

Family Income, Child-Parent Interaction, and Self-regulation as Predictors of Children's School Readiness

Youngwon Kim

Summary of Research Questions

The current study was guided by the following questions:

1. How much are family income, parent-child interaction, self-regulation, and school readiness correlated with each other?
 - a. School readiness is significantly associated with self-regulation and family income is moderately associated with parent-child interaction and school readiness.
 - b. There is no significant relationship between family income and self-regulation, family income and school readiness, parent-child interaction and self-regulation, and parent-child interaction and school readiness.
2. Do parents' income, parent-child interaction, and self-regulation predict school readiness?
 - a. Among three predictors, only self-regulation is highly predictable for school readiness.

Motivation and Background

School entry is one of the most pivotal developmental moments for early children who experience various behavioral, intellectual, and social changes. Each child shows different adaptation to school entry when encountering many new tasks to do: following a strict time schedule, making good relationships with peers and teachers, completing independent work, and learning basic literacy and mathematics. Research shows that meeting such demands depends on "*school readiness*" which indicates how much children are well-prepared and ready to learn (Connell & Prinz, 2002) and the differences between children with school readiness have lasting and significant influences on their future academic, behavior, social outcomes (Bernier, A., McMahon, C., & Perrier, R., 2017). This indicates that school readiness plays a significant role in early childhood. It, therefore, is essential to examine why some children are better prepared than others when entering school.

The definitions of school readiness have been varied across different research. Carlton and Winsler (1999) define school readiness as the minimum developmental level for children to successfully perform in school. The authors indicate that school readiness has been historically defined as two different constructs: readiness to learn and readiness for school. Readiness to learn indicates whether children are successfully able to learn specific materials. Readiness for school indicates whether children can successfully perform in a school context. Thus, school readiness combines these two concepts: readiness to learn and readiness for school. In addition, it is generally agreed that school readiness is a multifactorial concept, including not only academic skills, but also socioemotional and health development (Ferretti & Bub, 2017).

Many factors affect school readiness. One of the strongest predictors for school readiness is parenting. Research indicates that the quality of early parenting affects school readiness. For instance, the parenting engaging in the parent-child interaction, such as telling stories, reading books, playing puzzles or games, building with toys, playing sports, talking about nature or science, doing art, and singing a song are positively associated with children's school readiness in reading and mathematics (Puccioni, 2015). Related to parenting, contextual factors, such as income and education are also highly predictable for school readiness. Isaacs and Magnuson (2011) indicate that a child in a family with low-income parents or a low-level of school degree is likely to have a lower rate of school readiness than a child with a high-income family and a higher level of educational attainment. Parents' SES also has a strong influence on children's school readiness including reading, math, and general knowledge (Joe & Davis, 2009). The other strong predictor for school readiness is noncognitive factors such as self-regulation. Self-regulation, defined as "the ability to stop, think, and then act in goal-directed ways" (Duncan, Schmitt, Burke, & McClelland, 2018, p. 292) is a key component of school readiness and children's learning abilities in a classroom (Blair & Raver, 2014) because children use self-regulation when they engage in learning activities, follow rules, regulate stress and emotion, and persist with learning activities (Blair & Raver, 2015).

School readiness has attracted great public attention due to its influences on children because acquiring school readiness before entering school is considered one of the most significant developmental tasks in preparing for school entry for preschool- and kindergarten-aged children. In this context, it is highly relevant to identify the determinants of school readiness.

Although it is critical to understand what determines school readiness, there has been little recent study about school readiness in Korea because the data including school readiness recently came out from the Korean Institute of Children Care and Education (KICCE). This project using the published data might promote our understanding of school readiness.

Data Source and Sample

Data for this analysis was drawn from the Panel Study on Korean Children (PSKC), which was conducted by currently being conducted by the KICCE. The PSKC is a longitudinal study to examine the trajectory of Korean children's life from birth to nineteen years old (Kim et al., 2016). PSKC started to gather data from newborn babies in 2008 and will track down them annually until 2027. Collected at a national level, the data of the study include the information about children's growth and development, their parents, their teacher, their neighborhood, child-rearing environment, experiences in daycare centers, kindergartens, and schools (Ahn & Shin, 2013; KIECC, n.d.). Among recruited 2,562 households having newborn babies in 2008, 2150 households were confirmed to join the PSKC study. 2078 household participated in the study at the first wave in 2008 (Wave 1). After children entered preschools or childcare centers, PSKC study included teachers at institutions where children went (Wave 3).

