuals. The sampling method was stratified proportional sampling, where each staff category represented a stratum, and questionnaires were distributed randomly within each stratum proportionate to its population. The sample size of 264 individuals was determined using the Cochran formula. In the qualitative research section, semi-structured interviews were utilized for data collection, and in the quantitative section, questionnaires were employed. Validity and reliability in the qualitative phase were confirmed through necessary reviews, including acceptability and feasibility, while in the quantitative phase, the 74-item questionnaire's validity was established using face and content methods (with CVR and CVI ranges for items between 0.6 to 1 and 0.85 to 1, respectively) and reliability confirmed with a Cronbach's alpha of 0.83. The data analysis method in this mixed research was:

A- Qualitative section; to identify the research model, semi-structured interviews were conducted with experts and the Grounded Theory (GT) technique was applied using MAXqda2018 software.

[DOI: 10.61186/ijes.6.3.74]

B- Quantitative section; to test and quantify the identified model, a survey was conducted with statistical samples and Structural Equation Modeling (SEM) was applied in AMOS software.

3. Findings

Qualitative Findings

In the qualitative part of the study, the main focus was on exploring and identifying the factors influencing the dimensions, components, and indicators related to the "Human Resources Biorhythm Cycle" as the primary concept. To this end, in the first stage, main categories and sub-components were presented based on open and axial coding of the data from in-depth exploratory interviews with key experts and the refinement of conceptual codes. Consequently, for open and axial coding in the first stage, data at the sentence and phrase level were reviewed for each interview, and conceptual codes were extracted from the interview transcripts. In the subsequent stage, through refinement and reduction, these components were organized into sub-categories and named through continual review. To ensure proper organization of each concept and category, interview transcripts were re-examined, and the categories were revised to achieve logical saturation. Open and axial coding ceased when a meaningful classification was obtained after several reviews of interview transcripts. In total, 235 initial conceptual codes were derived from the qualitative data analysis. After review and alignment of these codes and elimination of duplicates, common codes were tallied. The qualitative findings were presented as outcomes of coding analysis with a thematic analysis approach. The primary step in this phase was open coding. Accordingly, common concepts were identified from recorded units, and common codes were counted. The results of open coding and the interviewee's code number for each factor were examined by experts. Table number (1) addresses the frequency and percentage of expert respondents in interviews regarding the most significant category derived from open coding.

Table 1. Components and indicators of model

Component (Axial Coding)	Indicator (Open Coding)
Work condition	1- Work difficulty and having a sensitive job related to public health Work Conditions
	2- Having rotating work shifts
	3- Having night shifts and staying up at night
	4- Long working hours in emergencies
Demographic characteristics	5- The impact of age on the biorythm cycle Demographic Characteristics
	6- The impact of gender on the biorythm cycle
	7- The impact of job type on the biorythm cycle
Individual condition	8- Individual's dissatisfaction with current status Individual Conditions
	9- Individual's need for self-improvement
	10- Individual's need for improving workplace values
Organizational structure	11- Designing an organizational structure aligned with organizational goals Organizational Structure
	12- Level of decision-making centralization in the organization
	13- Framework of relationships and responsibilities of units, departments, and managers
	14- Degree of specialization, division of labor, and number of levels in organizational hierarchy
	15- Formality and reliance on laws, regulations, guidelines, and job descriptions
Managers' and workers' motivations	16- Presence of work advancement motivation in employees Motivation of Managers and Employees
	17- Presence of work advancement motivation in managers
	18- Interest in work and service to people among employees
	19- Interest in work and service to people among managers
Moral intelligence	20- Accepting responsibility and consequences of actions, including mistakes and failures Ethical Intelligence
	21- Employees' preference for ethical behavior even at a cost

[DOI: 10.61186/ijes.6.3.74]

	22- Honesty and the ability to discern right from wrong, strong ethical beliefs, and adherence to them
	23- Mutual influence of compassion, attention, and willingness to help other colleagues
Biorythmic cycle of human resources	24- Physical cycle with control over strength, vigor, stamina, endurance, resistance, innovation, and initiative
	25- Emotional cycle with control over sensitivity, emotional issues, mood, mental states, nerves, and creativity levels
	26- Mental cycle with control over learning ability, analytical thinking, logic, judgment, and decision-making
	27- Intuitive cycle with spiritual and intuitive abilities, spiritual insights, and subconscious understanding
Culturalize	28- Establishing a culture of adaptability and transformation in society and among employees Culture Building
	29- Creating a vision and culture of attention to the biorythm cycle among organizational employees
	30- Creating a culture of attention to the biorythm cycle among managers and high-level officials in the organization
	31- Establishing a learning culture among employees
Teamwork and interaction	32- Employee participation in clearly defining vision and common goals Interaction and Teamwork
	33- Finding creative and new solutions to new problems as a team
	34- Focusing on team building to improve employee performance
	35- Encouraging individual participation and coordination and cooperation among organizational units
	36- Creating an environment for utilizing and spreading multiple skills and fostering a spirit of cooperation and collaboration
Organizational and Non-Organizational Challenges	37- Lack of proper understanding and focus on correct implementation of biorythm cycle charts
	38- Lack of understanding and cooperation of employees with biorythm cycle-based planning
	39- Traditional mindset and limited, short-term perspective of officials, managers, and employees
	40- High levels of job stress and work-family conflict
	41- Weakness in the educational system and lack of biorythm training in universities for managers
	42- Problems in establishing communication with others
	43- Creating problems and issues in teamworking
Training and informing	44- Organizing educational classes and seminars related to the biorythm cycle Education and Awareness
	45- Caution and avoidance of sensitive and high-risk tasks by knowing critical days
	46- Training and empowerment of employees, progress and development through scientific research
	47- Training to address backlogged tasks during the positive physical cycle
	48- Training to avoid serious decision-making during the negative rational cycle
Planning based on the biorythm cycle	49- Assessing readiness and capacity of employees for employing the biorythm cycle
	50- Aligning biological performance strategy based on the biorythm cycle with organizational strategy
	51- Implementing necessary changes for project execution
	52- Considering high and low points of biorythm cycles and aligning activities with them
	53- Forming multi-task groups for coordination of different sections
	54- Establishing coherent and systematic inter-departmental communication
	55- Better, more scientific, and reliable selection of individuals for work shifts
Biorythm Cycle of Human Resources	56- Striving to improve abilities and capabilities of individuals and organizational groups
	57- Aligning reward strategies
	58- Clarifying priorities, job responsibilities, and performance expectations for mutual trust and understanding between supervisors and employees

