

Talent Identification for Competitive Yoga: Multiple Regression Analysis Approach

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DOI: <https://doi.org/10.51583/IJLTEMAS.2025.1408000044>

Abstract: This paper explores the relationship between anthropometric, physical, and physiological variables and competitive yoga performance. The study involved 25 yoga players aged 10 to

15 from the Delhi-NCR region. The findings indicate a substantial positive association between flexibility and yoga performance, while an insignificant link was observed between sit-ups, push-ups, balance, and yoga performance. The regression equation derived for the study was as follows: Yoga Performance = $29.157 + 1.075 (\text{Flexibility}) - 0.856 (\text{Fat}\%) +$

$1.120 (\text{Respiratory rate})$. The reliability of the regression equation is supported by the R^2 value of 0.647. Therefore, it might be concluded that the variables Flexibility, Fat %, and Respiratory rate significantly explain the variation in the Yoga performance. This study provides valuable insights into the physical aspects of yoga and its impact on performance, which can be useful for athletes and yoga practitioners alike.

Keywords: Competitive Yoga, Anthropometric, Physical, Physiological Predication and Multiple Regression

Introduction

Yoga holds great importance in our lives, as it encompasses physical, mental, emotional, and psychological aspects. It helps to increase strength, endurance, flexibility, balance, and motor coordination. Furthermore, yoga practitioners experience increased energy, vitality, and balanced emotions through a heightened sense of mind-body awareness. Incorporating yoga into our daily routine can have profound effects on our overall well-being (Jamplis, 2015). In addition to its physical activity and yoga also has a profound impact on our immunity. (Kumar

& Jhajharia, 2018). Yoga is not just a physical practice but a holistic approach to achieving balance and harmony in life. It delves deep into the connections between the body, mind, and spirit, and encourages individuals to cultivate mindfulness and self-awareness. Through the practice of various yoga asanas (poses) and pranayama (breathing techniques), individuals can attain a deeper understanding of their physical and mental state, leading to a sense of inner calm and tranquillity. (Falkenberg et al., 2018)

The spiritual dimension of yoga also plays a significant role in guiding individuals towards a more meaningful and purposeful existence. Through practices such as meditation and introspection, individuals can explore their inner selves and connect with a higher sense of purpose, leading to a greater sense of fulfilment and contentment in life. (Arora & Bhattacharjee, 2008) Overall, yoga is a multifaceted practice that promotes physical health, mental well-being, emotional balance, and spiritual growth. Yoga has also been found to have a positive impact on stress reduction and mental clarity. The mindfulness and breathing techniques incorporated in yoga practice can help individuals manage stress, anxiety, and even symptoms of depression. By cultivating a calm and focused mind through meditation and relaxation, practitioners can experience a greater sense of mental clarity and emotional resilience. Additionally, the philosophy of yoga encourages individuals to lead a more mindful and conscious lifestyle. This includes making healthy dietary choices, practicing kindness and compassion towards others, and fostering a deeper connection with the natural environment. As a result, yoga not only benefits the individual but also contributes to a greater sense of social and environmental responsibility. Furthermore, the holistic approach of yoga extends to the physical body by promoting inner healing and self-care. Through the practice of restorative yoga and deep relaxation techniques, individuals can facilitate the body's natural ability to heal and rejuvenate, leading to a sense of overall wellness and vitality. Moreover, the benefits of yoga extend beyond the individual level and often have ripple effects on the surrounding environment and relationships. By fostering a sense of compassion, empathy, and understanding, yoga practitioners often find themselves better equipped to deal with the challenges of everyday life and to navigate relationships with a greater sense of clarity and equanimity. (Gopal et al., 2011)

In conclusion, the practice of yoga offers a comprehensive and transformative approach to enhancing the quality of life. Its influence encompasses physical, mental, emotional, and spiritual dimensions, providing a path to holistic well-being and personal growth. By embracing the multifaceted benefits of yoga, individuals can cultivate a harmonious and fulfilling life that radiates positivity and mindfulness, both within themselves and in their interactions with the world around them.

The athletic event of Yogasana focuses on the physical aspects of yoga, with participants practicing yogic postures. Players are evaluated based on the difficulty of their positions, coordination, control, adaptability and endurance. Different from Yoga

which emphasizes the psychological and spiritual elements of the practice. Yogasana contests have a long history, but its current structure was developed in 1989 when the first World Yogasana Championship was held in Pondicherry, India. Recently approved by the Ministry of Youth Affairs and Sports of Indian government as a recognized competitive sport during an event attended by Shripad Yesso Naik - Minister AYUSH and Kiren Rijiju - Minister for Youth Affairs and Sports.

