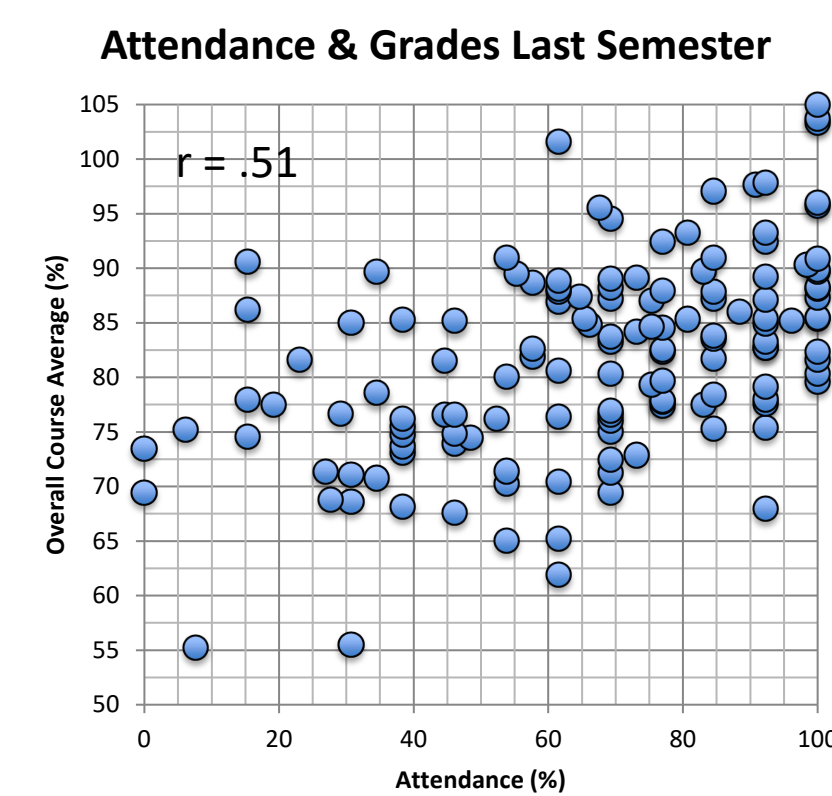


Formal Operations & Grit: Two Paths to Success in Class

Introduction

What individual differences predict success in a large college class, with hundreds of new concepts, tests involving the application of those concepts, and activities to illustrate concepts due before each class?



