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RESEARCH PAPER

The Influence of Personality Type (Extroversion vs Introversion) on Social Engagement

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ABSTRACT

This study aims to determine whether specific behaviors can significantly predict personality type using quantitative statistical methods and how do they correlate with each other. The study is limited to a secondary public dataset of college students. Personality can be classified into the extrovert and introvert categories, with their own specific patterns of behavior. Studies suggest that while behavioral differences are apparent across, situational factors can affect the expression of personality traits. This study can provide a quantitative basis for the link between social behaviors and personality type and provide context for further research into the lack of consistency among extroverts. A public dataset (N=2900) helped carry out a logistic regression and correlation analysis, with imputation used to analyze the predictors. The predictors included time spent alone and social engagement indicators. The dataset represents college students. Time alone strongly predicted introversion (β=0.121, p<0.001), while social engagement variables predicted extroversion, although their correlation was weaker compared to introverts. Future research can explore the reasons behind extrovert flexibility in context of social engagement. A prediction model can be created to determine personality type through data on social behaviors.

KEYWORDS Introversion, Extroversion, Social Engagement, Correlation, Logistic Regression

Introduction

Extraversion and introversion are the primary categories that are used to determine the way people interact with each other and behave in a society. They tend to have differing ways of socializing as these behaviors can predict the number of events they attend or the number of friends they have. Psychologists have spent years categorizing and understanding behaviors that reflect personalities. Personality traits manifest as particular behavioral patterns that determine the way that people interact and conduct their daily activities. Behavior patterns are described as "chains of behavior" that show a more complicated link and deeper meaning behind a particular behavior or action. (American Psychological Association, 2018).

The idea of extraversion and introversion was first introduced by Carl Jung in 1913. (Geyer, 2012). They are categories that describe where people source energy from. Extroverts are focused on the outside world and people; they love to interact with people and are extremely social. Introverts, on the other hand, are more focused on the inside world; they are quieter and tend to interact less with people and focus on inner thoughts and feelings. (McLeod, 2025).

Social engagement refers to activities that involve meeting friends, volunteering, or involvement in the community at some level. (Holt-Lunstad, 2015). This suggests that social engagement is a pattern of behavior.

For this paper, it was operationalized based on seven variables including, hours spent alone, feeling drained after socializing, presence of stage fear, frequency of posting on social media, frequency of going out and participants' friend circle size. Regression models test multiple predictors at the same time allowing to determine their exact effect on personality type.

A public dataset on Kaggle was used for this study. The objective is to predict personality type by behaviors such as attending social events or hours spent alone, using a regression model. A behavior-based predictive model was developed to determine what particular behavioral dimensions of socialization best contributed to personality type.

The existing literature provides a link between personality types and different variables such as decision making and flow experiences, by relying mostly on self-reports or qualitative descriptions. Previously, the link between personality and behavior was based on empirical or systemic studies, but fewer focus on the quantitative frequency of social engagement variables to predict personality type. The demographic of college students is important to explore as they are in a transitional stage when it comes to shaping their personality and identity. Therefore, due to a lack of quantitative studies on the demographic of college students, a focus on this perspective was required. This paper is written to explore the relationship between personality and social engagement behaviors focusing on data taken from college students.

Can personality type predict patterns of social engagement behaviors such as frequency of attending events and hours spent alone? What specific dimensions of social engagement behaviors contribute the most to determining personality type?

Literature review

Personality can be categorized based on the Myers-Briggs personality test and Jung's theories, and one important categorization in that is introversion and extraversion. These types display different behaviors in different settings, and this research focuses on the aspect of socialization. The implication for this study is that it provides further context and quantitative support for the apparent differences in behavior. It allows people to connect more effectively with each other, as they can understand each other better. The objective of this analysis is to provide support for the model of personality types and their behavior patterns. The purpose of this literature review is to provide background and further literature support for the hypothesis. By synthesizing findings from five empirical and theoretical studies, the review aims to contextualize behavioral differences between introverts and extraverts and evaluate the evidence supporting these distinctions.

Yadegari and Alinaghi (2020) conducted a qualitative study based on the library studies method, defined by a literature review and logical analysis. It contributes to architectural and psychological design. They were able to extract practical design patterns. A limitation stems from the fact that it is not an empirical study and does not provide any quantitative evidence. It discusses the differences between personality types and their needs in public social spaces. This establishes the idea that personality types

stay true to their traits as they seek similar needs in public spaces. Extroverts seek group activity and central spaces, while introverts focus on privacy and stress-free environments.

Liu and Csikszentmihalyi (2020) empirically tested the flow experiences of introverts and extroverts during solitary and social activities. This was a correlational survey with random assignment to activities. They quantified flow frequency and flow intensity, which provided a comprehensive understanding. The introduction of a mediator variable, extroversion, helped explain the results. On the other hand, a retrospective self-report can cause potential memory distortion and bias, and the collection of the sample through MTurk may introduce further biases.

Khalil (2016) explains that introverts' and extroverts' characteristics are essential differentiators when it comes to decision-making. Introverts' reliance on inner intuition makes them better decision-makers, while extroverts focus on discussing their decisions or making impulse decisions. It was a cross-sectional design using the Eysenck Personality Questionnaire, which addressed an underexplored variable in decision-making. However, it lacks generalizability due to convenience sampling and the use of subjective measures.

Margolis and Lyubomirsky (2020) conducted a within-subjects randomized experimental design where established measures, such as the Flow Short Scale, affect scales, and so on, were used. The study provided strong causal evidence for its variables and controlled individual baseline differences well. It provides contradictory evidence, as despite baseline personality traits, engaging in extroverted behavior massively improved well-being, which may suggest that introverts do not always stay true to their particular defined traits and behaviors. However, generalizability is weak due to a specific sample, and it lacked a control group to serve as a comparison and give an effect size estimate.

