

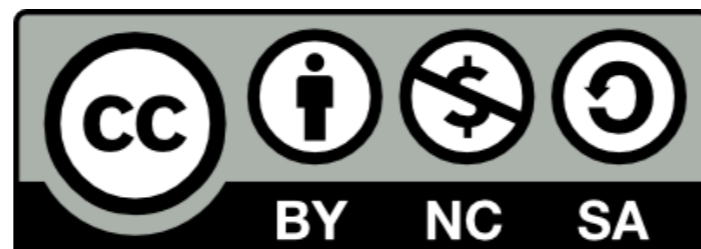


STUDENT LEARNING AND ANALYTICS AT MICHIGAN

November 16, 2012:

**Lessons Learned from Course-Level Analytics in
Psychology and the Bridge Program**

Bill Gehring, Arthur F. Thurnau Professor of Psychology,
University of Michigan



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STUDENT LEARNING AND ANALYTICS AT MICHIGAN

www.crlt.umich.edu/slam

Lessons learned from course-level analytics

Thanks to:

- Meg Noori, Ted Williamson and Bridge/CSP staff
- Shelly Schreier
- Tim McKay
- Rob Wilke
- Patricia Chen
- A couple thousand U of M students

_____ analytics

Caveats and disclaimers

and fine print

The problem

“I studied really hard for the exam and felt like I knew the material, but I did poorly.”

Approach

- Teach about study habits early in semester
- Collect surveys
- Give feedback to students on what works
- Rinse, repeat

Bad science but (potentially) good for students!

Teaching Effective Study Habits

What I tell them:

- Memory:
 - Your Brain Cares About Meaning
 - Use Desirable Difficulties
- Attention: Avoid Undesirable Distractions
- Mindsets and Self-Discipline

- Write down all the words:

table

reply

handle

below

define

- Write down all the words:

table

reply

handle

below

define

Write down words that will
complete the stems:

bli--

pia--

clo--

stu--

dan--



Your brain forms memories when you think about the meaning of something.

Even when you aren't trying to remember

Strive to make the material meaningful

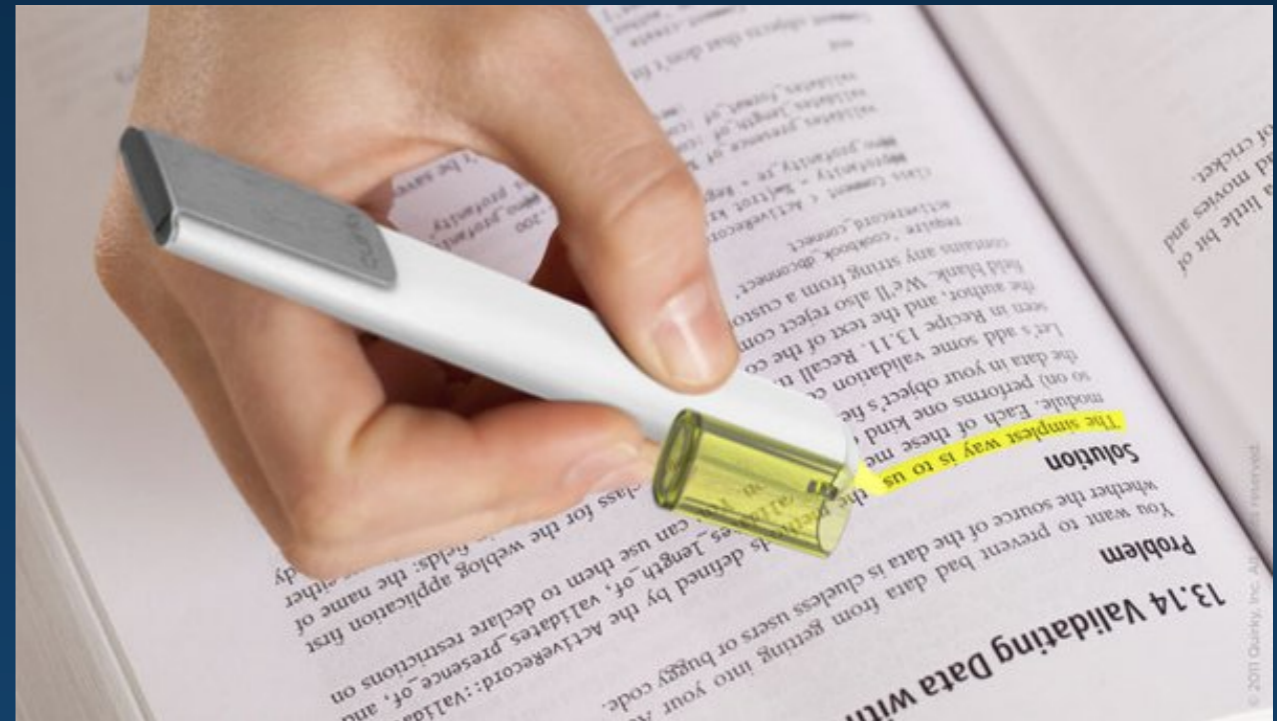
Craik and Lockhart (1972)

Make connections

- Relate ideas to each other and to other things you know
- Think of examples that are relevant to you personally
- Compare and contrast concepts
- Put things in your own words
- Think about the context in which a concept appears
- Talk over ideas with friends, GSIs, professors.

Deep, Meaningful Processing: Lessons

- Don't just “look over” or “go over” the chapter and your notes
- Don't rely only on “highlighting and underlining”
- Dangerous: these activities don't focus on meaning but they make things seem familiar



Desirable Difficulties

No pain, no gain.....



Things you can do that make learning seem more difficult and unpleasant, but that lead to better learning.

Robert and Elizabeth Bjork and colleagues (e.g., Bjork and Bjork, 2011)

Familiarity And Ease Mislead Us...

Looking over notes and highlights makes everything seem familiar. Misleads us into thinking we've learned it, when we haven't.



Desirable Difficulties

no pain, no gain...



Ways to introduce desirable difficulties

1. Generate your study material
2. Use tests (rather than presentations) as learning events.
3. Vary the conditions of learning
4. Interleave (mix) different topics
5. Distribute or space study or practice sessions

Without looking, write down as many as you can of the ten words you wrote down a few minutes ago.

See which words you remembered:

See which words you remembered:

table

reply

handle

below

define

See which words you remembered:

table

bli--

reply

pia--

handle

clo--

below

stu--

define

dan--

The Generation Effect

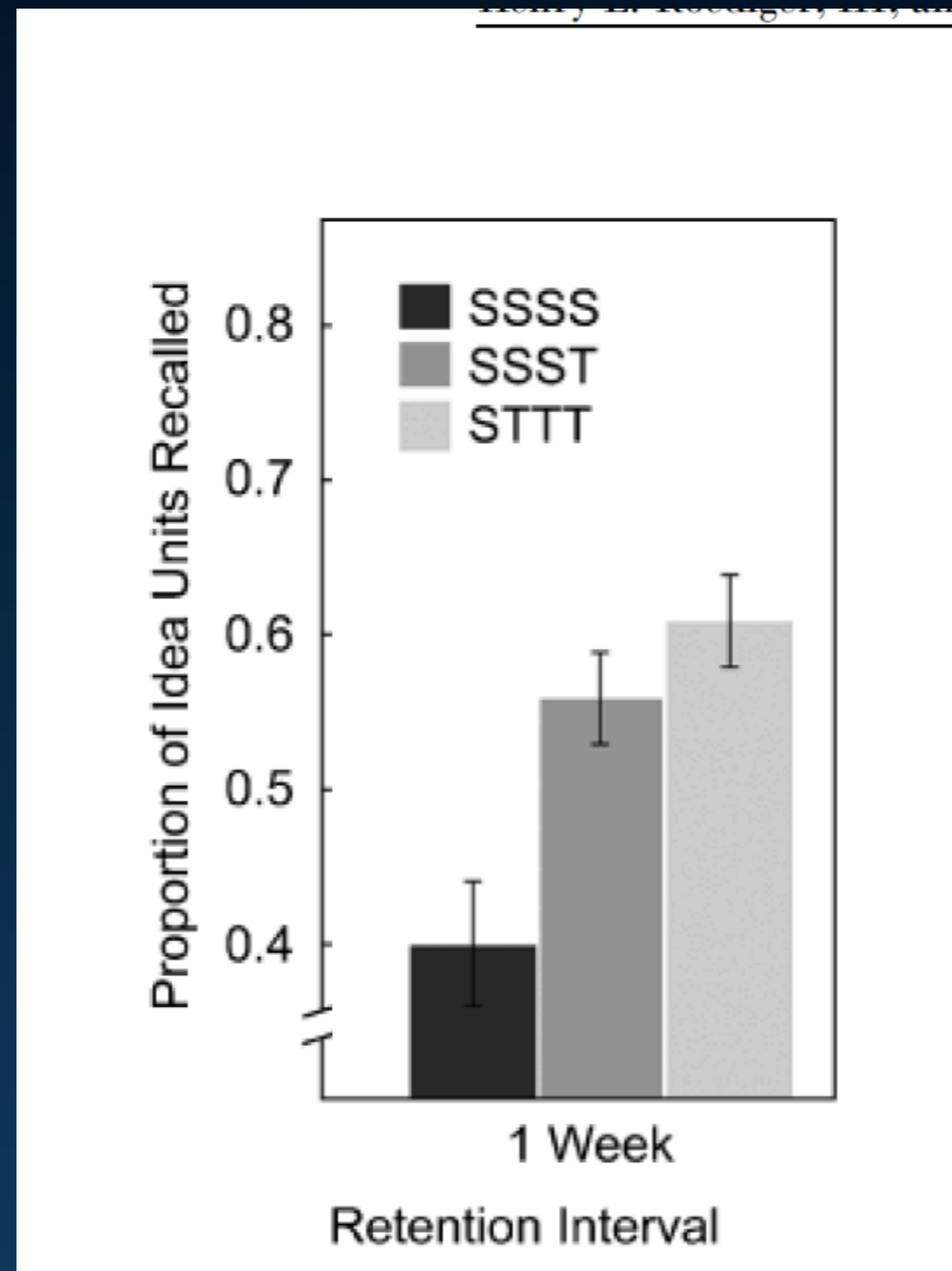
In general, material you generate yourself is recalled better

The Generation Effect: Lessons

- Generate information whenever possible
 - Draw figure or table from memory.
 - Draw graph on empty axes
 - Draw lecture Powerpoint slides from memory
 - Look at chapter headings and see if you can remember the specific points
 - Think of new examples that illustrate a point from lecture/text
- Don't just copy it or highlight it or underline it, etc.