Individual Differences

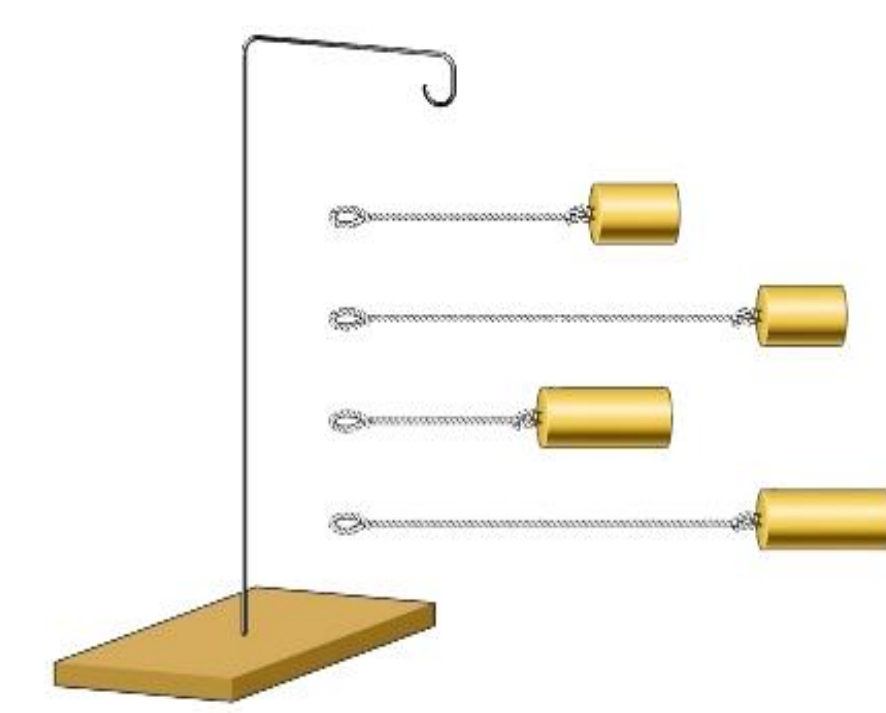
Need-for-Cognition

Formal Operations

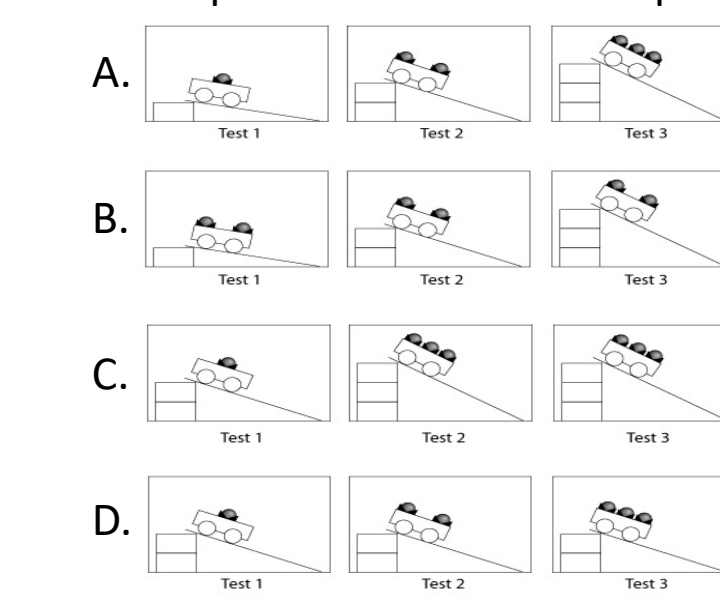
Grit

Formal Operations

Entering adolescence, children may achieve Piaget's most sophisticated stage of reasoning – **formal operations**. Formal operational thought entails analytical deductions in even purely hypothetical situations while systematically testing possibilities (e.g., Inhelder & Piaget, 1958).



Experiment to determine if weight affects speed of cart down ramp?



Course Grade Regression

OVERALL COURSE GRADE					
Step	Predictor	Std. β	sig	ΔR^2	sig
1	Marginalized Ethnic Minority	-0.230	0.008**	0.056	0.023*
	Gender	-0.058	0.495		
2	Marginalized Ethnic Minority	-0.244	0.004**	0.066	0.002**
	Gender	-0.067	0.420		
	Attendance	0.257	0.002**		
3	Marginalized Ethnic Minority	-0.142	0.066`	0.184	0.000***
	Gender	-0.118	0.120		
	Attendance	0.172	0.026*		
	Need for Cognition	0.007	0.939		
	Formal Operations	0.414	0.000		
	Grit Consistency of Interest	0.000	0.999		
Total Adjusted R²				0.267	0.000***

Activities & Grit Items

Correlations between Activities and Grit (sub-scales & items)

Consistency of Interest Scale

$r = .123, n = 160, p = .120$

Perseverance of Effort Scale

$r = .195, n = 160, p = .013^*$

I finish whatever I begin. ($r = .060, n = 160, p = .450$)
I am diligent. ($r = .202, n = 160, p = .010^*$)
I am a hard-worker. ($r = .161, n = 160, p = .041^*$)
Setbacks don't discourage me. ($r = .118, n = 160, p = .138$)

Participants

181 college students in *Introduction to Psychology*

2/3 of grade from 3 tests
1/3 of grade from about 25 activities

136 have complete data for current analysis (75%)

61% from a disadvantaged minority
75% women
avg. attendance of 82% of classes (sd = 18%)

Grit

Grit is passion to persevere toward achieving long-term goals. It helps spelling bee competitors win, West Point cadets stay committed, and new teachers struggle through obstacles. It is closely related to Big-5 conscientiousness, but not to intelligence (IQ).

(e.g., Duckworth et al., 2007; Robertson-Kraft & Duckworth 2014)

Consistency of Interest

1. I have been obsessed with a certain idea or project for a short time but later lost interest.
2. I have difficulty maintaining my focus on projects that take more than a few months to complete.
3. I often set a goal but later choose to pursue a different one.
4. New ideas and projects sometimes distract me from previous ones.

