



Medical Student Metacognition: The Predictive Personality Facets of Conscientiousness and Emotional Stability

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I affirm that all persons involved in the planning/content development do not have relevant financial relationships with pharmaceutical companies, biomedical device manufacturers or distributors, or others whose products or services may be considered related to the subject matter of the educational activity.

“Cogito, ergo sum” (I think, therefore I am)




- René Descartes

Metacognition¹ is the awareness and regulation of thinking² . . .

. . . which involves goal setting, memory, comprehension monitoring, and strategy selection . . .

. . . and are salient features of effective learning.³

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1. Flavell JH, Metacognition and Cognitive Monitoring: A New Area of Cognitive-Developmental Inquiry, *American Psychologist* 1979;34:906-911.
 2. Ohtani K, Hisasaka T, Beyond Intelligence: A Meta-analytic Review of the Relationship among Metacognition, Intelligence, and Academic Performance, *Metacognition Learning* 2019;13:179-212.
 3. Rhodes MG, Metacognition, *Teaching of Psychology* 2019;46(2):168-175.

It is important to examine how medical students regulate their own cognitive processes . . .

. . . so that if there are some underperforming elements they can be assessed and improved.



- Medical student personality impacts metacognition.⁴
- Detailed associations at the higher resolution levels of these two constructs⁵ will provide greater insight into the features of learning.
- This requires an examination of the internal structure and relationships of personality and metacognition at the narrower facet level instead of the broader factor level

4. Karpov AA, Karpov AV, Karabushchenko NB, Ivashchenko AV, The Interconnection of Learning Ability and the Organization of Metacognitive Processes and Traits of Personality, *Psychology in Russia: State of the Art* 2017;.10(1):67-79.

5. Jayawickreme E, Zachry CE, Fleeson W, Whole Trait Theory: An Integrative Approach to Examining Personality Structure and Process, *Personality and Individual Differences* 2019;136:2-11.

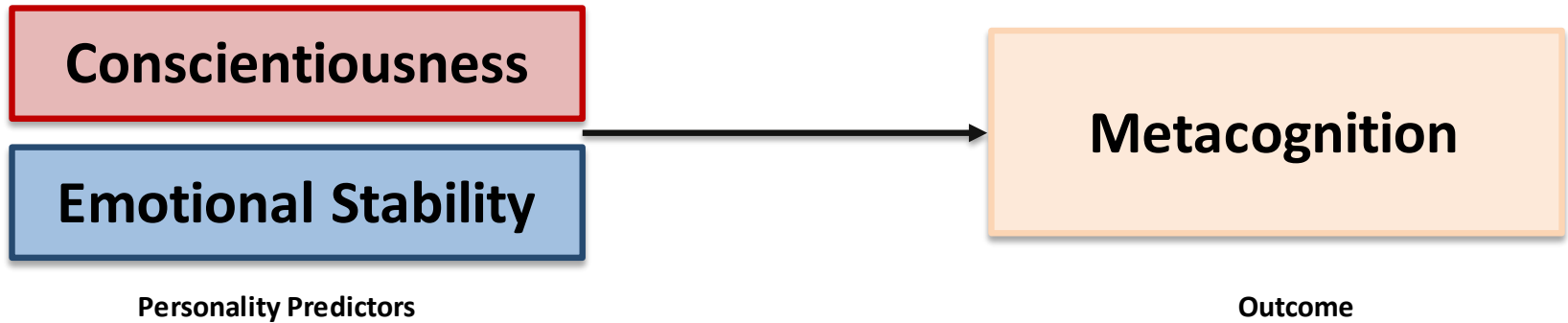
➤ Conscientious individuals . . .

- are reliable, persistent and achieve goals through careful planning
- but can be compulsive perfectionists and workaholics.

➤ Emotionally stable people . . .

- respond to challenges appropriately
- but minor frustrations as seen as hopelessly difficult and reactions can be intense. This makes it challenging to think clearly, make decisions and cope with anxiety or stress.