The concept posits that initial yoga tournaments similar to present-day iterations took place approximately two centuries ago. The introduction to Western countries can be attributed to Swami Vivekananda around 1890s. Bureau et al.'s study focused on promotion and visibility across North America and Europe. The Yoga Federation in India was established in 1974; it gained recognition from Indian Olympic Association between October 1998 to February 2011. Since its establishment in 1991, yoga has been part different sporting events such as all-India inter-university games starting particularly from year 2000 including Khelo India University Games, National school games etc. Multiple regression is used not only within sports settings like determining correlation between performance measures and predicting performance, but also other disciplines due mathematical complexity involved where relationships among multiple variables are being examined. The primary aims of this study were to firstly, to ascertain correlation between yogic performance and certain measures of anthropometric, physical, and physiological variable and secondly, to develop a multiple regression model for the purpose of predicting yogic performance.

Materials and Methods

Selection of subjects

The study involved the selection of 25 yoga players aged 10 to 15 from the Delhi-NCR region.

Selection of variables

In this study, anthropometric, physical, and physiological variables (ref. table no. 1) were selected as the independent variables while yogic performance served as the dependent variable.

Table No. 1 Test and Criterion Measures for the Selected Variables

S. No	Variables	Tools/ Instruments	Unit of measurements
1.	Height	Stadiometer	Centimetres
2.	Body weight	Weighing scale	Kilograms
3.	Fat percentage	Skinfold calliper	Percentage
4.	Blood pressure	Sphygmomanometer	mmHg
5.	Resting heart rate	Radial pulse count	Beats per Minute
6.	Respiratory rate	Abdominal Breathing	Beats per Minute
7.	Breath holding Time	Breath Hold Test	Seconds
8.	Muscular endurance	Push-up test	In numbers
9.	Flexibility	Sit and Reach Test	Centimetres
10.	Balance	Stork Balance Stand Test	Seconds
11.	Yogasna performance	Compulsory and Optional Asana	Points given by Expert

Statistical Analysis

The main aim of the study was to create a model for identifying talent for yoga players based on chosen independent variables. The selected variables' obtained data were statistically evaluated, for each of the chosen variables, the means and standard deviations were computed. Using the Pearson product-moment correlation coefficient, the association between the specified anthropometric, physiological, and physical factors linked to Yogasna's performance was calculated using IBM SPSS version 26. The chosen threshold of significance for this study was established at 0.05.

RESULTS

Descriptive statistic

Table 2 Descriptive statistics for different variables

Variables	Mean	Std. Deviation
Height (cm)	147.2100	12.15830
Body Weight (kg)	38.0760	9.90755
Fat (%)	14.1920	3.84728
Pull-ups (Numbers)	15.3200	6.64524
Sit-ups (Numbers)	15.7500	6.76649
Flexibility (cm)	15.8750	5.98752
Balance (Seconds)	27.7600	10.60981
Resting Heart Rate (Beat/min)	97.8800	10.79401
Respiratory Rate (Beat/Min)	14.2100	2.43001
Breath Holding Time (Second)	31.4500	8.31012
Systolic Blood Pressure(mmHg)	115.4700	11.62934
Diastolic Blood Pressure(mmHg)	70.0700	10.41100
Yogic Performance (Numbers)	59.9900	15.87435

Table 2 displays the descriptive statistics i.e., mean and standard deviation of the selected variables. The table reveals that the mean and standard deviation of selected variable i.e., height was 147.21 ± 12.15 cm. The mean and standard deviation of selected variable i.e., body weight was 38.08 ± 9.91 kg. The mean and standard deviation of selected variable i.e., Fat % was 14.19 ± 3.84 %. The mean and standard deviation of selected variable i.e., Pull-ups was 15.32 ± 6.64 . The mean and standard deviation of selected variable i.e., Sit-ups was 15.75 ± 6.77 . The mean and standard deviation of selected variable i.e., Flexibility was 15.88 ± 5.99 cm. The mean and standard deviation of selected variable i.e., balance was 27.76 ± 10.61 sec. The mean and standard deviation of selected variable i.e., Resting Heart Rate was 97.88 ± 10.79 bpm. The mean and standard deviation of selected variable i.e., Respiratory Rate was 14.21 ± 2.43 bpm. The mean and standard deviation of selected variable i.e., Breath Holding Time was 31.45 ± 8.31 sec. The mean and standard deviation of selected variable i.e., Systolic Blood Pressure was 115.47 ± 11.63 mmHg. The mean and standard deviation of selected variable i.e., Diastolic Blood Pressure was 70.07 ± 10.41 mmHg. The mean and standard deviation of selected variable i.e., Yoga Performance was 59.99 ± 15.87 .

