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<u>Deviant aggressive behavior:</u>

1. If Theory I were correct, this means that individuals learn from rewarding and punishment mechanism of certain behaviors through experience. Therefore, social policy that reinforces such mechanism might be helpful to lead individuals in a society to act in ways that are normal as well as avoid abnormal actions. In other words, if the society gives harsher punishment on deviant aggressive behavior, it is less likely that people would take the potential punishment risks to behave in such a way. However, this punishment cannot reach to an extreme such that it starts to oppress people to conform exactly in the same way that is considered as 'normal'. Therefore, we may establish a credit system that add on or subtract credits to regulate behaviors according to individual's violation or obedience to norms.

2. If Theory II were correct, this means that deviant aggressive behavior is a vent of feelings caused by hierarchical treatment. People may feel that their self-esteem get hurt when they receive negative and frustrating response from personal authorities. Therefore, we may want to facilitate an environment that offers respect to people and protects their dignity even if hierarchy exists. We should also oppose the oppressive attitudes from authority power. This should be implemented at different levels and for example can be achieved by setting corresponding regulations in labor unions in a working environment, limiting the power of public officials, offering social welfare.

3. If Theory III were correct, this means that our social policy should reflect on current systematic discrimination within the society. To be more specific, as a society, we have to present more attention to the groups that are being discriminated or neglected from a macro perspective. We need to build an environment that is more likely to provide equal opportunity for individuals within. By leveraging resources, we are able to provide more care to these groups both financially and mentally. If the system can give hope, justice and respect to these people, they may conform to the 'societal norms' because of the benefits they can obtain from the system. Therefore, to reduce such deviant aggressive behaviors, social policy should give incentives to people and they will follow

social rules voluntarily out of the beliefs of hope and development. We may also offer space for them to voice out their thinking and needs.

4. If Theory IV were correct, this means that socialization from culture is a key factor that influences behavior. For this reason, to reduce deviant aggressive behavior, we should look at the sphere of public culture, especially its subculture segment. We need to examine and evaluate the components of subculture that might have negative influences on such behaviors. Our social policy should try to encourage or even lead the development of creative subculture (art, sports, etc.) that will have a positive influence on the subculture consumers. In this way, when individuals are socialized into certain roles, they are following a positive figure.

Waiting until the last minute:

a. Reasons: (1) Psychological procrastination including resistance towards complex/boring tasks, fear of putting too much effort but receiving unsatisfying results, additions to internet, etc.; (2) Behavioral procrastination including inaccurate estimation on finishing time, unplanned distractions, etc.

b. A two-variable linear interaction regression model can be used to explain the reasons. Assumptions: Psychological and behavioral variable work together to determine procrastination while psychological incentives also have influence on behaviors.
Model: y = b0 + b1*x1 + b2*x2 + b3*(x1*x2) + e
y here is a dependent variable representing individual's procrastination level or possibility, x1 and x2 are explanatory variables that represent psychological variable and behavioral variable respectively, b1 and b2 are x1 and x2's slope coefficients, and e is the error of this model. This model also considers the interaction effect between psychological variable x1 and behavioral variable x2. We use *"b3*(x1*x2)"* to indicate such interaction. b3 represents the slope coefficients of *(x1*x2).* As explained above, this regression model indicates two aspects that determine procrastination, one is the

psychological condition and the other is the behavioral influence. These two variables also have mutual influences on each other.

c. An alternative model that may also explains such delaying behavior is the model Assumptions: People decide to procrastinate with rational minds. Individuals have different level of procrastination personal trait, and they measure and balance the cost and benefit of finishing tasks just in time to decide if they procrastinate. Cost includes risks of unable to finish task on time, working time, trade-off on other activities, etc. Benefits include early freedom to do other things, feeling of relaxing, etc.