[DOI: 10.61186/ijes.6.3.74]

	59- Assessing the extent and quality of program execution and goal achievement at the end of the evaluation period
	60- Creating a shared vision of goals to help employees understand their role in achieving them
Organizational and Non-Organizational Challenges	61- Revising work and organizational processes
	Job Performance Improvement
	62- Enhancing the quality of work life and assigned responsibilities
	63- Maintaining equality and group performance
	64- Enhancing job-specific skills
Biorythm Cycle-Based Planning	65- Improving the overall values expected by the organization from different organizational sections
	66- Preserving and enhancing the health of employees Improving Physiological Performance of Human Resources
	67- Reducing seemingly inexplicable mistakes in daily work
	68- Reducing and preventing many accidents in the workplace
Performance Management	69- Better and more optimal use of employees' abilities by knowing their status
	70- Creating a suitable work environment
	Organizational Performance Improvement
	71- Improving organizational relationships
	72- Meeting the needs and expectations of all groups and stakeholders

The paradigm model resulting from the qualitative analysis is shown as follows:

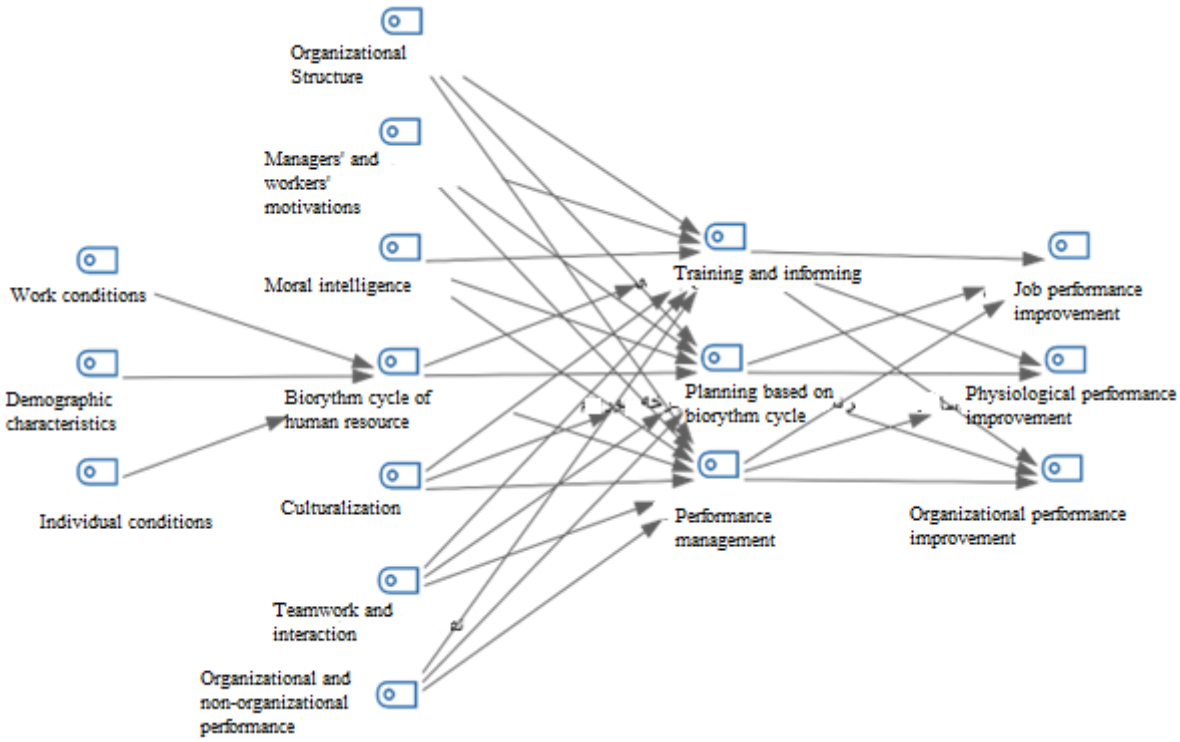

Figure 1. Components and indicators of model

Quantitative Findings

In the qualitative part of the study, the main focus was on exploring and identifying the factors influencing the dimensions, components, and indicators related to the "Human Resources Biorhythm Cycle" as the primary concept. To this end, in the first stage, main categories and sub-components were presented based

[DOI: 10.61186/ijes.6.3.74]

on open and axial coding of the data from in-depth exploratory interviews with key experts and the refinement of conceptual codes. Consequently, for open and axial coding in the first stage, data at the sentence and phrase level were reviewed for each interview, and conceptual codes were extracted from the interview transcripts. In the subsequent stage, through refinement and reduction, these components were organized into sub-categories and named through continual review. To ensure proper organization of each concept and category, interview transcripts were re-examined, and the categories were revised to achieve logical saturation. Open and axial coding ceased when a meaningful classification was obtained after several reviews of interview transcripts. In total, 235 initial conceptual codes were derived from the qualitative data analysis. After review and alignment of these codes and elimination of duplicates, common codes were tallied. The qualitative findings were presented as outcomes of coding analysis with a thematic analysis approach. The primary step in this phase was open coding. Accordingly, common concepts were identified from recorded units, and common codes were counted. The results of open coding and the interviewee's code number for each factor were examined by experts. Table number (1) addresses the frequency and percentage of expert respondents in interviews regarding the most significant category derived from open coding.