Test-enhanced learning (self-testing)

Test-enhanced learning



One week later: Better Memory in STTT group...
...but $\frac{1}{4}$ as much studying!

Spacing study sessions

Spacing study sessions

Cramming is inefficient, spacing study sessions is better.

Studying 1 hour on 4 separate days better than
Studying 4 hours on one day

Best: Start studying soon after the material is covered, return to it over and over

The Classes

The Classes

- Psych 240 (Fall 2011 and Winter 2012)
- Summer Bridge Program (Math 103, English, CSP 100)
- Psychology 111 (Shelly Schreier)

The Study Habit Survey

- Items on study habits
 - Notes: recopying, re-reading, highlighting
 - Self testing, flash cards
 - Outlines, diagrams
 - Desirable difficulties: generate material, interleave topics, vary conditions
 - Self-regulation: minimize distractions
 - Time spent, cramming vs. not
- Use of resources
 - podcasts
 - Powerpoint downloads
 - PDF readings
- Motivation, Self-regulation

And now some
results

Self-testing and generation

Items showing positive correlations with exam scores

- Bridge Math 103A: "Test your memory by recalling information without looking at the material (such as drawing graphs from memory, listing concepts from memory, writing math formulas from memory)."
- Psych 240 W12: "Test yourself with practice questions"

Elaborative, deep processing

- Do you “Think about the concepts or procedures illustrated by a homework assignment.”
- Change in answers correlated with improvement from midterm to final (Bridge Math 103)












Did students change their study habits?

Yes (if their reports are accurate)


	Psych 240 W12	Bridge Math 103A/B	Psych 111
Underline/ highlight	-	-	-
Flash cards	↓	-	↑
Self-testing	↑	↑	↑
Elaborative/ Deep	↑	↑	↑
Diagrams/ charts/pics	↑	↑	-

↑ increase ↓ decrease - no change

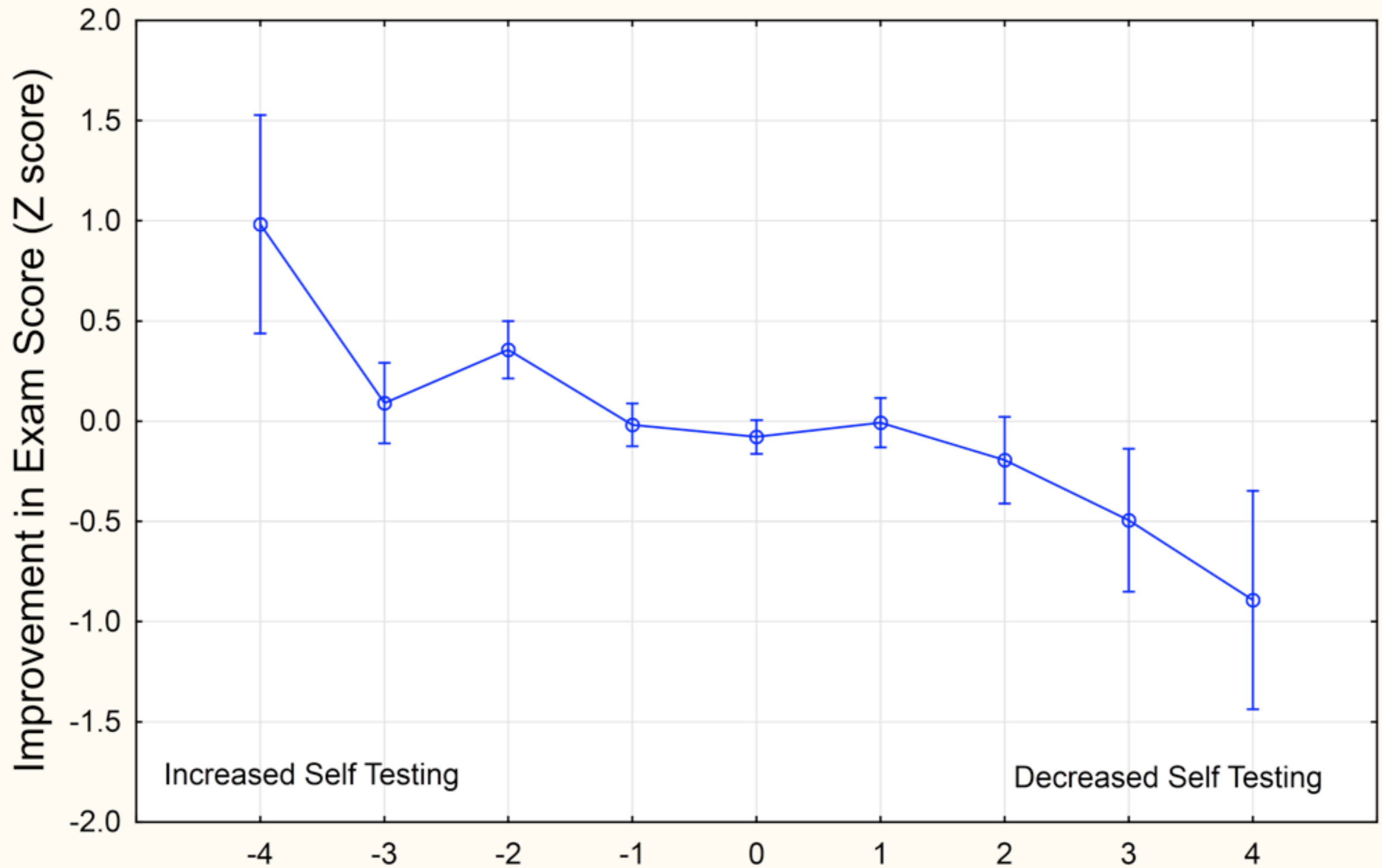
Did changes in study habits correlate with exam performance changes?

	Psych 240 W12	Bridge Math 103A/B	Psych 111
Underline/ highlight	-	-	-
Flash cards		-	
Self-testing			
Elaborative/ Deep			
Diagrams/ charts/pics			

 increase  decrease - no change

 Significant correlation: change in habit vs. Exam 1 to Exam 2 improvement

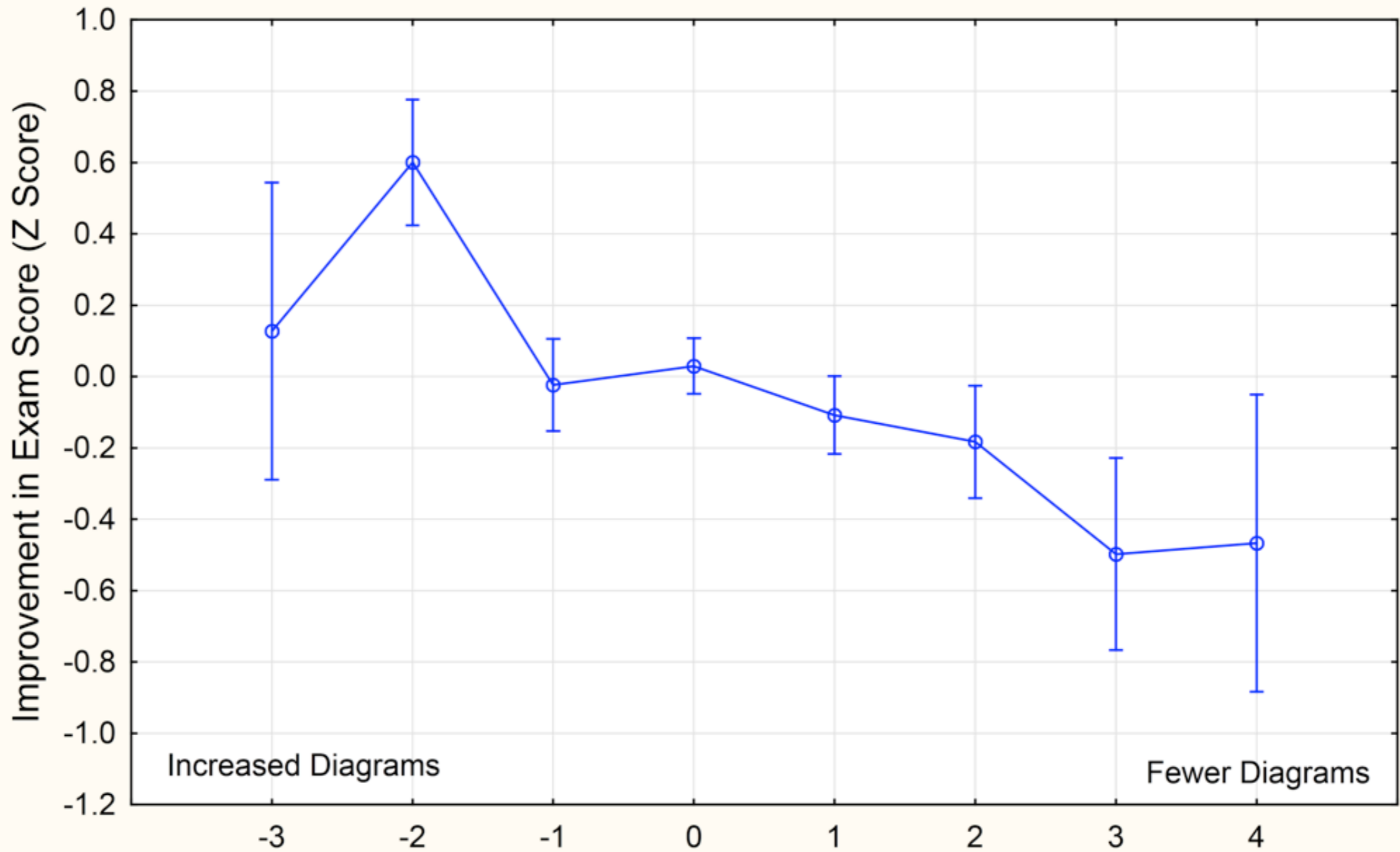
Psych 111 Change from Exam 1 to Exam 2 in:
"Test yourself by writing your own questions or practice problems."