Perseverance of Effort

5. I finish whatever I begin.
6. I am diligent.
7. I am a hard-worker.
8. Setbacks don't discourage me.

(All consistency items reverse-scored; 8-item short scale by Duckworth & Quinn, 2009)

Test Grade Regression

TEST GRADE					
Step	Predictor	Std. β	sig	ΔR^2	sig
1	Marginalized Ethnic Minority	-0.204	0.018*	0.043	0.056`
	Gender	0.037	0.668		
2	Marginalized Ethnic Minority	-0.219	0.009**	0.07	0.002**
	Gender	0.028	0.734		
	Attendance	0.265	0.002**		
3	Marginalized Ethnic Minority	-0.089	0.215	0.285	0.000***
	Gender	-0.020	0.773		
	Attendance	0.179	0.013*		
	Need for Cognition	0.087	0.284		
	Formal Operations	0.524	0.000***		
	Grit Consistency of Interest	-0.058	0.471		
Total Adjusted R²				0.364	0.000***

Summary

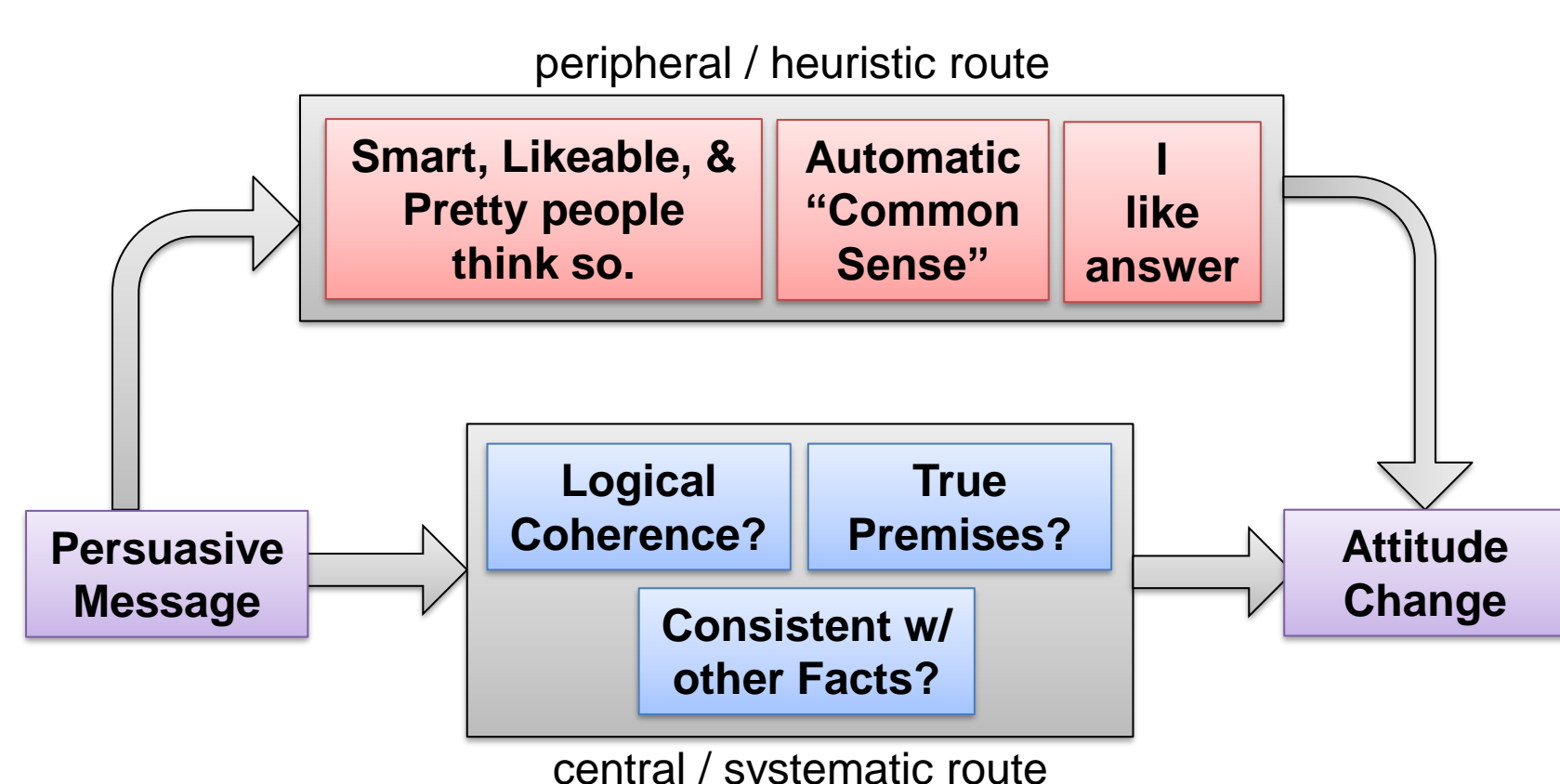
Students' efforts to persevere with grit ($r^2 = 2.9\%$) and their formal operational thinking ($r^2 = 16.6\%$) predict higher grades in *Introduction to Psychology*.

