## A Hybrid Model of Structural Equation Modelling-Artificial Neural Networks: Prediction of Influential Factors on Eating Behaviors

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Abstract : Background: The presence of nonlinearity among the risk factors of eating behavior causes a bias in the prediction models. The accuracy of estimation of eating behaviors risk factors in the primary prevention of obesity has been established. Objective: The aim of this study was to explore the potential of a hybrid model of structural equation modeling (SEM) and Artificial Neural Networks (ANN) to predict eating behaviors. Methods: The Partial Least Square-SEM (PLS-SEM) and a hybrid model (SEM-Artificial Neural Networks (SEM-ANN)) were applied to evaluate the factors affecting eating behavior patterns among university students. 340 university students participated in this study. The PLS-SEM analysis was used to check the effect of emotional eating scale (EES), body shape concern (BSC), and body appreciation scale (BAS) on different categories of eating behavior patterns (EBP). Then, the hybrid model was conducted using multilayer perceptron (MLP) with feedforward network topology. Moreover, Levenberg-Marquardt, which is a supervised learning model, was applied as a learning method for MLP training. The Tangent/sigmoid function was used for the input layer while the linear function applied for the output layer. The coefficient of determination (R<sup>2</sup>) and mean square error (MSE) was calculated. Results: It was proved that the hybrid model was superior to PLS-SEM methods. Using hybrid model, the optimal network happened at MPLP 3-17-8, while the R<sup>2</sup> of the model was increased by 27%, while, the MSE was decreased by 9.6%. Moreover, it was found that which one of these factors have significantly affected on healthy and unhealthy eating behavior patterns. The p-value was reported to be less than 0.01 for most of the paths. Conclusion/Importance: Thus, a hybrid approach could be suggested as a significant methodological contribution from a statistical standpoint, and it can be implemented as software to be able to predict models with the highest accuracy.

Keywords : hybrid model, structural equation modeling, artificial neural networks, eating behavior patterns

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