**Assignment 2: The General Linear Model**

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**Results**

A general linear model with a single categorical predictor with two levels and two numeric predictors was used to investigate the relationship between negative affect and sex, conscientiousness, and socially prescribed perfectionism (SPP). Two hypotheses were tested. First, it was hypothesized that sex, conscientiousness, and SPP will all significantly predict negative affect, such that women will have more negative affect than men, conscientiousness will be negatively related to negative affect, and SPP will be positively related to negative affect. Second, it was hypothesized that SPP would predict unique variance in negative affect, over and above sex and conscientiousness in a meaningful way.

Before analyses were run, missing data was removed (*n* = 6) and one participant was removed because they were the only participant who identified as not male or female, and therefore, were not generalizable. The final dataset had 131 participants, with the majority being female (*n* = 112). The variable ‘sex’ was recoded to be factor variable for analysis and one item in the conscientiousness subscale was reverse coded to ensure consistent directionality in the scale. Descriptive statistics and inter-correlations for all variables are presented in Table 1. It can be noted that negative affect and SPP are negatively related to conscientiousness, while positively related to one another.

The univariate visualizations show no clear issues with the data. The majority of the participants were female. The conscientiousness data appears to be negatively skewed, while the SPP data appears to be only slightly negatively skewed. The negative affect data is positively skewed.

Statistical assumptions were tested. As there was no longitudinal data or dyads, the assumption of independence was met. The assumption of normality was met based on the histogram, although it shows a slight positive skew. If normality is a concern, a Q-Q Plot can be observed to see if the data is skewed. Based on the Residual-Dependence plot, the assumption of linearity was violated as we can see a curve in the data. This violation can be addressed by modelling the curve with polynomial terms instead of as a linear equation and doing a model comparison to see if that improves the fit of the model. Based on the S-L plot, the assumption of homoskedasticity is violated as the plot is not flat. To address this, robust standard errors can be used to solve the issues of heteroskedasticity. This method calculates the standard errors, but does not assume that they have constant variance. This will only change the standard error, not the values for the coefficients.

**Sex, Conscientiousness, and SPP as Predictors of Negative Affect**

It was hypothesized that sex, conscientiousness, and SPP will all significantly predict negative affect, such that women will have more negative affect than men, conscientiousness will be negatively related to negative affect, and SPP will be positively related to negative affect.

The full model visualizations suggest that there is a negative relationship between negative affect and conscientiousness and a positive relationship between negative affect and SPP. Women appear to score higher than men on negative affect across almost all relationships, except when they score low on both SPP and conscientiousness.

The model fit indices suggest that the full model should be used (see Appendix A for model equations). For the model with SPP, conscientiousness, and sex as predictors (full model), the AIC = 333.26 and the BIC = 347.63, while the model without the predictors (reduced model) had an AIC = 368.29 and the BIC = 374.63. As the full model had lower values than the reduced model, the fit indices support the full model. The Bayes’ Factor for the full model was larger than 100, suggesting decisive evidence for this model. The full model explained 26.9% of the variance in negative affect, suggesting that these variables are important in predicting negative affect scores. Overall, scores on SPP accounted for 13.4% of the variability in negative affect, scores on conscientiousness accounted for 10.8%, and sex accounted for 2.6%.

Estimates and the model results can be found in Table 2. The estimates suggest that for every one-point increase in SPP, participants’ negative affect increases by 0.20. For every one-point increase in conscientiousness, participants’ negative affect decreases by 0.26. Finally, male participants are suggested to score 0.58 points lower than females on the negative affect scale. This last finding has a medium effect size, *d* = 0.68, suggesting that the difference between male and female participants is moderate. However, the standard error is higher for sex than the other two predictor variables, suggesting more variability for this variable. All estimates have a 95% confidence interval that does not cross zero, suggesting significance*.* If scores on all of the predictor variables were equal to zero, the negative affect score would be 2.93.

The predicted differences between the reduced model without the predictors and the full model with the predictors suggest that the full model can predict up to a 1.48-point differential in negative affect, which is a large amount given the range of the scale. This supports the finding that SPP, conscientiousness, and sex predict negative affect scores.

