Module 3:
General Linear Model

MSIR 525

October 14-28, 2019

Recap of Module 2 (check list from syllabus; see pages 1-2)

- We learned about several issues in data sets (e.g., outliers, missing data, non-normal distributions) that may bring into question the robustness of empirical results
- We developed R code that will estimate descriptive statistics for a set of data
- We learned about the importance of interpreting and communicating descriptive statistics (e.g., in tandem, visually and empirically)
- Although we did not perform an ANOVA to assess if means differed across multiple groups, we discuss the technique's utility and limitations
- We learned how to perform a t-test; interpret its results; use its results to inform an evidence-based management decision
  - Importantly, we learned how to "explore further" to gain a better understanding of what the data are telling us

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  - Review of hackathon exercise; introduction to the general linear model (GLM); an assessment of the GLM assumptions

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  - Module 3 recap and software tutorial
- 10/28/2019
  - In-class exercise for credit (i.e., a hackathon)
  - Determine the strongest correlates of employee performance and turnover behavior

Agenda for Module 3

- Let’s get started! ☺

Motivating Example:

- Imagine that you are an HR Analyst who is interested in knowing if there is a relationship between an individual's applicant exam score and (a) future job performance and (b) future turnover behavior.

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- **NOW, WE ARE DEALING WITH BIVARIATE STATISTICS (MODULE 3)**

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WHAT DOES THIS MEAN?

- **MEASURES OF CENTRAL TENDENCY (E.G., MEAN) SUMMARIZE DATA PERTAINING TO JUST *ONE* VARIABLE (MODULE 2)**
- **NOW, WE ARE INTERESTED IN THE RELATION BETWEEN *TWO* VARIABLES (MODULE 3)**

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  - In other words, are the screening tools useful for forecasting important outcomes that will affect organizational performance

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How can bivariate statistics be used in the aforementioned example?

- You're right, we don't know how to do this just yet (it's the whole purpose of Module 3!

So, let's go and learn about the correlation coefficient and the simple linear regression model

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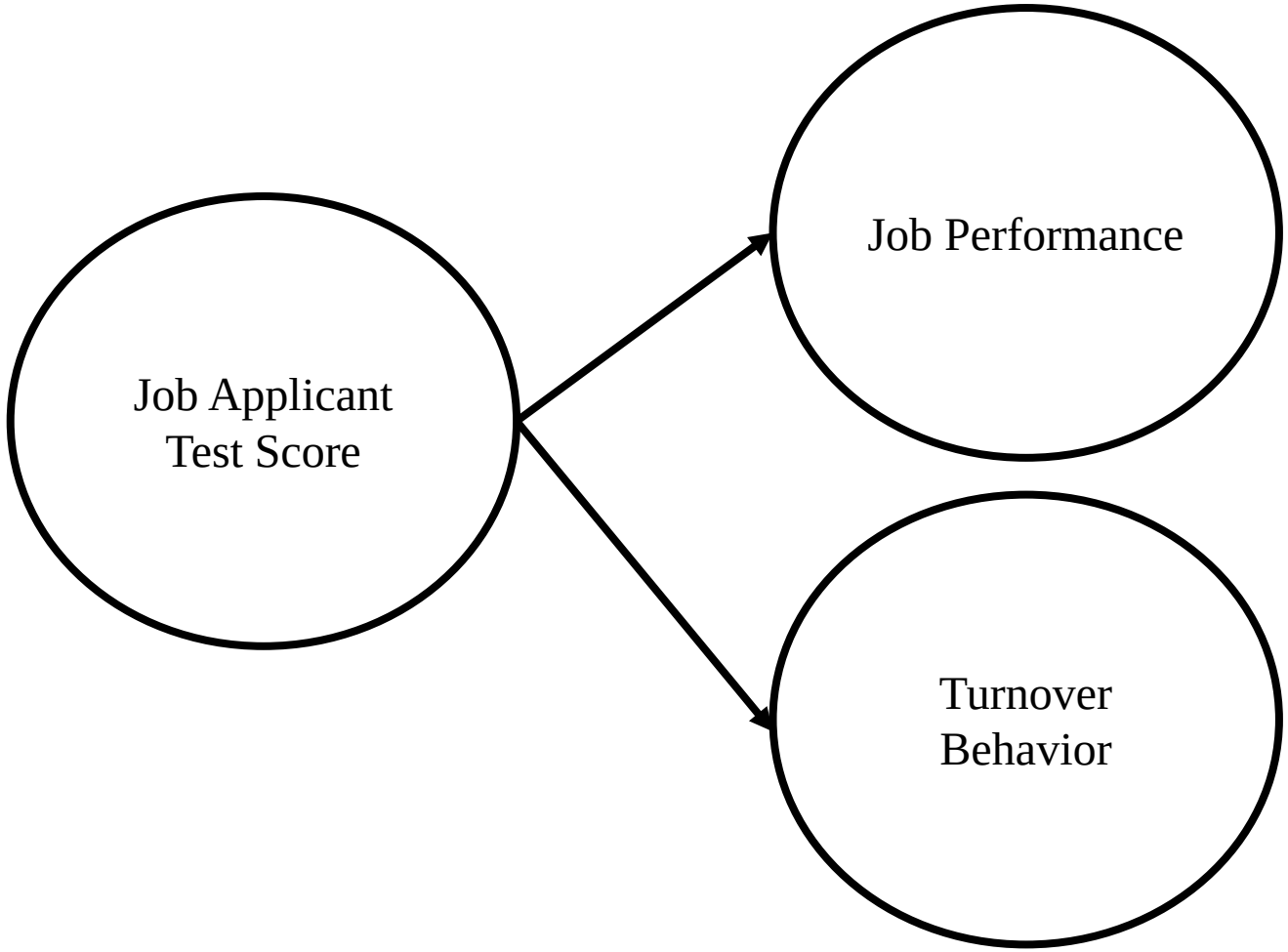

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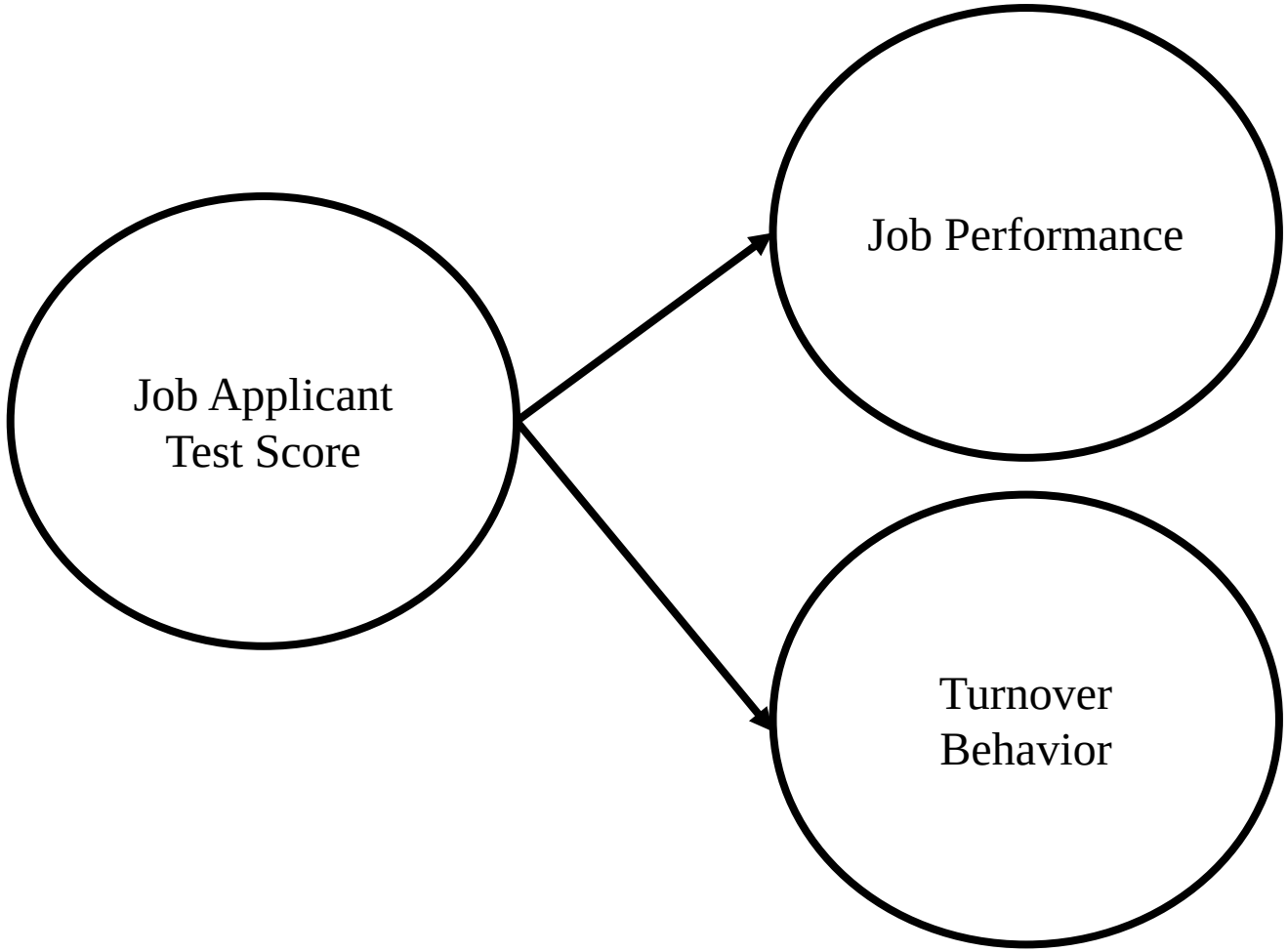

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(1) Test score → Performance
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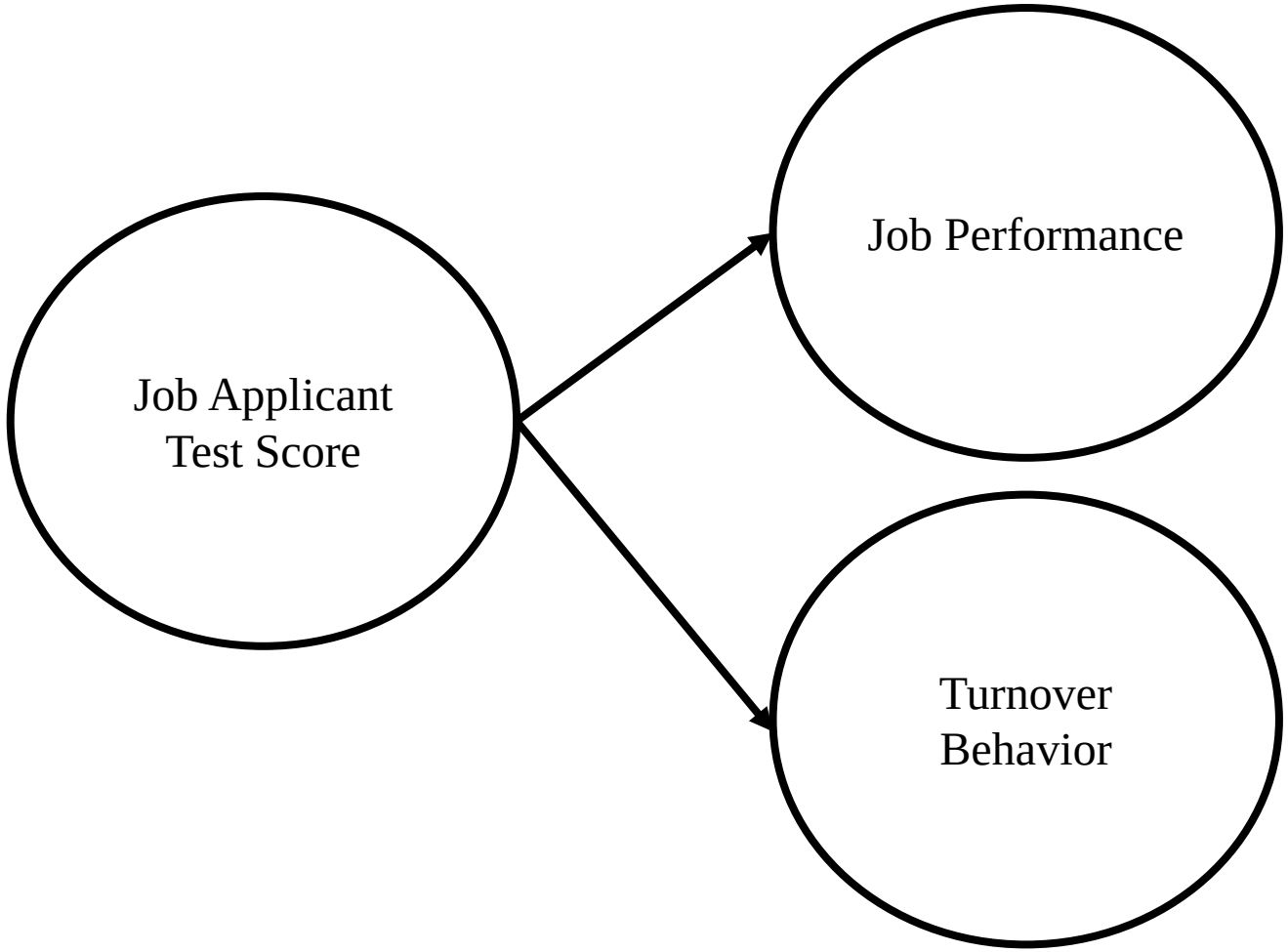