Current effect: $F(8, 349)=1.9871, p=.04723,$
Spearman's rho = .16, $p < .03$

Vertical bars denote +/- standard errors

Psych 111 Change from Exam 1 to Exam 2 in:
Make diagrams, charts or pictures.



Current effect: Current effect: $F(7, 346)=2.6992, p=.00980,$
Spearman's rho = .16, $p < .003$

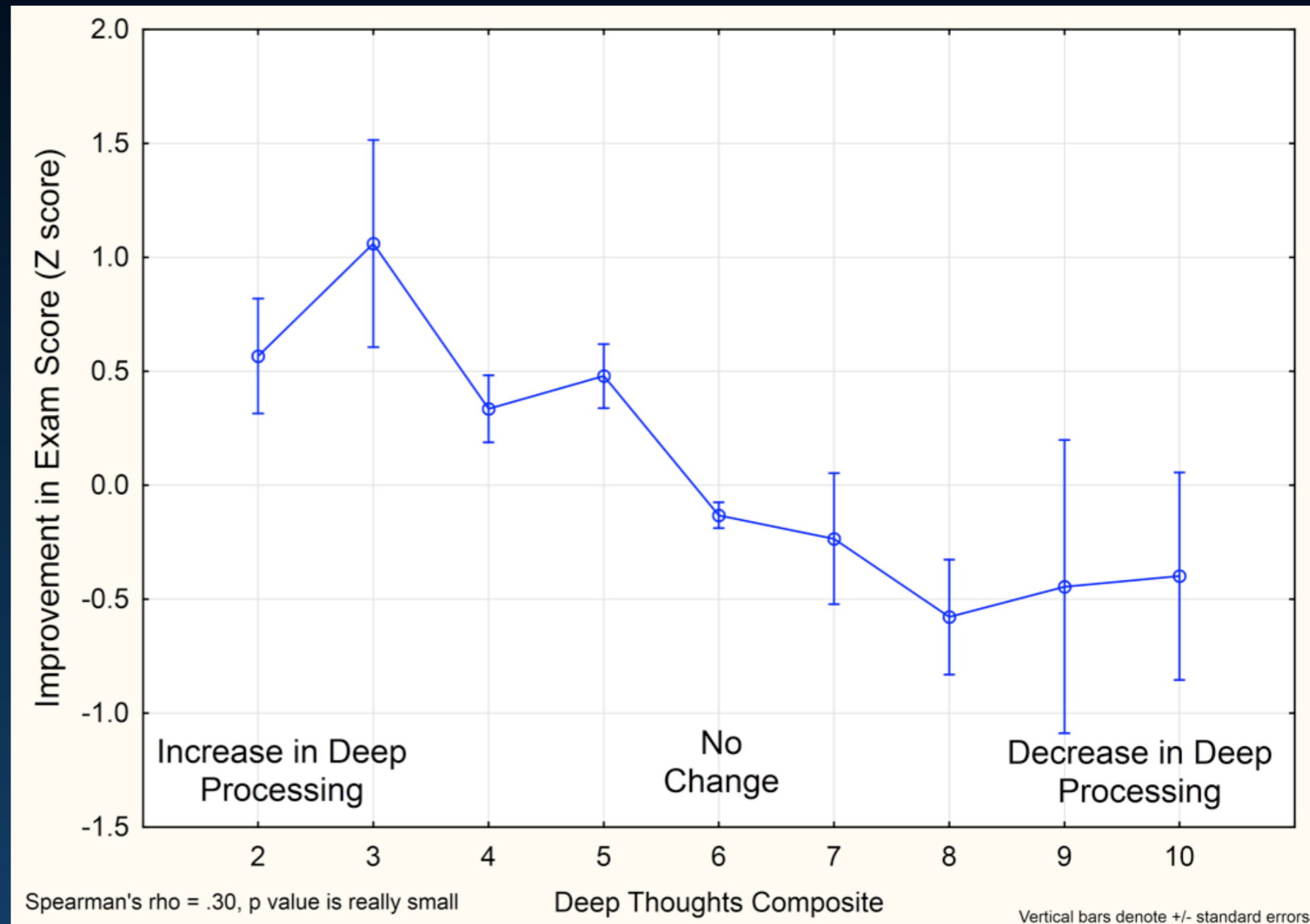
Vertical bars denote +/- standard errors

Deep Processing

◆ Create exercises that require you to think deeply about the meaning of the material, such as thinking of related topics, doing compare/contrast, applying concepts to new examples.

◆ Make special efforts to think about the concepts illustrated by a homework assignment.

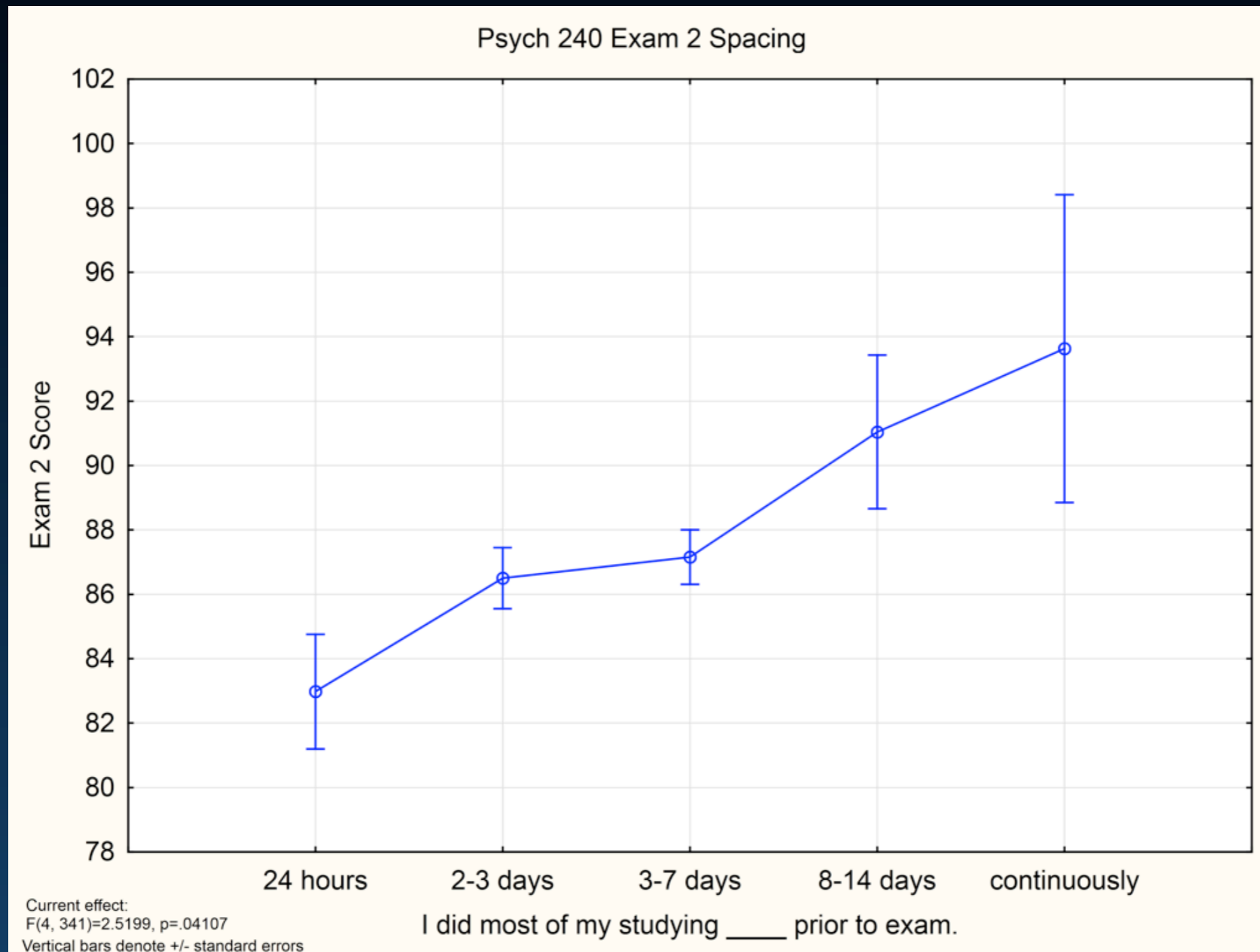
Improvement in exam scores is associated with increased deep processing (Psych 111)



Spacing

Spreading study sessions out over time is better than cramming.