DeMeo, Smyth, et al. (2023) focused on daily uplifts and hassles for introverts in the context of personality traits. It used Ecological Momentary Assessment (EMA) to collect reports from an ethnically and racially diverse sample. It analyzed and clearly separated frequency and intensity as well to report uplifts and hassles. There was high ecological validity and minimization of recall bias to address weaknesses in earlier studies. The sample increased generalizability to a number of people and cultures. However, there was only a focus on social aspects of the trait, and there was no information on uplift categories, which prevented analysis of the question of whether positive experiences matter. Even though introverts reported less frequent and less enjoyable uplifts, there was no significant association with the intensity or frequency of stressors.

These papers emphasize that introverts source their energy from spending time alone, and they find solace in isolation. They tend to focus on themselves and their feelings, learning through internal reflection. Flow for introverts is more frequent during solitary activities, as they do not experience flow as frequently and intensely as extroverts. In terms of social spaces, introverts seek private spaces with high spatial quality and a stress-free environment. Meanwhile, extroverts are energized through social interaction, though they also require solitary time to concentrate fully on tasks. For flow state, they experience it more in social situations, as for them, the relationship between solitary activity and flow frequency lessens. As these papers agree on the

rudimentary basis of these behaviors, they disagree on the relationship between decision-making and the impact of social and solitary activities on experiences.

The studies mentioned all clearly establish that there is a difference between introvert and extravert behavior, especially in the way they engage with their environment, social or spatial. The behavioral patterns between the two are extremely apparent as well. Despite differences in design, the studies reinforce the idea that situational factors like the type of activity can be seen to moderate the effects of personality on behavior. The research supports the hypothesis that personality type can be predicted by behavior while also accounting for the flexibility of the environment or situation.

This paper hypothesizes the following:

H1: introversion will be positively predicted by more time spent alone and lower frequency of posting and going out.

Despite the role of all seven variables collectively affecting personality type, only the most significant variables were included for conciseness.

Material and Methods

A quantitative approach was adopted to cross sectionally study the data. Initially, all the variables will be described using exploratory data analysis. The variables are behaviors that provide insights into categorizing people based on personality, and to confirm this, a predictive model of personality will be used. The relationship between these variables, such as time spent alone and social event attendance, will be observed using bivariate analysis.

The dataset was procured from Kaggle, "Extrovert vs. Introvert Behavior Data." As disclosed by the creator, the dataset is based on real responses of college students. The sample size was 2900 observations with 8 variables and there were no further details of the demographic provided.

This dataset was chosen because it has a wide variety of numeric and categorical variables as well as a large number of observations which provides better support for a quantitative analysis and contains the specific variables that allows social engagement to be analyzed. The exact frequency of any variable has not been disclosed by the creator.

The variables are measuring the following:

Time spent alone: a continuous variable on a scale of 0-11, that counts the number of hours spent alone.

Going outside: a discrete variable with a range of 0-7, that counts the number of times participants go outside.

Friend circle size: a discrete variable with a range of 0-15, that counts the number of friends they have.

Post frequency: a discrete variable with a range of 0-10 that describes how often participants post on social media..

Stage fear: a categorical variable which describes whether a participant has stage fright or not, and is answered in yes/no.

Social event attendance: a discrete variable with a range of 0-10, that counts how often participants attend social events.

Drained after socializing: a categorical variable that indicates if participants felt drained after socializing, answered with a yes/no.

Personality: a categorical variable with two options, extrovert, or introvert.

R Studio was used to analyze all the variables and the excel file containing the raw data was imported. The initial step was to do an exploratory data analysis along with cleaning the data. Missing values were removed and imputed to compare the effect of both techniques. A description of the variables was provided with a table, histogram, and bar chart. A correlation was run both simply on the data and then with data grouped based on personality type to examine the linear relationship between all the variables. Then, logistic regression was run to evaluate whether there was a predictive relationship between social engagement and personality, all variables were tested, and only significant relationships were discussed. The significance level was taken at $p < 0.05$.

Results and Discussion

The results are organized starting with an exploratory data analysis followed by correlations and a logistic regression.

Descriptive and exploratory analysis

With a mean of 4.51 and a median value of 4, most people spend a moderate amount of time alone. Based on the analysis, people go out 3 days a week, while the average person reports a mean of 6.27 friends. The mean of post frequency is 3.57, suggesting that there is moderate average posting. Social event attendance has a mean of 3.96, meaning that the average participant attends 3.96 events, however there is wide variation in how many events people attend, as the standard deviation and variance are 2.90 and 8.43. These patterns indicate that the sample is mostly well balanced in terms of social engagement behaviors, which is consistent with the two personality types.

Categorical variables

The frequency of the category variables was calculated and displayed in the table. The count of the variables displays an overall balanced distribution. The table also shows that there are fewer people who feel drained after socializing. There are more introverts in this dataset than extroverts as well as people who don't have stage fright. Extroverts, lack of stage fear and feeling drained after socializing is higher than the introverts' presence of stage fear and feelings of being drained after socializing.

Table 1
Frequency of qualitative variables

No.	Variable	Category	Frequency
1	Personality	Introvert	1491
2	Personality	Extrovert	1409
3	Stage fear	Yes	1410
4	Stage fear	No	1417

5	Drained after socializing	Yes	1407
6	Drained after socializing	No	1441

Bar Charts

The spread of the data and skewness were checked using bar graphs. It shows that all of the variables have a right skewed distribution, with post frequency appearing to have the most skewness. The skewness highlights that extreme social behaviors are not that common among participants and that they engage more moderately.