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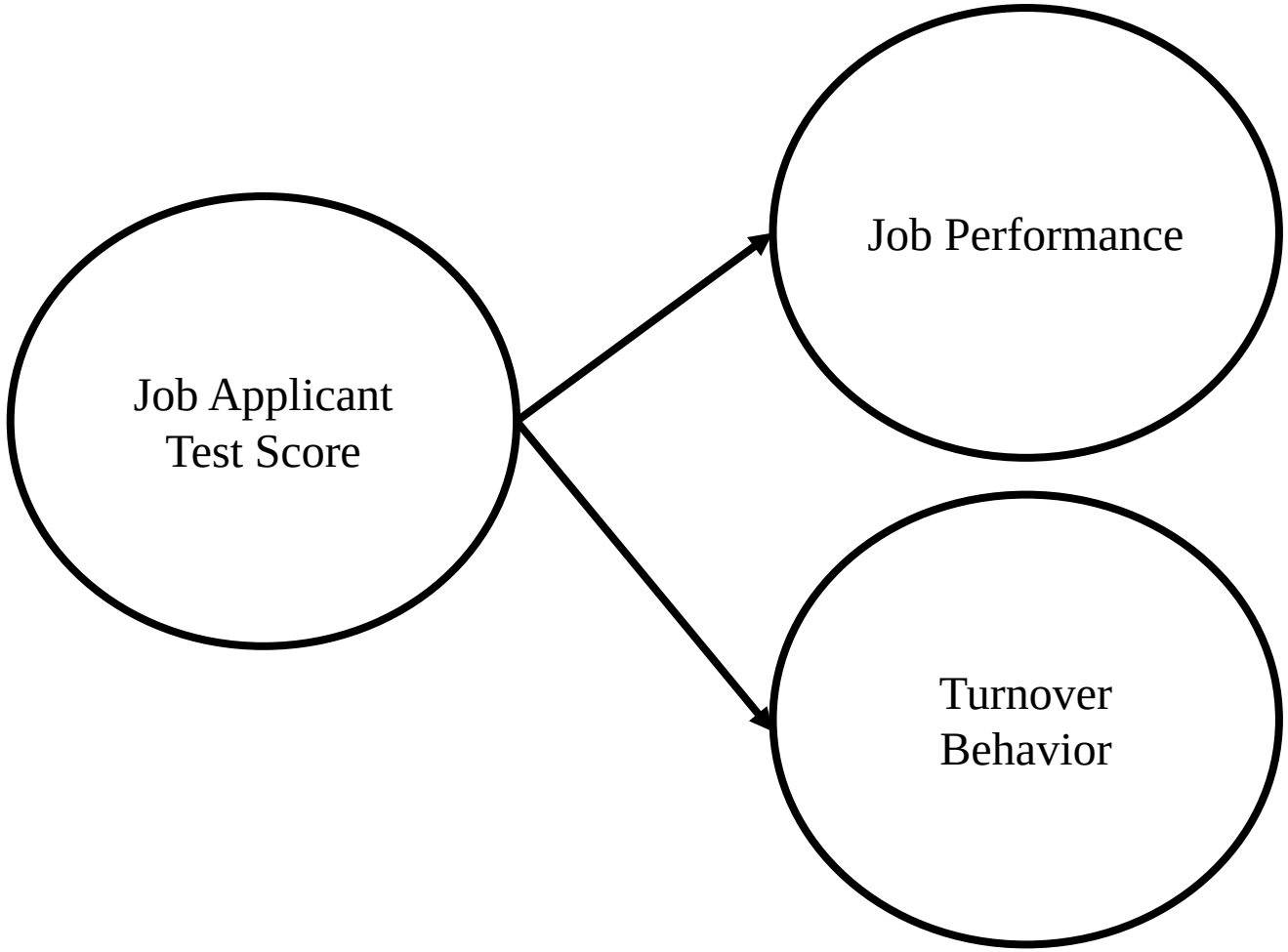

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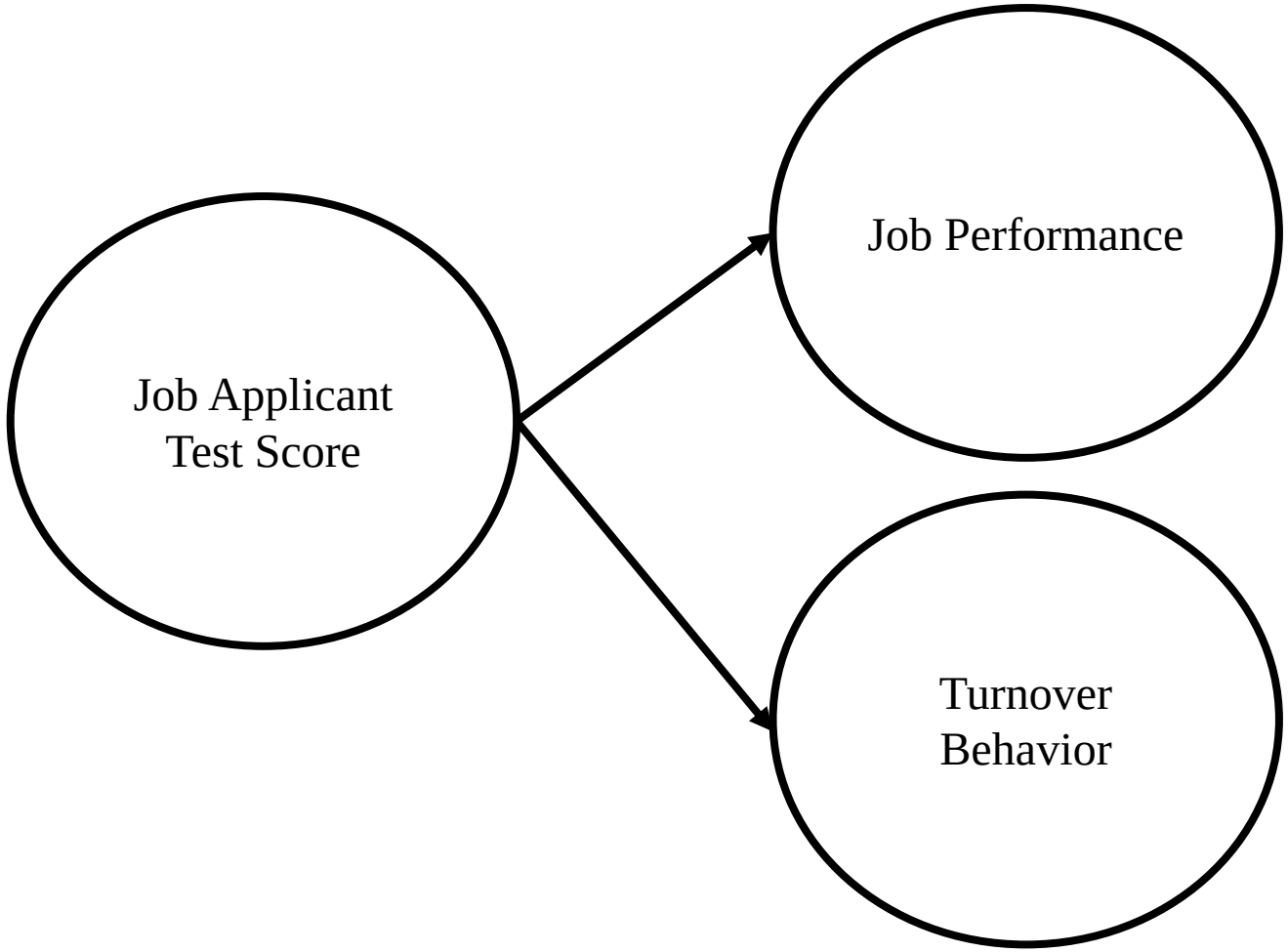

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We are not predicting one them from another

Motivating Example:

- Imagine that you are an HR Analyst who is interested in knowing if there is a relationship between an individual's applicant exam score and (a) future job performance and (b) future turnover behavior.

- Effectively, you want to know if the organization's current screening tools have important **validity** outcomes.

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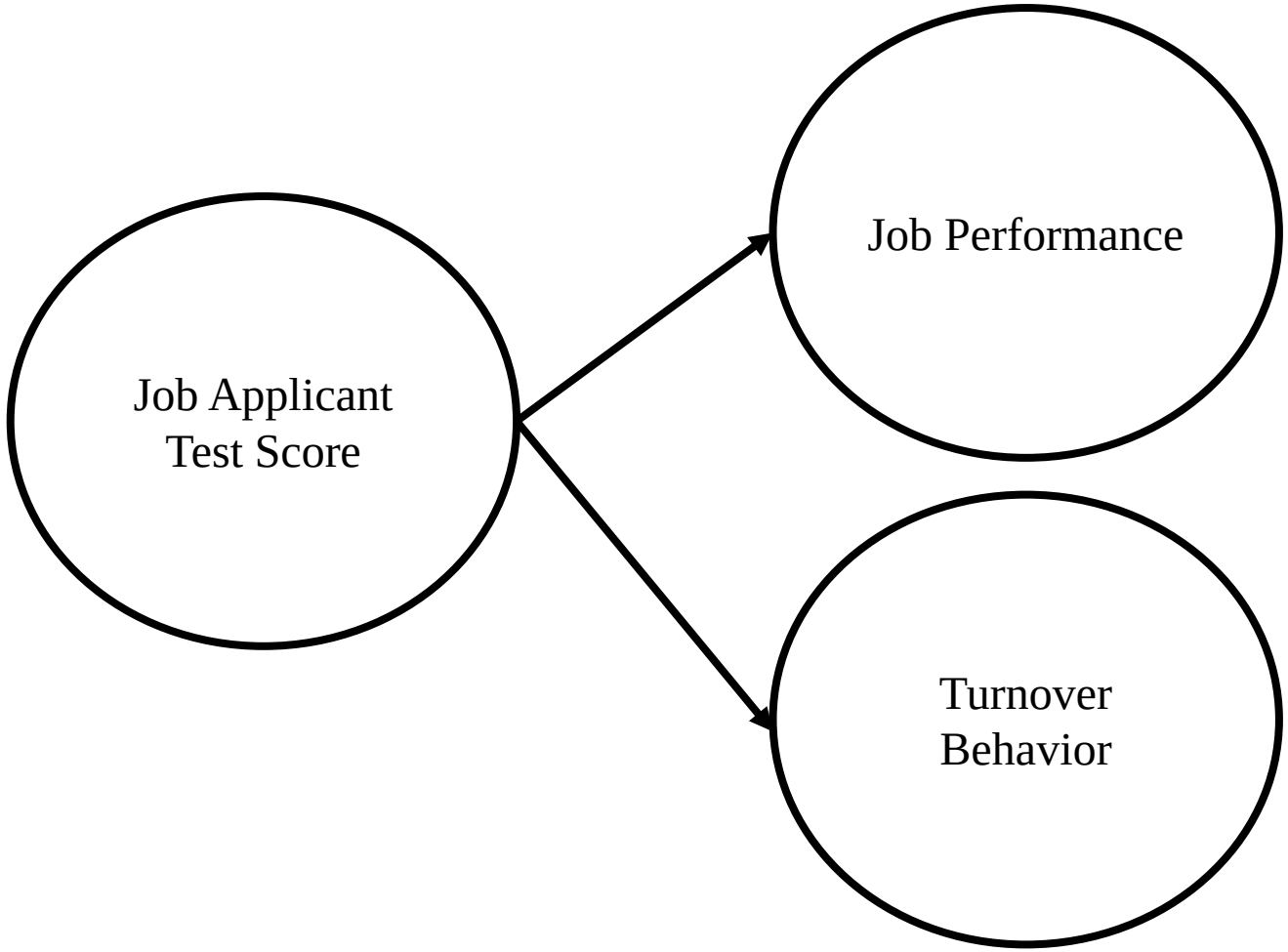