As participants decreased every year, 1620 households and teachers participated in 2014 at the seventh wave (75.3%, Wave 7). However, our final sample included 1159 five-year-old Korean children (48.5% girls) assessed by 1159 households and teachers who completed the all questionnaires.

Variables.

Parent-child Interaction. The construct representing parent-child interaction (henceforth referred to as interaction) utilized measures drawn from PSKC in 2014 (Wave 7). This measure is from Home Environment, Activities, and Cognitive Stimulation (HEQ) in Early Childhood Longitudinal Study Kindergarten Cohort (ECLS-K)'. There are 9 items. Parents were asked to report the frequency in which they participated in the following activities with their child: reading books, telling stories, singing songs, playing games or puzzles, playing sports, teaching about nature, making art, and building things together. Parents responded on a 4-point Likert scale from 1 (not at all) to 4 (every day).

Family income. Parental reports on family income per month were included as a predictor of school readiness because family income is related to be children's school readiness. Family income is a continuous variable provided in the PSKC dataset (Wave 7).

Self-regulation. Gresham and Elliott (1990) developed the measurement to assess social skills and Seo (2004) translated this into Korean Social Skills Rating System (K-SSRS). This measurement includes four aspects: cooperation, responsibility, self-assertion, and self-regulation. The present study will use only self-regulation. Teachers completed 7 items respectively, using a 3-point Likert scale (1 = Never, 3 = Very often).

School readiness. Murphy and Burns (2007) developed the measurement to assess school readiness. In 2014 (wave 7), teachers completed 22 items using a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree). As a multidimensional factor, there are four aspects in social readiness: social development (e.g. having a time with peers), attitude toward learning (e.g. following directions and class rules), and language (e.g. desire and friends).

Methodology

The present study will empirically test the conceptual model of the influences of family income, self-regulation, and parent-child interaction on school readiness in Korean socioeconomic and cultural context. To be specific, this current study will examine the associations among parent's income, parent-child interaction, children self-regulation, and school readiness. To conduct this research, I am going to analyze family income (1 items), interaction (9 items), child self-regulation (7 items), and school readiness (22 items).

Loading data from a csv file. By using a csv package, I loaded data from 'project_data.csv'. The data were extracted from 7th wave PSKC study. In the csv file, there are only variables related to this project because sharing whole data is restricted.

Descriptive analysis.

Gender of children. The numbers of boys and girls were counted and the ratio of girls among total children was calculated.

Other variables. By using a pandas package, I calculated the averages, standard deviation, minimum, and maximum of parents' incomes (1 item), interaction (9 items), child self-regulation (8 items), and school readiness (22 items).

Inferential analysis.