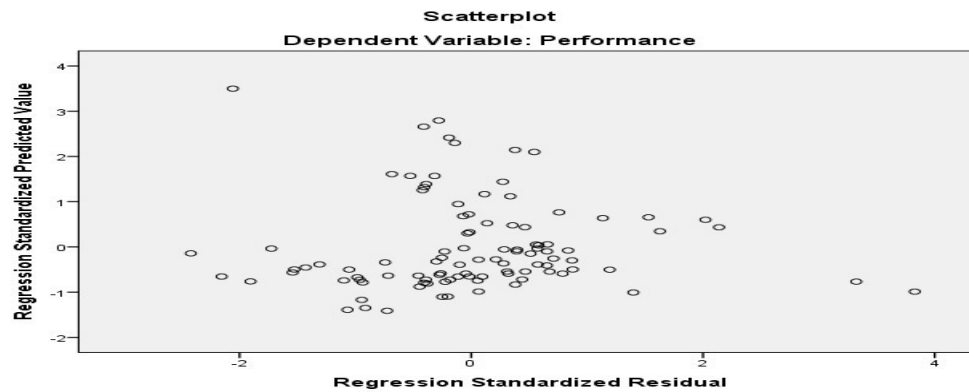
Testing of Assumptions for Multiple Regression Analysis (MRA)

Prior to completing any statistical test, it is important to evaluate the underlying assumptions. The process of testing assumptions of statistical tests enables the determination of whether the conclusion may be accurately derived from the analysis findings. Assumptions are essential prerequisites that must be satisfied prior to doing the ultimate statistical analysis. In order to use multiple regression analysis in this research, it is necessary to assess the assumption of normality. However, given the substantial sample size ($n > 100$) in the present investigation, it is reasonable to assume that the data follows a normal distribution. The other assumptions that were evaluated before to doing multiple regression analysis are as follows:

B. 1 Assumption of linearity

The assumption posits that there must exist a linear connection between the independent and dependent variables. In order to verify this assumption, a scatter plot (Figure 1) was used. The scatter plot exhibits a random distribution of values, seen on both the positive and negative sides. Hence, it may be inferred that they are not adhering to any particular pattern, thereby confirming the fulfilment of this premise.

Fig 1 Scatter Plot



B. 2 Assumption of independent errors

The theory of independent errors posits that each observation should exhibit independence from all other observations. Put otherwise, the knowledge of the value of a single observation should not provide any information on the value of another observation. The Durbin Watson (DW) test is used in order to verify this assumption. The Durbin-Watson test statistic should ideally fall within the range of 0 to 4. The test result of 1.639 fell within the specified range (ref table 4), leading to the assumption that there was no presence of autocorrelation.