Overall, the first hypothesis was supported. Sex, conscientiousness, and SPP all significantly predict negative affect, with increased conscientiousness being associated with lower negative affect, females having increased negative affect compared to males, and increased SPP being associated with increased negative affect.

**SPP as a Predictor of Negative Affect When Controlling for Sex and Conscientiousness**

For the second hypothesis, it was expected that SPP would predict unique variance in negative affect, over and above sex and conscientiousness in a meaningful way.

Based on the Added Variable plot, the full model visualizations suggested that there may be a slight nonlinear relationship between negative affect and SPP when controlling for sex and conscientiousness. To fix this, different polynomials could be tested to find the correct fit. However, the points on the plot show no clustering, which supports the suggestion that there may be variability in the data. Generally, there does appear to be a slight positive relationship between SPP and negative affect when controlling for sex and conscientiousness.

All of the model fit indices suggest that the model with SPP as a predictor above and beyond sex and conscientiousness should be used (see Appendix A for model equations). For the model with SPP, the AIC = 333.26 and the BIC = 347.63, while the model only sex and conscientiousness as predictors (reduced model) had an AIC = 345.56 and BIC = 357.06. As the full model had lower AIC and BIC values than the reduced model, these fit indices supported the full model. The Bayes’ Factor for the full model was larger than 100, suggesting decisive evidence for this model. This model explains 8.45% more variance than sex and conscientiousness alone. While the full model accounts for 26.9% of the variance in the model, SPP accounts for 13.4% of that variance. This suggests that SPP is an important predictor for negative affect, over and above sex and conscientiousness.

The estimates suggest that for every one-point increase in SPP, participants’ negative affect increases by 0.20, with a standard error of 0.05. The model results can be found in Table 2.

The predicted differences between the model without SPP as a predictor and the model with SPP as a predictor suggest that the model with SPP can predict up to a 0.64-point differential in negative affect, which is a moderate affect given the range of the scale. This supports the finding that SPP predicts negative affect scores above and beyond conscientiousness scores and sex.

Overall, the second hypothesis was supported, and it can be concluded that SPP predicts unique variance in negative affect, over and above sex and conscientiousness in a meaningful way.

**References**

Stanley, D. (2023, June 26). apaTables. <https://dstanley4.github.io/apaTables/articles/apaTables.html>

Yakovenko, I. (2024, March 23). PSYR6003-Assignment-2. GitHub. <https://github.com/iyakoven/PSYR6003-Assignment-1.git>

**Table 1**

*Means, Standard Deviations, and Correlations with Confidence Intervals*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | *M* | *SD* | 1 | 2 |
|  |  |  |  |  |
| 1. Conscientiousness | 5.03 | 1.29 |  |  |
| 2. SPP | 4.38 | 1.43 | -.21\* |  |
|  |  |  | [-.37, -.04] |  |
| 3. Negative Affect | 2.44 | 0.98 | -.37\*\* | .37\*\* |
|  |  |  | [-.51, -.22] | [.21, .51] |

*Note.* *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. \* indicates *p* < .05. \*\* indicates *p* < .01.

**Table 2**

*Model Results Using Total Negative Affect as the Outcome*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Predictor | | *b* | *b*  95% CI  [LL, UL] | | *SE* | Fit | |
| (Intercept) | 2.93 | | | [2.08, 3.77] | 0.43 | |  |
| SPP | 0.20 | | | [0.10, 0.31] | 0.05 | |  |
| sex1 | -0.58 | | | [-0.99, -0.16] | 0.21 | |  |
| Conscientiousness | -0.26 | | | [-0.37, -0.14] | 0.06 | |  |
|  |  | | |  |  | | *R2*  = .269 |
|  |  | | |  |  | | 95% CI[.14,.40] |

*Note.* A significant *b*-weight indicates the semi-partial correlation is also significant. *b* represents unstandardized regression weights. *SE* represents the standard error of the unstandardized coefficient. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

**Appendix** **A**

The reduced and full model for the first hypothesis, respectively.

The reduced and full model for the second hypothesis, respectively.

The final full model with the coefficient values.