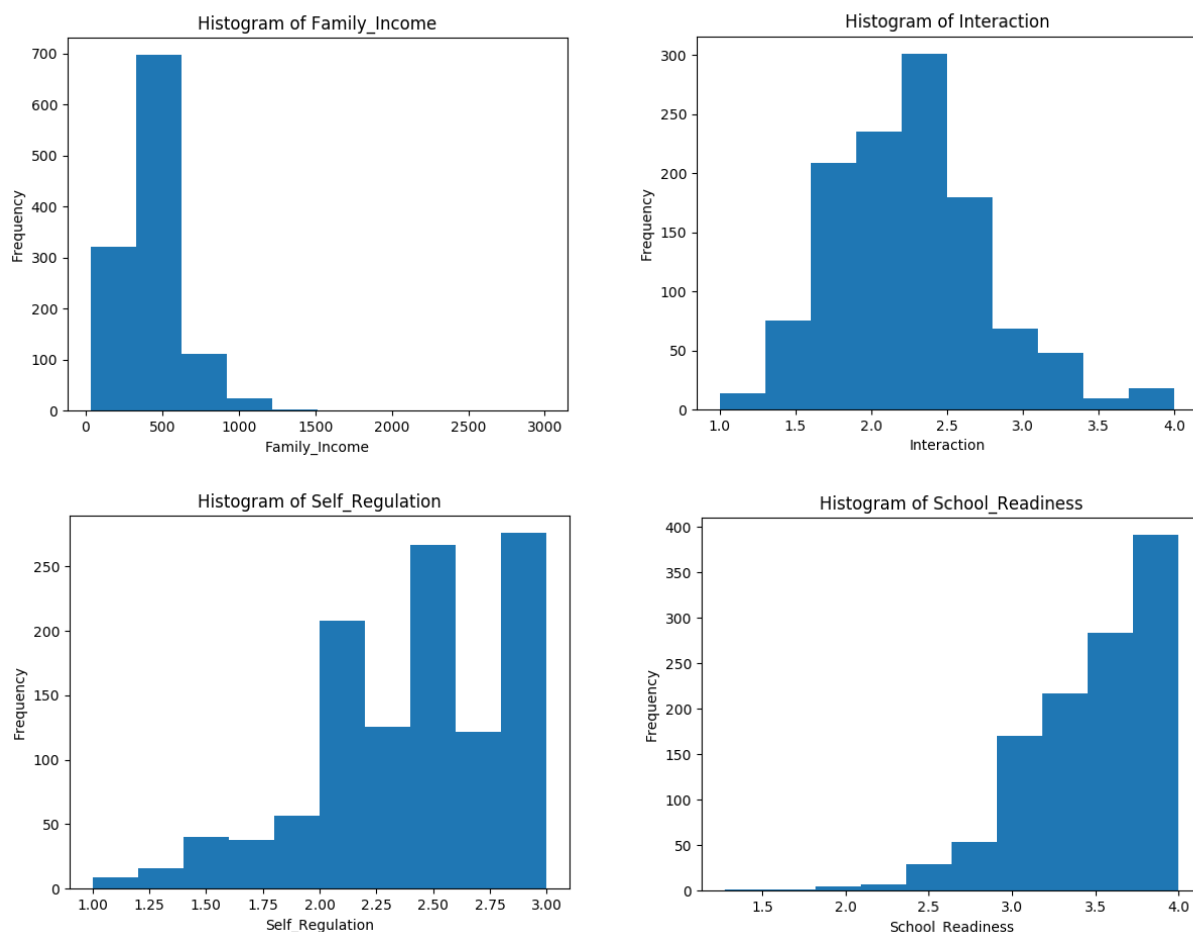
Correlation. By using pandas and statsmodels packages, I got the values and significances of correlations between variables and made.

Regression. To understand how family income, interaction, and child self-regulation predict child school readiness, I ran regression using pandas and statsmodels packages and made a scatter plot of theoretical quantile to check how the regression fits

Results

Figure 1

Histograms of Family Income, Interaction, Self-Regulation, and School Readiness (N = 1059)