Descriptive Statistics

In the descriptive analysis of research subjects, there were 105 men (39.77%) and 159 women (60.23%), with 58 individuals being single (21.97%) and 206 married (78.03%). Age-wise, 54 individuals were 30 years or younger (20.45%), 73 were between 31 to 40 years (27.65%), 85 were 41 to 50 years (32.20%), and 52 were over 50 years old (19.70%). In terms of education, 122 individuals had a bachelor's degree or lower (46.21%), 98 had a master's degree (37.12%), and 44 had a doctorate (general or specialized) (16.67%). Regarding service history, 41 individuals had 5 years or less (15.53%), 59 had between 6 to 10 years (22.35%), 66 had between 11 to 15 years (25.00%), 51 had between 16 to 20 years (19.32%), and 57 had over 20 years of service.(%21.84)

Inferential Statistics

Initially, the face validity of the questionnaire, derived from the qualitative stage, was confirmed after consulting several experts and making the necessary revisions. The content validity of the questionnaire was endorsed by a 20-member group of academic and organizational experts, with the CVR and CVI ranges for each item between 0.6 to 1 and 0.85 to 1, respectively. To test the model, the questionnaire from the qualitative stage, after reliability confirmation, was distributed among 264 individuals using stratified proportional sampling, and the data were analyzed using exploratory and confirmatory factor analysis in SPSS and AMOS software.

Special Question 1: What are the dimensions of the model for improving physiological performance of human resources based on the biorhythm cycle in educational-therapeutic centers?

To determine whether the size of the sample and the relationship between variables were suitable for factor analysis, the Kaiser-Meyer-Olkin (KMO) test for sampling adequacy and the Bartlett's test of sphericity were utilized. The KMO index, which examines the minor correlation between variables, was 0.798, 0.841, 0.852, 0.845, and 0.853 for the causal, contextual, interventional, strategic, and outcome conditions, respectively, with the significance level of the Bartlett's test being 0.0009. Therefore, in addition to sample adequacy, factor analysis based on the studied correlation matrix was justified. The research model was examined using second-order confirmatory factor analysis, with the results presented in Table 2 as follows:

Table 1. Second-order factor analysis of the explanatory dimensions of the research paradigm model

Work conditions	Standard coefficients	Values	P-Value	Results
Demographic characteristics	0.78	369.5	0.0009	Significant

[DOI: 10.61186/ijes.6.3.74]

Individual conditions	0.72	447.6	0.0009	Significant
Organizational structure	0.42	155.5	0.0009	Significant
Motivation of managers and employees	0.61	958.5	0.0009	Significant
Moral intelligence	0.53	463.5	0.0009	Significant
Culturebuilding	0.71	964.6	0.0009	Significant
Interaction and teamwork	0.58	726.6	0.0009	Significant
Organizational and nonorganizational challenges	0.76	443.7	0.0009	Significant
Education and awarenessraising	0.85	724.9	0.0009	Significant
Planning based on circadian rhythm cycles	0.55	117.5	0.0009	Significant
Performance management	0.58	117.5	0.0009	Significant
Improvement of job performance	0.56	204.5	0.0009	Significant
Improvement of physiological performance of human resources	0.58	920.6	0.0009	Significant
Improvement of organizational performance	0.87	822.7	0.0009	Significant
Work conditions	0.46	887.5	0.0009	Significant

From the perspective of the samples, the sixteen-dimensional exploratory model as constructs of the model significantly influenced the explanation of the model for improving physiological performance of human resources based on the biorhythm cycle in educational-therapeutic centers. To prioritize the model-defining dimensions, considering the standardized coefficients of the second-order factor analysis, the dimension of "Improving Physiological Performance of Human Resources" was prioritized first, with the dimension of "Individual Conditions" being the final priority.

Special Question Two: How are the relationships between the dimensions of the model for improving the physiological performance of human resources, based on the biorhythm cycle in educational-medical centers?

To investigate the second research question, path analysis in the research model was utilized to examine the relationships between the dimensions of improving the physiological performance of human resources, based on the biorhythm cycle in educational-medical centers. Figure (2) displays the effects and relationships between each dimension of the model in terms of standardized coefficients.