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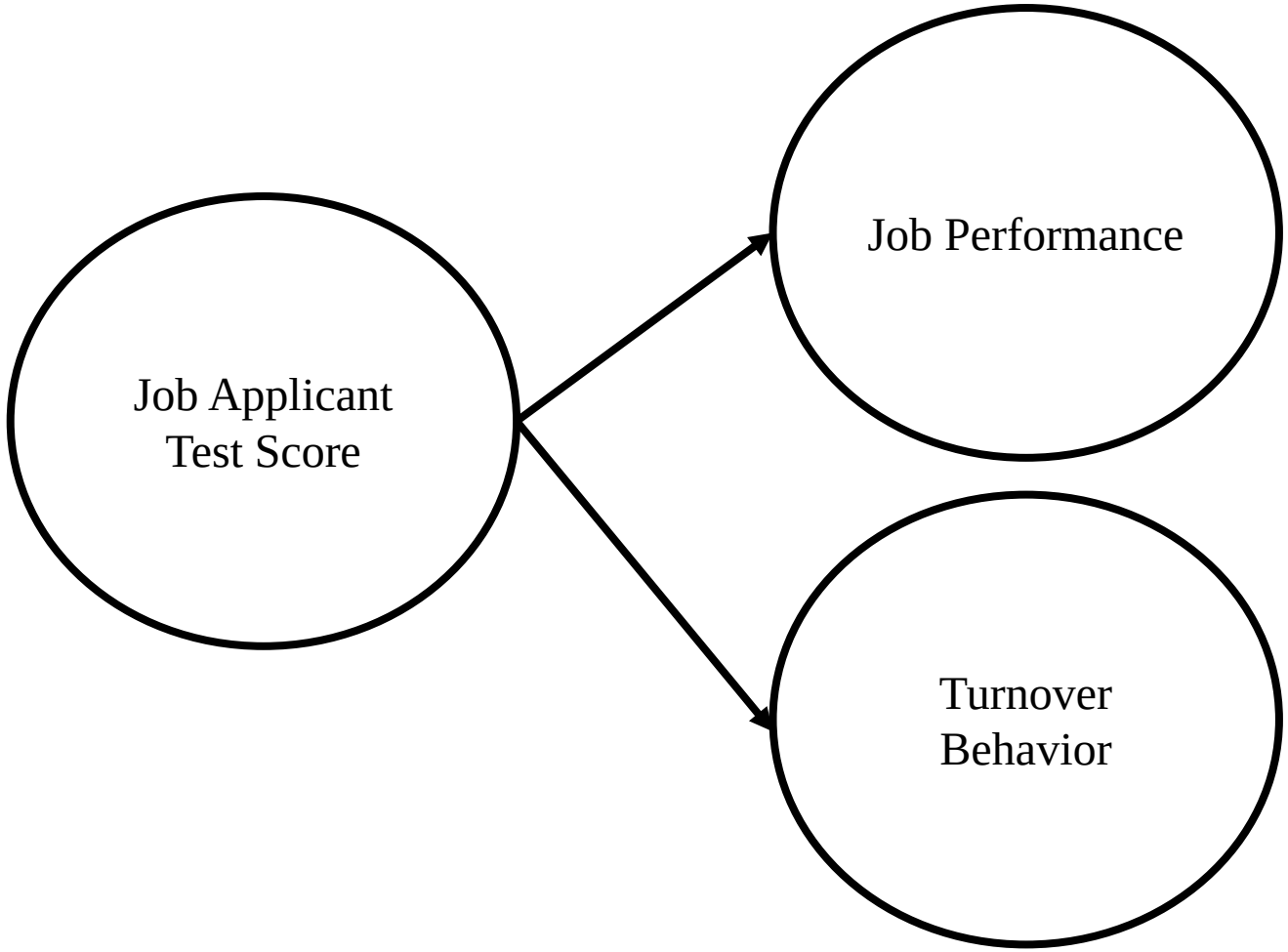

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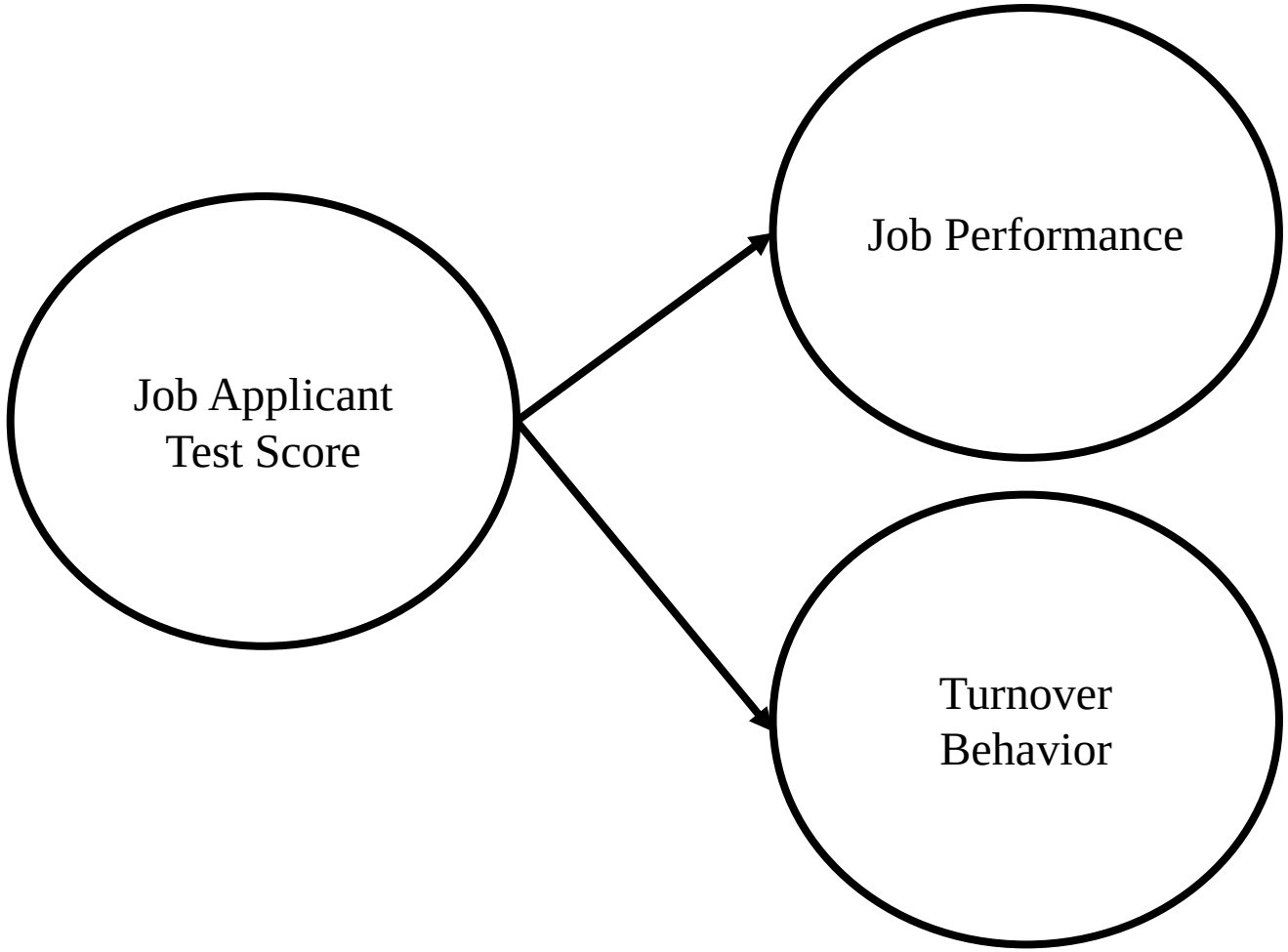

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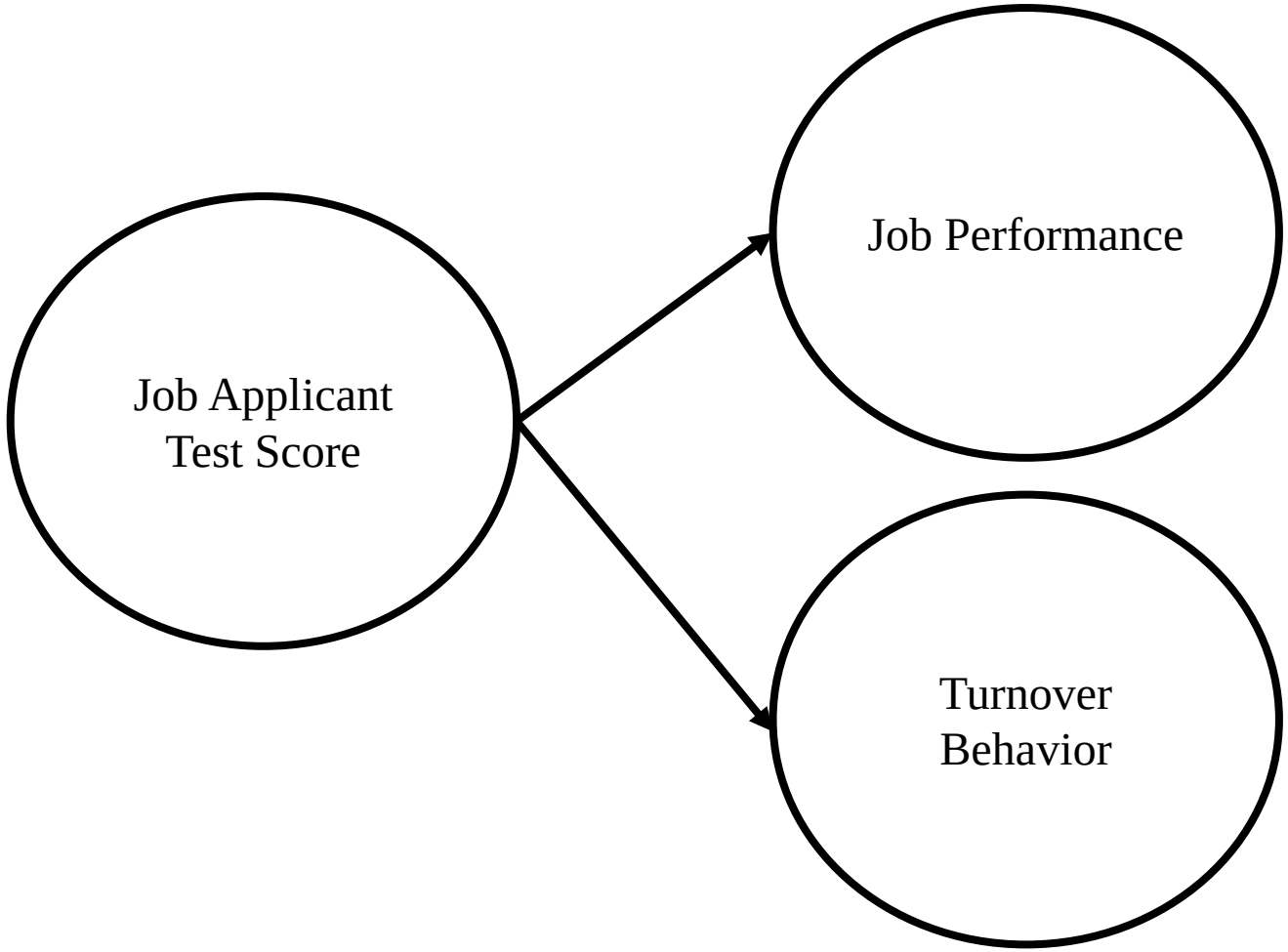

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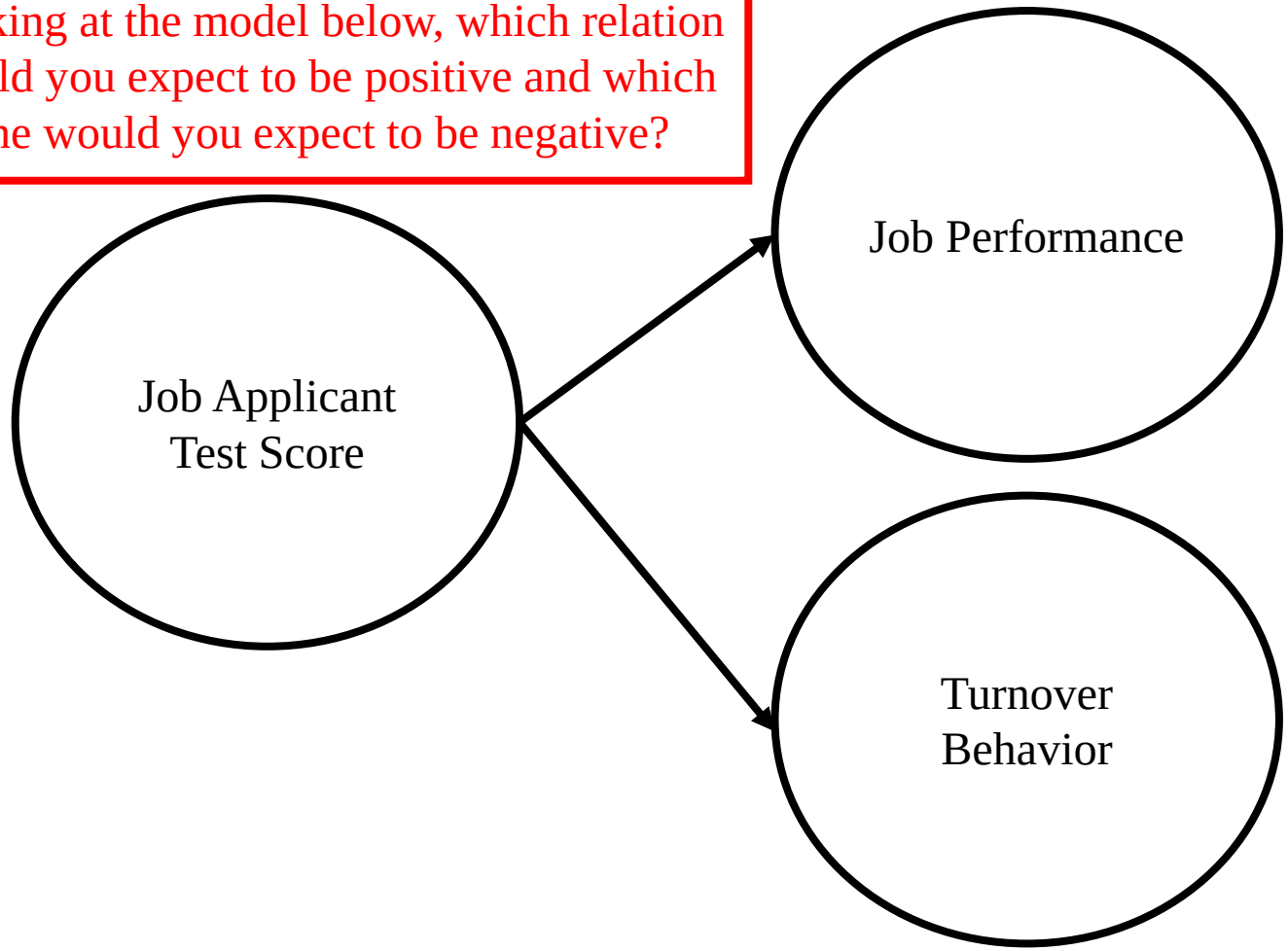