Formal operational thought predicts grades through tests ($r^2 = 30.7\%$) while effort to persevere with grit predicts grades through activities ($r^2 = 6.7\%$).

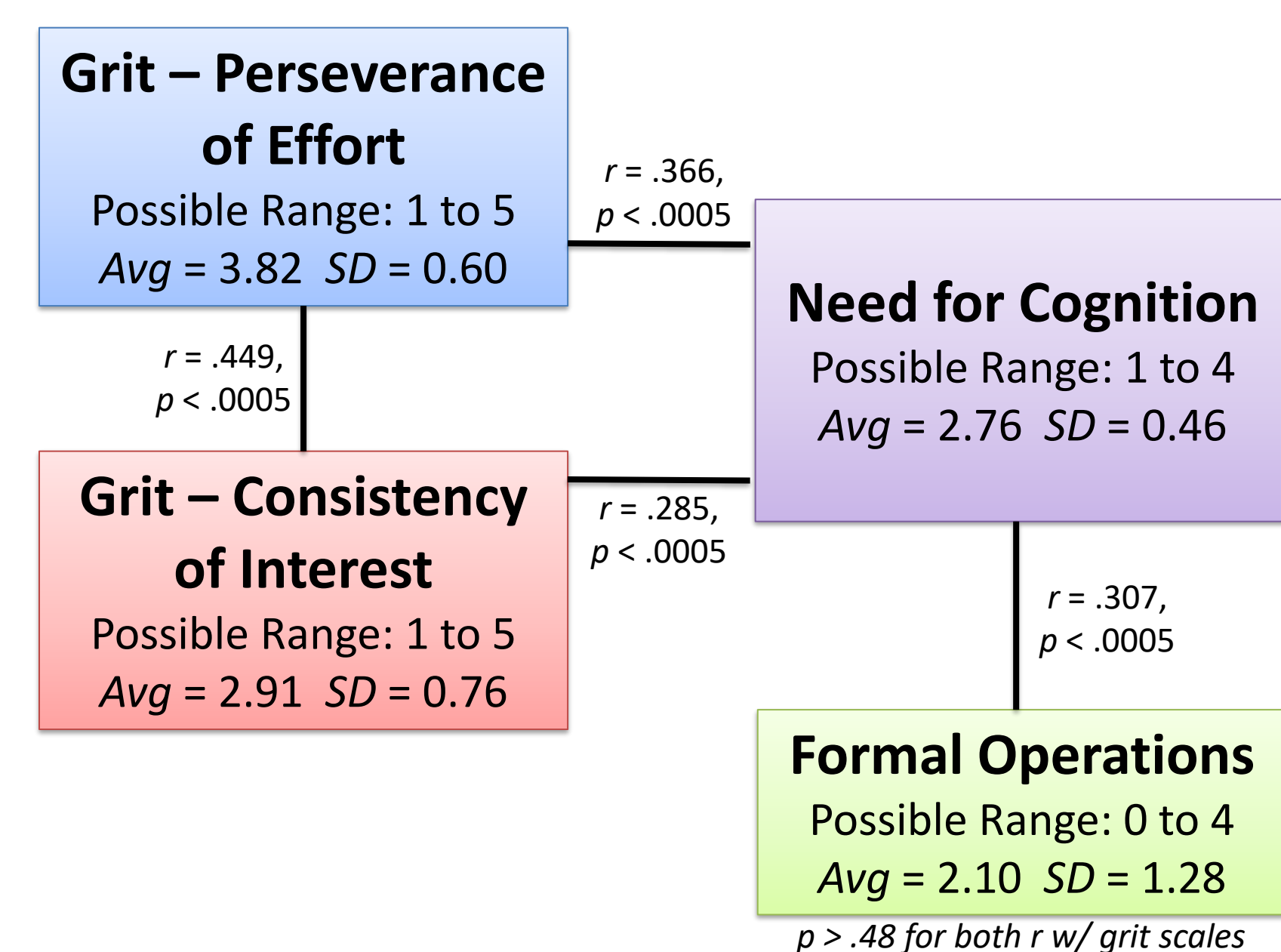
Grit may matter more as students take more tests and need to keep studying despite the challenge of tests that focus on critical thinking. Future analyses will examine the entire semester, changes in attendance, & participation in test review sessions.