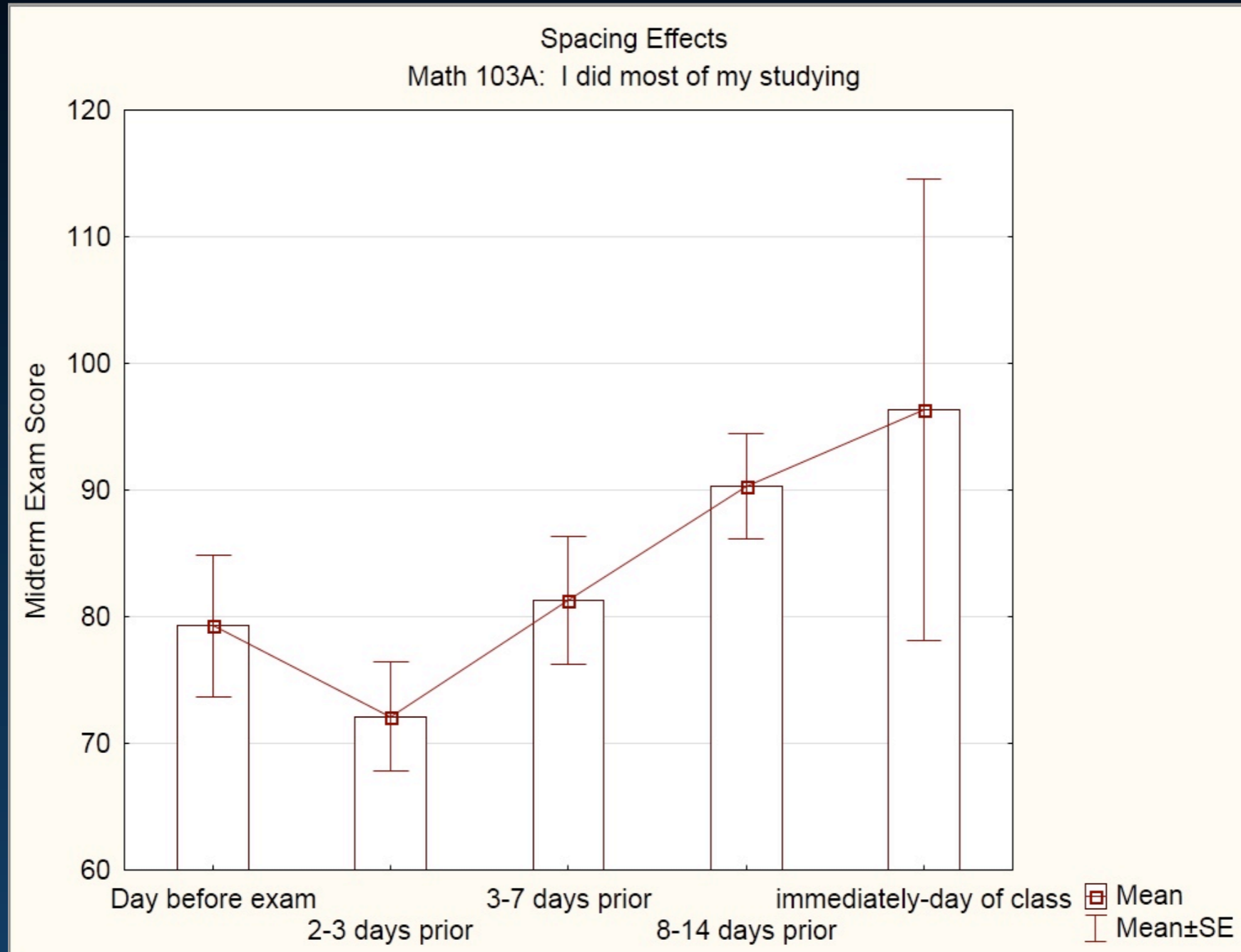
Spacing study sessions: Cramming led to lower Psych 240 exam scores



Cramming

Not cramming

Spacing study sessions: Cramming led to lower Bridge/Math 103 exam scores



Cramming

Not cramming

Multitasking

Attention

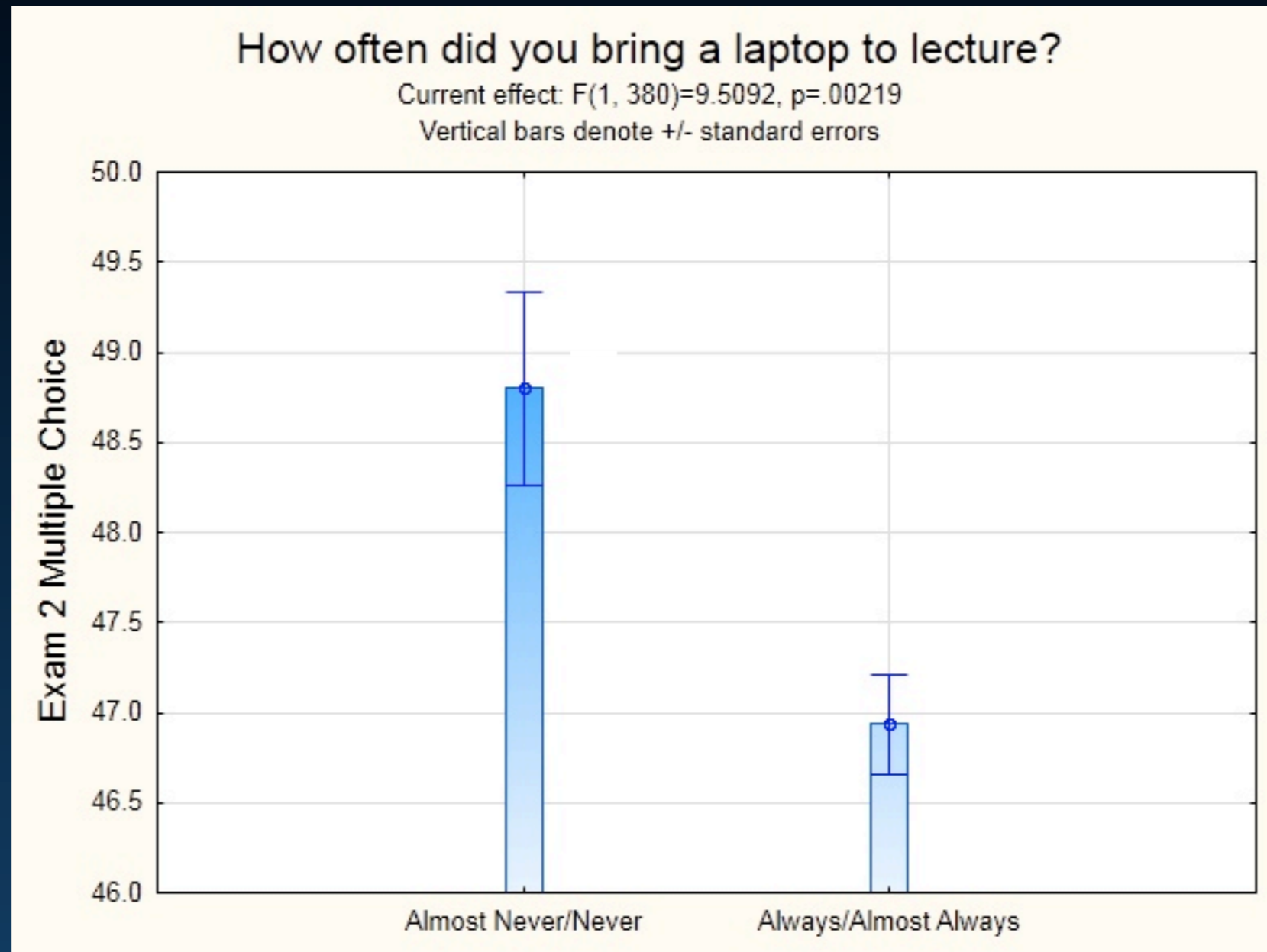
Attention is limited and the brain has difficulty multitasking

Avoid Undesirable Distractions

- Reduce Multitasking
- Control Tempting Alternatives







Laptops in the classroom



Why?

Correlation with “During class, I missed something the instructor said because I was paying attention to my computer.”

Heavy laptop users only:

During class, I looked at websites that were unrelated to the class (Facebook, ESPN, etc.)	
During class, I looked at websites related to the class (e.g., ctools, googling a concept, Wikipedia)	
During class, I used a computer to take notes.	
Using a computer during class helped me to stay attentive and engaged with the material.	

Computer use during studying

Two items: Indicate how often you used this study strategy (Scale: Always...Never):

- "Allow yourself to use a computer during studying, but only for things related to studying (Googling a concept, consulting Wikipedia, etc.)"
- "Allow yourself to use a computer during studying for things unrelated to studying (email, Facebook, etc.)."

Do you “Allow yourself to use a computer during studying for things unrelated to studying (email, Facebook, etc.).”

Negatively correlated with exam score...and:

Motivation



Hours of study



Spacing of study



Self control (e.g., resist temptation)



Ignore texts during studying



Grit, e.g. “I am a hard worker.”



Procrastination



Mind-wandering



Non-cognitive factors

Self-discipline

- Sticking to a schedule, working hard, planning, organizing, resisting tempting fun activities.
 - Self control, grit
- Predicts academic achievement better than IQ!
 - Duckworth & Seligman (2005)

PSYCHOLOGICAL SCIENCE

Research Article

Self-Discipline Outdoes IQ in Predicting Academic Performance of Adolescents

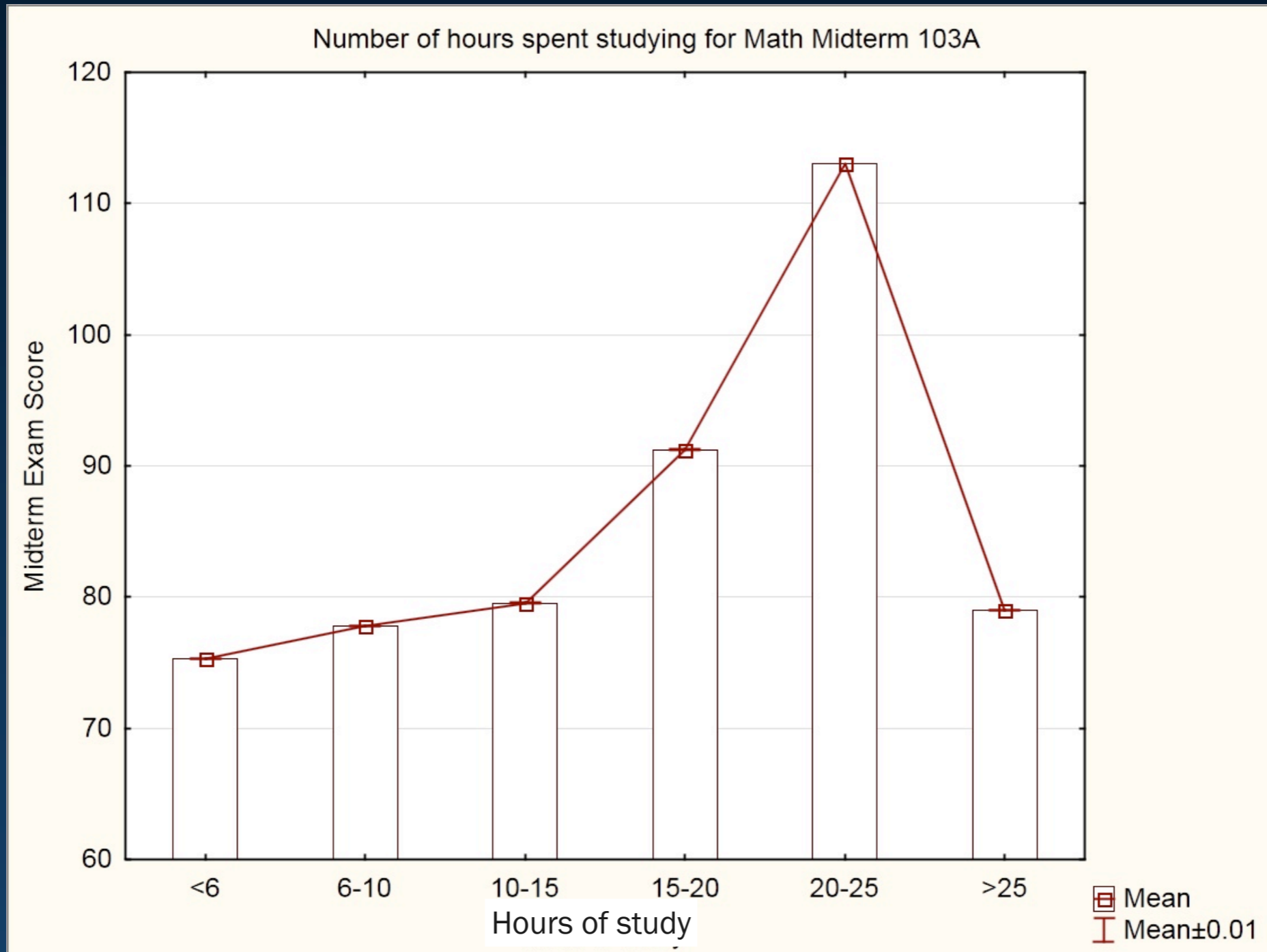
Angela L. Duckworth and Martin E.P. Seligman