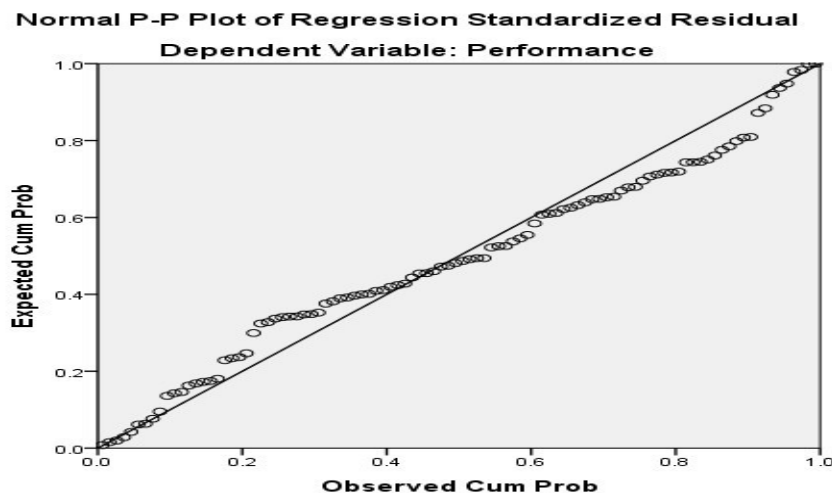
B. 3 Assumption of homoscedasticity

This assumption asserts that the error terms exhibit identical variances throughout the range of values observed for the independent variable. Put differently, the occurrence of the mistake must be randomly distributed and devoid of any discernible pattern. According to the plot (Figure 1), it can be seen that all the error terms were random, therefore implying the assumption of equal error variance.

B. 4 Assumption of normality of errors

The assumption of normality of error states that the errors are normally distributed at every value of the dependent variable and distributed symmetrically (Fig 2).

Fig 2 P-P Plot of regression standardized residual



5 Assumption of No multicollinearity

This assumption state that the independent variables should not show multicollinearity. It occurs when two or more independent variables are highly correlated.

The present study checked multicollinearity using the "variance inflation factor" (VIF). A VIF less than 10 is acceptable. Table 3 indicates that the VIF values for all the independent variables were less than 10; hence, it can be assumed that no multicollinearity existed in the data.

Table 3: Collinearity statistics of all the independent variables

Variable	VIF
Height	1.053
Body Weight	1.033
Fat	1.166
pull-ups	1.273
Sit-ups	1.000
Balance	1.026
Resting Heart Rate (Beat/min)	1.024
Respiratory Rate (Beat/Min)	1.036
Breath Holding Time (Second)	1.004
Systolic Blood Pressure(mmHg)	1.006
Diastolic Blood Pressure(mmHg)	1.002

MRA Results

Table 4: Correlation of selected anthropometric, physiological, and physical variables and Yoga Performance.

Variable		Yoga Performance
Height	Pearson Correlation	.185
	Sig. (2-tailed)	.065
Body Weight	Pearson Correlation	.120
	Sig. (2-tailed)	.234
Fat	Pearson Correlation	-.497 ^{**}
	Sig. (2-tailed)	.000
pull-ups	Pearson Correlation	.366 ^{**}
	Sig. (2-tailed)	.000
Sit-ups	Pearson Correlation	-.023
	Sig. (2-tailed)	.821
Flexibility	Pearson Correlation	.753 ^{**}
	Sig. (2-tailed)	.000
Balance	Pearson Correlation	.109
	Sig. (2-tailed)	.280
Resting Heart Rate	Pearson Correlation	-.123
(Beat/min)	Sig. (2-tailed)	.224
Respiratory Rate	Pearson Correlation	.349 ^{**}
(Beat/Min)	Sig. (2-tailed)	.000
Breath Holding	Pearson Correlation	-.030
Time (Second)	Sig. (2-tailed)	.769

Systolic Blood	Pearson Correlation	.034
Pressure(mmHg)	Sig. (2-tailed)	.736
Diastolic Blood	Pearson Correlation	-.026
Pressure(mmHg)	Sig. (2-tailed)	.799

** . Correlation is significant at the 0.01 level (2-tailed).

Table no 4 displays the correlation between the selected Correlation of selected anthropometric, physiological, and physical variables and Yoga Performance with their significance value. The Yoga performance was significantly correlated with Fat%, Flexibility and Respiratory variables at 0.05 level of significance.

Table 5: Model summary with the values of R and R²

Model	R	R Square	Adjusted R	Std. Error of the Square Estimate	Durbin- Watson
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1	.753 ^a	.567	.563	10.49427	
2	.788 ^b	.621	.613	9.87906	
3	.805 ^c	.647	.636	9.57183	1.639

a. Predictors: (Constant), Flexibility

b. Predictors: (Constant), Flexibility, Fat

c. Predictors: (Constant), Flexibility, Fat, Respiratory Rate (Beat/Min)

d. Dependent Variable: Performance

Table 5 reveals a model summary of regression analysis for selected anthropometric, physiological, and physical variables and Yoga Performance. The R^2 value of model no.1 is 0.567, model no.2 is 0.621. It could be seen from table-4 Third model has three independent variables Flexibility, Fat, Respiratory Rate; thus, for developing the regression equation, the third model was used as it has the maximum value of R^2 . It also reveals that these three independent variables explain 0.647% variation in yoga performance; hence the third model can be used to develop the regression equation.