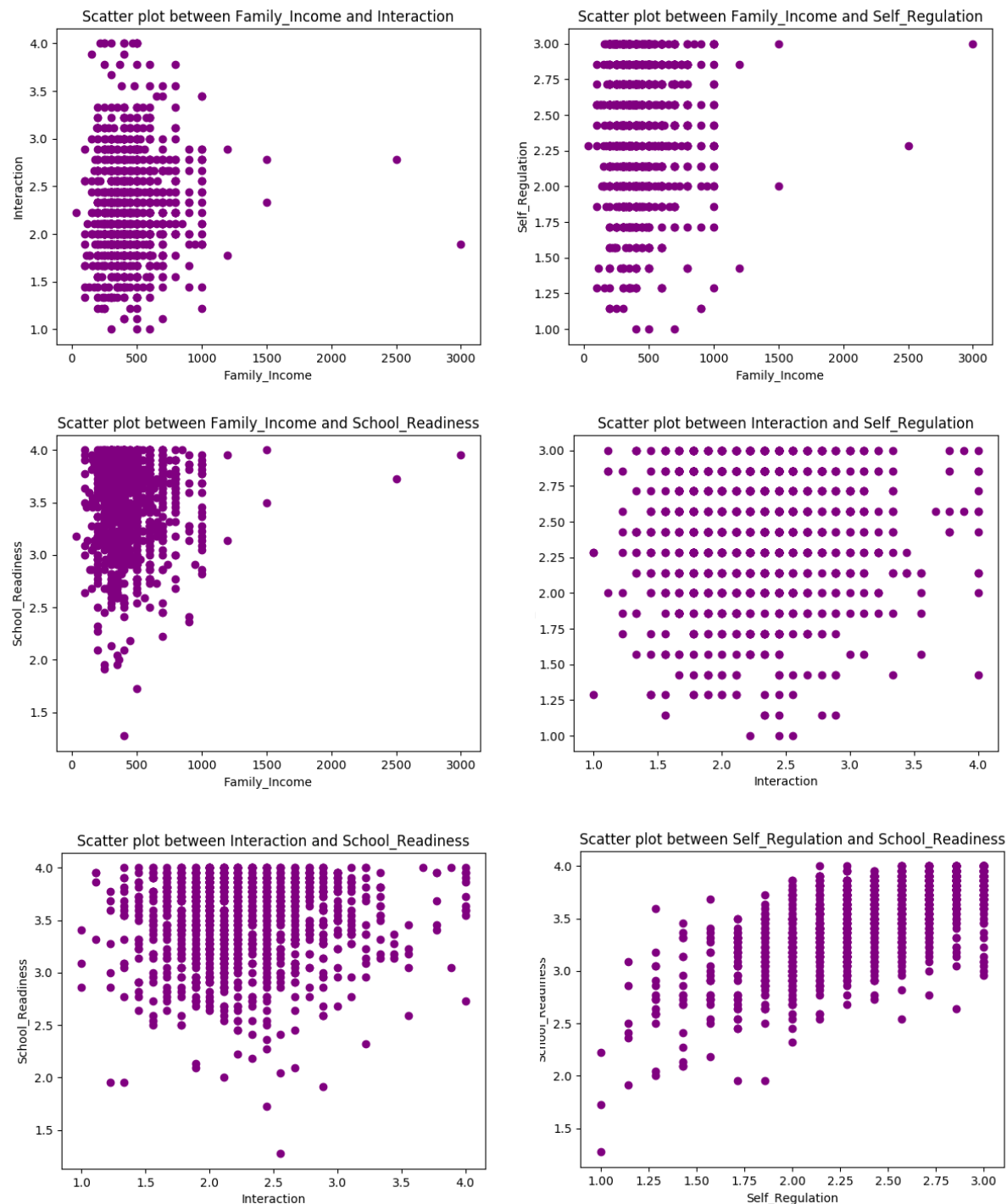


Descriptive analysis. In the final sample, the total of students were 1159 students (boys: 597; girls: 562). Their parents' incomes per month ranged from 300,000 won to 30,000,000 won (from \$278 to \$27,800 at the exchange rate of 1,075.5 won to the U.S. dollar on June 2, 2018) with a mean of 4,477,213.11 won ($SD = 2,063,414.41$ won, \$ 4,162.91 at the exchange rate of 1,075.5 won to the U.S. dollar on June 2, 2018). In Figure 1, the graph on family income is positive skewed because of a few high income participants. The interaction ranged from 1 to 4, with a mean of 2.27 ($SD = .51$). The responses of this variables look well distributed. The self-regulation ranged from 1 to 3, with a mean of 2.41 ($SD = .44$). The child school readiness ranged

from 1.27 to 4, with a mean of 3.49 ($SD = .41$). The graphs on child self-regulation and school readiness are negatively skewed because teachers were likely to rate their students with high scores.

Figure 2

Scatter Plots among Family Income, Interaction, Self-Regulation, and School Readiness



Bivariate correlation among variables. In Figure 2, the last scatter plot on the correlation between self-regulation and school readiness shows the most positive linear tendencies, indicating the highest correlation. The scatter plot of interaction and family income looks randomly distributed, pointing the lowest correlation. Specifically, Table 1 presents the intercorrelation matrix for all variables. Self-regulation was significantly correlated with school readiness ($r = .711, p < 0.001$). In addition, family income is moderately associated with interaction ($r = .069, p < 0.05$) and school readiness ($r = .066, p < 0.05$), with the exception of self-regulation. Interaction is not significantly correlated with self-regulation and school readiness.

Table 1

Bivariate Correlations among the Variables (N = 1059)

	Family income	Interaction	Self-regulation
Family income			
Interaction	.069*		
Self-regulation	.036	.056	
School readiness	.066*	.055	.711***

* $p < 0.05$. *** $p < 0.001$

Family income, child-parent interaction, and self-regulation as predictors of children's school readiness. In Figure 3, the quantile-quantile plot is almost straight line, thus, this provides strong evidence that the data in this project show a uniform distribution, which is not skewed. This indicates that our regression model may be reasonable to predict school readiness. According to Table 2, the regression model resulted in a statistically significant degree of variance in school readiness explained ($\Delta R^2 = 0.507, \Delta F(3, 1055) = 395.8, p < 0.001$). Among three variables, the only significant predictor was the self-regulation variable, which was positively associated with school readiness. To be specific, for every unit change in the self-regulation, the school readiness variable changes by .6594 units ($t(1055) = 34.219, p < .001$).