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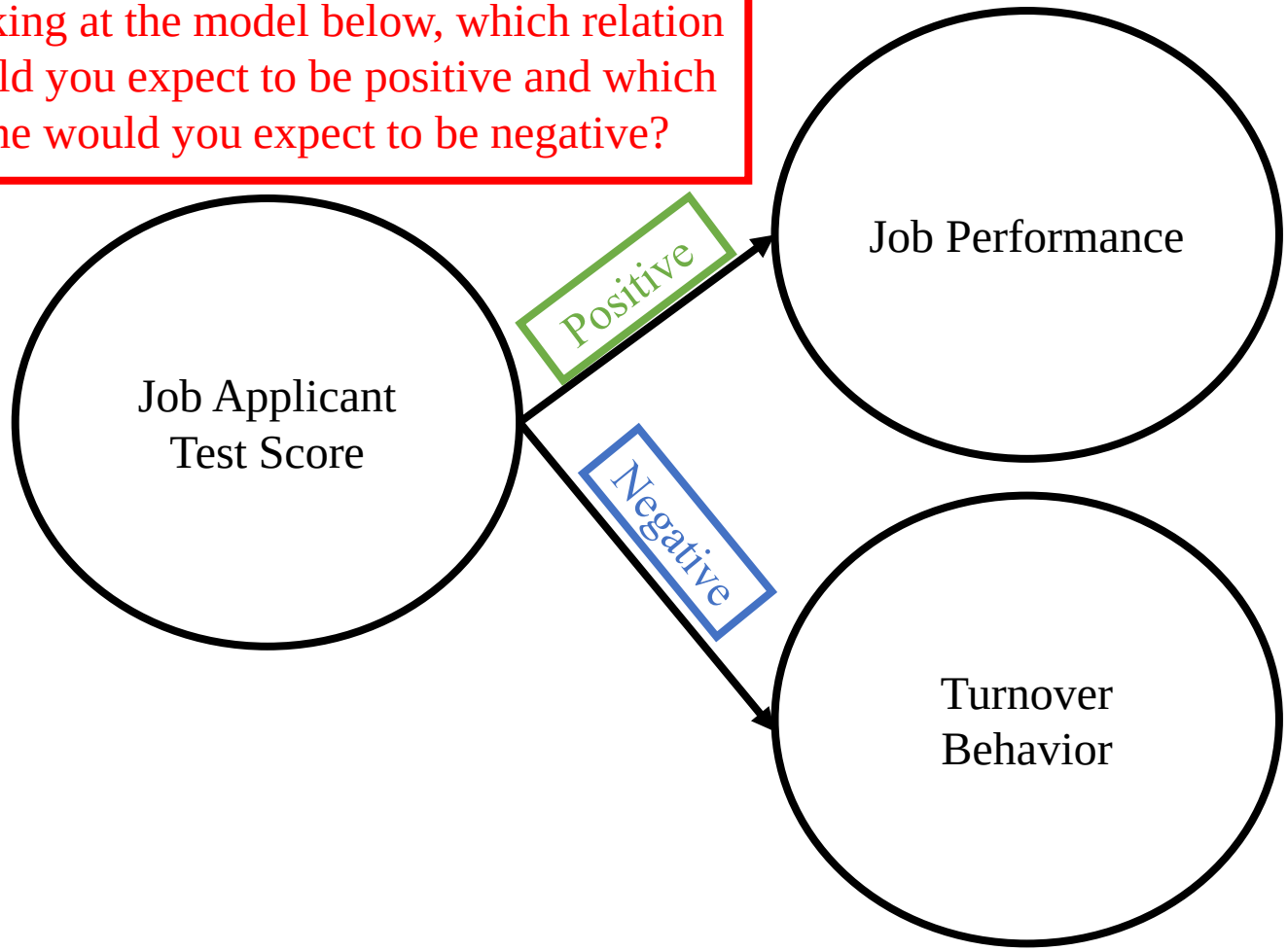

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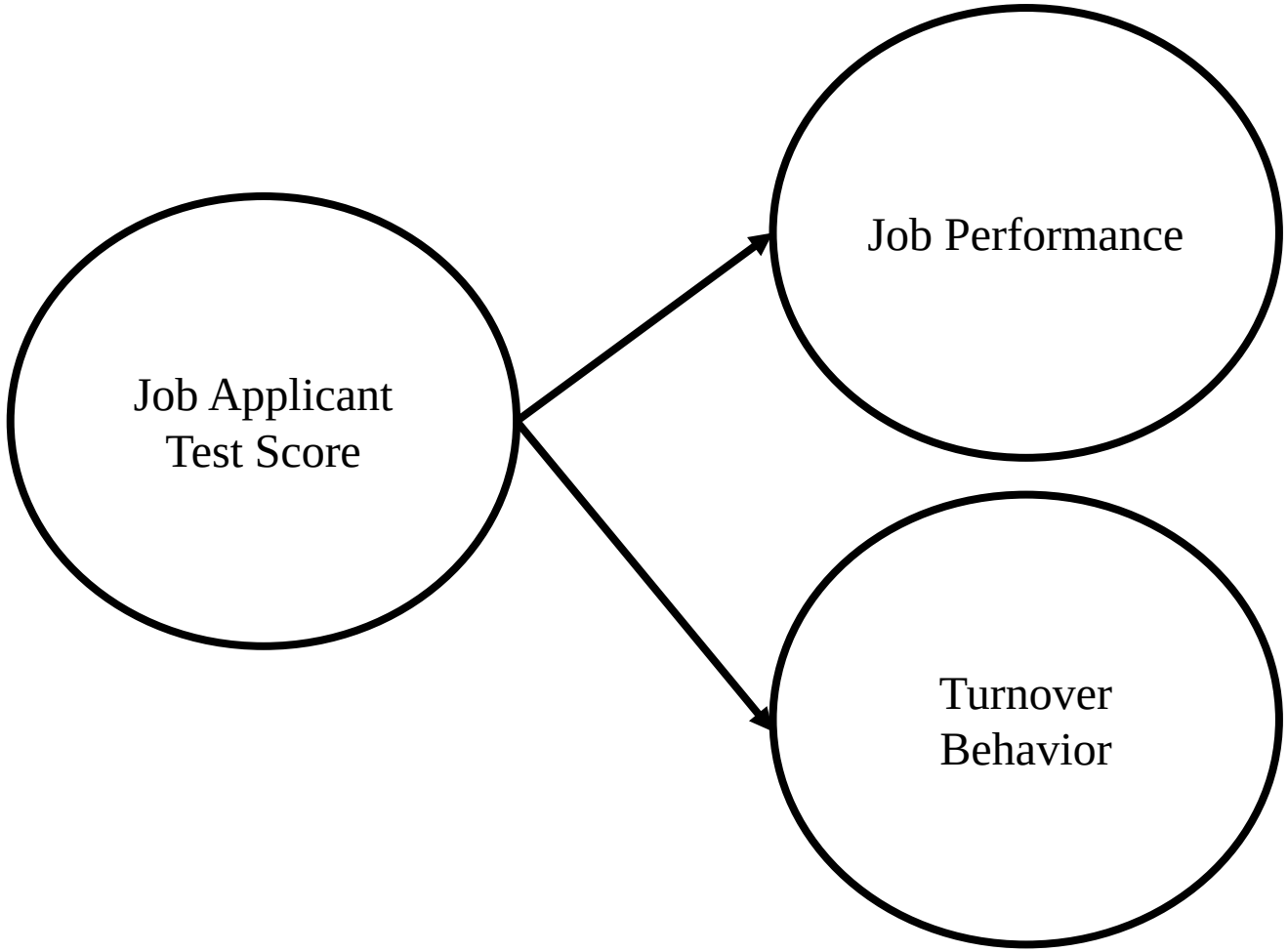

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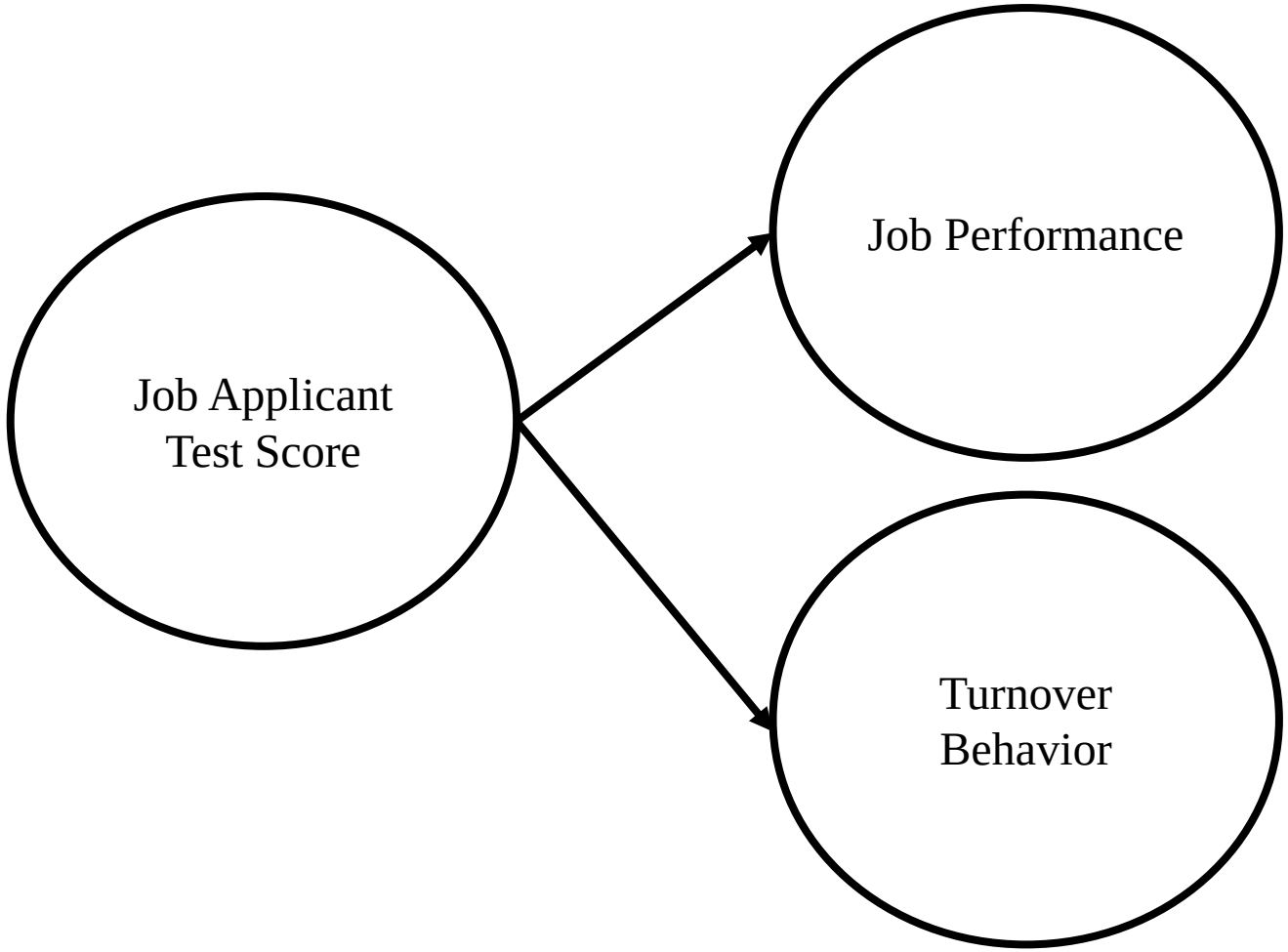