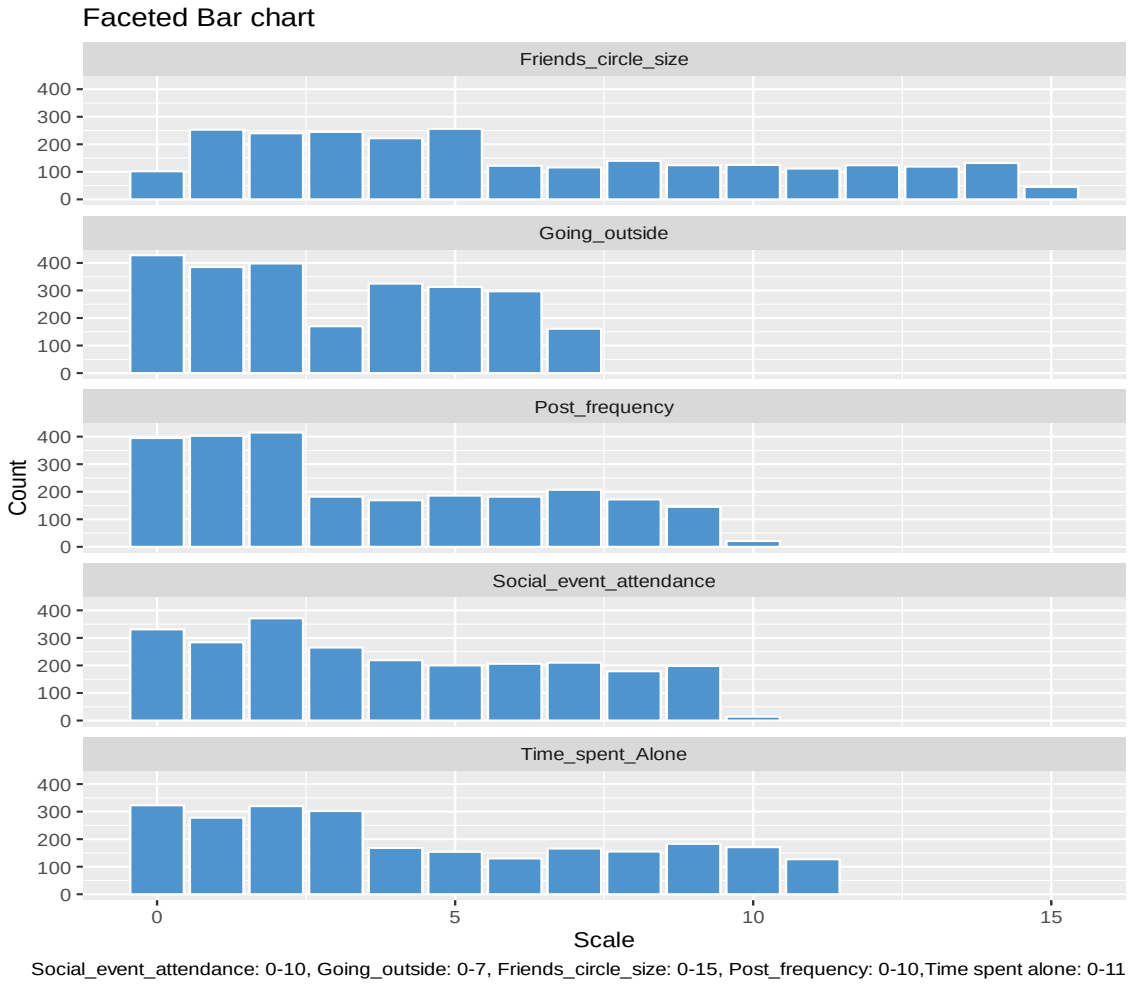

Figure 1 Faceted bar graph of discrete variables

Bar graph of extroverts and introverts

This chart shows the distribution of five social behavior variables for introverted personality types. The social engagement variables have a right skewed distribution, while time spent alone has a somewhat normal distribution with some extreme values. It affirms that introverts exhibit low social engagement while they do spend a considerable amount of time alone. This confirms the expected behavioral pattern given the personality types.