- The purpose of this study is to analyze the impact of conscientiousness and emotional stability on medical student metacognition at high resolution.





**Declarative
Knowledge**

What to Learn



**Procedural
Knowledge**

How to Learn



**Conditional
Knowledge**

When to Learn

6. Schraw G, Dennison RS, Assessing Metacognitive Awareness, *Contemporary Educational Psychology* 1994;19;460-475. <https://doi.org/10.1006/ceps.1994.1033>

*Analysis of performance
and strategy effectiveness*



Evaluation



Planning

Planning, goal setting, allocating resources prior to learning



**Info
Management
Strategies**

*Strategies used to process
information efficiently*

*Strategies to correct
comprehension and
performance errors*



**Debugging
Strategies**



**Comprehension
Monitoring**

*Assessment of one's
learning or strategy use*

Industriousness



Self-Efficacy



Self-Discipline



Achievement
Striving

Orderliness



Dutifulness



Cautiousness



Orderliness

7. Judge TA, Rodell JB, Klinger RL, Simon LS, Crawford ER, Hierarchical Representations of the Five-Factor Model of Personality in Predicting Job Performance: Integrating Three Organizing Frameworks With Two Theoretical Perspectives, *Journal of Applied Psychology* 2013;98(6):875-925.

Volatility



Anxiety



Anger



Immoderation

Withdrawal



Depression



Self-Consciousness



Vulnerability

7. Judge TA, Rodell JB, Klinger RL, Simon LS, Crawford ER, Hierarchical Representations of the Five-Factor Model of Personality in Predicting Job Performance: Integrating Three Organizing Frameworks With Two Theoretical Perspectives, *Journal of Applied Psychology* 2013;98(6):875-925.

- In 2019/20, an explanatory mixed methods study was initiated
- 41 students completed these online self-reported surveys

Table 1: List of Medical Student Surveys

Construct	Survey	# Elements			Scale
		Factors	Facets	Items	
Metacognition	Metacognitive Awareness Inventory ⁶	2	8	52	0=false, 1=true
Personality	Five Factor Personality (IPIP-120) ⁸	5	30	120	1=very inaccurate , 5=very accurate

6. Schraw G, Dennison RS, Assessing Metacognitive Awareness, *Contemporary Educational Psychology* 1994;19:460-475. <https://doi.org/10.1006/ceps.1994.1033>

8. Cooper AJ; Smillie LD, Corr PJ, A Confirmatory Factor Analysis of the Mini-IPIP Five-Factor Model Personality Scale, *Personality and Individual Differences* 2010;48(5):688-691.

➤ Comparative Tests

- Single sample t-tests (sig of Δ)