[DOI: 10.61186/ijes.6.3.74]

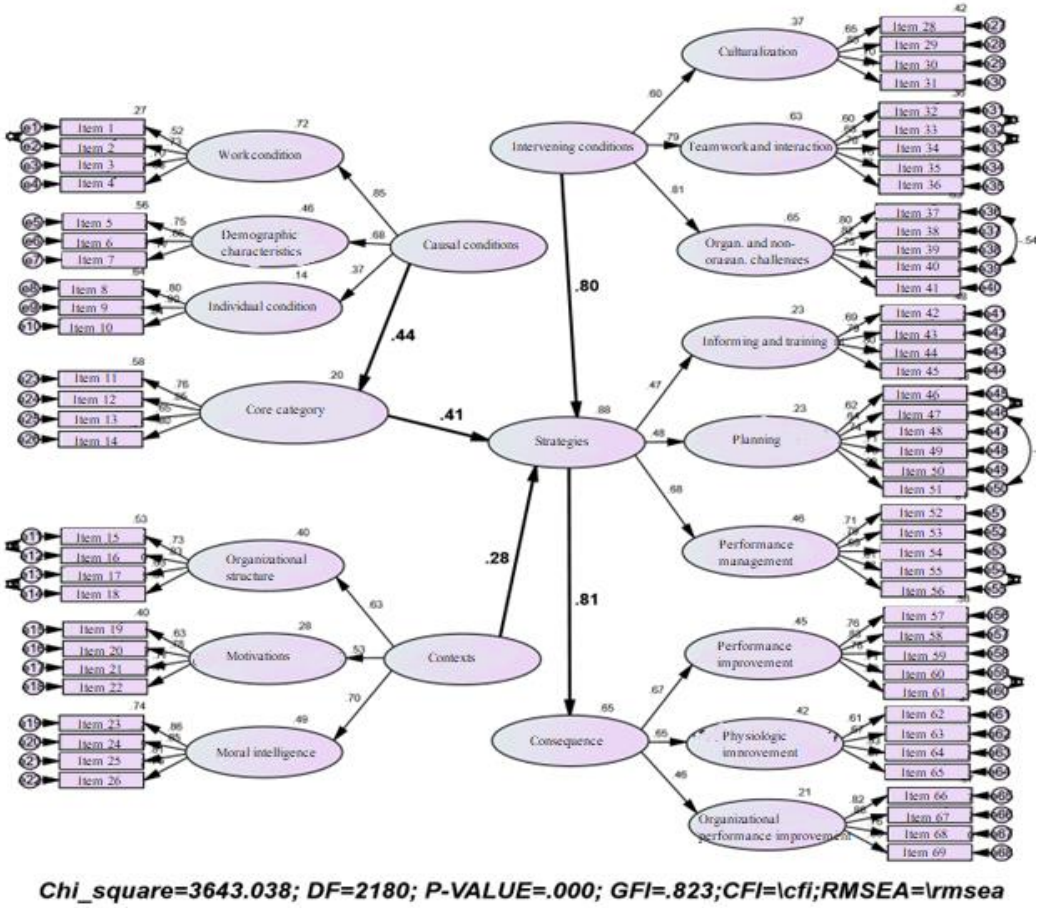

Figure 2. Paradigm model of study with standard coefficients

Table 3. Path analysis of paradigm model

Path	Standard coefficient	t	P-Value	Results
Causal conditions affecting the main category	0.44	048.4	0.0009	Significant
Main category on strategies (solutions)	0.41	468.4	0.0009	Significant
Background conditions on strategies (solutions)	0.28	911.2	004.0	Significant
Intervening conditions on strategies (solutions)	0.80	599.4	0.0009	Significant
Strategies (solutions) on results (consequences)	0.81	801.4	0.0009	Significant

Special Question Three: How are the dimensions of the model for improving the physiological performance of human resources, based on the biorhythm cycle in educational-medical centers, prioritized?

Considering that the confirmatory factor analysis in the second order was utilized to prioritize each of the explanatory dimensions of the model, this section conducted the prioritization using the Friedman test. The highest priority in terms of function related to intervention conditions with an average rank of 4.10, the second priority related to outcomes with an average rank of 3.70, the third priority related to strategy (solutions) with an average rank of 3.58, the fourth priority related to contextual conditions with an average rank of 3.41, the fifth priority related to causal conditions with an average rank of 3.14, and the lowest priority in terms of function related to the main category (human resources biorhythm cycle) with an average rank of 3.06. In causal conditions, the highest priority in terms of function related to the component of

[DOI: 10.61186/ijes.6.3.74]

working conditions with an average rank of 2.25, and the lowest priority related to demographic characteristics with an average rank of 1.80. In contextual conditions, the highest priority in terms of function related to the component of organizational structure with an average rank of 2.26, and the lowest priority related to the motivation of managers and employees with an average rank of 1.84. In intervention conditions, the highest priority in terms of function related to the component of interaction and teamwork with an average rank of 2.25, and the lowest priority related to the component of organizational and non-organizational challenges with an average rank of 1.85. In strategies, the highest priority in terms of function related to the component of performance management with an average rank of 2.35, and the lowest priority related to the component of training and awareness with an average rank of 1.66. In outcomes, the highest priority in terms of function related to the component of organizational performance improvement with an average rank of 2.46, and the lowest priority related to the component of job performance improvement with an average rank of 1.57.