Table 6 ANOVA Table with F-Values of Models

Model		Sum of Squares	df		Mean Square	F	Sig.
	Regression	14154.781		1	14154.781	128.528	.000 ^b
1	Residual	10792.709		98	110.130		
	Total	24947.490		99			
	Regression	15480.687		2	7740.343	79.310	.000 ^c
2	Residual	9466.803		97	97.596		
	Total	24947.490		99			
	Regression	16151.984		3	5383.995	58.764	.000 ^d
3	Residual	8795.506		96	91.620		
	Total	24947.490		99			

a. Dependent Variable: Performance

b. Predictors: (Constant), Flexibility

c. Predictors: (Constant), Flexibility, Fat

d. Predictors: (Constant), Flexibility, Fat, Respiratory Rate (Beat/Min)

The ANOVA table (Table 6) displays that the F-value for the third model is significant, and it might be concluded that the model was efficient also.

Dependent Variable: Yoga Performance

Table 7 shows the values for unstandardized and standardized regression coefficients. The unstandardized regression coefficient is also called as "B" coefficient, whereas the standardized regression coefficient is also called as "beta" coefficient indicated by " β ." The beta coefficient values are generally used for comparing the contribution of independent variables. In other words, the beta coefficient describes the importance of independent variables regarding their contribution toward throwing velocity, which is the study's dependent variable. For example, the t-values (p values) were significant (<0.05) for all the variables in the third model. Therefore, it might be concluded that the variables Flexibility, Fat %, and Respiratory rate significantly explain the variation in the Yoga performance.

Regression Equation: - The unstandardized regression coefficient (B) of the fifth model shown in Table 6 was used to

develop the regression equation.

Discussion on Findings

The selected subjects for the study had practiced Hatha Yoga and Astang Yoga for more than 3 years which ultimately improves physical fitness. Various researches (Tran MD, Holly RG, Lashbrook J, 2001)(Van Puymbroeck M, Payne LL, 2007) and (Telles S, Dash M, 2009) also reported regular yogic practices improves flexibility levels. The primary objective of yoga is not to achieve hypermobility, but rather to attain a suitable degree of flexibility that facilitates improved utilisation of our muscles during routine tasks. In order to do this, it is important to possess the requisite muscular flexibility to sustain proper posture, namely in the tonic muscles, as well as sufficiently strong muscles responsible for the movement of the body's distal segments, known as phasic muscles. (Schneider W, Spring H, 1992) Typically, the practise of yoga is characterised by a deliberate and methodical execution, inside a closed kinetic chain framework, including particular poses or static postures. This practise may include active stretching, isometric muscular contractions, as well as the cultivation of attention and adherence to precise breathing patterns.(Posadzki P, 2009) The findings from the present research are not surprising, but they do provide a statistical explanation for all of the reasons that laypeople provide for why yoga is effective. According to the findings of the study, the regression equation was developed using flexibility. This indicates that flexibility levels have a significant impact on competitive yoga performance. As you practice yoga for a longer amount of time, your body is encouraged to hold yoga poses for longer periods of time, which allows muscles to go deeper into the stretch. This helps to improve flexibility, which is why doing yoga for a longer period of time is beneficial. (Qian, 2021) reported After 8 weeks of training, the students in the experimental group also gradually improved their heart rate, lung function and other related indicators, especially their vital capacity and maximal oxygen uptake. This shows that yoga for a period of time can improve alveolar tension, strengthen breathing muscles, and effectively improve students' lung function. Because breathing is so crucial to the yoga experience. In yoga, we alternate between these two types of breathing. When breathing in, do so slowly and deeply, and when breathing out, do so subtly and for a prolonged period of time. Do not wait too long or hold your breath. You need to readjust to the laws of physiology gradually. During yoga instruction, students must learn how to control their breathing in tandem with the physical postures and movements being practised. The lungs are able to take in more oxygen if the chest is allowed to completely expand during inhalation. Full chest compression during exhalation allows for greater CO₂ elimination, enhanced lung compliance, decreased bronchial smooth muscle resistance, whole-body mobilisation for enhanced athletic performance, massage of the muscle's own microvessels, enhanced metabolism and gas exchange, and higher vital capacity and oxygen consumption. Yoga has been shown to strengthen the respiratory muscles over time, increase lung reserve capacity, and enhance respiratory function if practised regularly and consistently. (Yadav RK, 2001) reported improved respiratory function after practicing Yoga for more than 3 months and concluded the following reasons for that: The enhanced strength of respiratory muscles resulting from the muscular hypertrophy incurred during yoga and other physical activities. Yogic breathing exercises aim to enhance the efficacy and thoroughness of the respiratory system by improving the use of the diaphragmatic and abdominal muscles, resulting in more efficient emptying and filling of the respiratory apparatus. Studies by (Mane et al., 2014) and (Beutler et al., 2016) also reported continuous yoga practices improved respiratory function values which ultimately explains the presence of breathing rate variable in the equation.