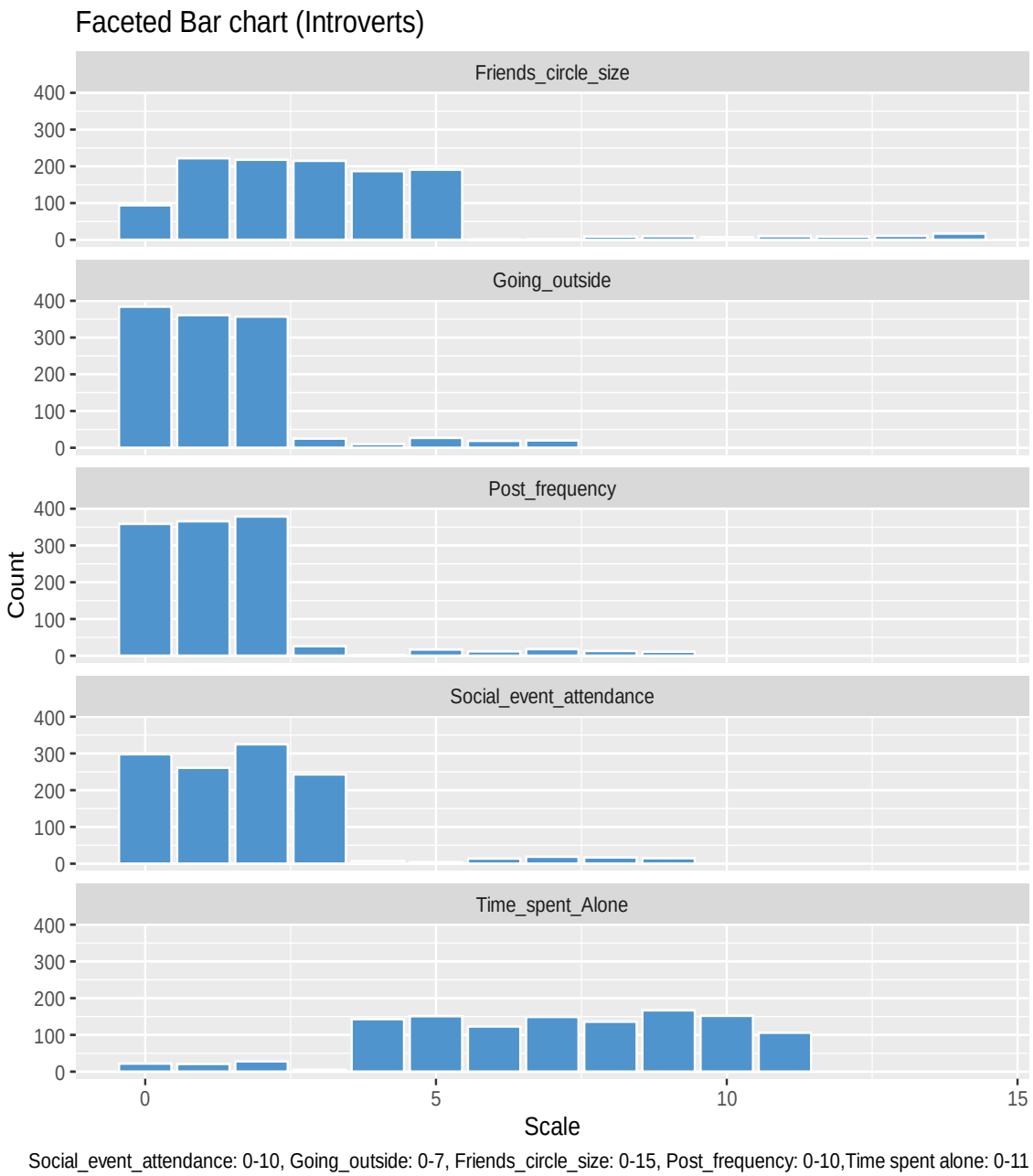

Figure 2 Faceted bar graph of variables grouped for introverts.

The distribution of social engagement for extroverts show left sided skewness while for time spent alone the data skewed towards the right. Extroverts show high social engagement with less time spent alone. This is characteristic of their personality type. The interesting point is that they have a large variation in friend circle sizes and they tend to spend less time alone and go out more frequently, also supported by previous literature. The variation seen in extrovert friend circle sizes does not specifically mean that social activities come with larger social networks. It can also be a result of extroverts' flexibility in social engagement.

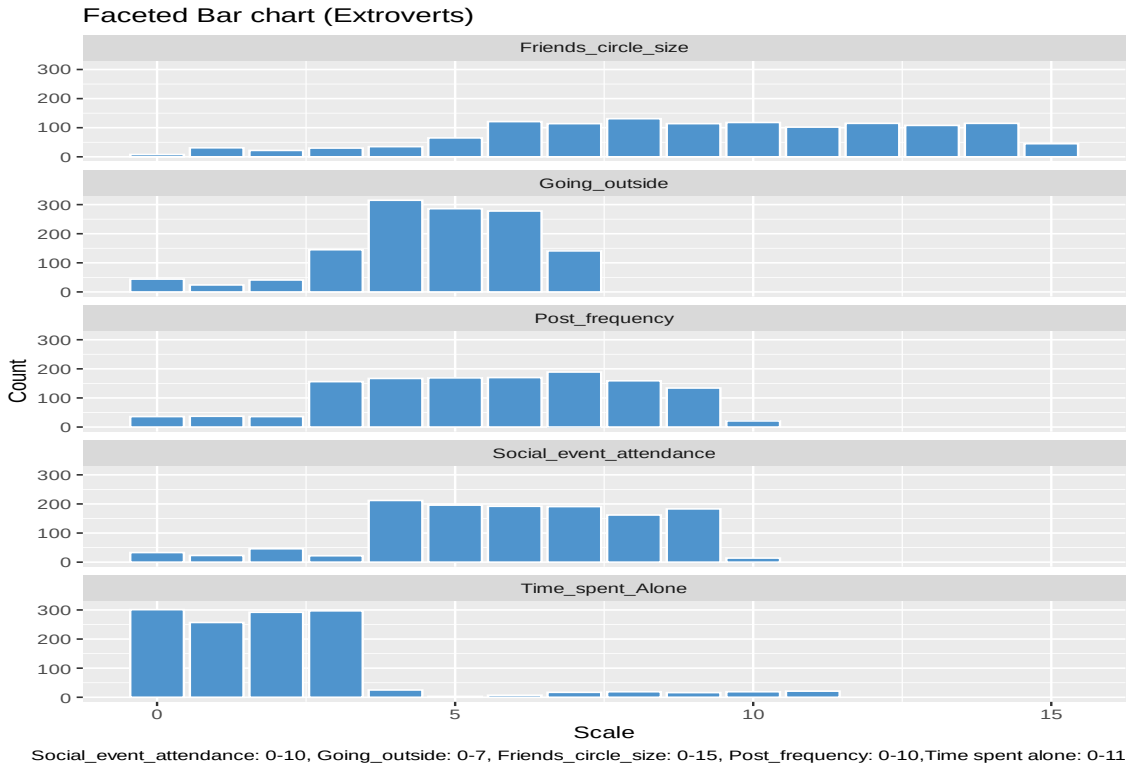

Figure 3 Faceted bar graph of variables grouped for extroverts.

Outliers

Outliers are data points that do not fall into a normal range of the dataset, usually seen above or below compared to the rest of the data. They tend to skew results making them tilt in one direction. They were tested using boxplots and a function was created to manually check for outliers using the IQR method. IQR stands for inter quartile range which determines the distribution of about 50% of the data. The IQR method provides a more accurate method of outlier detection as it compares each point against the range and highlights those which do not fall into that range. There were zero outliers seen and calculated.

