**Assignment 2**

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**PSYR 6003: Fundamentals of Applied Statistics**

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**Design Statement**

Prior work suggests that both biological sex and conscientiousness are associated with negative affect. Women appear to have higher negative affect than men and conscientiousness has a negative relationship with negative affect. Recent evidence suggests that socially prescribed perfectionism (SPP) may also be associated with negative affect. The present study will conduct a secondary analysis of a historically collected dataset, which contains information collected in a survey of 137 undergraduate university students. For the first time, we will assess the ability of sex, conscientiousness, and socially prescribed perfectionism together to predict negative affect. We hypothesize that 1) sex, conscientiousness, and SPP will significantly predict negative affect, and based on recent findings we predict that 2) SPP will predict negative affect over and above both sex and conscientiousness.

**Methods**

All analyses were performed using R Statistical Software (v4.4.2; R Core Team 2024). Original survey data was obtained from a public GitHub repository (available here: https://github.com/iyakoven/PSYR6003-Assignment-2), and cloned to another public repository for manipulation (reproducible code for following analyses available here: https://github.com/mseward96/6003assignment2)

Data were imported, cleaned, and manipulated using the tidyverse R package (v2.0.0; Wickham et al., 2019) and the haven package for tidyverse(v2.5.4; Wickham et al, 2023) Visualizations and model comparisons were generated using the flexplot package for R(v0.22.4; Fife, 2022).

**Measures**

To measure negative affect, we used the negative affect sub scale of the Positive and Negative Affect Schedule (PANAS), the conscientiousness subscale of the Ten Item Personality Measure (TIPM), and the Multidimensional Perfectionism Scale Short Form: Socially Prescribed Subscale (MPS) to measure SPP.

In the historical dataset, each item on each scale was recorded as its own variable. To get usable subscale scores for this study, we had to generate subscale total values by taking the mean of all the items for each subscale, conducting these data manipulations using the tidyverse package for R (v2.0.0; Wickham et al., 2019). For the analysis, biological sex was recoded to a factor variable, and the second item on the TIPM was reverse coded before the final scale total was calculated, also using the tidyverse package for R.

**Results**

The study sample was comprised of undergraduate university students (N =137, 117 female) who filled out multiple questionnaires about their mental health and personality. Descriptive statistics and bivariate correlations for questionnaire measures and demographic variables of interest were first calculated to explore existing associations, these can be seen below in Table 1.

Table 1

*Means, standard deviations, and correlations with confidence intervals*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | *M* | *SD* | 1 | 2 | 3 |
|  |  |  |  |  |  |
| 1. PANAS (Negative Affect) | 2.46 | 0.99 |  |  |  |
|  |  |  |  |  |  |
| 2. TIPM(Conscientiousness) | 5.03 | 1.29 | -.37\*\* |  |  |
|  |  |  | [-.50, -.21] |  |  |
|  |  |  |  |  |  |
| 3. MPS(SPP) | 4.41 | 1.44 | .39\*\* | -.18\* |  |
|  |  |  | [.23, .52] | [-.34, -.02] |  |
|  |  |  |  |  |  |
| 4. Sex | 0.15 | 0.35 | -.19\* | -.11 | -.02 |
|  |  |  | [-.34, -.02] | [-.28, .06] | [-.19, .15] |
|  |  |  |  |  |  |

*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.

**SPP, conscientiousness, and sex as predictors of negative affect**

To test our two main hypotheses, we used a general linear model with multiple numeric predictors. To determine whether SPP, sex, and conscientiousness predicted negative affect, we built a general linear model with sex, conscientiousness (TIPM), & SPP (MPS) as predictor variables on the outcome variable of negative affect (PANAS). Upon initial visualization, one outlier case which identified and excluded from further analysis. Linear model assumptions for further analyses were partially met. Independence was met by design. The residuals were nearly normally distributed, meeting the assumption of normality. Based on visual assessment of the residual dependency plot which was reasonably flat, we can say that the assumption of linearity has been met. Finally, for homoscedasticity, we determined this assumption was partially met based on the slightly sloping spread-location plot. See appendix for plots.

Before interpreting the model we built a reduced model for comparison, to determine if this model would better account for variance in negative affect than no predictors. The full model with sex, conscientiousness, and SPP as predictors for negative affect fit the data better, as evidenced by lower Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC), a larger bayes factor, and a higher R-squared value. Upon confirming that the model met assumptions, and fit the data better than no predictors, we ran the model as described above. The overall model accounts for 31.4% of the variance in negative affect (R2 =.314, 96%CI[.18,.42]). This model demonstrates that sex, conscientiousness, and SPP do in fact predict negative affect in a meaningful way, confirming our first hypothesis. See coefficients detailed in table 2.