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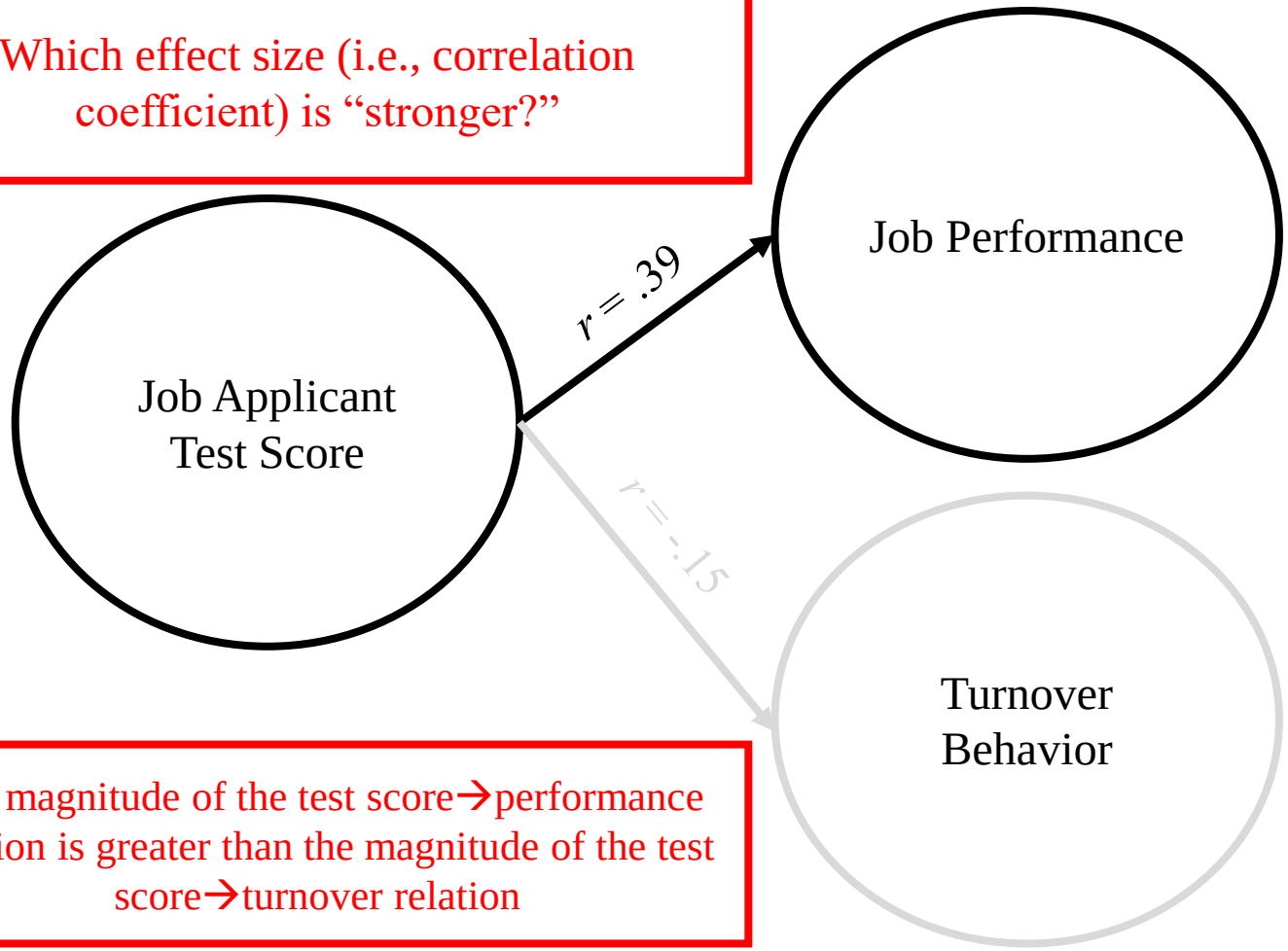

The magnitude of the test score→performance relation is greater than the magnitude of the test score→turnover relation

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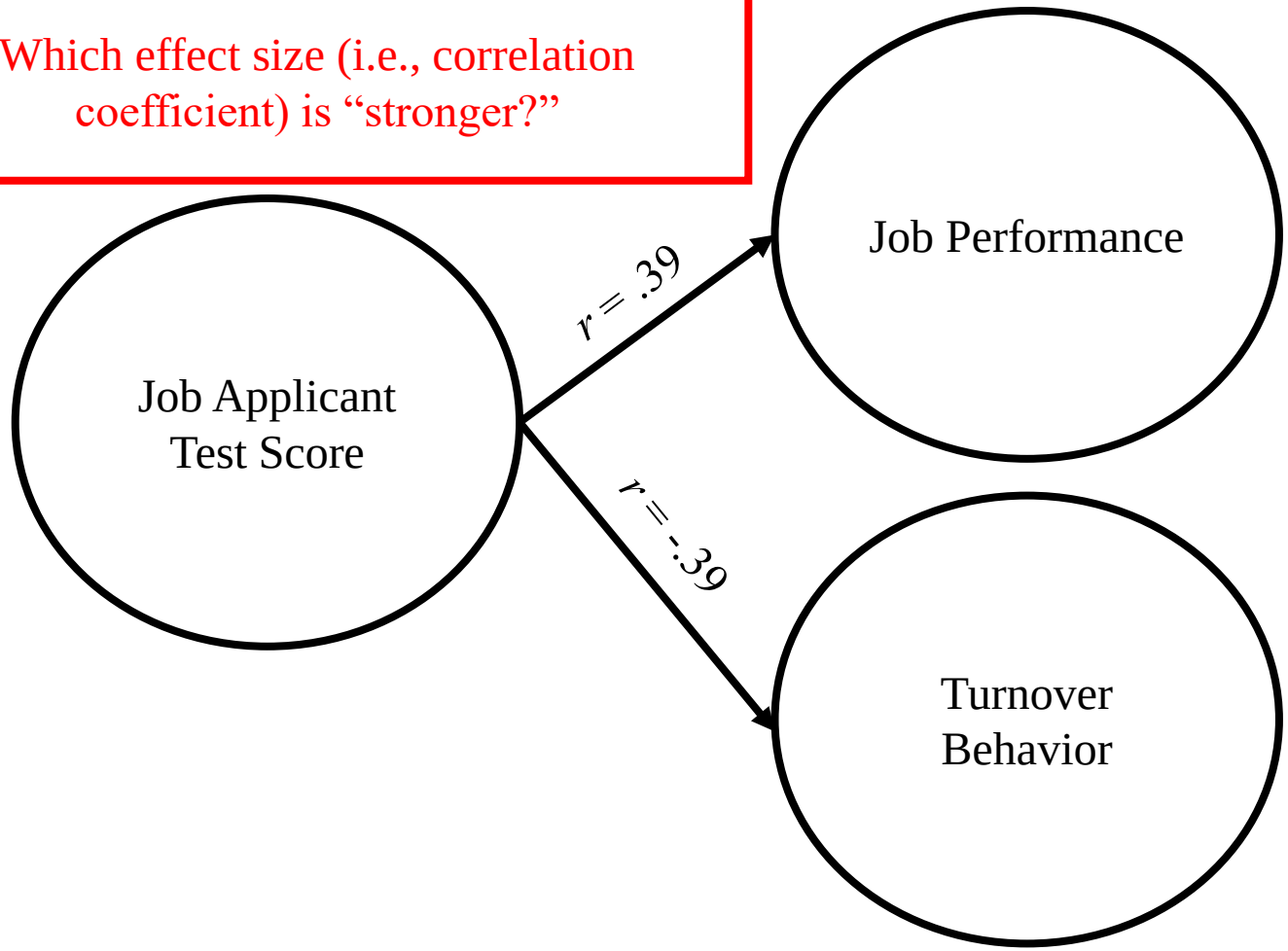

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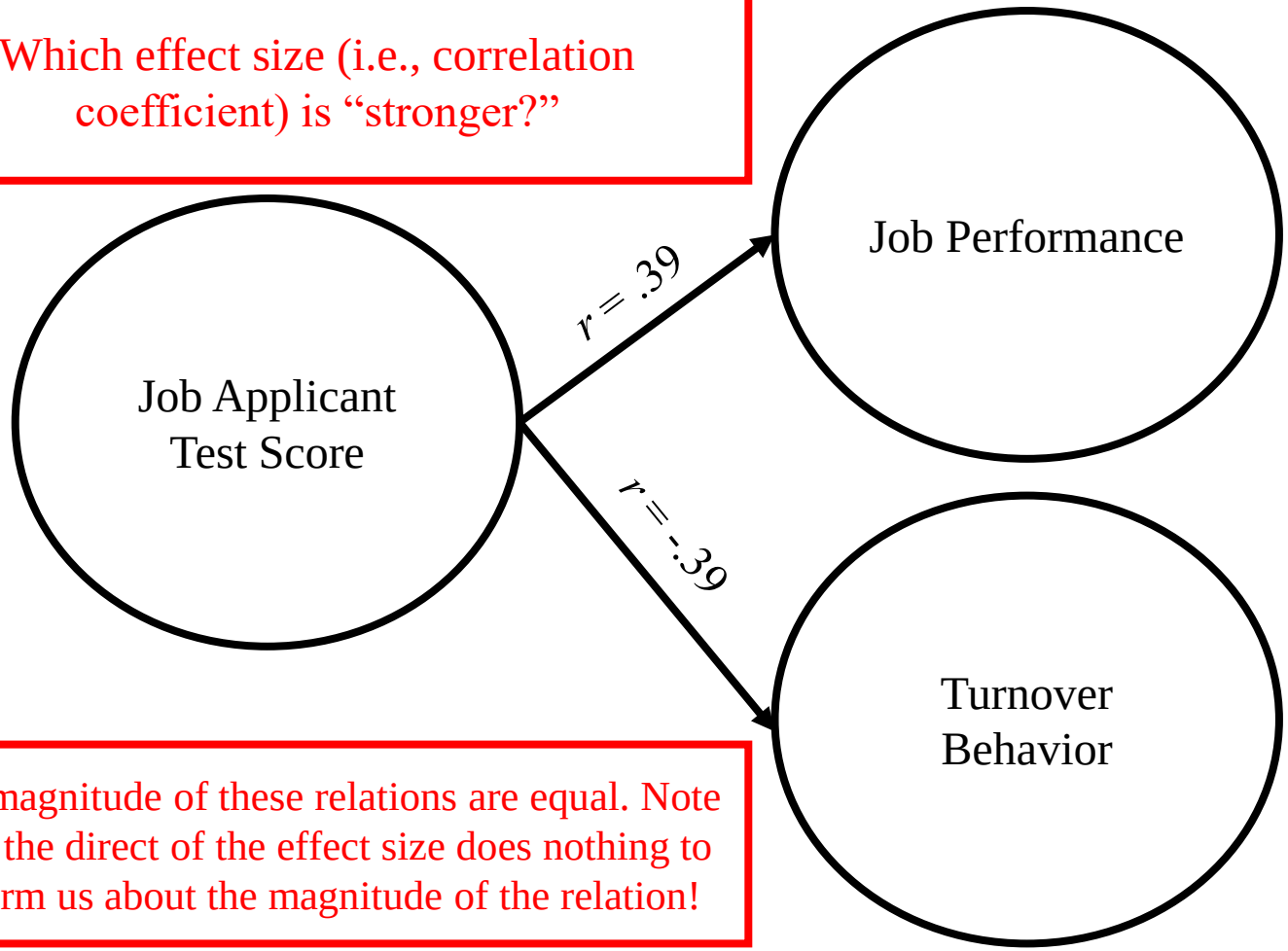

The magnitude of these relations are equal. Note than the direct of the effect size does nothing to inform us about the magnitude of the relation!

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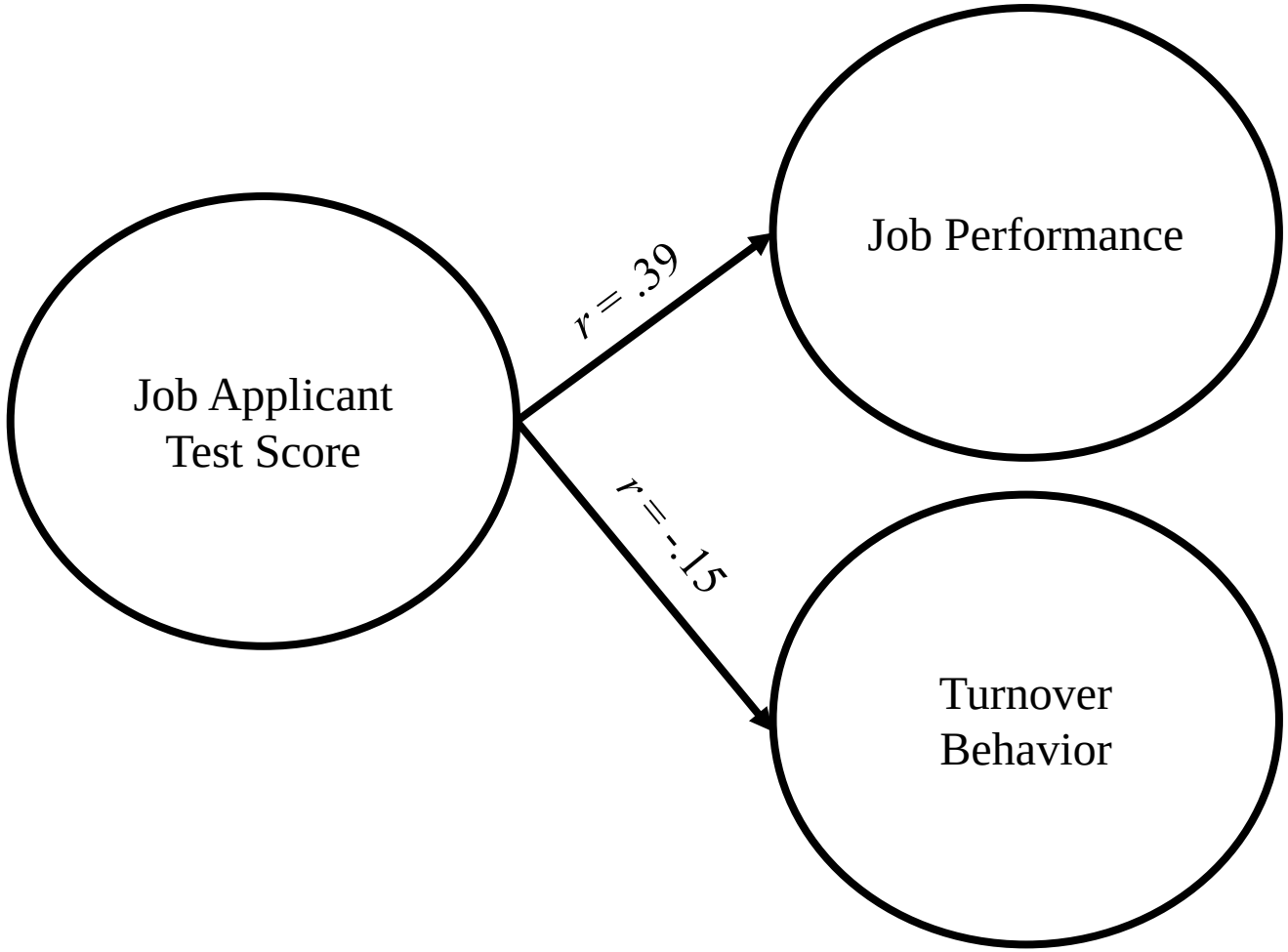