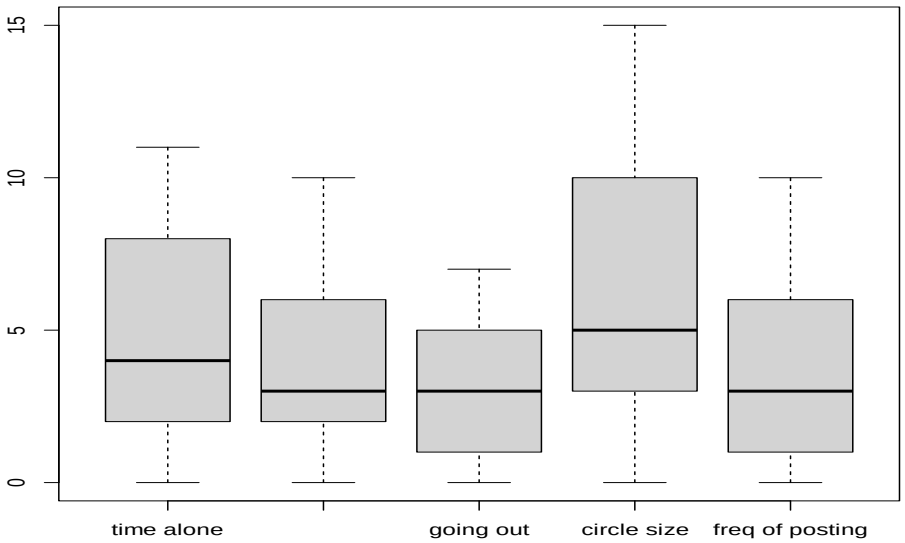

Figure 4 Boxplot of numeric variables

Note. Missing caption refers to events attended.

Bivariate analysis

Correlation

A correlation determines the strength and direction of the relationship among variables, providing evidence for our hypothesis. The variables are highly intercorrelated with going outside and frequency of posting on social media, being the highest at 0.77. While spending time alone increases the other social engagement variables will decrease as well. This shows that people who are spending a lot of time alone are not compensating by going out much or attending social events. They tend to also have a smaller friend group.

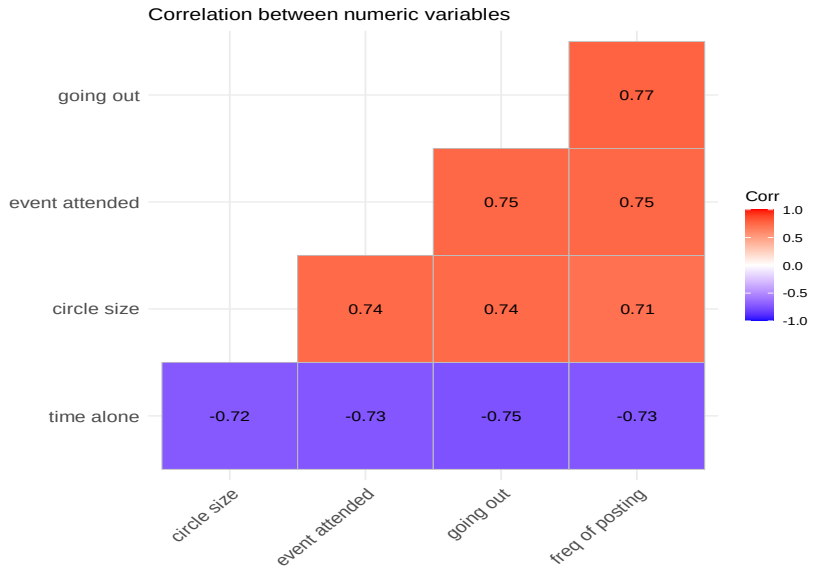

Figure 5 Correlation matrix for numeric variables

Introverts have a moderate correlation with social engagement behaviors, while having a moderate negative correlation with time spent alone. This shows that when introverts do engage socially, they do so in every sphere. While spending time alone means their engagement in social activities also decreases. This emphasizes that introverts engage consistently or they completely retract from engaging.

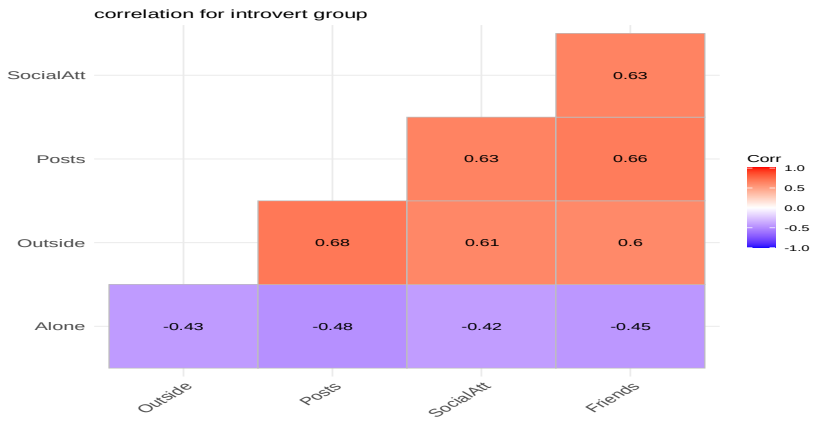

Figure 6 Correlation matrix for introvert group

Contradictory behavior was seen for extroverts as their social engagement behaviors have a weaker to, moderate correlation with each other than introverts, who have a higher number. This shows that they are more flexible when it comes to social engagement. Those extroverts who spend a higher amount of time alone also spend less time going out or posting and have a stronger correlation to those variables than introverts. But the stronger relationship also shows that they tend to avoid this behavior more actively. This correlation provides quantitative support behind these patterns and their flexibility.

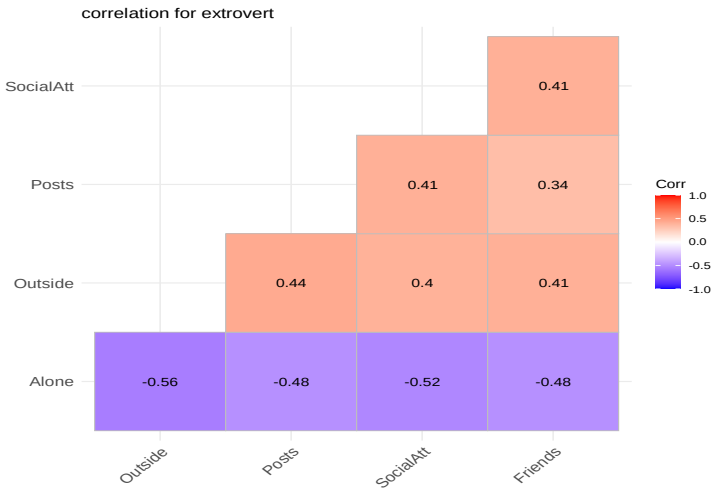

Figure 7 Correlation matrix for extrovert group

Mosaic

Mosaic plot was drawn to see to the differences between extrovert and introvert personality types when it comes to feeling tired after socializing. The mosaic plot shows that a large number of extroverts do not feel tired after socializing while introverts do which follows the expected outcome given the theories of personality. Here, the pattern of behavior seems to follow the results found in past literature as the introverts do feel tired after socializing which falls in line with their defining characteristics.