Figure 3

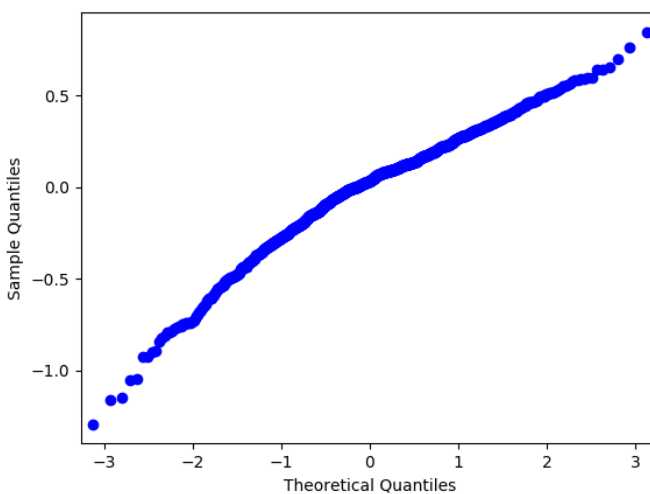
Quantile-quantile plot of Regression

Table 2

Regression of Variables onto School Readiness (N = 1059)

	Coefficient	S.E	t.	p
Family income	.0000792	.0000411	1.927	.054
Interaction	.0103	.017	.618	.537
Self-regulation	.6594	.019	34.219***	.000

R-squared: .507, Adjusted *R*-squared: .506*** $p < 0.001$

Discussion and implication. In the current study of the influence of family income, parent-child interaction, and self-regulation on child school readiness, I found that family income were modestly correlated with the other variables with the exception of self-regulation which was only critically associated with school readiness. This finding is supported by the research that has shown how school readiness is correlated with family income (Joe & Davis, 2009) and self-regulation (Blair & Raver, 2014). However, parent-child interaction is not related to school readiness. This is inconsistent with the research that emphasized the importance of parenting engaging in the parent-child interaction (Puccioni, 2015). In addition, among the variables, only self-regulation had a strong influence on children's school readiness even though family income also had relationship with school readiness.

To understand the above results better, it is necessary for us to think where the data for this project come from and to understand educational contexts for early childhood in Korea. According to Lee and her colleagues (2016), the public early child education system in Korea, is relatively well-established. Korean government has implemented a new national-wide Nuri Curriculum since 2012 which enables comprehensive high-quality curriculum regardless of the type of ECEC service they were attending and contributes to achieving free child care. In addition, Korean government has increased infrastructures and investments for early childhood education and care since 2005. Therefore, it is true that most children can be educated by a preschool, kindergarten, or caregiver center regardless of their parents' income level in Korea. This might reduce the influences of family income on child school readiness and self-regulation which is essential when engaging in school activities and keeping learning could be one of the strongest predictors.

Reproducing your results.

1st step (Read and clean Korean early childhood data). To process 1st step, it is necessary to read "project_data.csv" using "read_csv" and then store the data in "data".

2nd step (Make a dictionary of necessary variables for analysis). To process 2nd step, it is necessary to make a new dictionary including 'Family_Income', 'Gender', 'Interaction', 'Self_Regulation', and 'School_Readiness' using "make_a_new_dict" and then store it in "new_dict".

3rd step (Change a dictionary into a dataframe). To process 3rd step, it is necessary to exchange a dictionary ("new_dict") into a dataframe using "pandas" and then store the dataframe

in “new_dataframe”.

4th step (Count the number of boys and girls and get gender ratio). To process 4th step, it is necessary to count the numbers of boys and girls in the dictionary using “count_gender”, get a ratio of girls among children, and then print the numbers and ratios.

5th step (Show frequencies, means, standard deviations, min/max numbers). To process 5th step, it is necessary to get frequencies, means, standard deviations, min/max numbers, using a pandas package and then print out.

6th step (Show a correlation matrix between variables).

7th step (Check how significant correlations are).

8th step (Show histograms of variables).

9th step (Show scatter_plots between variables).

10th step (Regression and show a quantile-quantile plot).

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#####
Gender
#####

The number of boys is 597 and the number of girls is 562. The ratio of girls is 0.484900776531.