Conclusion

The popularity of competitive yoga is steadily increasing, resulting in heightened expectations for improved performance. The primary objective of this study is to investigate the relationship between anthropometric, physical, and physiological variables and yoga performance. The study's findings indicate a substantial positive association between flexibility and yoga performance, while an insignificant link was observed between sit-ups, push-ups, balance, and yoga performance. The regression equation derived for the study was as follows: $\text{Yoga Performance} = 29.157 + 1.075 (\text{Flexibility}) - 0.856 (\text{Fat}\%) + 1.120 (\text{Respiratory rate})$. The reliability of the regression equation is supported by the R^2 value of 0.647. Therefore, it might be concluded that the variables Flexibility, Fat %, and Respiratory rate significantly explain the variation in the Yoga performance.

References

1. Arora, S., & Bhattacharjee, J. (2008, January 1). Modulation of immune responses in stress by Yoga. *International Journal of Yoga*, 1(2), 45-45. <https://doi.org/10.4103/0973-6131.43541>
2. Beutler, E., Beltrami, F. G., Boutellier, U., & Spengler, C. M. (2016). Effect of regular yoga practice on respiratory regulation and exercise performance. *PLoS ONE*, 11(4), 1-16. <https://doi.org/10.1371/journal.pone.0153159>
3. Falkenberg, R., Eising, C. M., & Peters, M. L. (2018, February 10). Yoga and immune system functioning: a systematic review of randomized controlled trials. *Journal of Behavioral Medicine*, 41(4), 467-482. <https://doi.org/10.1007/s10865-018-9914-y>
4. Gopal, A., Mondal, S., Gandhi, A., Arora, S., & Bhattacharjee, J. (2011, January 1). Effect of integrated yoga practices on immune responses in examination stress - A preliminary study. *International Journal of Yoga*, 4(1), 26-

26. <https://doi.org/10.4103/0973-6131.78178>
5. Jamplis, L. E. (2015, November 30). Stretching One's Limits: The Development of Self-Efficacy in a Senior Yoga Community. <https://scite.ai/reports/10.30958/ajspo.2-4-1>
6. Kumar, A., & Jhajharia, B. (2018, January 1). Effect of morning exercise on immunity. 3(1): 1987- 1989
7. Mane, A., Paul, Cn., & Vedala, S. (2014). Pulmonary functions in yogic and sedentary population. International Journal of Yoga, 7(2), 155. <https://doi.org/10.4103/0973-6131.133904>
8. Posadzki P, P. S. (2009). Yoga and physiotherapy: a speculative review and conceptual synthesis. Chin J Integr Med, 15, 66–72.
9. Qian, Z. (2021). REFLECTIONS OF YOGA PRACTICE ON THE PHYSICAL PERFORMANCE OF OBESE STUDENTS. Rev Bras Med Esporte, 29, 1–4.
10. Schneider W, Spring H, T. T. (1992). Mobility: theory and practice.
11. Telles S, Dash M, N. K. (2009). Effect of yoga on musculoskeletal discomfort and motor functions in professional computer users. Work, 33, 297–306.
12. Tran MD, Holly RG, Lashbrook J, A. E. (2001). Effects of Hatha Yoga Practice on the Health-Related Aspects of Physical Fitness. . . Prev Cardiol, 4, 165-170.
13. Van Puymbroeck M, Payne LL, H. P. (2007). A phase I feasibility study of yoga on the physical health and coping of informal caregivers. Evid Based Complement Alternat Med, 4, 519–529.
14. Yadav RK, D. S. (2001). Effect of yogic practice on pulmonary functions in young females. Indian J Physiol Pharmacol., 45, 493–439.