Calculating the likelihood ratio for the ego depletion effect

The likelihood ratio ($\lambda$) compares the relative fit of the data to two models. In the most common application of $\lambda$, the models are the null and a model based on the observations. Likelihood ratios can be calculated from many common statistics; for an F-ratio obtained from a repeated measures ANOVA, one would calculate the likelihood ratio as follows:

$$\lambda = \left[ 1 + \frac{F(1, df)}{df} \right]^{(df+1)/2}$$

One then applies an adjustment for the fact that the alternative model has one more parameter than the null. A commonly-used adjustment is based on the Akaike Information Criterion (Akaike, 1973):

$$AIC = -2\ln(l) + 2k$$

where $l$ is the maximum likelihood of the data and $k$ is the number of parameters. For models that differ by one parameter, the effect of applying the AIC adjustment simplifies to $1/\exp(1)$, meaning the adjusted likelihood ratio in this case would be

$$\lambda_{adj} = \left[ 1 + \frac{F(1, df)}{df} \right]^{(df+1)/2} \left[ \frac{1}{\exp(1)} \right]$$

Applying this to the effect of ego depletion on attention control, where $F[1, 653] = 4.84$, we get

$$\lambda_{adj} = \left[ 1 + \left( \frac{4.84}{653} \right)^{327} \right] \left[ \frac{1}{2.718} \right]$$

$$= 4.11$$

Thus, the data are 4.11 times as likely given an effect of ego depletion than given no effect.