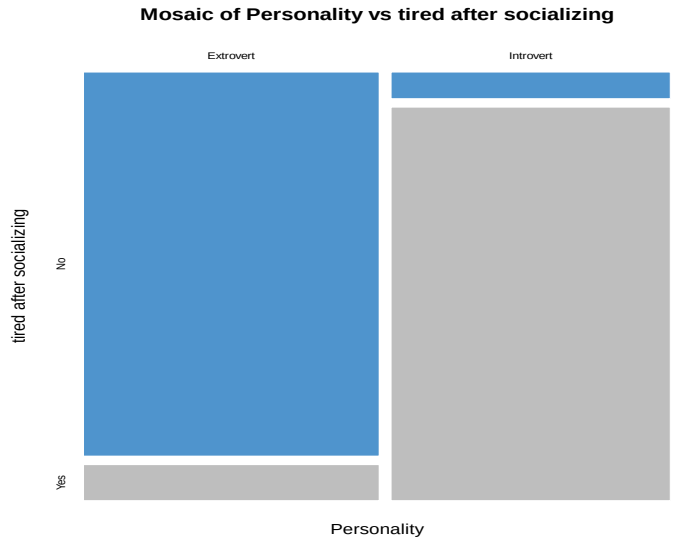

Figure 8 Mosaic plot of personality type and feeling tired after socializing.

Multivariate analysis

Logistic Regression

A logistic regression is best method for determining the relationship between categorical and numeric variables as was the case in this study.

The summary of the generalized linear model shows that the predictors are significant, with time spent alone and social event attendance having positive and negative coefficients, respectively. The binary outcomes 0/1 refer to extrovert and introvert. The intercept is also significant, which is approximately 91.2%. The model also explains most of the variation in the data.

This suggests that people who spend more time alone and don't engage much in social activities, post less, have smaller friend groups all predict an introverted personality type. The hypothesis was partially supported as time spent alone and the frequency of going outside were the most significant predictors of introvert personality type while there was a weaker relationship with the frequency of posting.

Table 2
General model figures of original dataset

Predictor	Estimate	Std. Error	z - value	p - value
Intercept	2.42715	0.31254	7.766	8.11e-15 ***
Time spent alone	0.10548	0.03296	3.200	0.00137 **
Social Event Attendance	-0.21541	0.04411	-4.884	1.04e-06 ***
Going Outside	-0.32959	0.05860	-5.624	1.87e-08 ***
Friend Circle Size	-0.07219	0.02744	-2.631	0.00851 **
Post Frequency	-0.23566	0.04516	-5.218	1.81e-07 ***

Note. Null deviance = 3431.8 (*df* = 2476); Residual deviance = 1533.4 (*df* = 2471); AIC = 1545.4. *** $p < 0.001$, ** $p < 0.01$

This regression graph shows that there is a positive linear relationship between time spent alone and the probability of being an introvert. The ranges of predicted probability are 0.43-0.72. The confidence interval increases at the ends.

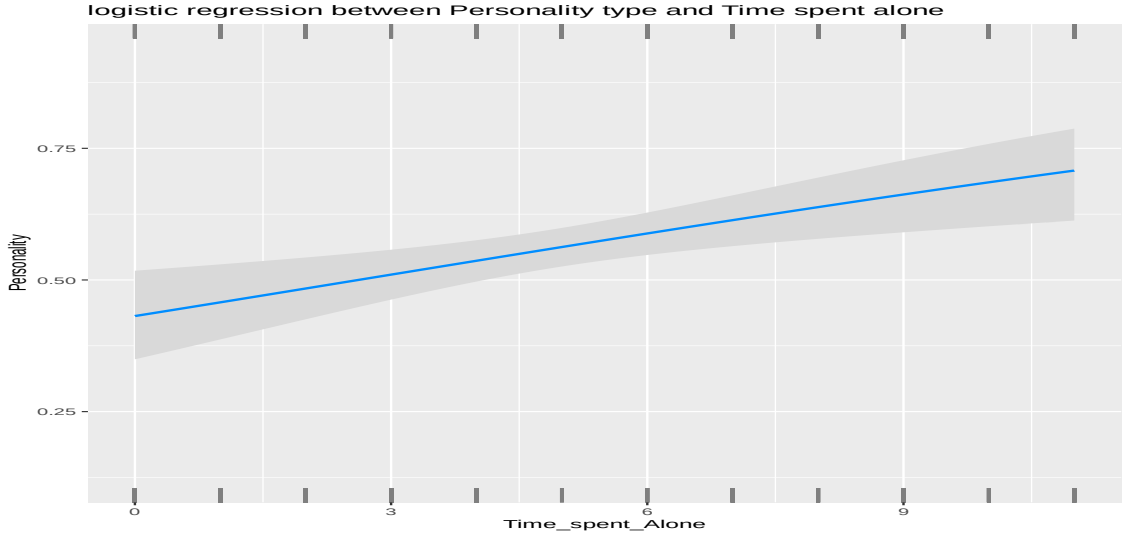

Figure 10 Logistic regression graph for introvert group and time spent alone.

The plot shows that the predicted probability of an introverted personality increases as social event attendance decreases. The probability for 0 events is around 70% while for an increase in events, the probability of being an introvert decreases. The negative linear relationship is seen, and the confidence interval is narrower, showing a good estimate. The results partially support the hypothesis, and the model indicates a strong predictive fit.