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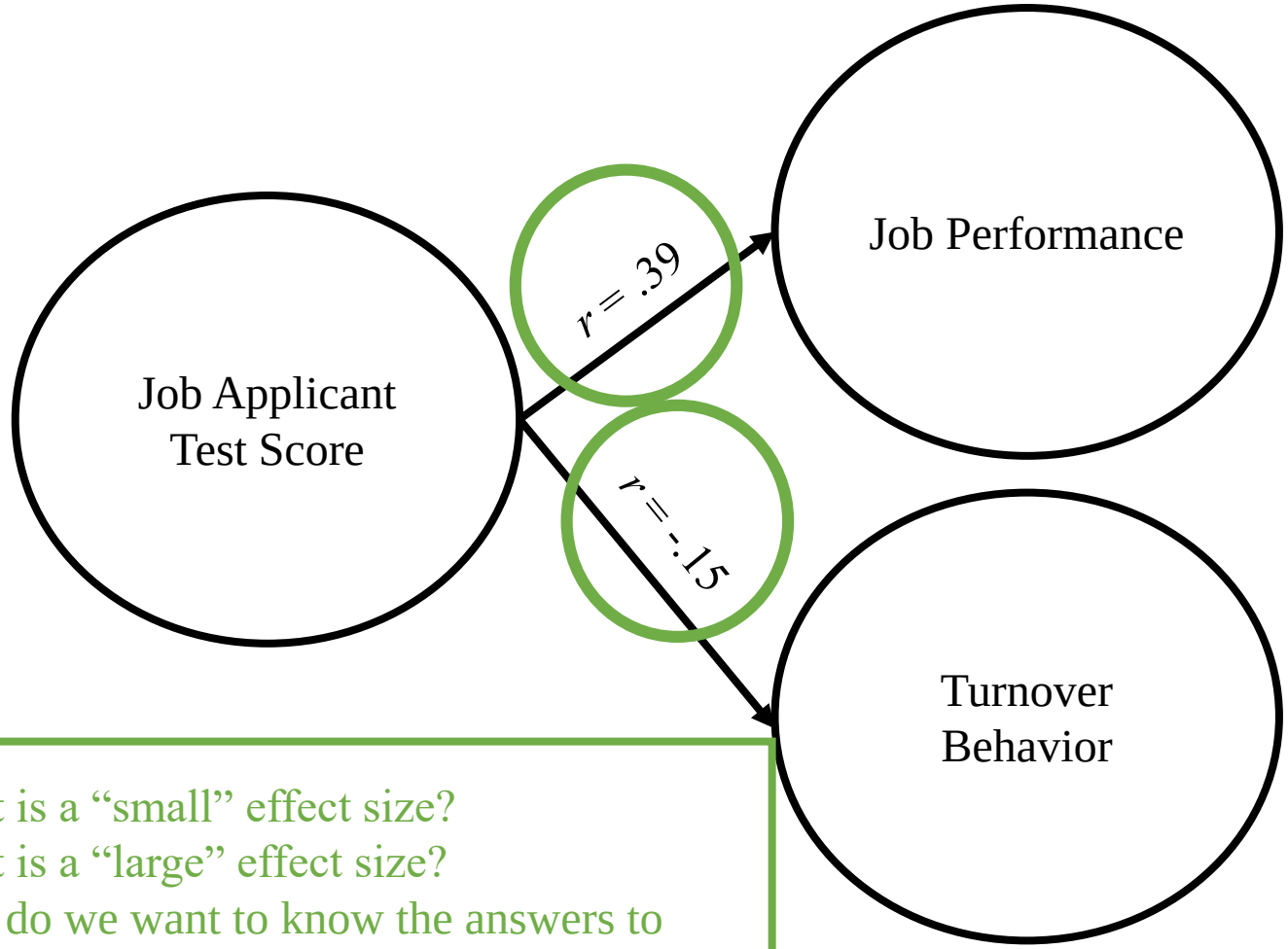

- What is a “small” effect size?
- What is a “large” effect size?
- Why do we want to know the answers to these questions?

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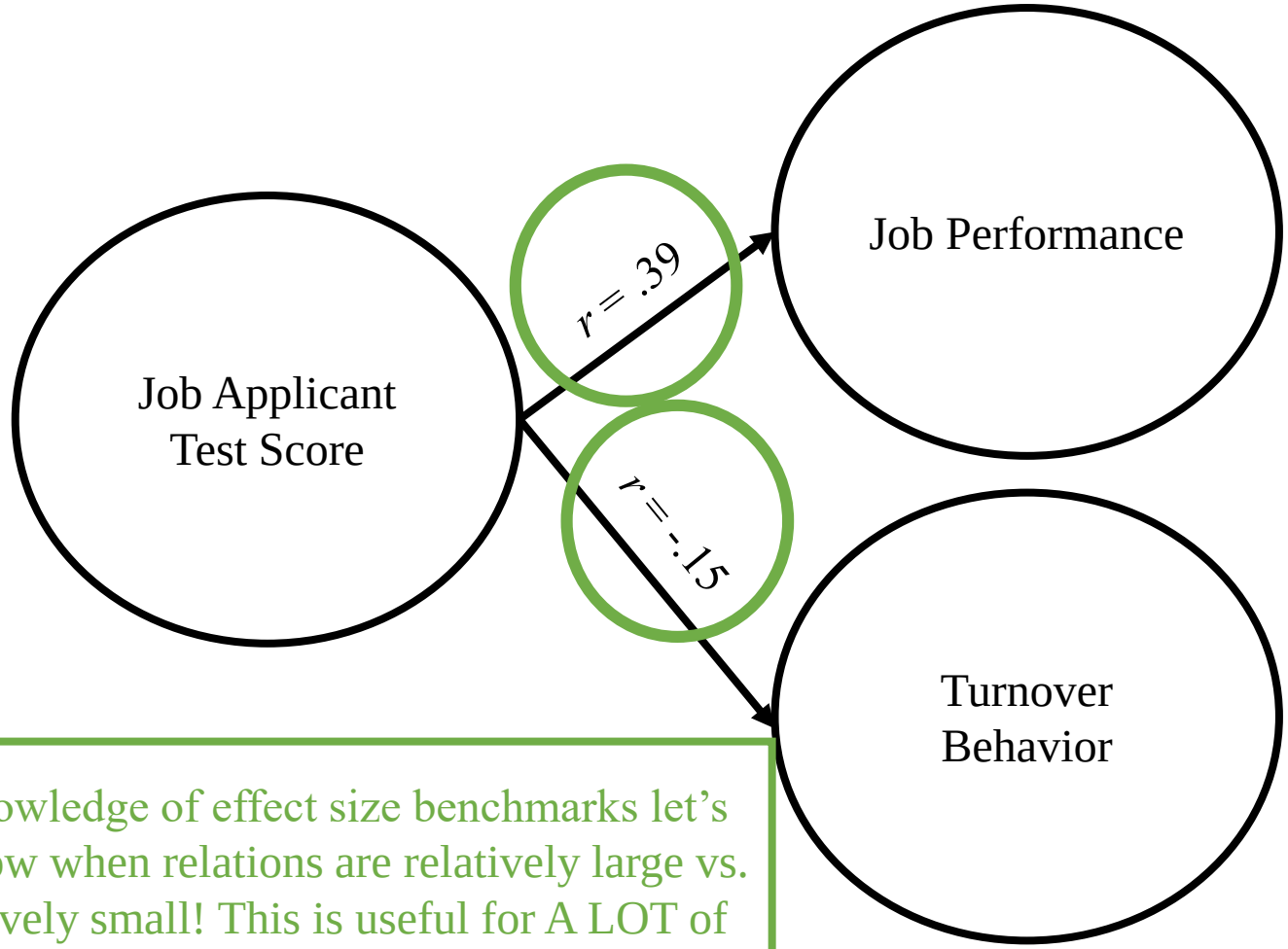

A knowledge of effect size benchmarks let's us know when relations are relatively large vs. relatively small! This is useful for A LOT of things!

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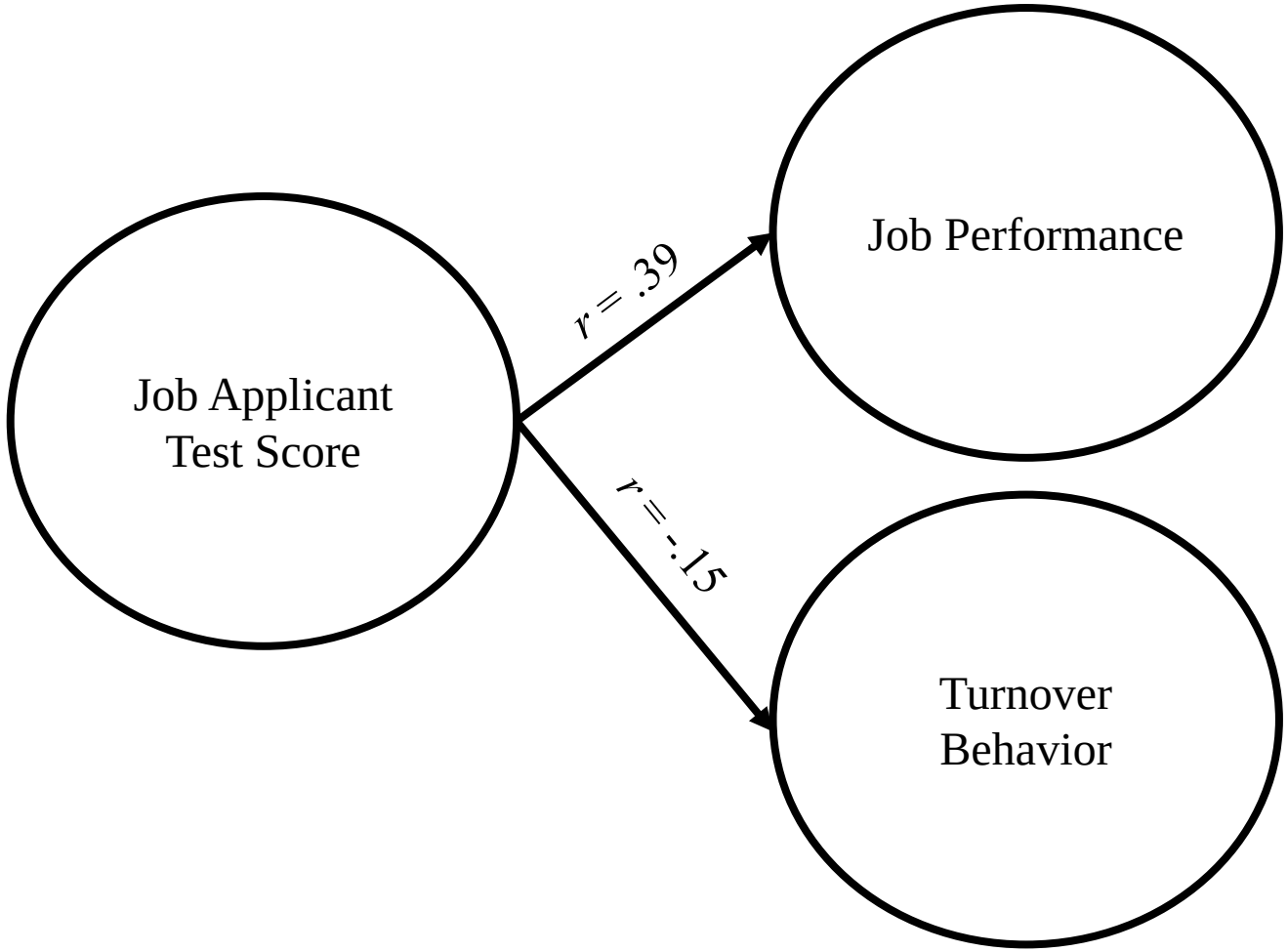