Table 2

*Regression results using PANAS Total (negative affect) as the criterion*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Predictor | *b* | *b*  95% CI | *sr2* | *sr2*  95% CI | Fit |
| (Intercept) | 2.78\*\* | [1.98, 3.57] |  |  |  |
| MPS(SPP) | 0.24\*\* | [0.14, 0.34] | .17 | [.03, .21] |  |
| TIPM(Conscientiousness) | -0.26\*\* | [-0.37, -0.15] | .099 | [.02, .20] |  |
| Sex | -0.59\*\* | [-0.99, -0.19] | .045 | [-.01, .10] |  |
|  |  |  |  |  | *R2*  = .314\*\* |
|  |  |  |  |  | 95% CI[.18,.42] |
|  |  |  |  |  |  |

*Note.* A significant *b*-weight indicates the semi-partial correlation is also significant. *b* represents unstandardized regression weights. *sr2* represents the semi-partial correlation squared.

\* indicates p < .05. \*\* indicates p < .01.

To test our second hypothesis, we built a reduced general linear model with only sex and conscientiousness (removing SPP from the model) as numerical predictors for negative affect. The reduced model, without SPP, also only partially met required assumptions. Independence was met by design. The histogram of residuals showed a relatively normal distribution, meeting the normality assumption. The residual dependency plot is relatively flat, however less so than the full model and outliers can be seen as driving the curve. The spread-location plot is also slightly sloped, partially meeting the assumption of homoscedasticity. See appendix for plots.

After checking that assumptions were met, we compared the full model, and the reduced model determine which model better fit the data. The full model (model including SPP) had a lower Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC), a larger bayes factor, and a higher R-squared value, all suggesting that the full model was a better fit for the data. Furthermore, within the full model, SPP accounts for 17% of the variance in negative affect, while conscientiousness accounts for 9.9%, and sex accounts for 4.5% (see table 2 and table 3). These findings together suggest that SPP does in fact predict unique variance in negative affect, over and above sex and conscientiousness, confirming our second hypothesis. See table 3 and table 4 for summary of model comparison.

Table 3

*Regression results using PANAS total score (negative affect) as the criterion.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Predictor | *b* | | *b*  95% CI | *sr2* | *sr2*  95% CI | Fit | Difference |
| (Intercept) | | 4.09\*\* | [3.47, 4.72] |  |  |  |  |
| TIPM(Conscientiousness) | | -0.31\*\* | [-0.43, -0.19] | .145 | [.05, .27] |  |  |
| Sex | | -0.64\*\* | [-1.06, -0.21] | .052 | [-.02, .12] |  |  |
|  | |  |  |  |  | *R2*  = .197\*\* |  |
|  | |  |  |  |  | 95% CI[.08,.30] |  |
|  | |  |  |  |  |  |  |
| (Intercept) | | 2.78\*\* | [1.98, 3.57] |  |  |  |  |
| MPS(SPP) | | 0.24\*\* | [0.14, 0.34] | .17 | [.03, .21] |  |  |
| TIPM | | -0.26\*\* | [-0.37, -0.15] | .099 | [.02, .20] |  |  |
| Sex | | -0.59\*\* | [-0.99, -0.19] | .045 | [-.01, .10] |  |  |
|  | |  |  |  |  | *R2*  = .314\*\* | Δ*R2*  = .118\*\* |
|  | |  |  |  |  | 95% CI[.18,.42] | 95% CI[.03, .21] |
|  | |  |  |  |  |  |  |

*Note.* A significant *b*-weight indicates the semi-partial correlation is also significant. *B* represents unstandardized regression weights. *Sr2* represents the semi-partial correlation squared. \* indicates p < .05. \*\* indicates p < .01.

Table 4

*Model Comparison (Model with SPP as a predictor = Full Model)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model | *AIC* | *BIC* | *Bayes Factor* | *p* | R2 | Adjusted R2 |
| Full model | 339.55 | 354.12 | 4080.31 | < 0.001 | .314 | .299 |
| Reduced Model | 359.10 | 370.74 | 0 |  |  |  |
|  |  |  |  |  | .197 | .185 |

**Conclusion**

Based on the results of our analyses, we can conclude that socially prescribed perfectionism, conscientiousness, and sex are significant predictors of negative affect. Furthermore, we can also conclude that socially prescribed perfectionism predicts negative affect over and above sex and conscientiousness alone, due to the stronger fit of the model that included SPP.

**References**

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**Appendix**

**Figure 1A**

*Visual assumption check for full linear model including histogram of residuals, residual dependence, and spread-location plots.*

A graph of different types of graphs

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**Figure 2A**

*Visual assumption check for reduced linear model including histogram of residuals, residual dependence, and spread-location plots.*

A graph of a plot

AI-generated content may be incorrect.