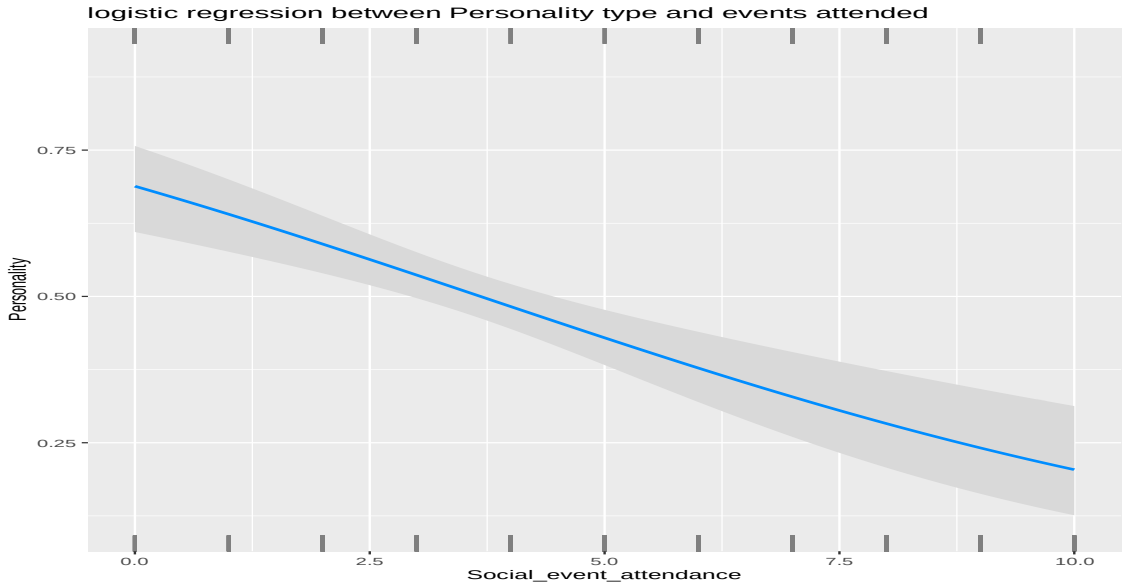

Figure 11 Logistic regression graph for introvert group and social event attendance

Logistic regression with imputed dataset

The dataset had missing values, and some NAs were introduced intentionally as well. They were imputed using a mean imputation function, which calculated the mean value of the observations and imputed them into the areas with missing values. Imputation was done to see the effect of it on regression models.

There are minor differences between the models. The sample size was increased to 2900 due to imputation, but it has a higher AIC value than the original. It does have a higher value for explaining deviance. The predictors remain highly significant, with the effect size slightly increased. There was no change in the direction of any relationship or effect. However, the strongest predictor of changed to going outside.

Table 3
General model figures with imputed data

Predictor	Estimate	Std. Error	z value	p value
Intercept	2.63209	0.29674	8.870	< 2e-16 ***
Time Spent Alone	0.12588	0.03125	4.028	5.63e-05 ***
Social Event Attendance	-0.23874	0.04092	-5.834	5.41e-09 ***
Going Outside	-0.36203	0.05415	-6.685	2.31e-11 ***
Friend Circle Size	-0.08556	0.02552	-3.353	8e-04 ***
Post Frequency	-0.24111	0.04176	-5.773	7.78e-09 ***

Note. Null deviance = 4017.9 (*df* = 2899); Residual deviance = 1675.4 (*df* = 2894); AIC = 1687.4. *** $p < 0.001$

The range of probability changes to 0.37-0.70. There is a much narrower confidence interval, although it is still broader at the ends. It means that people with zero alone time are even less likely to be introverted. There is a stronger effect of alone time as the gradient is steeper.

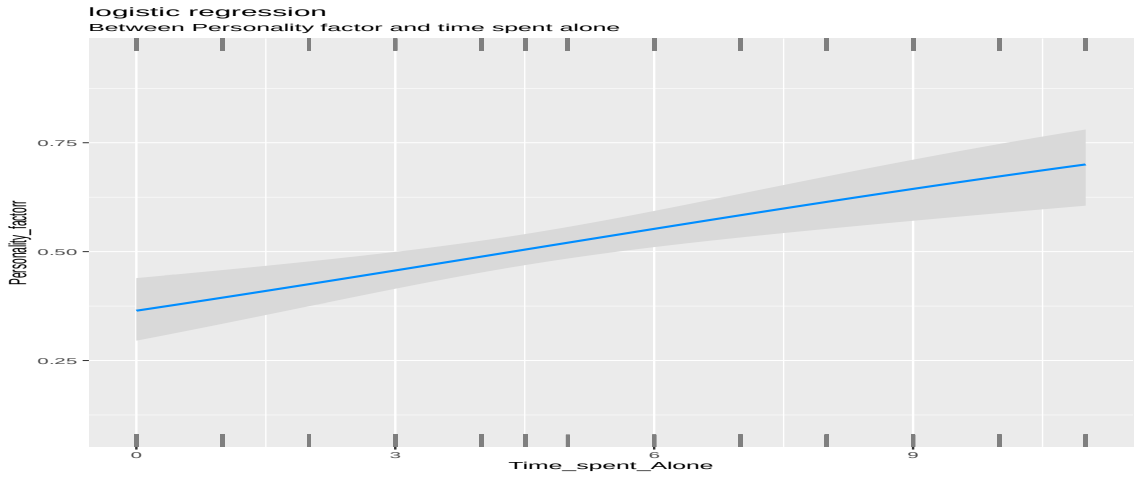

Figure 13 Logistic regression with imputed data for introvert group and time spent alone

The slope is identical to the original one, as the starting and ending probabilities of 0.70-0.20 are also similar to the original. The only difference is that the confidence band for this is slightly wider in the imputed data, reflecting more variability.