Positive Psychology Center, University of Pennsylvania

Total hours of study

Self-discipline: Hard work counts!

People who studied more got better scores on the Bridge Program Math 103 midterm



Other items related to self-discipline that correlate with exam score (Psych 111)

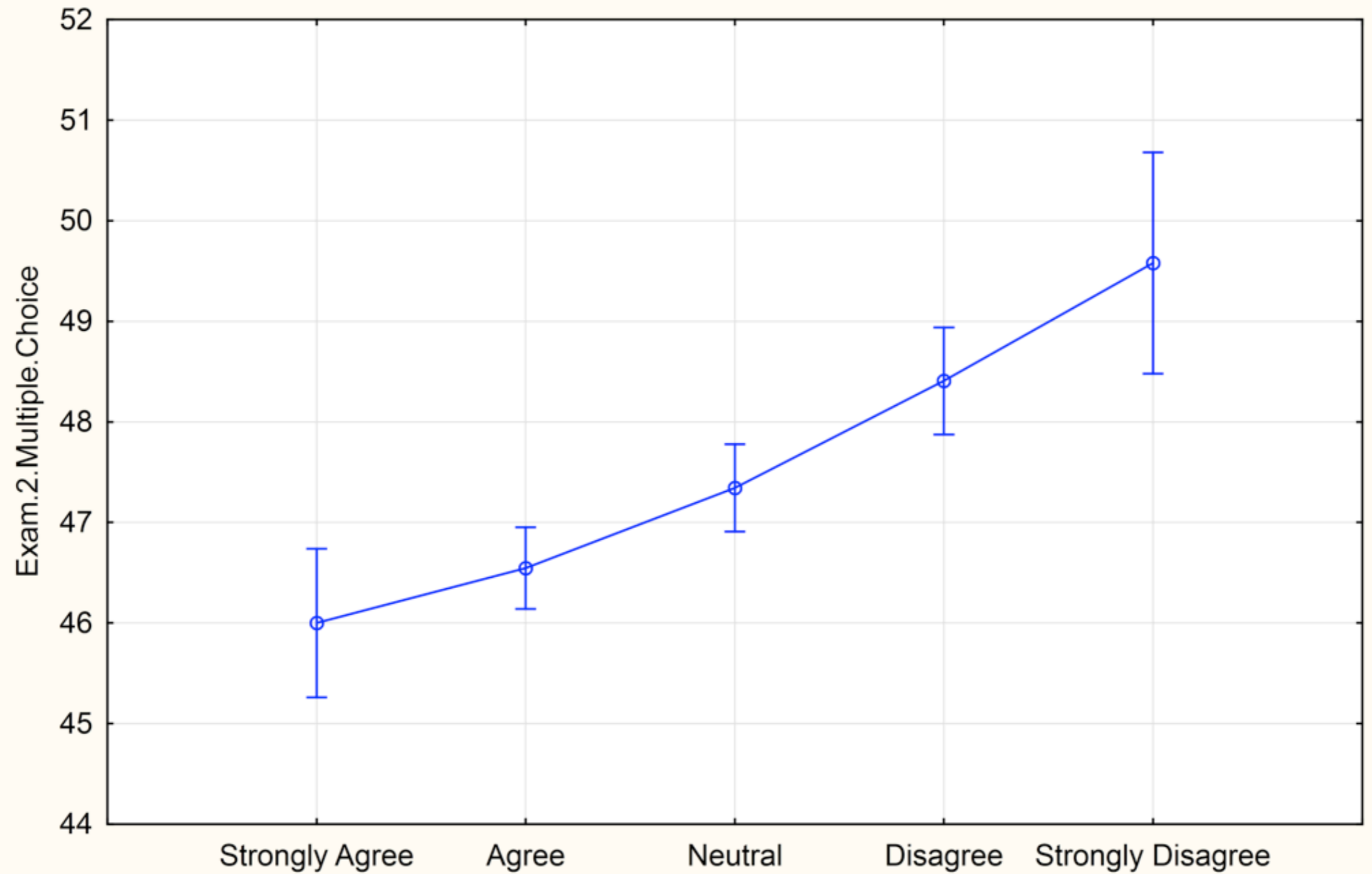
- ↓ When I studied for the exam, my mind often wandered.
- ↓ I tended to procrastinate when studying.
- ↑ One of my highest priorities was doing well on the exam.
- ↓ There were things that came up as I studied that prevented me from studying as thoroughly as I usually do.
- ↑ I kept track of my priorities and goals using a todo list or organizer.
- ↑ I am a hard worker.

Anxiety/Worry

The Psych 111 exam made me anxious and/or worried.

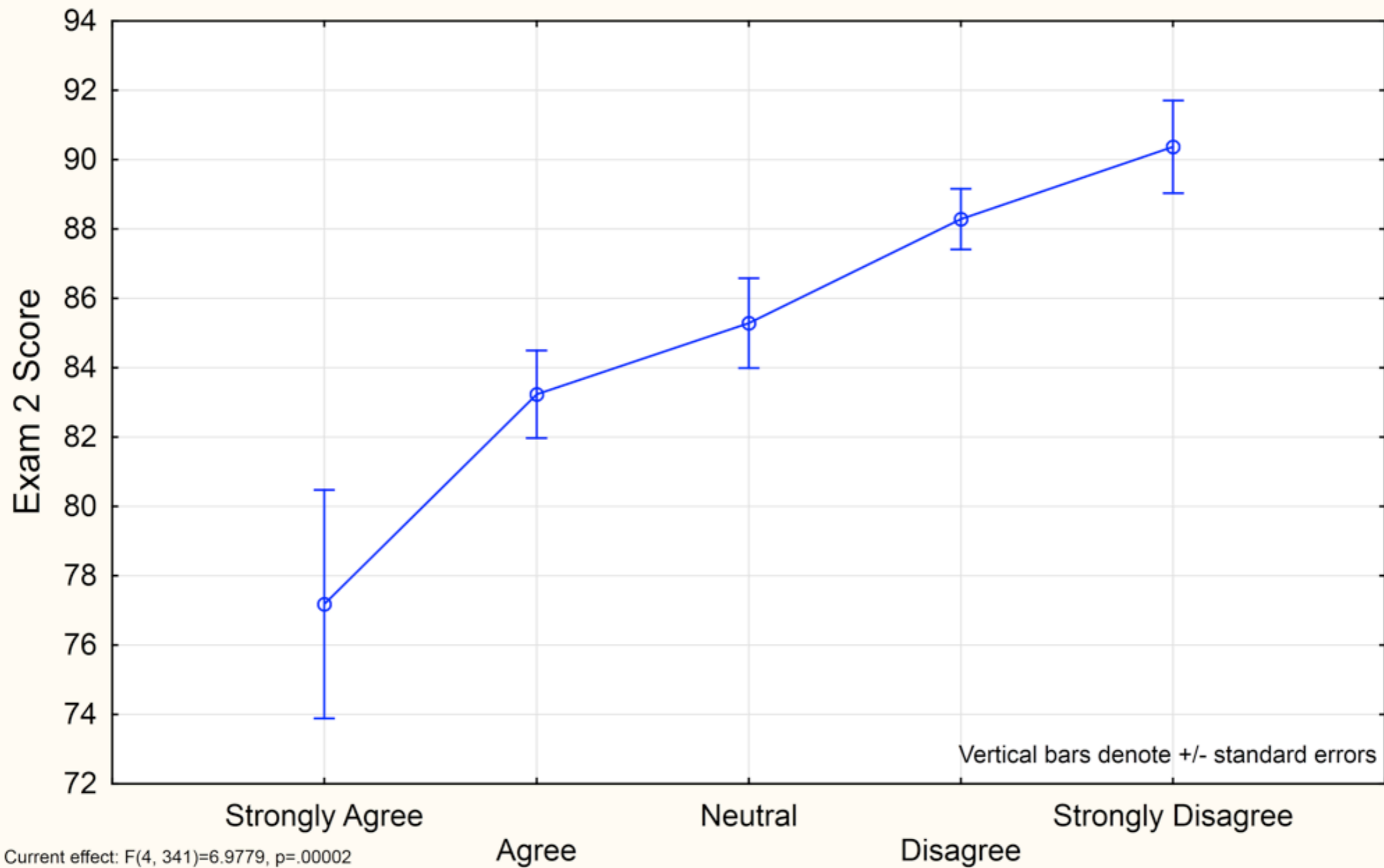
Current effect: $F(4, 398)=3.7751, p=.00500$