4. Conclusion

The current research aimed to model the improvement of physiological performance of human resources based on the biorhythm cycle in educational-medical centers, answering research questions through qualitative and quantitative methods. According to the qualitative results, the paradigmatic model of the research had sixteen dimensions, and based on the quantitative results, the dimensions of working conditions (path coefficient 0.78, t-values 5.369, and p-value 0.0009), demographic characteristics (0.72, 6.447, and 0.0009), individual conditions (0.42, 5.155, and 0.0009), organizational structure (0.61, 5.958, and 0.0009), motivation of managers and employees (0.53, 5.463, and 0.0009), ethical intelligence (0.71, 6.964, and 0.0009), culture building (0.58, 6.726, and 0.0009), interaction and teamwork (0.76, 7.443, and 0.0009), organizational and non-organizational challenges (0.85, 9.724, and 0.0009), training and awareness (0.55, 5.117, and 0.0009), biorhythm cycle-based planning (0.58, 5.117, and 0.0009), performance management (0.56, 5.204, and 0.0009), job performance improvement (0.58, 6.920, and 0.0009), physiological performance improvement of human resources (0.87, 7.822, and 0.0009), and organizational performance improvement (0.46, 5.887, and 0.0009), are the explanatory dimensions of the model for improving physiological performance of human resources, based on the biorhythm cycle in educational-medical centers. The research findings by Mahdavi et al. (2020), indicate unsuitability of some bodily compositions, poor physical readiness, and a mismatch between individual capabilities and job requirements. The mentioned research pointed out that physiological performance of individuals is affected by working conditions and personal and individual circumstances. The dimensions "working conditions" and "individual conditions" were explanatory of the causal conditions of the present research model. Hence, the outcome derived from the explanatory power of these two dimensions in the model aligns with the results of the research by Mehrali and Mirghafouri. The research findings by Shekari and Kargarbideh (2019) suggest the potential impact of biorhythm as a source of different behaviors on the interactive relationships of employees, the selection of the correct leadership style in the organization, and the effectiveness and growth and excellence of the organization. The dimension "interaction and teamwork" explains the intervention conditions, and the dimensions "job performance improvement" and "organizational performance improvement" explain the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of these three dimensions in the model aligns with the results of the research by Shekari and Kargarbideh. The research findings by Taheri et al. (2018) showed that the static and dynamic balance of the elderly significantly improved after the research intervention. On the other hand, indicators related to selective attention, comprising the average reaction time and the appropriate response to the applied stimuli, significantly positively changed. The dimension "physiological performance improvement of human resources" explains the outcomes (consequences) of the present research model. Therefore, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Taheri et al. The research findings by Rahavi Azabadi, Abbasi

[DOI: 10.61186/ijes.6.3.74]

Bafghi, and Biareh (2017) demonstrated that biorhythm feedback in a cognitive context affected agility in athletes and non-athletes, and individuals' agility performance improved. The dimension "physiological performance improvement" explains the outcomes (consequences) of the current research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Rahavi Azabadi, Abbasi Bafghi, and Biareh. The research findings by Nikmaram et al. (2016) indicated that the management of the biorhythm cycle significantly affected the work relationships of the employees. The dimension "interaction and teamwork" explains the causal conditions of the present research model. Therefore, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Nikmaram et al. According to the research results by Mirmozafari and Rahmati Noodeh (2015), a close relationship was observed between proximity to critical days in each of the biorhythm cycles and the quality of employees' performance, and the biorhythm cycles affected the quality of performance. The dimensions "job performance improvement" and "organizational performance improvement" explain the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of these two dimensions in the model is consistent with the results of the research by Mirmozafari and Rahmati Noodeh. According to the research results by Darabpour (2015), managers can defer their decision-making to times when their mental cycle is in a positive area and the memory and mental ability for analysis are at their highest. The dimension "biorhythm cycle-based planning" explains the strategy (solution) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Darabpour. The research findings by Saken-Azari, Hashemian, and Sharifi (2014) showed that education under high cognitive biorhythm conditions led to an increase in creative thinking, critical thinking, scientific thinking, and self-efficacy, enhancing various dimensions of thinking and self-efficacy, while different cognitive biorhythms (positive and negative) moderated this effect. The dimension "job performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Saken-Azari, Hashemian, and Sharifi. According to the research results by Kiani (2014), the influence of general biorhythm, the physical cycle, and the mental cycle on the occurrence of violations was confirmed. The dimension "culture building" explains the intervention conditions, and the dimension "job performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of these two dimensions in the model is consistent with the results of the research by Kiani. According to the research results by Hesami and Ghadam Kheir (2013), the average level of employee satisfaction when the biorhythm cycles were high was compared to when the biorhythm cycles were low, and a significant difference between them was observed, indicating that the highest level of performance was related to the days when the three biorhythm cycles were on average better and higher than on other days. The dimension "individual conditions" explains the causal conditions, and the dimension "job performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of these two dimensions in the model is consistent with the results of the research by Hesami and Ghadam Kheir. According to the research results by Shabani-Bahar, Samadi, and Momeni-Piri (2013), different positions of the cognitive and sensory cycles could affect the performance of athletes. Therefore, attention to the different positions of the cognitive and sensory biorhythm cycles can help coaches better design training and select athletes for participation in sensitive competitions. The dimension "physiological performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Shabani-Bahar, Samadi, and Momeni-Piri. According to the research results by Sabaghi-Nadoush (2013), biorhythm variables from biorhythm software were influential on the dependent variable of performance. The dimension "job performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with

[DOI: 10.61186/ijes.6.3.74]