➤ Relational Tests

- Pearson (r) correlations
- Multivariate linear regressions

➤ Psychometric Tests

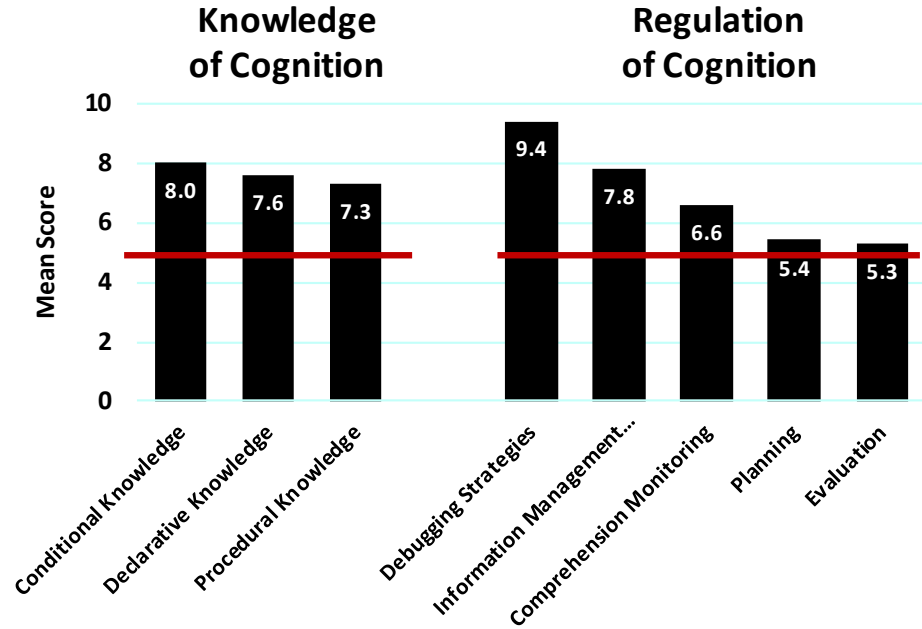
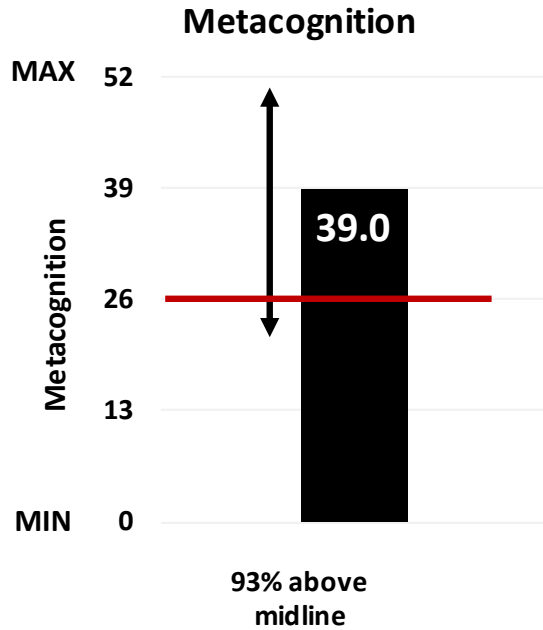
- Inter-item reliability
 - ✓ Cronbach alpha (α)

➤ Software: Quantitative

- IBM® SPSS® 24 used for analysis

➤ Human Research Protection

- This research approved by the school's IRB.



Inter-Item reliability	$\alpha=0.8$	0.8	0.9	0.9	0.7	0.8	0.8	0.8	0.7
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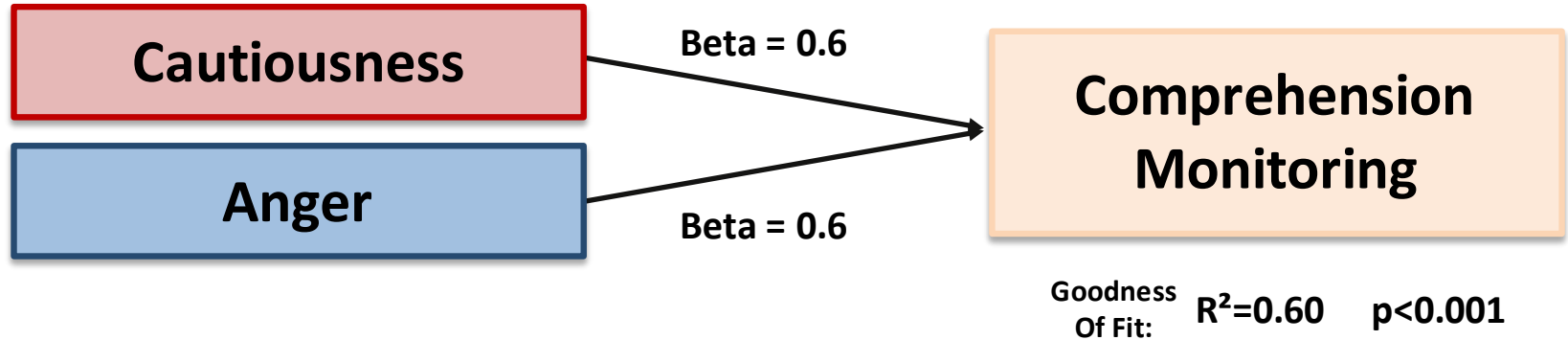
N=41