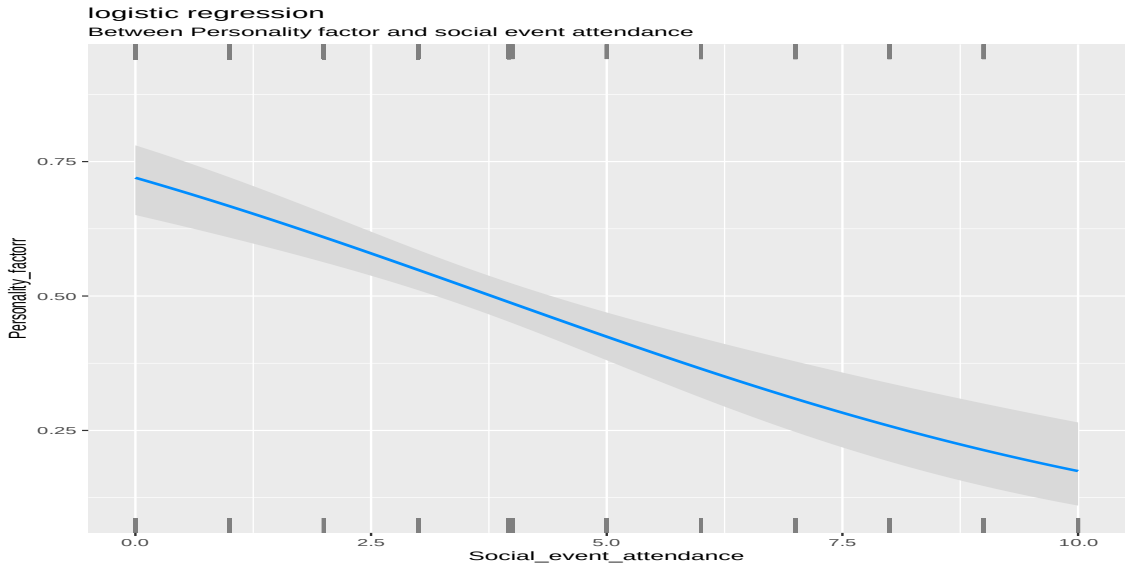

Figure 14 Logistic regression graph with imputed data for introvert group and social event attendance

These findings provide quantitative support for the hypothesis that personality type can be predicted using observable social behaviors. The consistency between both models reinforces the findings seen before. However, the mean imputation method does introduce artificial uniformity which can affect the accuracy of results.

Discussion

The study aimed to clarify the relationship between social engagement behaviors and personality type. The major findings suggest that personality type can be predicted using social engagement behaviors. The strongest predictors are time spent alone and social event attendance. Introverts show more consistent socialization pattern than extroverts. These finding support Jung's theory of personalities as introverts are characterized by spending more time alone compared to extroverts. This is based on their tendency to gravitate towards isolation as a form of gaining energy back.

The findings presented by Yadegari and Alinaghi (2020) converge based on the traits of introverts and extroverts. Introverts seek low stimulating environments with privacy and away from crowds which connects to the data seen in this paper as they tend to spend more time alone and engage less frequently in social engagement. This highlights that introverts naturally fall into a pattern of reduced social and sensory stimulation. This is true for extroverts as well, they tend to spend less time alone and go out more frequently, also supported by Yadegari and Alinaghi, as they seek more expressive and people-oriented environments. However, the points of difference arise as the study focuses on spatial needs while this paper focuses on behavioral predictors. Results show that despite high social engagement, they are less flexible than introverts across different dimensions. This correlation provides quantitative support behind these patterns as well as highlighting the flexibility of extroverts. Their model assumes that extroverts consistently seek stimulation whether socially or sensory.

The correlation between extroverts and social engagement supports DeMeo et al. (2023), claiming that introverts experience daily social interactions more intensely and more often. Similarly, Liu and Csikszentmihalyi (2020) confirmed that introverts source their energy from solitude. The hypothesis was partially supported as time spent alone and the frequency of going outside were the most significant predictors of introvert personality type while there was a weaker relationship with the frequency of posting.

The data tends to support the qualitative research by proving that social behaviors are associated with introversion and extroversion. However, results extend the literature as well by modeling the predictive framework.

Implications, strengths, and weaknesses

The implication arises that there are many variables that affect the behavior of extroverts and social support might be another variable that can affect why introverts may be more socially engaging while extroverts tend to be more consistent with isolation behaviors. These findings also support the theory of personalities as both types follow the patterns established by the literature, therefore adding more content to the existing literature. The predictive model can provide a quantitative basis for further research into the prediction of personality based on different variables of socialization such as quality and hours of conversation.

The strengths of this study include a large sample of 2900 observations which allows generalization to a population. The statistical effect is greater here due to the use of regression and imputation for comparison which can provide a more reliable and valid result. However, the dataset was taken from Kaggle which does lack reliability as all the demographic details are not given. The mean imputation method is a weaker method as it can replace values that mimic uniformity that is not authentic. The lack of authenticity

can make the relationship between variables inaccurate. Since the data was collected from a survey there is a chance that there is a self-report bias.

Conclusion

The analysis carried out helped to establish the most significant predicators of personality type, extrovert, or introvert. Time spent alone and attending social events were the leading determinants of personality type. Extroverts were seen to be less strongly socially engaged compared to introverts. This study affirms the common pattern of traits distinguishing both personality types such as the fact that introverts spend more time alone. It also provides evidence to the idea that an unknown variable such as social support, etc., is affecting the determinants of personality. Overall, the study contributes to the literature of personality theories by focusing on objective, behavior-based determinants of behavior and lays the foundation for future studies on exploring further dimensions of socialization.

Recommendations

Future research can focus on providing more context behind why extroverts are more flexible in their approach to social engagement. Collecting behavioral data and feeding it to a predictive model can provide a better test of personality. The flexibility shown by extroverts is an important effect that needs to be explored as the role of social support or other unknown variables might be at play here.

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