the results of the research by Sabaghi-Nadoush. The research findings by Momeni-Piri (2012) showed that there is a significant relationship between the performance of athletes and the physical, cognitive, and sensory cycles. The dimension "physiological performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Momeni-Piri. The research findings by Saeidi and Alami-Mehr (2011) indicated the undeniable impact of biorhythm on the occurrence of work accidents. The dimension "organizational and non-organizational challenges" explains the intervention conditions of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Saeidi and Alami-Mehr. Zakarian et al. (2011) concluded that in physical activities, the frequency of accidents in the negative part and on the critical days of the physical cycle, when the individual is not physically prepared to perform heavy physical work, was higher than expected. The dimension "job performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Zakarian et al. The research findings by Afjei and Jabari (2011) showed the relationship between physical, cognitive, and intuitive rhythms with academic performance. The dimension "job performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Afjei and Jabari. According to the research results by Rabiei and Khatami-Now (2010), by recognizing the cognitive, physical, and spiritual aspects of a person, one can effectively increase the level of job satisfaction of individuals, and this matter is of greater importance in sensitive and complex jobs. The dimension "individual conditions" explains the causal conditions of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Rabiei and Khatami-Now. The research findings by Piri-Zadeh and Hemati (2010) showed that being aware of the status of physical, emotional, and perceptive energy levels can help increase an individual's productivity. Furthermore, biorhythm knowledge can be used to increase personal productivity and efficiency. The dimension "job performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Piri-Zadeh and Hemati. The research findings by Hosseini and Mahdizadeh-Ashrafi (2009) showed that the highest level of students' grades related to times when the mental cycle of students alone or along with other cycles was above the zero line. The dimension "job performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Hosseini and Mahdizadeh-Ashrafi. Iyer and Sukumaran (2021) in their research on the circadian biorhythm rhythm and its impact on physiology, assessed this effect to be significant among patients. The dimension "physiological performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Iyer and Sukumaran. According to the research results by Moldovan et al. (2017) regarding the impact of human biorhythm on sports performance activities, individuals in the positive stages had a considerable advantage over those who were in the negative periods of the three cycles. The dimension "physiological performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Moldovan et al. The research findings by M. Dalenbay, Sikova, Slivukina, and Kudashov (2014) regarding the impact of biorhythms on sports performance, clarified the influence of multiple rhythms on the outcomes of competitions and had a positive relationship with cognitive rhythm and a negative relationship with physical rhythm, which should be included in the training and competition of athletes. The dimension "physiological performance improvement" explains the outcomes (consequences) of the present research model. Thus, the

[DOI: 10.61186/ijes.6.3.74]

outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by M. Dalenbay and colleagues. The study by Milik et al. (2014) regarding the success of school employees, biorhythm, and sleepiness, showed that employees who start school in the early hours also have early chronotypes, which may be the result of adaptation to an earlier school start time. The dimension "job performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Milik et al. The research findings by Sin and Sharma (2011) regarding the impact of biorhythm cycles on labor accidents, showed that the incidents under review included all injuries related to the skeletal system, disorders and amputation of body parts, treatment or hospitalization that required long-term treatment were related to the biorhythms of the individuals. The dimension "performance management" explains the strategy (solution) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Sin and Sharma. The research findings by Stanko (2009) in a study on the relationship between biorhythm cycles and sports performance, showed a significant relationship between performance and biorhythm cycles. The dimension "physiological performance improvement" explains the outcomes (consequences) of the present research model. Thus, the outcome derived from the explanatory power of the mentioned dimension in the model is consistent with the results of the research by Stanko. Based on the obtained data and with reference to the results of the research questions, the following recommendations are presented:

A- Strengthening the causal conditions of the model for improving physiological performance of human resources, based on the biorhythm cycle: Considering the difficulty of work and having sensitive jobs related to public health by hospital managers. Providing sufficient rest time to nurses and staff after long working hours in emergencies. Having rotating shifts aligned with fairness and hospital's codified instructions. Considering the age and gender of nurses and staff in assigning tasks and fulfilling the desires of department managers.

B- Strengthening the environmental conditions of the model for improving physiological performance of human resources, based on the biorhythm cycle: The existence of an organizational structure (formality, complexity, and centralization) consistent with organizational goals. Clear and codified framework of relationships and responsibilities of each of the units, departments, and managers in the hospital. Specialization in the hospital, division of labor, and the number of levels in the organizational hierarchy within the hospital body. Formality and high reliance of managers on laws, regulations, guidelines, and job descriptions, and avoiding law evasion.

C- Strengthening the intervention conditions of the model for improving physiological performance of human resources, based on the biorhythm cycle: Enhancing the culture of changeability and transformation among nurses and staff of different hospital units. Creating a culture of attention to the biorhythm cycle among managers and high-ranking officials of the organization through specialized training courses. Establishing a learning culture among nurses and staff of different hospital units through specialized training courses appropriate for the duties of different units. Involving staff and nurses in drawing a clear vision and common goals of the hospital by seeking their opinion.

D- Strengthening the strategies (solutions) of the model for improving physiological performance of human resources, based on the biorhythm cycle: Organizing training classes and seminars related to the biorhythm cycle and regular participation of the hospital management team in scientific conferences related to physiological performance and the biorhythm cycle. Training and empowering employees, advancement, and development through scientific research and turning the hospital environment into a knowledge-based setting. Seasonal assessment of the readiness and capacity of employees and nurses for employing the biorhythm cycle in the hospital. Aligning the strategies related to biological performance based on the biorhythm cycle with the overall strategies of the hospital. Forming multi-task groups for coordination of different sections in the hospital environment for planning based on the biorhythm cycle.

[DOI: 10.61186/ijes.6.3.74]

Finally, considering the results obtained from the qualitative and quantitative phases of the research, the final model for improving physiological performance of human resources, based on the biorhythm cycle in educational-medical centers, is presented as follows:

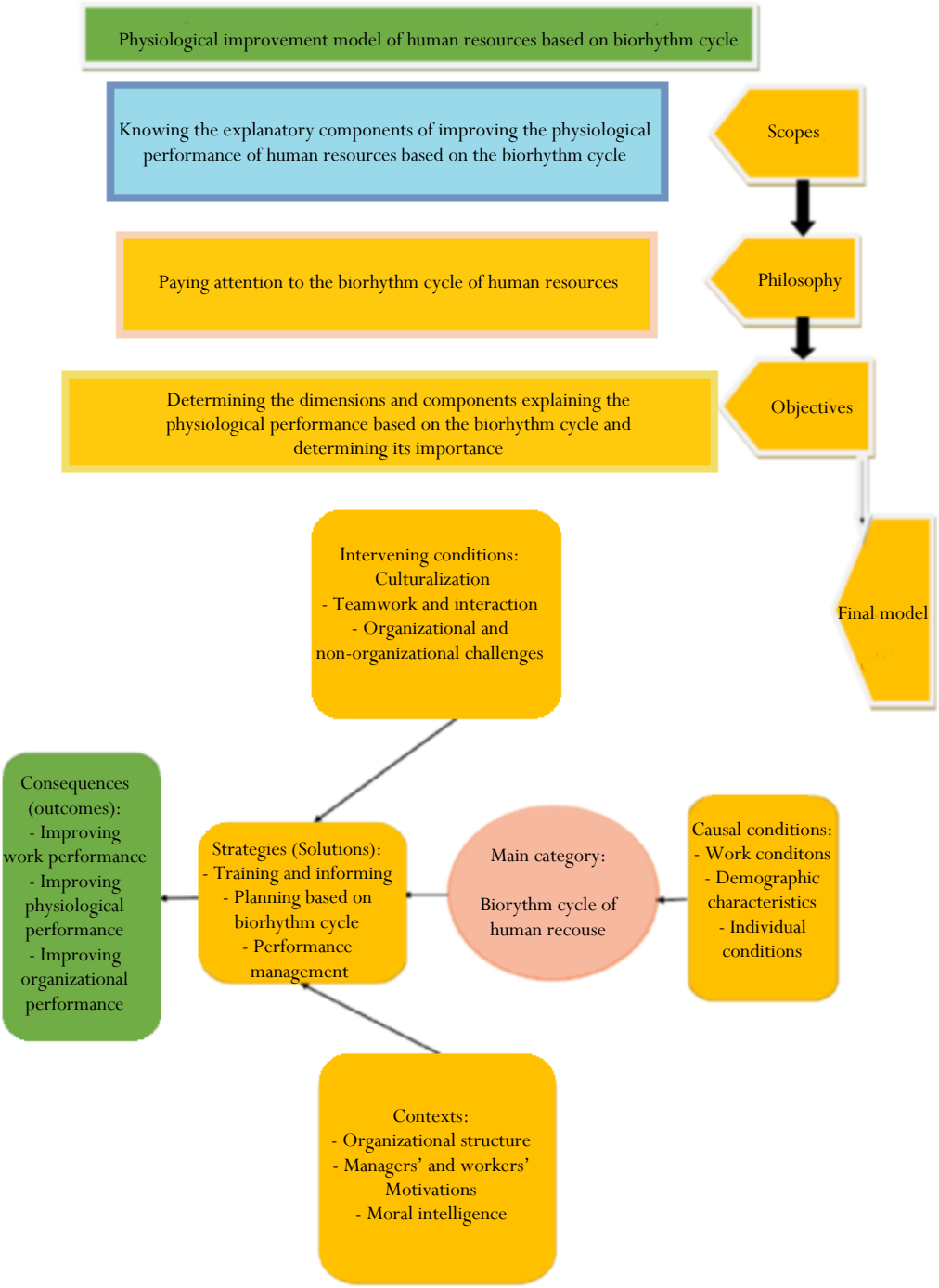

Figure 3. Pradigm model of study

Ethical Considerations

In this study, all ethical standards, including honesty in reporting findings, were observed.

[DOI: 10.61186/ijes.6.3.74]

Acknowledgments
We would like to express our gratitude and appreciation to all those who contributed to this research.

Authors' Contributions
All authors have made equal contributions to this study.

Conflict of Interest
There was no conflict of interest in the present study.

References
Afjeh, A. A., & Jabbari, R. (2011). The relationship between human circadian rhythms and academic performance of government management students (case study: Azad Islamic University of Science and Research Branch). Management Research Journal, 92 and 93(2011), 55-37.

Ayyar V. S, Sukumaran S. (2021). Circadian rhythms: influence on physiology, pharmacology, and therapeutic interventions. Journal of Pharmacokinetics and Pharmacodynamics. 48 (2021). 321–338.

Balducci, C., Avanzi, L., Consiglio, C., Fraccaroli, F., & Schaufeli, W. (2017). A Cross-National Study on the Psychometric Quality of the Italian Version of the Dutch Work Addiction Scale (DUWAS). *European Journal of Psychological Assessment*. 33(6). 422-428.

Darabpour, A. (2015). Biorhythm management and decision-making. International Conference on New Directions in Management, Economics, and Accounting, Tabriz, East Azerbaijan Industrial Management Organization.

Hossami, I., & Ghodamkhir, V. (2013). Investigating the relationship between biological rhythms and employee satisfaction (case study: Pasargad Bank). Second National Conference on Strategies for Improving Management, Accounting, and Industrial Engineering, Tehran.

Hosseini, S. M., & Mahdizadeh Ashrafi, A. (2010). Biorhythm and academic performance (case study: Islamic Azad University of Firuzkuh students). Management Quarterly, 6(13), 76-70.

Kanikowska D, Sato M, Witowski J. (2015). Contribution of daily and seasonal biorhythms to obesity in humans. *International Journal of Biometeorology*. 59(4). 377-84.

Kiani, M. (2014). Investigating the effect of biorhythm on administrative violations of Ministry of Agriculture employees. Master's thesis, Islamic Azad University Central Tehran Branch, Faculty of Management, Department of Government Management.

M. Daulenbaev, S. Syzdykova, N. Slivkina and E. Kudashov. (2014). Impact of biorhythms to athletic performance of kickboxer's high skills (706.23), *FASEB Journal*. 28(1).