Vertical bars denote +/- standard errors

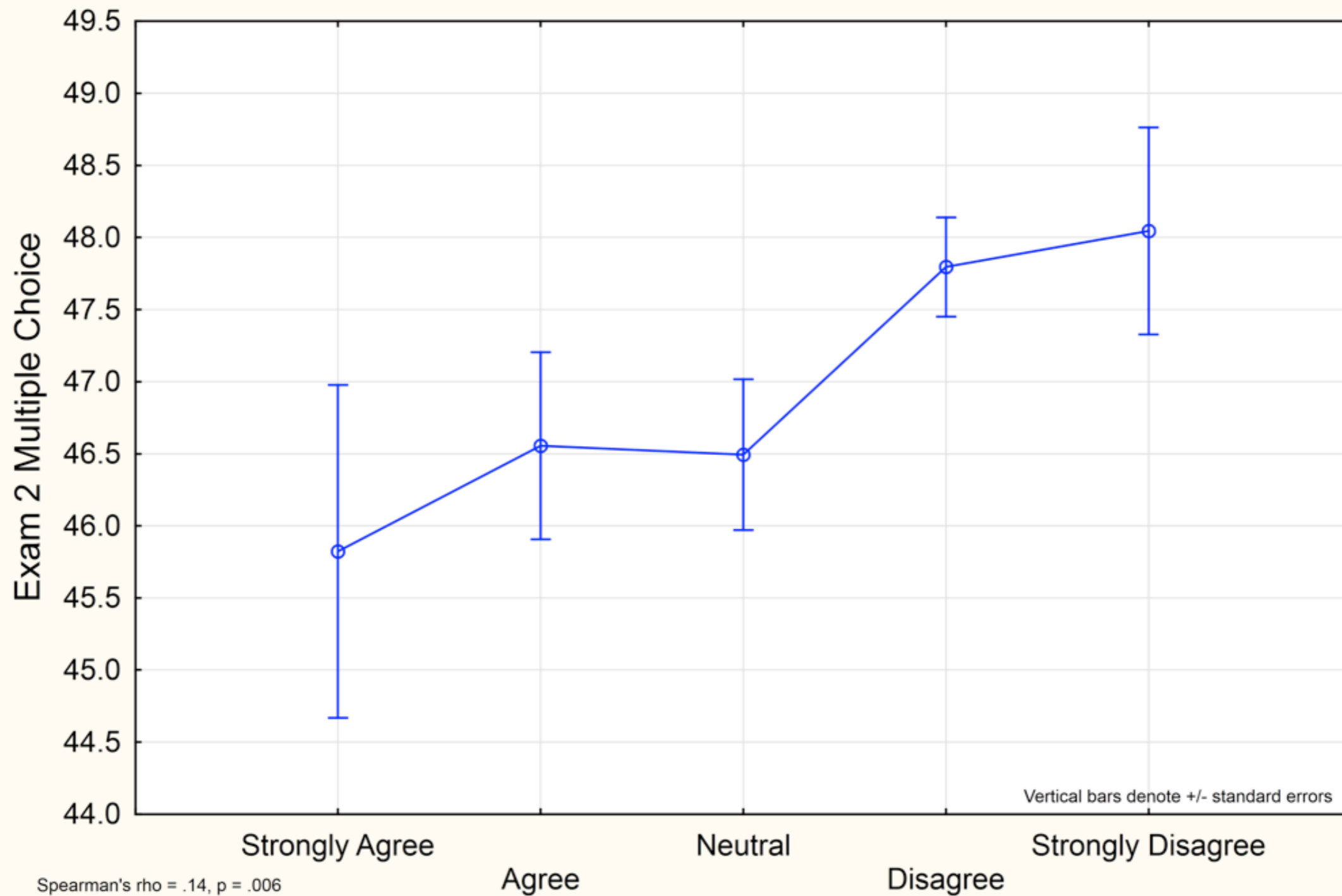


Motivation

"I often felt so unmotivated when I studied that I quit before I finished what I had planned to do."
(Psych 240 W12)



"I often felt so unmotivated when I studied that I quit before I finished what I had planned to do."

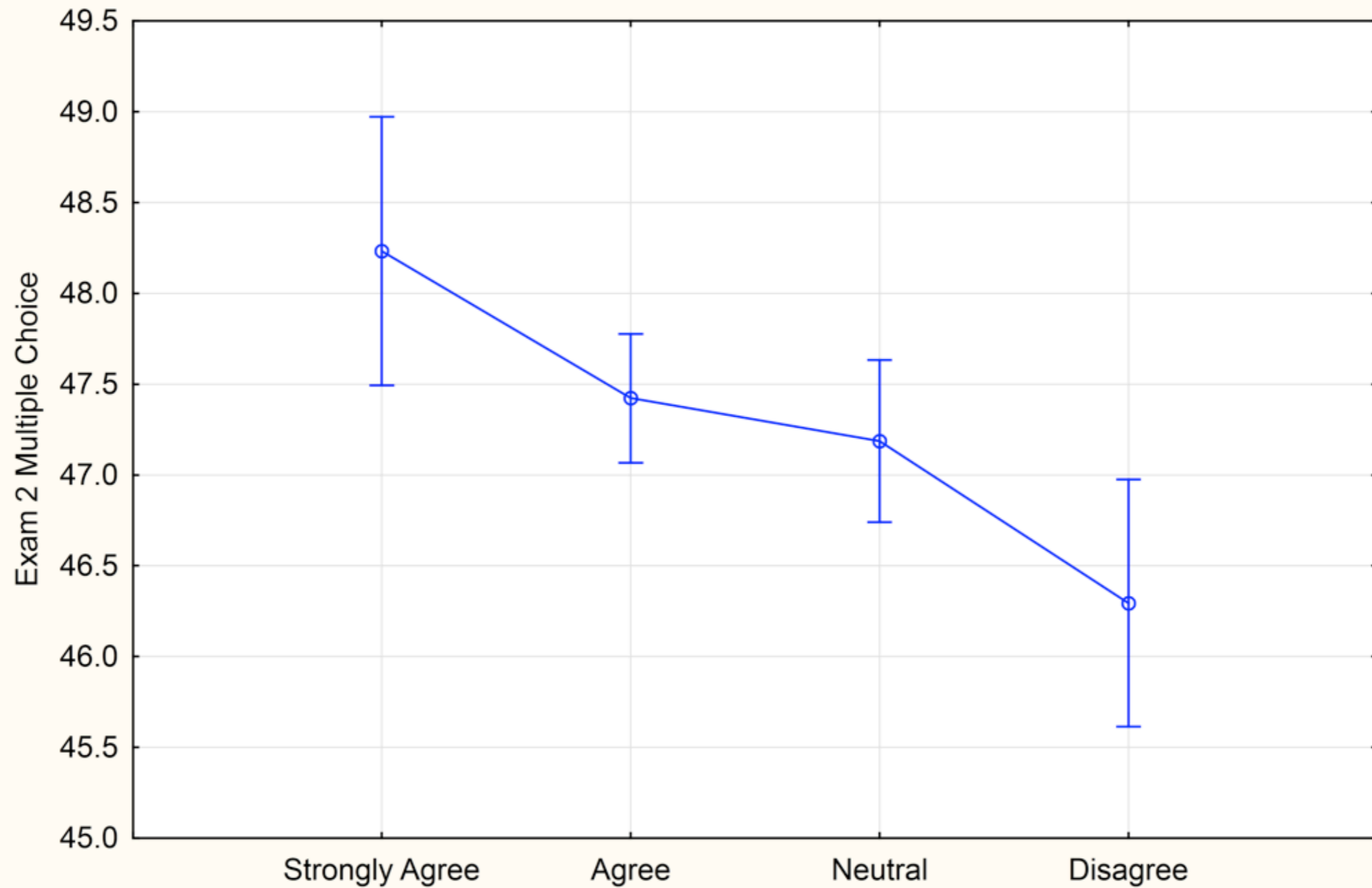


Mood

I was in a positive mood as I studied.