#####
Descriptive Statistics
#####
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	Family_Income	Interaction	Self_Regulation	School_Readiness
count	1159.000000	1159.000000	1159.000000	1159.000000
mean	447.721311	2.265267	2.407248	3.492588
std	206.341441	0.507382	0.439838	0.409327
min	30.000000	1.000000	1.000000	1.272727
25%	300.000000	1.888889	2.142857	3.227273
50%	400.000000	2.222222	2.428571	3.590909
75%	500.000000	2.555556	2.714286	3.818182
max	3000.000000	4.000000	3.000000	4.000000

```
#####
Correlations
#####
```

	Family_Income	Interaction	Self_Regulation	\
Family_Income	1.000000	0.068954	0.036285	
Interaction	0.068954	1.000000	0.056079	
Self_Regulation	0.036285	0.056079	1.000000	
School_Readiness	0.066516	0.055298	0.710692	

	School_Readiness
Family_Income	0.066516
Interaction	0.055298
Self_Regulation	0.710692
School_Readiness	1.000000


```
#####
Significances of Correlations
#####
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The significance (p) of correlation (0.0689539887449) between Family_Income and Interaction:
0.0188878305152

The significance (p) of correlation (0.036284748705) between Family_Income and Self_Regulation:
0.217070741781

The significance (p) of correlation (0.0665163899206) between Family_Income and School_Readiness:
0.0235400217313

The significance (p) of correlation (0.0560793796854) between Interaction and Self_Regulation:
0.0563119836691

The significance (p) of correlation (0.0552977962866) between Interaction and School_Readiness:
0.059839844169

The significance (p) of correlation (0.710691523274) between Self_Regulation and School_Readiness:
6.38840870172e-179

```
#####
Regression
#####
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OLS Regression Results

Dep. Variable:	School_Readiness	R-squared:	0.507
Model:	OLS	Adj. R-squared:	0.506
Method:	Least Squares	F-statistic:	395.8
Date:	Sat, 02 Jun 2018	Prob (F-statistic):	8.98e-177
Time:	22:34:14	Log-Likelihood:	-199.04
No. Observations:	1159	AIC:	406.1
Df Residuals:	1155	BIC:	426.3
Df Model:	3		
Covariance Type:	nonrobust		

	coef	std err	t	P> t	[0.025	0.975]
Intercept	1.8464	0.061	30.519	0.000	1.728	1.965
Family_Income	7.92e-05	4.11e-05	1.927	0.054	-1.45e-06	0.000
Interaction	0.0103	0.017	0.618	0.537	-0.022	0.043
Self_Regulation	0.6594	0.019	34.219	0.000	0.622	0.697

Omnibus:	108.696	Durbin-Watson:	1.914
Prob(Omnibus):	0.000	Jarque-Bera (JB):	156.693
Skew:	-0.712	Prob(JB):	9.43e-35
Kurtosis:	4.104	Cond. No.	3.66e+03

Warnings:

- [1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
- [2] The condition number is large, 3.66e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Work Plan Evaluation.

Original plan - Part 1. Because I cannot submit all data that I have, I need to edit the data at first. This data have 659 variables. I will use approximately 40 variables and submit them. Because the variable name is not English, I cannot see the variable names with my laptop. Therefore, it will take time to find appropriate variable names from a code book, convert them into readable types of data, and make a new data file for this project. (4-6 hours).

Evaluation. This plan worked well because I found the ways to check the variable names in the PSKC dataset and a staff at the information center where I rented the lap that I am using helped me to install Korean language at the laptop. It took 6 hours.

Original plan - Part 2. I will write codes for analyzing and visualizing the data that I have. (3 or 4 days, at least, 5-6 hours per day)

Evaluation. Although I made plans and outlines for this project before starting coding, it took much more time for to write codes for analyzing and visualizing the data than I expected. The coding for this final project was totally different from previous homework which had specific directions and processes that I needed to follow. Because I also had many other tasks to do for final week of this quarter, I could not fully focus on writing coding every day. It took almost a week, 5-6 hours per day.

Original plan - Part 3. I will analyze the results after running codes that I made at Part 2 and complete this final project (3 or 4 days, at least 4-5 hours per day)

Evaluation. Analyzing results took less time than I expected. I think that this is due the fact that the results for the final project were not complicated. In addition, I already spend much time writing codes. Thus, I do now have enough time to check every statistical issue related to the results and analysis from data deeply. It took 2 days, 5-6 hours per day.

Original plan - Part 4. I will check the results with my advisor and get some feedback from my advisor. According to the feedback, I will edit or rewrite my project.

Evaluation. Although I asked my advisor to check my project, my advisor could not make a time for reviewing my work. Before submitting this project, I showed this one of my cohorts. This did not work well.

Collaboration

Alex Zhou advised me to use a pandas package for this project. I do not know the TA name, but he taught me how to use “strip()” when dealing with blanks in my data.

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