Mahdavi, N., Zarei, M., Keshvari, N., Mohammadi, Y., Zarei, M., & Heydari Moghadam, R. (2020). Investigating the physiological compatibility of staff in facilities, services and regulations with their occupations. Ergonomy Journal, 8(1), 55-42.

Milić A, Kvolik A, Ivković M. B. Č. A. , Labak I; Benšić M. I. V. ,Ništ M. ,Zibar L, Marija H. (2014). Are There Differences in Students' School Success, Biorhythm, and Daytime Sleepiness Depending on Their School Starting Times?, *Collegium antropologicum*, 38(3). 889-894.

Mirmoezafari, S., & Rahmati Nodehi, R. (2015). The relationship between biorhythms and organizational performance among employees: Case study of Pars Petrochemical Company. In Proceedings of the 2nd National Conference and 1st International Conference on New Research in Humanities (pp. 1-8). Tehran: Ideh-Pardazan Paytakht Vira Institute.

Moldovan, E., Enoiu, R. S., Ruxanda, R. A., & Leibovici, A. (2017). The influence of the human biorhythm in the performance sport activity. *Gymnasium*. 12(1). 2344-5645.

Momeni Piri, S. (2013). The relationship between biorhythm and athletic performance of individual athletes in Hamedan province. Master's thesis, Abou Ali Sina University, Faculty of Literature and Humanities, Physical Education and Sports Science Department.

Nikmaram, S., Akhghari, H., & Najafzadeh, H. (2016). Management of biorhythms and their impact on interpersonal relationships and employees in the East Azerbaijan Water and Sewage Company. In Proceedings of the 1st

[DOI: 10.61186/ijes.6.3.74]

International Conference on New Paradigms of Business and Organizational Intelligence Management (pp. 1-10). Tehran: Shahid Beheshti University.

Pirizadeh, B., & Hemmati, H. (2010). Understanding life rhythms and their impact on the success of entrepreneurs. First International Conference on Management and Innovation, Shiraz.

Rabiei, A., & Khatami Nou, F. (2010). Investigating the relationship between biorhythm and job satisfaction of employees (case study: Nargan Company). Fourteenth International Oil, Gas and Petrochemical Congress, Tehran.

Radu, C. C., Larisa, H., Casandra, M. R., Codrin, R., & Dan, P. D. (2017). Biorhythm and the prediction of suicide behavior in Bihor county. Analele Universităţii din Oradea, Fascicula: Ecotoxicologie, Zootehnie şi Tehnologii de Industrie Alimentară. 16(2017). 397-402.

Rahavi Azaad, R., Abbasi Bafghi, H., & Biareh, F. (2017). The effect of cognitive biorhythm feedback training on the motor performance of athlete and non-athlete students. Motor Learning & Sports, 9(3), 477-492.

Sabaghindoust, M. I. (2013). Investigating the effect of biorhythms on employee performance (case study: Mellat Bank, Tehran six city region). Master's thesis, Islamic Azad University Central Tehran Branch, Faculty of Management and Accounting.

Saedi, P., & Alami Mehr, F. (2014). Investigating the effect of biorhythm physical cycles on work accidents. First National Conference on the Role of Management and Accounting in the New World of Business, Economics, and Culture, Aliabad Katoul, Islamic Azad University Aliabad Katoul.

Saken Azari, R., Hashemian, K., & Hassan Pasha Sharifi, H. (2014). The effect of innovative problem-solving skills training on creative thinking, critical thinking, scientific thinking, and self-efficacy of humanities students at Tabriz Islamic Azad University under different cognitive biorhythm conditions. Educational and Assessment Journal, 7(27), 7-22.

Shakari, H., & Kargar Bideh, E. (2019). Biorhythm and its importance in organizational management and employee interactions. Fifth International Conference on Management and Accounting Sciences, Tehran.

Shimazu, A., Schaufeli, W. B., Kamiyama, K., & Kawakami, N. (2015). Biorhythm Management vs. work engagement: the two different predictors of future well-being and performance. International journal of behavioral medicine. 22(1). 18-23.

Shirazian, Z. (2016). Investigating the relationship between shareholder biorhythms and financial decision-making errors in the Tehran Stock Exchange. Financial Knowledge Journal, 9(32), 51-66.

Shojaei Bahar, G., & Moghaddam Piri, S. (2012). Determining the relationship between biorhythm (physical cycle) and athletic performance of individual athletes in Hamedan province. Sports Physiology and Management Research, 11(2012), 47-57.

Singh, R., & Sharma, R. (2011). The influence of "biorhythm" on the incidence of injuries among Agra foundry workers. *International Journal of Bioinformatics Research*. 3(2). 236-240.

Stancu M. (2009). Bio-periodicity and its influence on the football results obtained by the student teams during the "university spring" sport competition. *Journal of Physical Education and Sport* 25(4). 115-118.

Su L. (2020). Motion Analysis of Human Biorhythm Based on Cosine Model. *published in Izvestiya Vysshikh Uchebnykh Zavedenii, Radioelektronika*. 63(6). 357-367.

Taheri, M., Irandoost, Kh., Soghalami, A. N. M., & Rezaei, M. (2018). The effect of yoga training on the circadian biorhythm theory, balance, and selective attention of elderly women. Elderly Journal, 13(3), 312-323.

Talaei Zavareh, H. (2010). Manager and life rhythm in school. Management Growth in Schools Journal, 9(5), 11-18.

Zakeryan, S. A., Fororesh, E., Noran, A., Mohammad, H., & Habibi Marz, M. (2011). Ergonomic study of the effect of biological rhythms on human errors and traffic accidents. Health and Safety at Work Journal, 1(2), 39-44.

[DOI: 10.61186/ijes.6.3.74]