Wilcoxon signed rank test: pre and post workshop analysis.

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**Abstract**

Wilcoxon signed rank test was employed to analyze difference in scores pre and post workshop. A further subset analysis was done for each category of gender to assess gender differences. Analysis was restricted to level of significance. There were no statistically significant differences reported.

**Key words**: score index, Wilcoxon signed rank test.

# 1 Introduction

Focus of this analysis was to assess if there were any statistically significant differences in scoring by participants attending a workshop prior and post attendance. Prior to the workshop, participants scored a list of questions, on how much they agreed with the subject matter. Assigned score ranged between 0-10, 10 indicating highest agreement. After the workshop, participants again scored same set of questions.

Wilcoxon signed rank test allows for paired comparisons when parametric assumptions are not met. For this problem, analysis was restricted to level of significance and wilcox.test from {exactRankTests} package used for analysis setting paired argument to TRUE, and alternative as ‘greater’ - since interest was on assessing improvement in indicators as specified in the problem statement.

# 2 Results

There were N = 27 in the pre workshop data and N = 24 in the post workshop test. Three observations never reported data in the post workshop set and were dropped as paired test require exact length of data. Of the N = 24, females were the minority group, with n = 8 accounting for 0.33 percent.

Results from the paired Wilcoxon signed rank test are presented in table @ref{tab:res}. There were no significant difference at 95% level of significance. A subset analysis for each gender category did not report any significant differences. Tables @ref{tab: males} and @ref{tab: females} report estimates for males and females participants respectively.

Table 2.1: Wilcoxon signed rank test results

| variable | statistic | p value |
| --- | --- | --- |
| art\_based\_activities\_promote | 45.5 | 0.3134766 |
| improve\_creativity | 63.5 | 0.1120605 |
| improve\_literacy | 64.0 | 0.2465210 |
| languages\_humanity\_subjects | 60.0 | 0.1674805 |
| mental\_wellbeing | 64.5 | 0.0972900 |
| reading | 80.5 | 0.2609558 |
| science\_subjects | 68.0 | 0.6565475 |
| student\_mental\_wellbeing | 61.0 | 0.1491699 |
| teacher\_mental\_wellbeing | 30.0 | 0.4121094 |
| teaching | 60.0 | 0.1579590 |

Table 2.2: Wilcoxon signed rank test results - males

| variable | statistic | p value |
| --- | --- | --- |
| art\_based\_activities\_promote | 21.5 | 0.3632812 |
| improve\_creativity | 22.0 | 0.3359375 |
| improve\_literacy | 17.5 | 0.5703125 |
| languages\_humanity\_subjects | 22.5 | 0.2929688 |
| mental\_wellbeing | 24.0 | 0.2304688 |
| reading | 41.5 | 0.2387695 |
| science\_subjects | 24.5 | 0.9373779 |
| student\_mental\_wellbeing | 33.0 | 0.3212891 |
| teacher\_mental\_wellbeing | 7.5 | 0.5625000 |
| teaching | 19.0 | 0.4804688 |

Table 2.3: Wilcoxon signed rank test results- females

| variable | statistic | p value |
| --- | --- | --- |
| art\_based\_activities\_promote | 3.0 | 0.6250 |
| improve\_creativity | 6.0 | 0.1250 |
| improve\_literacy | 8.5 | 0.1875 |
| languages\_humanity\_subjects | 8.0 | 0.2500 |
| mental\_wellbeing | 6.0 | 0.1250 |
| reading | 4.5 | 0.6250 |
| science\_subjects | 5.0 | 0.2500 |
| student\_mental\_wellbeing | 8.5 | 0.1875 |
| teacher\_mental\_wellbeing | 4.5 | 0.3750 |
| teaching | 13.0 | 0.1250 |

# 3 Discussion

The data as presented was not sufficient to pick any significant differences in indicator scores, pre and post workshop. A larger study may be needed do arrive at such significant differences.

# 4 Appendix

Programs used in this report

test\_improvement\_gender <- function(pre, post, choice, ...){  
 out <- list()  
 cols <- pre %>% select(where(is.numeric)) %>% names()  
 cols <- cols[-1]  
 for(i in seq\_along(cols)){  
 column <- cols[i]  
 control <- pre %>% filter(tolower(gender) %in% choice) %>%   
 pull(column)  
 treatment <- post %>% filter(tolower(gender) %in% choice) %>%  
 pull(column)  
 # diff <- treatment - control  
 # sign <- sum(diff > 0, na.rm = T)  
 # test <- binom.test(sign, length(diff[diff != 0]), 1 / 2, alternative="greater")  
 test <- wilcox.exact(treatment, control, alternative = "greater", paired = T)  
 out1 <- tibble(variable = column, statistic = test$statistic,  
 `p value` = test$p.value)  
 out[[i]] <- out1  
 }  
 return(out)  
}