Linear trend: $F(1, 395)=3.89, p<.05$

Vertical bars denote +/- standard errors

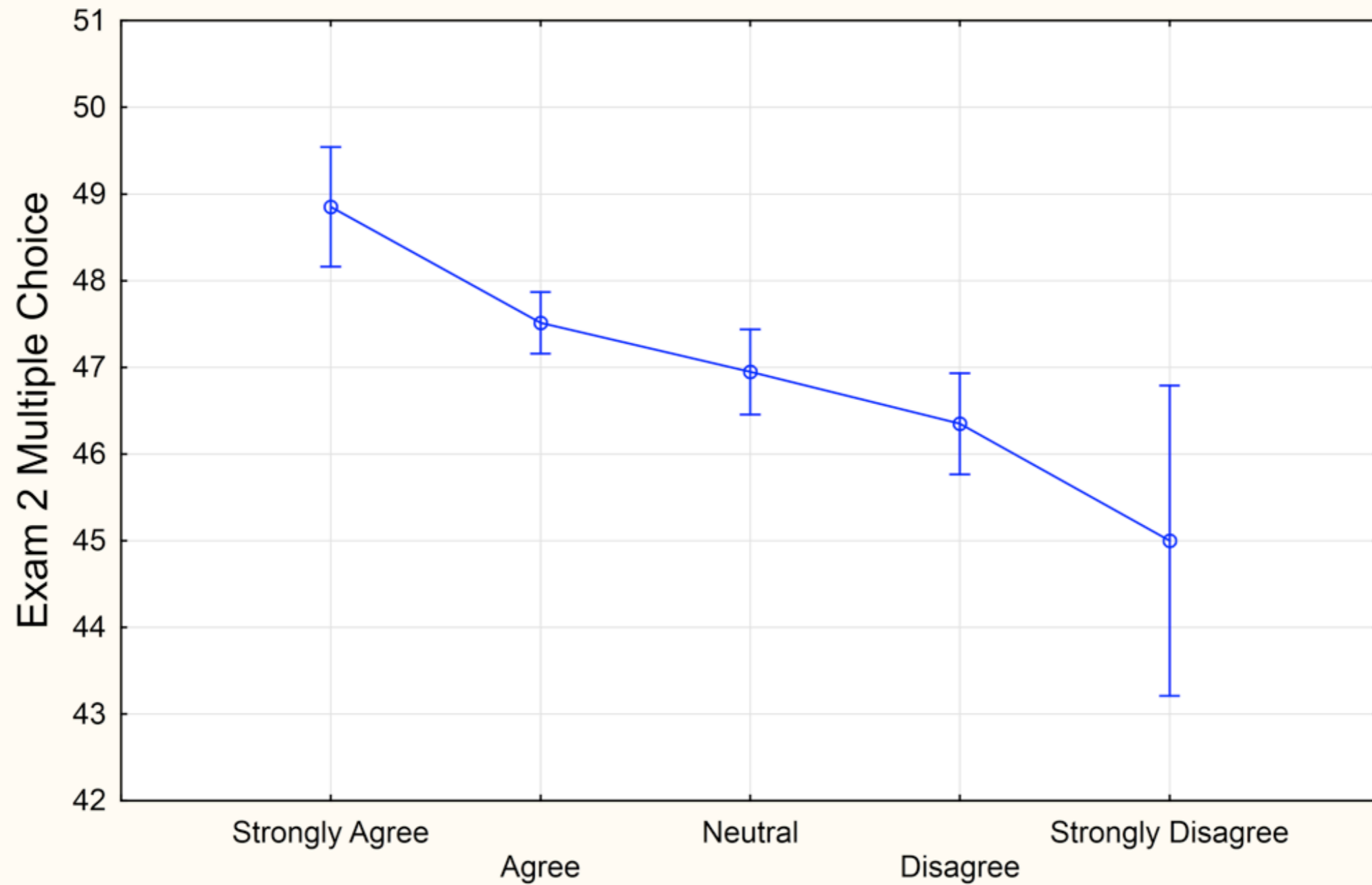


How prepared do
you feel?

Before taking Psych 111 Exam 2, I felt highly prepared for it.

Current effect: $F(4, 387)=2.5577, p=.03839$

Vertical bars denote +/- standard errors



Correlates of perceived preparedness

(Spearman's rho)

Spacing of study sessions (.48)

"Schedule study time ahead of time and stick to it..." (.39)

"One of my highest priorities was doing well..." (.39)

"I was in a positive mood as I studied." (.38)

Grit, e.g. "I am a hard worker." (.27)

"Kept track of priorities...using todo list or organizer" (.26)

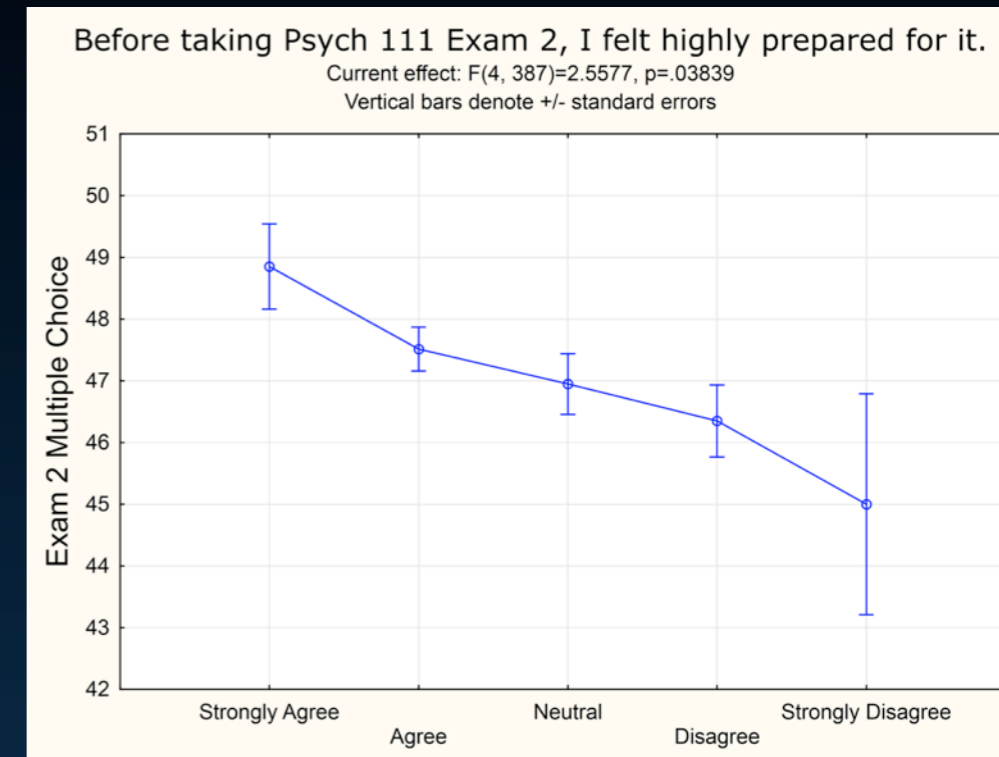
"Motivated myself ...long-term goals and values in mind" (.23)

Ignore calls/texts during studying (.22)

"I often felt so unmotivated...that I quit..." (-.25)

"I tended to procrastinate..." (-.28)

"Things came up that prevented me from studying..." (-.35)



Interests



Vocational Interests and Performance: A Quantitative Summary of Over 60 Years of Research

Perspectives on Psychological Science
7(4) 384–403

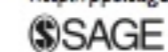
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<http://pps.sagepub.com>



Christopher D. Nye¹, Rong Su², James Rounds², and Fritz Drasgow²

¹Department of Psychology, Bowling Green State University, Bowling Green, OH, and ²Department of Psychology, University of Illinois at Urbana–Champaign

Interests correlate with class success

↑ = enjoying this is associated with doing well

↓ = enjoying this is associated with doing poorly

I enjoy...

Psych
240 F I I

Nat Sci classes (biol, chem, phys)	↑
Quant classes (math, stats)	
Soc Sci classes (psych, soc, econ, comm)	-
Humanities classes (lit, languages)	↓
Studying creative arts (art, music, dance)	↓
Learning new things about any topic	-

Interests correlate with class success

↑ = enjoying this is associated with doing well

↓ = enjoying this is associated with doing poorly

I enjoy...	Psych 240 F11	Psych 240 W12
Nat Sci classes (biol, chem, phys)	↑	↑
Quant classes (math, stats)		
Soc Sci classes (psych, soc, econ, comm)	-	-
Humanities classes (lit, languages)	↓	↓
Studying creative arts (art, music, dance)	↓	↓
Learning new things about any topic	-	-

Interests correlate with class success

↑ = enjoying this is associated with doing well

↓ = enjoying this is associated with doing poorly

I enjoy...

Psych
240 F11

Psych 240
W12

Bridge
Math 103A, Math 103B, CSPI00, ENG

Nat Sci classes (biol, chem, phys)	↑	↑	- ↑ - ↑
Quant classes (math, stats)			↑ ↑ - ↑
Soc Sci classes (psych, soc, econ, comm)	-	-	- - - -
Humanities classes (lit, languages)	↓	↓	↓ - - -
Studying creative arts (art, music, dance)	↓	↓	- - - -
Learning new things about any topic	-	-	- - - -

Interests correlate with class success

↑ = enjoying this is associated with doing well

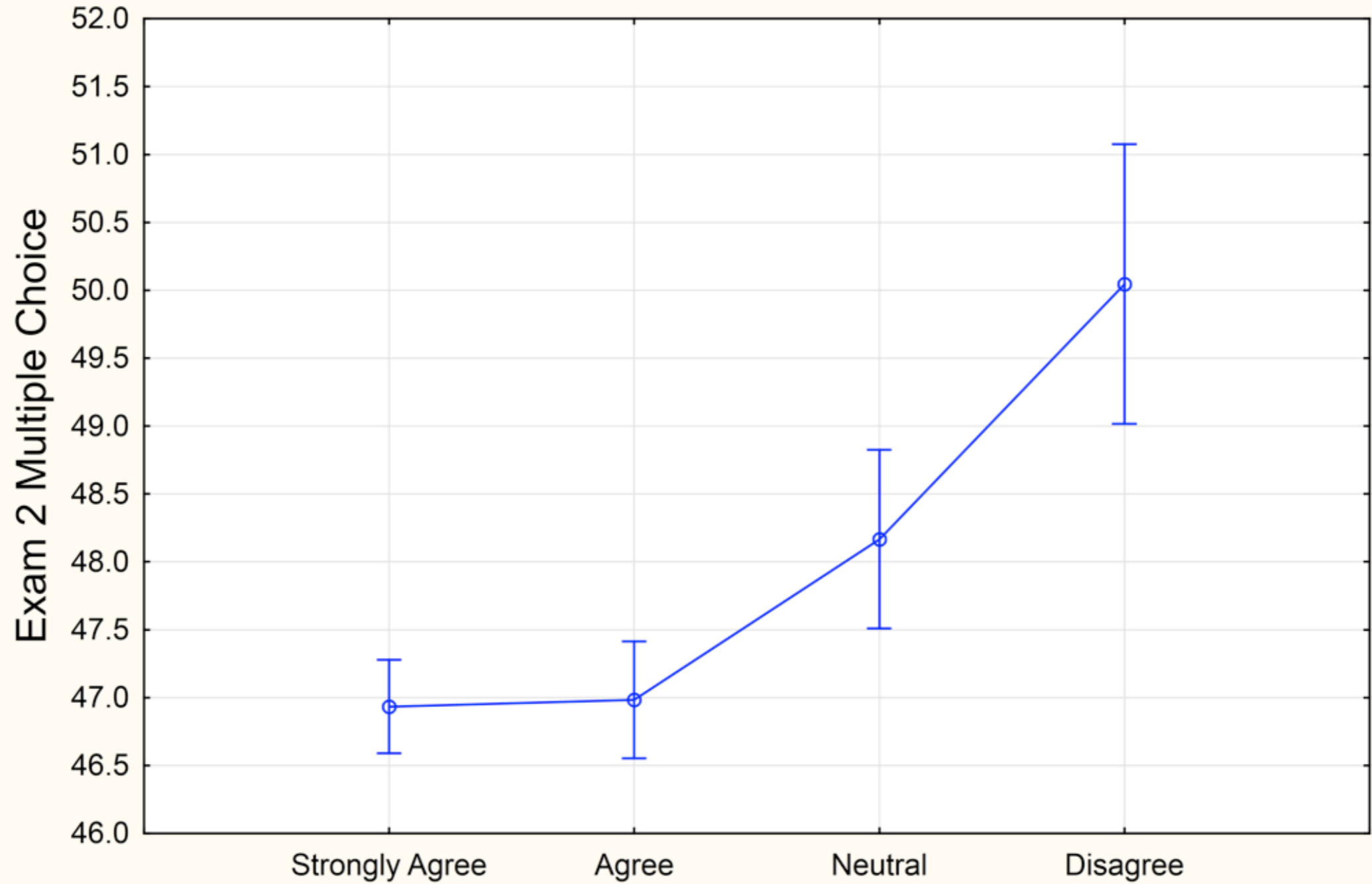
↓ = enjoying this is associated with doing poorly

