

A Study on the Effect of Shift Rotation and Nap Time on Nurses' Physiological and Cognitive Performance Indices

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Abstract

The study aims to determine the significant factors that caused the negative impacts in the current shift schedule. This goal was achieved by applying the statistical design of experiment, which involved two phases: the screening stage and the response surface methodology (RSM). The independent factors considered in the screening phase were lighting, music, schedule of break time, schedule of shift rotation and naptime while the dependent variables identified were the scores of the respondents in the Mental Health questionnaire, Swedish Occupational Fatigue Inventory, Memory and Response to Stimuli Test. The screening stage aimed to filter out few important main effects from the many lesser important ones. This revealed that out of the five factors (lighting, music, schedule of break time, shift rotation and nap time), only two factors shift rotation and naptime was found to be significant. The latter phase aimed to determine and quantify the relationship and optimal settings of the factors involved in the study that would eventually yield the best set of response values. The response values refer to the respondents' scores in the mental health, fatigue, memory and response to stimuli. The results of the RSM were analyzed in three ways: analysis of variance (ANOVA), regression analysis and graphical analysis. ANOVA revealed that all models for the four responses are significant. Regression analysis generated different model equations that were appropriated and it showed in the plot vs. predicted that no evident patterns were exhibited, thus were considered reliable predictors of responses. Likewise, the residuals models method demonstrated positive results that there were no biases present in the model equations that suggested its consistency in predicting the responses. Thorough graphical analysis revealed that responses increased whenever the days of shift rotation were increased and the minutes of naptime were decreased. Since for most of the responses (Mental Health, Fatigue and Response to Stimuli) lower responses were more desirable, a shorter shift rotation and longer minutes for naptime were considered more advantageous. The optimal setting was obtained from the generated model from the experimental design, which revealed that the comprehensive solution is given four days for shift rotation and 10 minutes for naptime.