Model: $y=b_0 +b_1x_1 +b_2x_2 +e$

y here is a dependent variable representing individual's procrastination level or possibility, b0 is the intercept x1 and x2 are explanatory variables that represent cost evaluation and benefit evaluation, b1 and b2 are x1 and x2's slope coefficients, and e is the error of this model. The cost variable x1 refers to individual's evaluation on the consequences of not completing the task as well as the possibility of delaying submission. The benefit variable x2 refers to the benefit evaluation on completing the task early.

d. Model1 Predictions: (1) b1 and b2 are both positive and b1 may be greater than b2. In these two variables, we predict that psychological factor may play a more significant role in determining procrastination compared with behavioral factor;(2) b3 may be a positive coefficient that is very large, this is because actual behaviors are significantly led by psychological conditions;

Model2 Predictions: (1) b0 measures personal attribute of procrastination and differs greatly from people to people. The difference of b0 among different people may directly determine the procrastination level despite x1 and x2; (2) b1 is a negative number and x1's absolute value may be greater than x2's, for the reason that people are likely to consider the risks instead of benefits of finishing tasks in advance.

Selecting and fitting a model

1. a. The flexible statistical learning method works better.

Large sample size and small p mean that outliers may have little influence on the model, therefore a flexible statistical learning method performs good.

b. The inflexible statistical learning method works better.
When statistical learning method contains too many parameters, the flexible one will cause strong overfitting effects, and fail to fit additional data and fail to make future predictions. The limited number of observations cannot explain the extremely large p, and lead to overfitting.

c. The flexible statistical learning method works better.
The flexible statistical learning method works better for describing and predicting non-linear relationships. Each predictor matches with its corresponding response and the method has more degrees of freedom, thus can provide more accurate predictions than the inflexible one.

d. The inflexible statistical learning method works better.
When the variance of the error terms is extremely high, it means that data discrepancy is high and possibly contains great amount of irrelevant information. Flexible statistical learning method is likely to lead to overfitting that fit the discrepant data into error term, therefore the inflexible one is better in this case.

2. a.
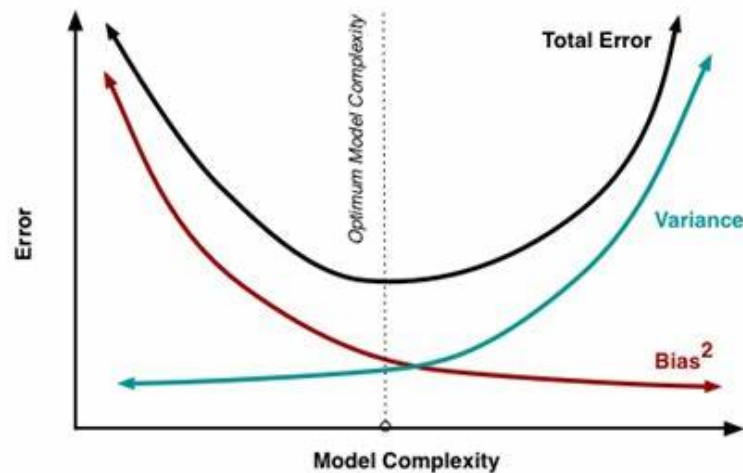
1) Bias error

Bias error comes from inaccurate or incorrect model assumptions, this is because sometimes linear relationship cannot fully explain real-world problems. The curve will go down with increasing model complexity. This means that the more complex a model is, the lower bias error it may have, for the reason that more model factors are taken into consideration.

2) Variance error

Variance error comes from fluctuations around mean in training data. The curve goes up when the model becomes more complex because of outliers overfitting.

3) Training error

The curve goes down when the model is more complex. Models with high model complexity yields lower MSE on training data, thus have a better quality fit.

4) Testing error

The curve is a U-shape. It firstly goes down and then goes up with model complexity keep increasing. It shows the interaction between the three error types above. The going-down trend is caused by fast decreasing bias error and decreasing training error; the going-up trend is caused by fast increasing variance error.

5) Irreducible error

The curve is a flat curve that stay the same. Irreducible error is an error inherent from the problem itself, therefore does not change when the model complexity changes.