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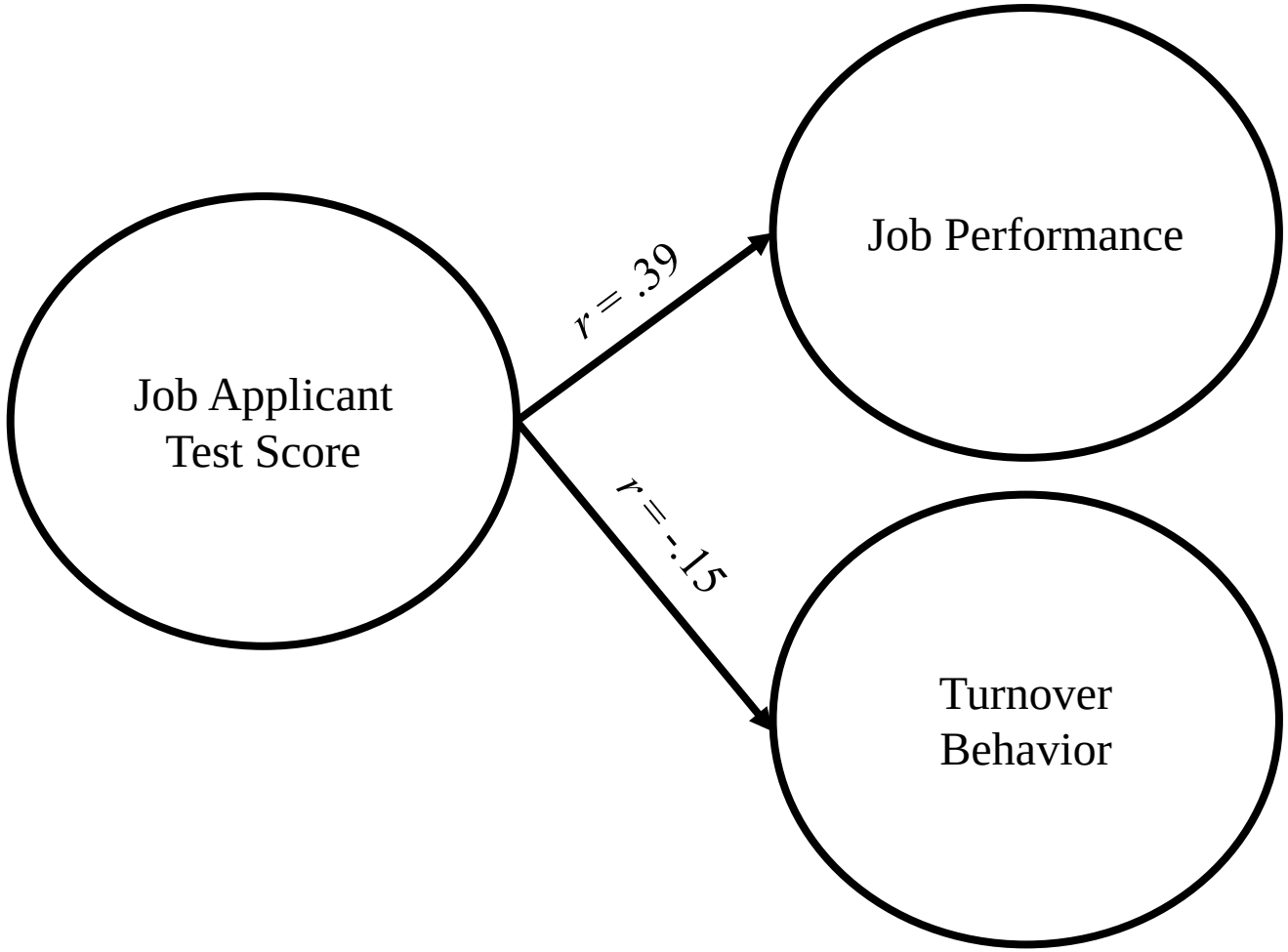

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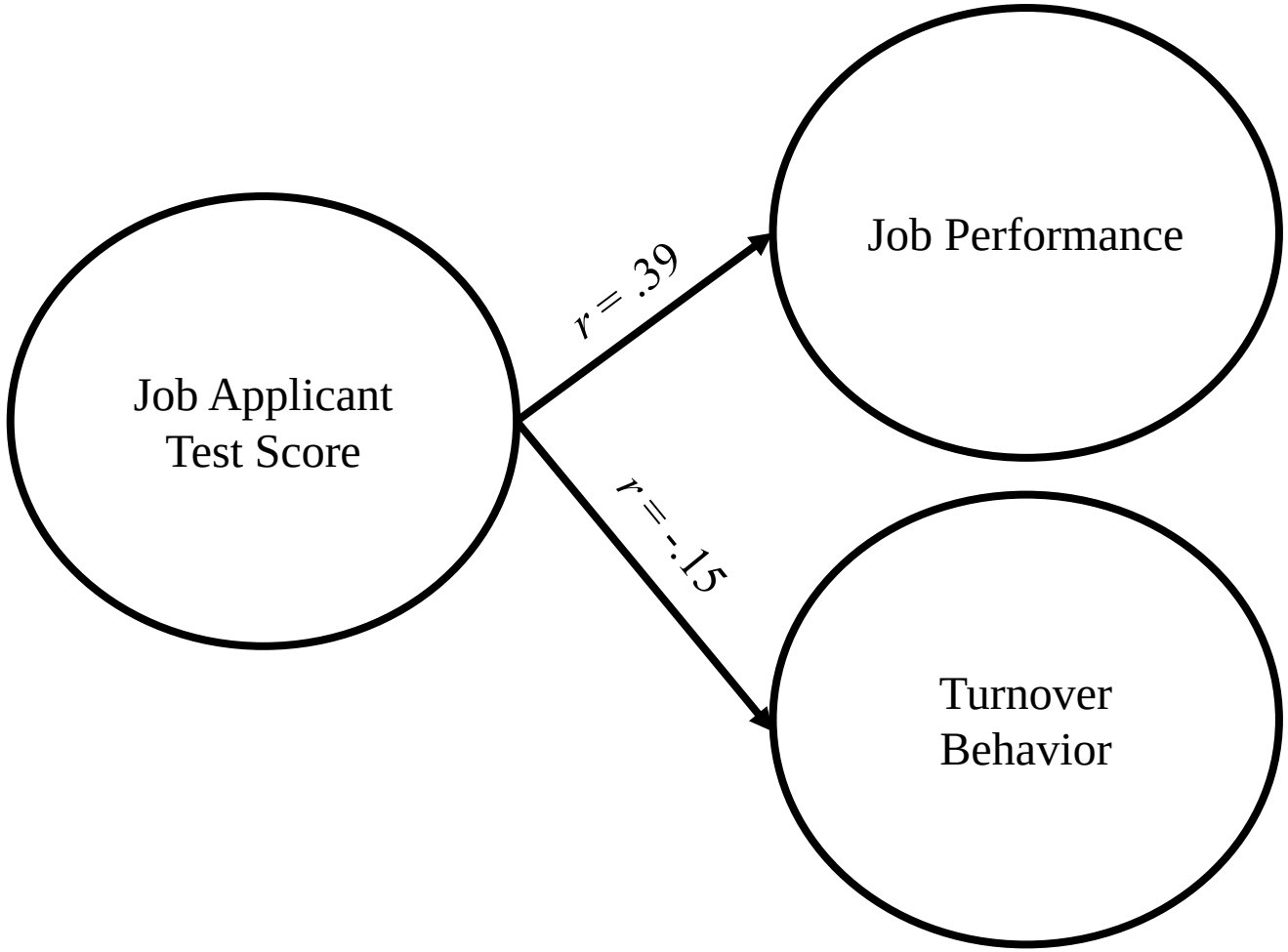

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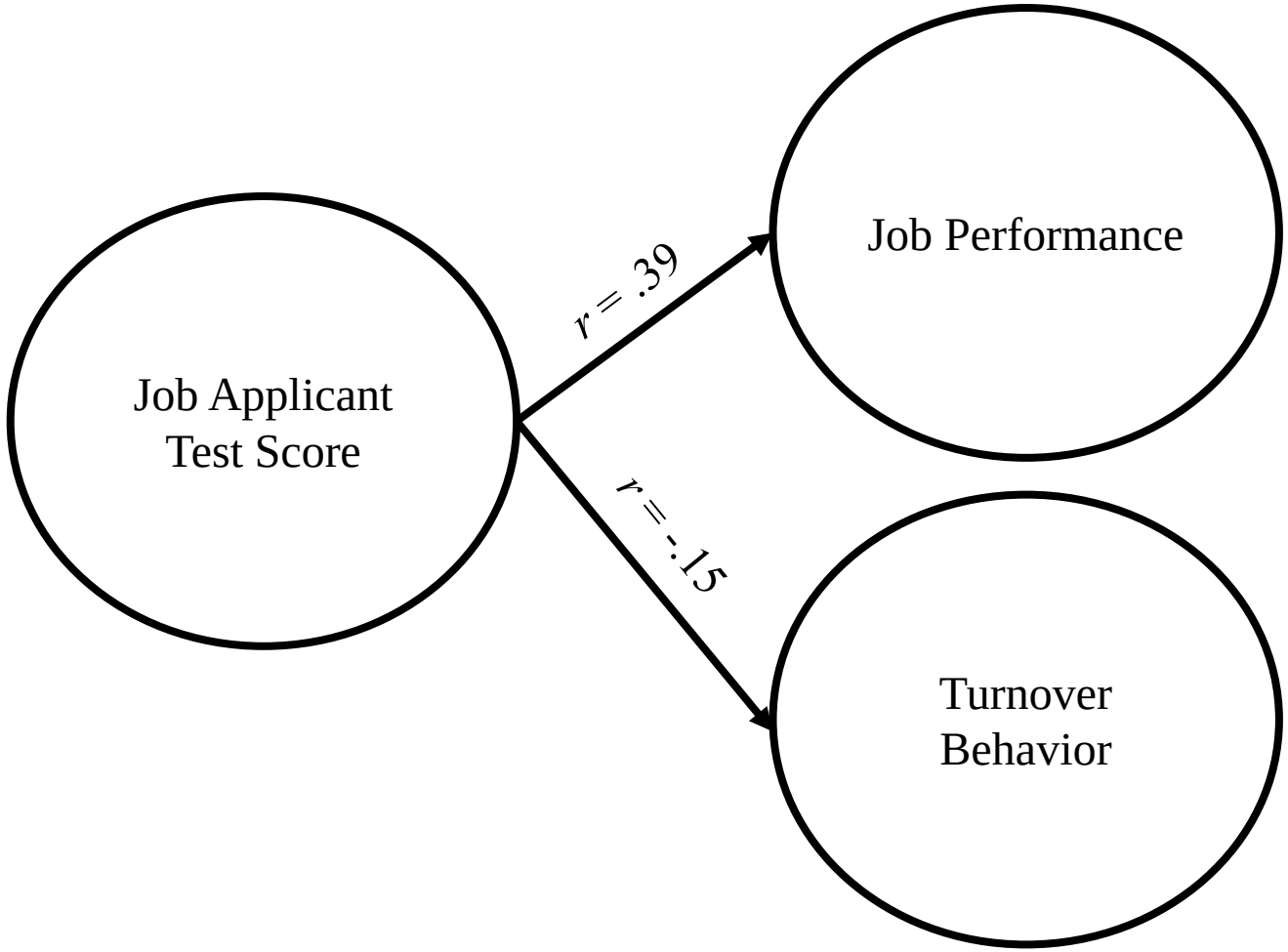

