**Assignment 1 Write Up**

Nicole Basso

PSYR6003

Dr. Igor Yakovenko

**Method**

**Data Cleaning and Analyses**

Data analyses were conducted in R using packages from the *tidyverse* and are available in a GitHub repository as a Quarto Markdown file. Prior to analyses, the data were cleaned by removing any incomplete cases from the dataset; two participants were removed from the 814 case dataset following this process (*N*clean dataset = 812). Following this, a new composite variable measuring combat effectiveness was generated through summing individual scores for agility, speed, strength, and willpower.

Our two main analyses consisted of descriptive statistics (Mean, Standard Deviation, Range) of a subset of the sample without superpowers who perished both as a total subsample and also grouped by their battle site, as well as a secondary analysis on the total sample using an independent t-test to investigate the impact of having superpowers (predictor) on IQ scores (outcome).

Power analyses were conducted for both the independent t-test and for a potential follow-up equivalence test in order to estimate sample size required, as the entire population could not be measured due to missing avengers. In this context, an equivalence test would be used following an independent t-test where results failed to reject the null hypothesis; by conducting an equivalence test we would be able to confirm that there is no meaningful difference between the groups of the independent t-test (i.e., a zero effect on superpowers on IQ scores) rather than stating that we could not detect an effect with the t-test. Conducting a power analysis for both these tests allows us to see if our sample was sufficiently large to detect a meaningful effect. A Cohen’s d of one was used as a meaningful effect benchmark in our power analyses. Rather than following other effect sizes produced in IQ literature due to potential for error, this was chosen using the SESOI justification. That is, our smallest effect size of interest was 1 standard deviation based on the fact that IQ falls on a normal curve, and as such a 1 standard deviation difference is relatively meaningful. A power curve was generated to determine the optimal power for the t-test; from this 80% power was chosen as its place on the curve (i.e., before largely flattening) means it maximizes power per participant. To be consistent, 80% power was also used to the equivalence test power analysis. An alpha value of 0.05 was chosen in line with typical APA journal guidelines for analyses. A two-sided test was chosen due to novelty in the analyses.

Results of the power analyses indicated that 17 individuals per group would be needed for the independent t-test and 18 individuals per group would be needed to conduct the equivalence test. As such, our planned analyses were adequately powered.

**Results**

**Descriptive Statistics**

Descriptive statistics for the no superpower and perished subsample (*n* = 101) are available in Table 1. As indicated in Table 1, the North Battlefield was both more effective in combat on average as compared to the South Battlefield but also had more injuries on average in comparison. Across the three variables of interest (i.e., combat effectiveness, kills, and injuries) in the total subsample, combat effectiveness was the most erroneous, as indicated by it having the largest standard deviation, and this the largest variance among the three.

**Independent T-Test**

In line with our hypothesis, those with superpowers tended to have higher IQs than those without superpowers (*t*(810) = 4.25, *p* < 0.01, *d* = 0.3, 95%CI [0.16, 0.44])**.** The effect size, though small, is fairly precise based on the narrow range between the upper and lower bounds of the 95% confidence interval in the context of IQ.

**Table 1**

*Mean, Standard Deviation, and Range for Combat Effectiveness, Kills, and Injuries in Participants Who had no Superpower and Who Perished by Battlefield Location*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | | *M* | *SD* | Minimum | Maximum |
| All Battlefields | |  |  |  |  |
|  | |  |  |  |  |
| Combat Effectiveness | | 497.53 | 177.56 | 67.25 | 946.89 |
| Kills | 2.55 | | 8.81 | 0.00 | 79.00 |
| Injuries | | 4.55 | 0.74 | 2.00 | 5.00 |
|  | |  |  |  |  |
| North Battlefield | |  |  |  |  |
|  | |  |  |  |  |
| Combat Effectiveness | | 499.78 | 174.07 | 130.68 | 897.06 |
| Kills | 1.71 | | 4.57 | 0.00 | 34.00 |
| Injuries | | 4.60 | 0.68 | 2.00 | 5.00 |
|  | |  |  |  |  |
| South Battlefield | |  |  |  |  |
|  | |  |  |  |  |
| Combat Effectiveness | | 491.68 | 189.53 | 67.25 | 946.89 |
| Kills | 4.75 | | 14.99 | 0.00 | 79.00 |
| Injuries | | 4.43 | 0.88 | 2.00 | 5.00 |
|  | |  |  |  |  |