I enjoy...	Psych 240 F11	Psych 240 W12	Bridge Math 103A, Math 103B, CSPI00, ENG	Psych III F12
Nat Sci classes (biol, chem, phys)	↑	↑	- ↑ - ↑	↑
Quant classes (math, stats)			↑ ↑ - ↑	-
Soc Sci classes (psych, soc, econ, comm)	-	-	- - - -	-
Humanities classes (lit, languages)	↓	↓	↓ - - -	-
Studying creative arts (art, music, dance)	↓	↓	- - - -	-
Learning new things about any topic	-	-	- - - -	-

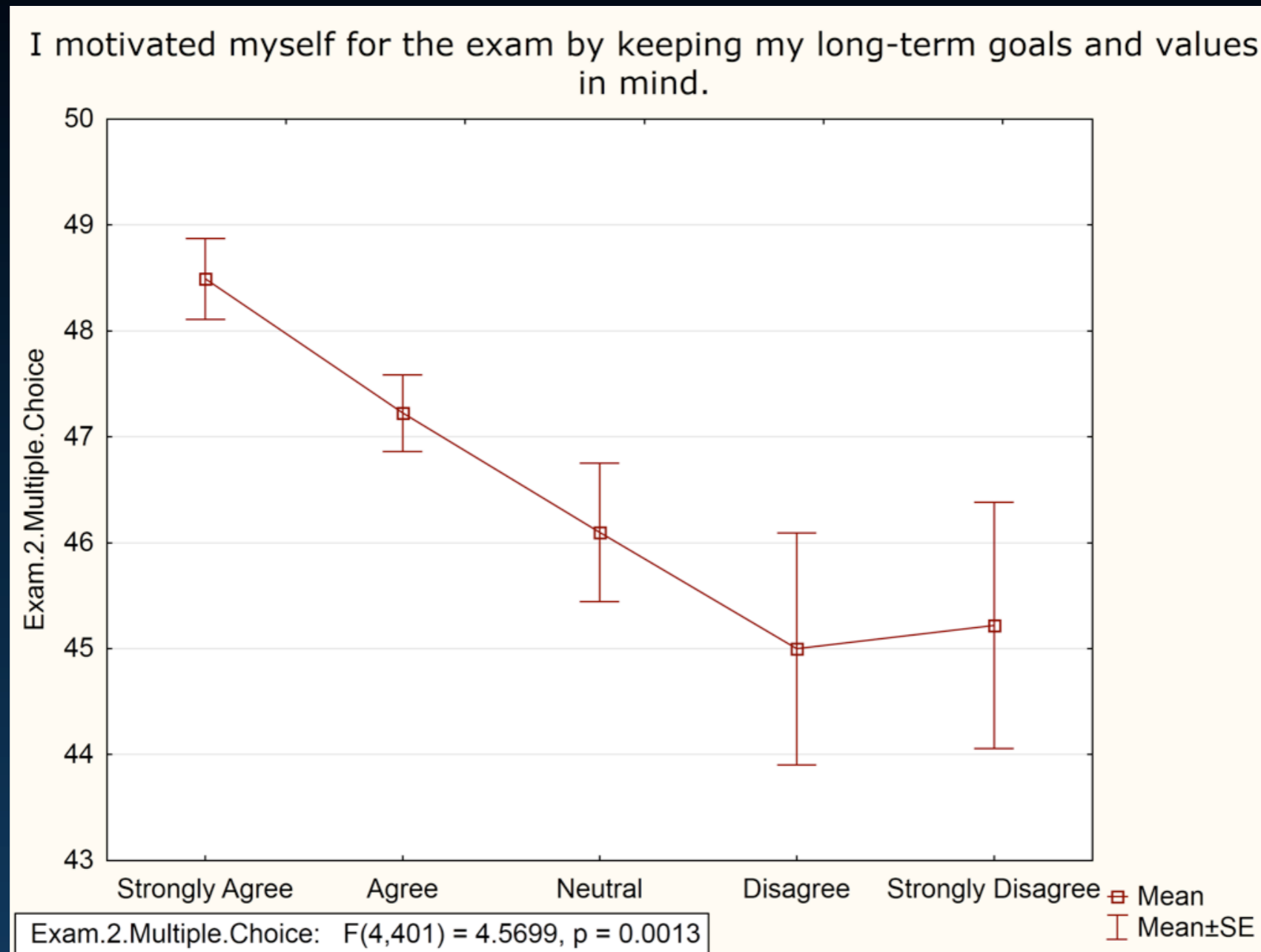
I enjoy following U of M sports

Current effect: $F(3, 395)=3.5057, p=.01551$

Vertical bars denote +/- standard errors



What motivates the motivated?



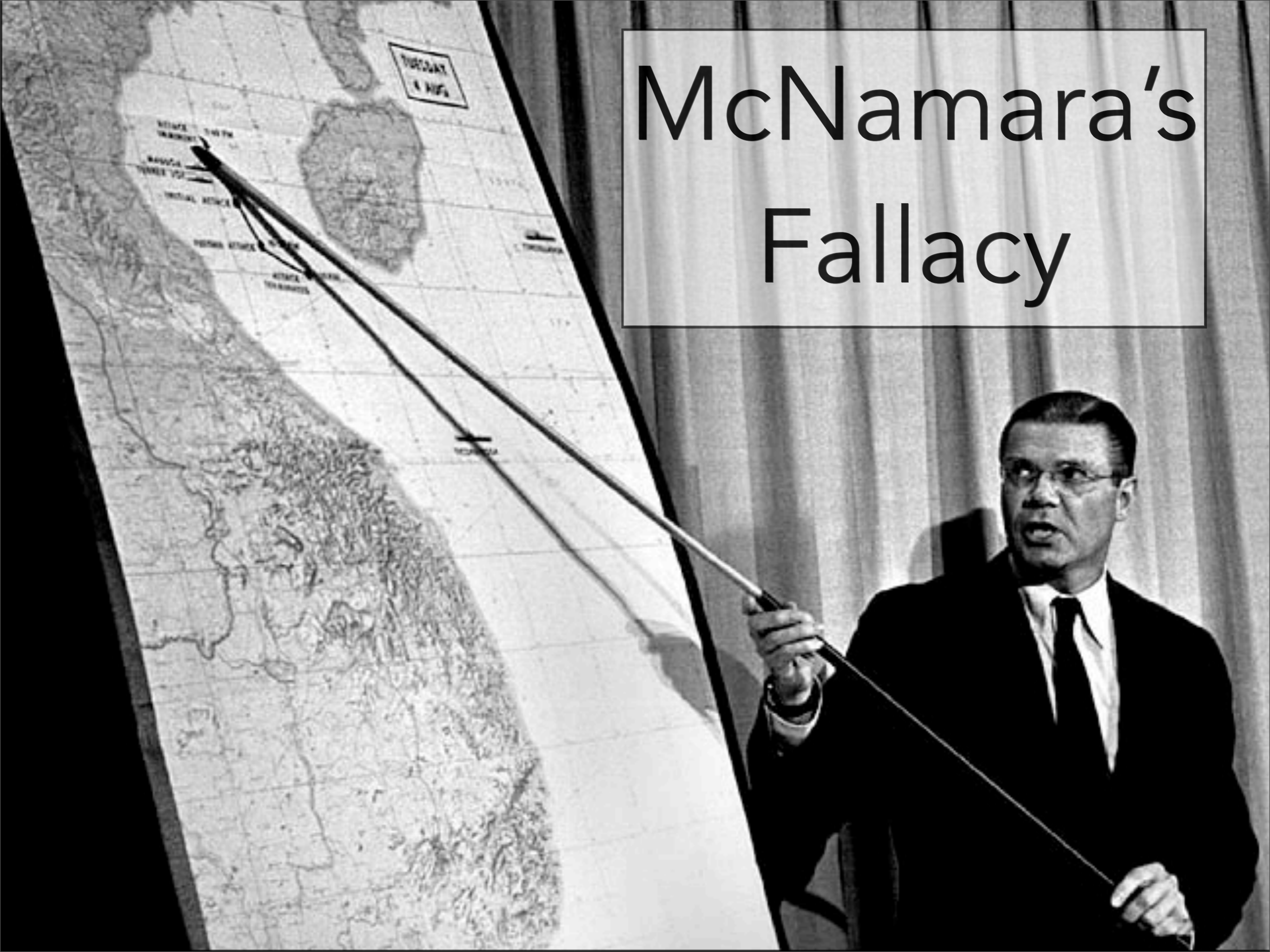
Change correlated with exam improvement

Lessons learned

- There's a lot going on out there and it is worth trying to measure it.
- It's useful to teach not only the content, but also how to study that content
 - Including domain-specific skills
- Rich opportunities for course-level interventions that target study habits.
- Possibly richer opportunities for interventions that target motivation, anxiety, self-regulation and other non-cognitive factors.
- Need outcome measures other than exam scores and GPA:
 - well being? happiness? getting along with others?

_____ analytics

McNamara's Fallacy



McNamara's Fallacy



McNamara's Fallacy

"The first step is to measure whatever can be easily measured. This is OK as far as it goes. The second step is to disregard that which can't be easily measured or to give it an arbitrary quantitative value. This is artificial and misleading. The third step is to presume that what can't be measured easily really isn't important. This is blindness. The fourth step is to say that what can't be easily measured really doesn't exist. This is suicide."

- Daniel Yankelovich