Conscientiousness	Metacognition				
	Debugging Strategies	Info Management	Comprehension Monitoring	Declarative Knowledge	Planning
Orderliness		.4			.6
Dutifulness				.5	.5
Cautiousness	-.4		.5	.4	.4
Self-Efficacy					.4
Achievement			.4		
Self-Discipline					

- Comprehension monitoring, declarative knowledge, planning, and cautiousness have multiple significant correlations (all $p \leq 0.050$)

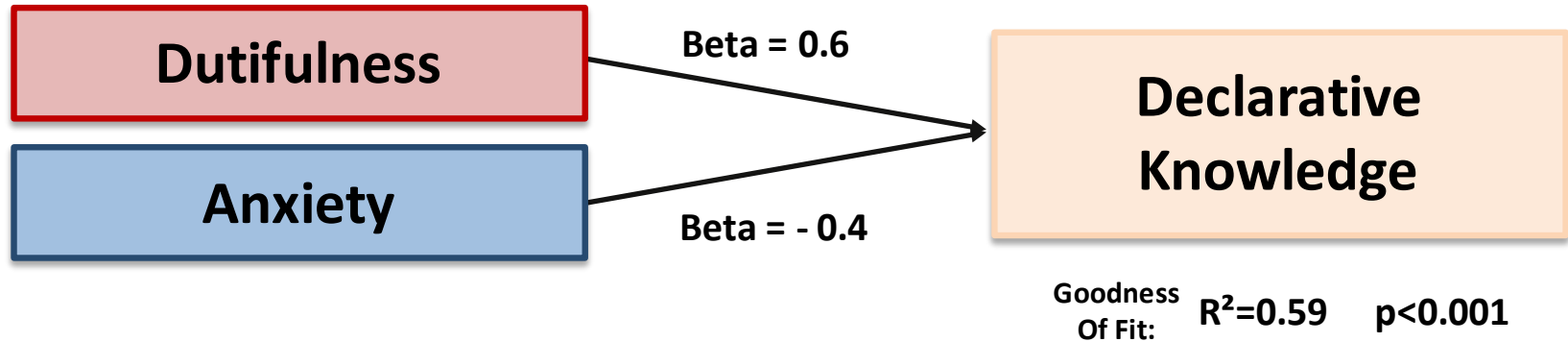
Emotional Stability	Metacognition	
	Comprehension Monitoring	Declarative Knowledge
Vulnerability		-.6
Anxiety		-.5
Anger	.5	
Self-Consciousness	.4	
Depression		
Immoderation		

- Comprehension monitoring and declarative knowledge are common relational facets to both personality traits
- Self-consciousness and anger are positively related to metacognition
- Vulnerability and anxiety are negatively related



- Being prudent and judicious in decision making (cautiousness)
- Getting annoyed and irritated (anger)

- Assessing learning and strategy use (comprehension monitoring)



- Being responsible and committed (dutifulness)
- Uncertainty, doubt and apprehension (anxiety) neg relation

- What to learn and understanding expectations (declarative knowledge)

- Metacognition scores positive
 - Awareness of cognition is consistently high
 - Regulation of cognition varies greatly

- Metacognition predicted by personality facets:
 - Cautiousness and Dutifulness
 - Anger and Anxiety (-)

- Metacognition facets of comprehension monitoring and declarative knowledge most impacted by personality

- Participation rate limitations decreases student representation and reduces validity
- Self-reported values of psychological factors are complementary to but not identical to observed values

If you only remember one thing from this presentation . . .

**Medical student metacognition is predicted
by conscientiousness and emotional stability
at higher resolutions**

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1. Flavell JH, Metacognition and Cognitive Monitoring: A New Area of Cognitive-Developmental Inquiry, *American Psychologist* 1979;34:906-911.
2. Ohtani K, Hisasaka T, Beyond Intelligence: A Meta-analytic Review of the Relationship among Metacognition, Intelligence, and Academic Performance, *Metacognition Learning* 2019;13:179-212.
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Neuroticism

Anxiety

Worry about things.
Fear for the worst.
Am afraid of many things.
Get stressed out easily.