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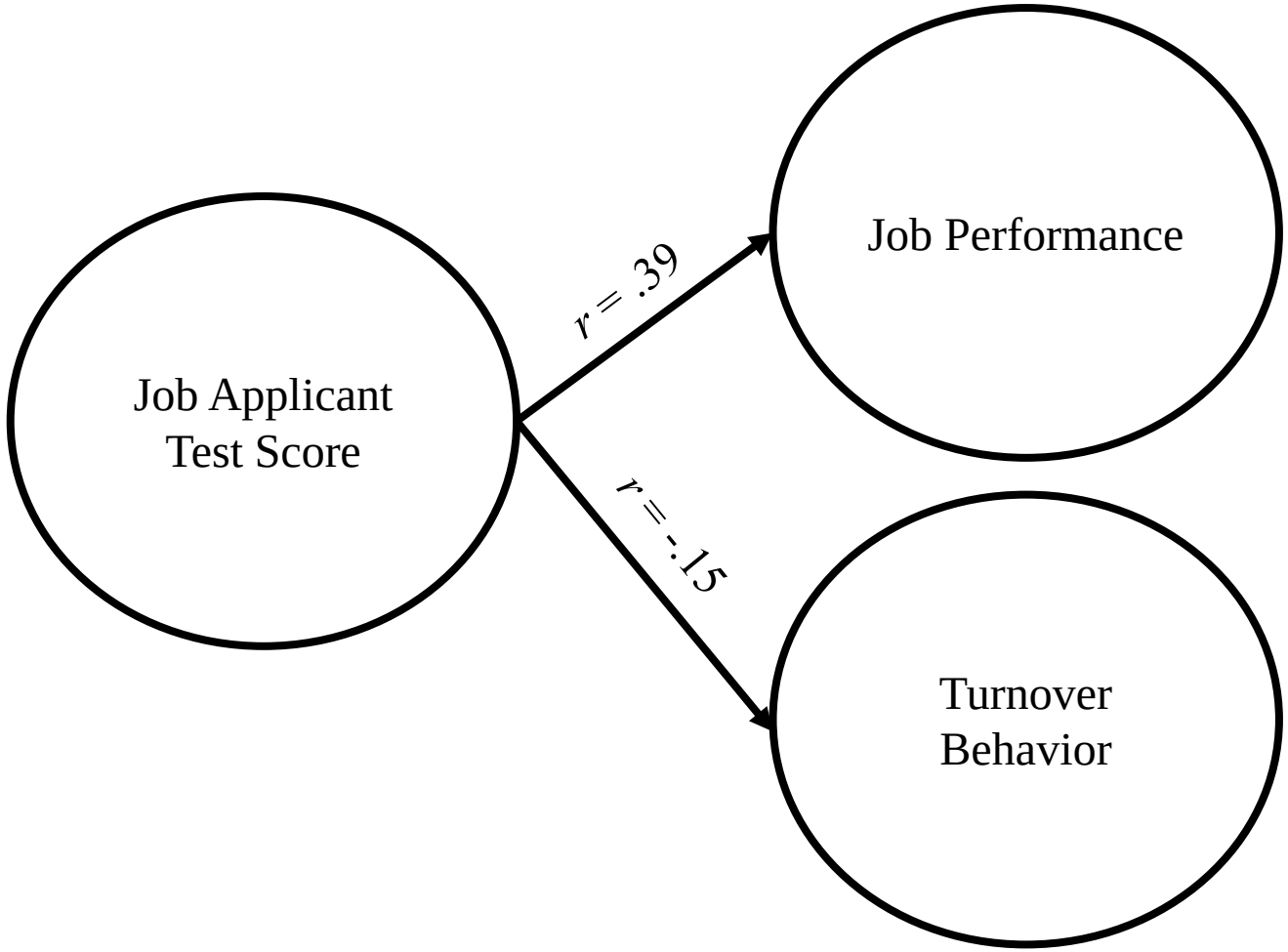

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Does this affect our interpretation of the results shown in the adjacent model?

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TABLE 1. "REGULAR" CORRELATION MATRIX

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Supplier innovation	5.05	0.75	-													
2. Supplier innovation knowledge	5.43	0.99	.35**	(.83)												
3. Customer innovation know.	4.93	1.17	.29**	.29**	(.85)											
4. Embedded ties	5.58	0.86	.22**	.22**	.13	(.72)										
5. Relationship length	12.28	12.36	.03	-.03	-.04	.00	-									
6. Relationship formalization	4.28	1.49	.04	.17*	.01	.11	.02	-								
7. CRS investments	2.96	0.97	.15	.09	.15	.25**	.09	.03	(.84)							
8. Supplier financial performance	4.73	1.38	.23**	.16*	.11	.33**	.12	.02	.14	(.93)						
9. Supplier strategic advantage	5.27	1.20	.32**	.21 **	.20*	.27**	.06	-.00	.19*	.43**	(.81)					
10. Customer dependence	0.18	0.39	.07	.09	-.01	.01	-0.1	-.1	.02	.04	.03	-				
11. Market turbulence	4.30	1.18	.20*	.20*	.27**	.09	.04	.15	.13	.11	.00	-.10	(.83)			
12. Technological turbulence	4.50	1.16	.15	.14	.14	.05	.02	.19*	.11	.02	.11	.04	.40**	(.80)		
13. Opportunism	2.84	1.10	-.24**	-.26**	-.25**	-.25**	.09	.28**	-.04	-.22**	-.31**	.07	-.06	.07	(.78)	
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Intercorrelations and reliability estimates

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These are descriptive statistics, *not* correlations! So, we jump right over these!

What is the effect size for the "relationship length→customer dependence" relation?

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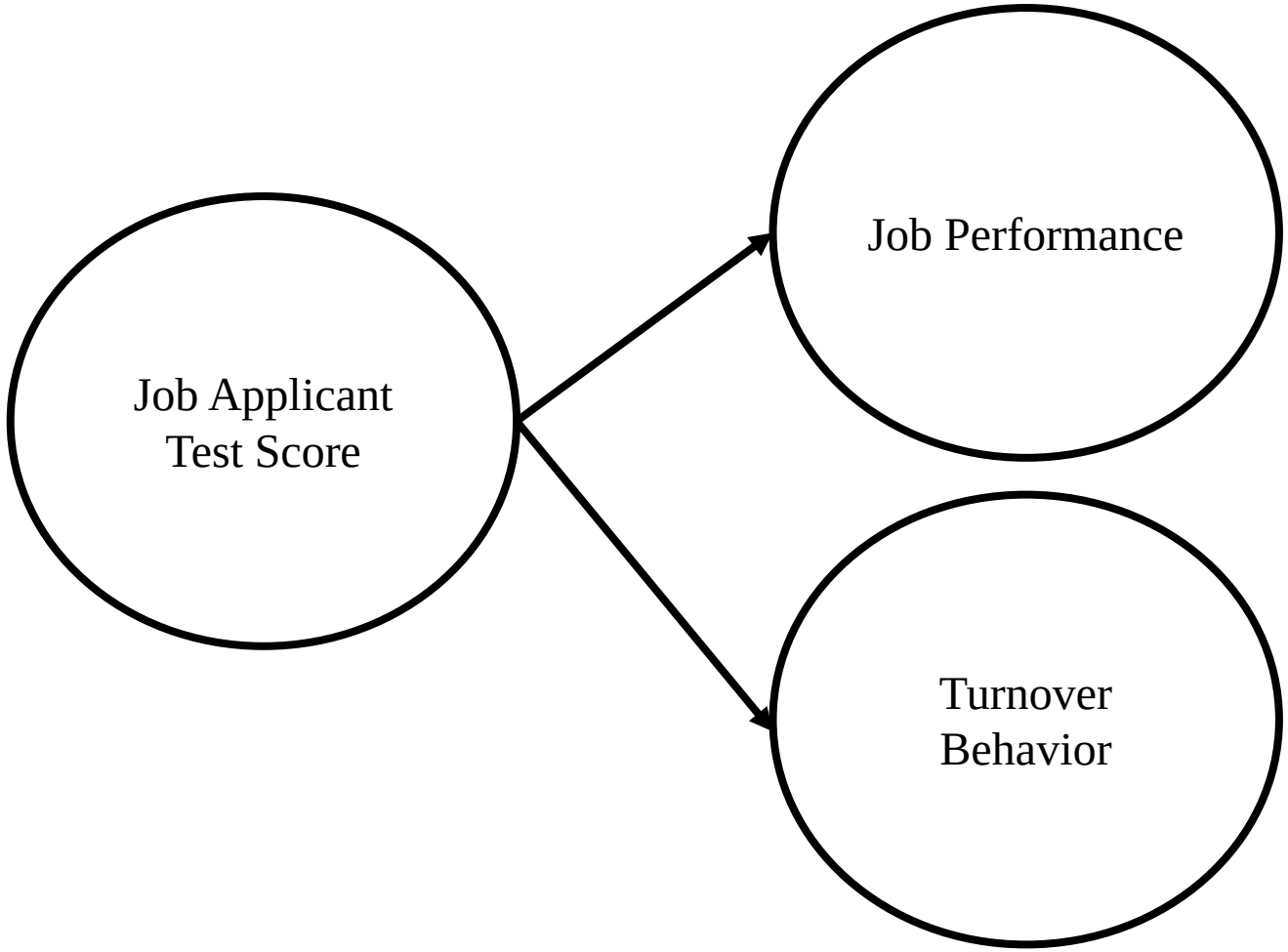
Motivating Example:



In addition to the correlation coefficient, which quantifies the association between two things, one can employ a technique called ***Simple Linear Regression.***

General Linear Model

- Both correlation analysis and simple linear regression are part of a family of analysis called the *general linear model* (GLM)

- Later on, in Module 4, we will learn about multiple regression, which is another member of the GLM family
  - Simple linear regression = one predictor in the model
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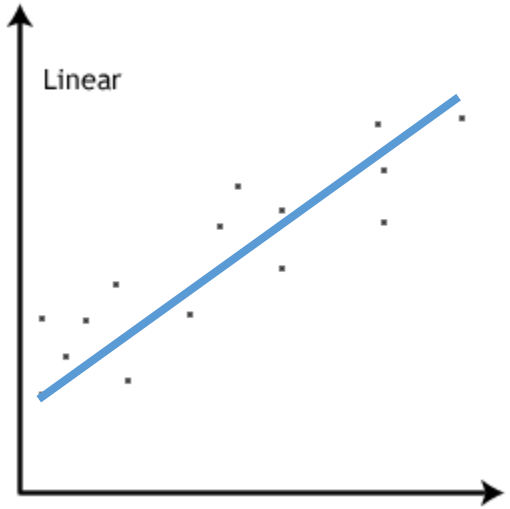
- Although the GLM technique relies on *many* assumptions, we are only going to introduce and discuss one of them…

GLM Assumption: Linearity

- Linearity is the assumption that the outcome variable is, in reality, linearly related to the predictor
  - Put differently, the X→Y relation can be summarized by a straight line



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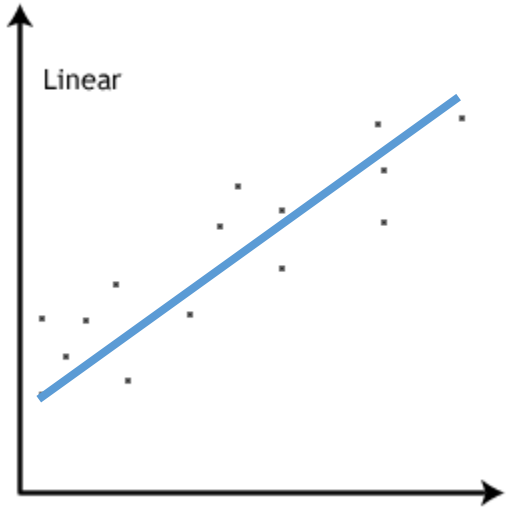

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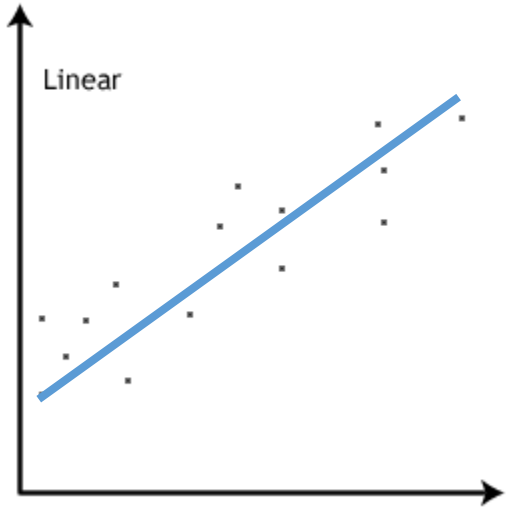
But, will we always observe a linear relationship?

Can you think of examples of non-linear relationships?



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- Linearity is the assumption that the outcome variable is, in reality, linearly related to the predictor
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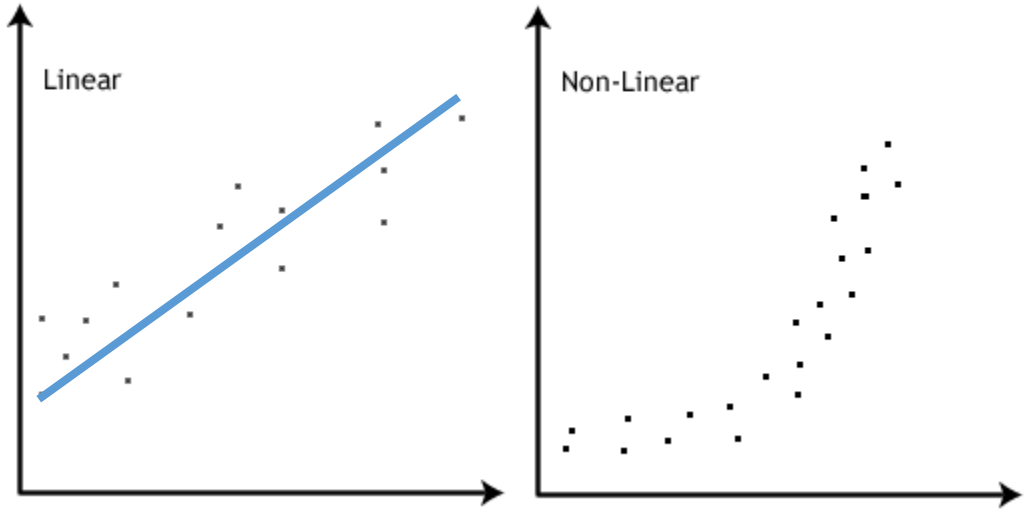

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