Need for Cognition

Those with higher **Need for Cognition** like to think things through. They enjoy thinking & put effort into thinking when others might use heuristics instead (e.g., Cacioppo & Petty, 1982).



Correlate Success Scales



Activity Grade Regression

ACTIVITIES					
Step	Predictor	Std. β	sig	ΔR^2	sig
1	Marginalized Ethnic Minority	-0.154	0.071`	0.042	0.059`
	Gender	-0.134	0.117		
2	Marginalized Ethnic Minority	-0.157	0.066`	0.017	0.125
	Gender	-0.137	0.107		
	Attendance	0.130	0.125		
3	Marginalized Ethnic Minority	-0.145	0.089`	0.072	0.036*
	Gender	-0.165	0.049*		
	Attendance	0.111	0.185		
	Need for Cognition	-0.082	0.392		
	Formal Operations	0.070	0.437		
	Grit Consistency of Interest	0.068	0.470		
Total Adjusted R²				0.083	0.011*

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Citation and Abstract

New students begin their college experience in introductory classes of more than 100 students, without the individualized attention of high school, and with fast-paced exposure to new concepts. What do students bring to the classroom to foster their success? Historically, IQ has been the most prominent predictor of academic and career success (e.g., Cronbach & Snow, 1977; Duncan et al., 1972). Yet IQ does not fully account for performance; other individual differences matter. Sternberg (1997; 2000) predicted the success of Ivy League college students more effectively by combining IQ (analytical intelligence) with creative and practical intelligence. At an open-enrollment university of mostly low-income African-American students, practical intelligence – not IQ - was the strongest predictor of success. Duckworth et al. (2007) propose that a personality trait - grit – adds to our explanation beyond intelligences. “Grit” is the ability to persevere in the long-term despite an absence of positive feedback. Grit is similar to practical intelligence, resilience, and the big-5 personality trait of conscientiousness; but grit is not correlated with IQ (Duckworth & Quinn, 2009).

My Introductory Psychology students complete individual difference measures, interpret graphs of the resulting data, and discuss the measures in the context of learning psychology. During the current semester, figuring out creativity problems did not correlated with overall course grade, $r=-.01$, $p=.453$. Openness to New Experiences, the personality trait with a modest association with IQ, is not correlated with overall course grade, $r=-.07$, $p=.203$. In contrast, students with greater conscientiousness earn higher course grades, $r=.14$, $p=.049$. If we measure conscientiousness as behaviors, rather than through a questionnaire, it is an even stronger predictor of success. Students earn higher grades if they attend class more, $r=.62$, $p<.0005$, and complete more course activities, $r=.43$, $p<.0005$. (Correlations are one-tailed and $N=143$). Given the close association of grit and conscientiousness, these results suggest indirectly that grit may be an important disposition predicting students’ success in this large class. Next semester, I intend to replicate these results and add a standardized measure of grit. About half of students with poor test 1 grades meet with me, improve their attendance, and participant in study strategy & test review sessions. I hypothesize that these resilient students, who bounce back from a poor test, will have more grit. This research may suggest that instilling grit is a pathway to reduce college drop out rates.

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Grobman, K. H. (2015, March). Grit and resilience after poor first test performance in a college class. Poster presented at the Annual California State University Symposium on University Teaching, Los Angeles, CA