

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 $\alpha = 0.05$ level of significance. There were no statistically significant differences reported.

Key words: score index, Wilcoxon signed rank test.

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 $\alpha = 0.05$ 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.

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 1. There were no significant difference at 95% level of significance. A subset analysis for each gender category did not report any significant differences. Tables 2 and 3 report estimates for males and females participants respectively.

Table 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: 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

variable	statistic	p value
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 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

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 to arrive at such significant differences.

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)
    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)
}
```