Anger

Get angry easily.
Get irritated easily.
Lose my temper.
Am not easily annoyed.

Depression

Often feel blue.
Dislike myself.
Am often down in the dumps.
Feel comfortable with myself.

Neuroticism

Self-Consciousness

Find it difficult to approach others.
Am afraid to draw attention to myself.
Only feel comfortable with friends.
Am not bothered by difficult social situations.

Immoderation

Go on binges.
Rarely overindulge.
Easily resist temptations.
Am able to control my cravings.

Vulnerability

Panic easily.
Become overwhelmed by events.
Feel that I'm unable to deal with things.
Remain calm under pressure.

Conscientiousness

Self-Efficacy

Complete tasks successfully.
Excel in what I do.
Handle tasks smoothly.
Know how to get things done.

Orderliness

Like to tidy up.
Often forget to put things back in their proper place.
Leave a mess in my room.
Leave my belongings around.

Dutifulness

Keep my promises.
Tell the truth.
Break rules.
Break my promises.

Conscientiousness

Achievement-Striving

Do more than what's expected of me.
Work hard.
Put little time and effort into my work.
Do just enough work to get by.

Self-Discipline

Am always prepared.
Carry out my plans.
Waste my time.
Have difficulty starting tasks.

Cautiousness

Jump into things without thinking.
Make rash decisions.
Rush into things.
Act without thinking.

Metacognitive Awareness

Declarative Knowledge

- 5. I understand my intellectual strengths and weaknesses.
- 10. I know what kind of information is most important to learn.
- 12. I am good at organizing information.
- 16. I know what the teacher expects me to learn.
- 17. I am good at remembering information.
- 20. I have control over how well I learn.
- 32. I am a good judge of how well I understand something.
- 46. I learn more when I am interested in the topic.

Procedural Knowledge

- 3. I try to use strategies that have worked in the past.
- 14. I have a specific purpose for each strategy I use.
- 27. I am aware of what strategies I use when I study.
- 33. I find myself using helpful learning strategies automatically.

Conditional Knowledge

- 15. I learn best when I know something about the topic.
- 18. I use different learning strategies depending on the situation.
- 26. I can motivate myself to learn when I need to.
- 29. I use my intellectual strengths to compensate for my weaknesses.
- 35. I know when each strategy I use will be most effective.

Metacognitive Awareness

Planning

4. I pace myself while learning in order to have enough time.
6. I think about what I really need to learn before I begin a task.
8. I set specific goals before I begin a task.
22. I ask myself questions about the material before I begin.
23. I think of several ways to solve a problem and choose the best one.
42. I read instructions carefully before I begin a task.
45. I organize my time to best accomplish my goals.

Information Management Strategies

9. I slow down when I encounter important information.
13. I consciously focus my attention on important information.
30. I focus on the meaning and significance of new information.
31. I create my own examples to make information more meaningful.
37. I draw pictures or diagrams to help me understand while learning.
39. I try to translate new information into my own words.
41. I use the organizational structure of the text to help me learn
43. I ask myself if what I'm reading is related to what I already know.
47. I try to break studying down into smaller steps.
48. I focus on overall meaning rather than specifics.

Metacognitive Awareness

Comprehension Monitoring

1. I ask myself periodically if I am meeting my goals.
2. I consider several alternatives to a problem before I answer.
11. I ask myself if I have considered all options when solving a problem.
21. I periodically review to help me understand important relationships.
28. I find myself analyzing the usefulness of strategies while I study.
34. I find myself pausing regularly to check my comprehension.
49. I ask myself questions about how well I am doing while learning something new.

Debugging Strategies

25. I ask others for help when I don't understand something.
40. I change strategies when I fail to understand.
44. I re-evaluate my assumptions when I get confused.
51. I stop and go back over new information that is not clear.
52. I stop and reread when I get confused.

Evaluation

7. I know how well I did once I finish a test.
19. I ask myself if there was an easier way to do things after I finish a task.
24. I summarize what I've learned after I finish.
36. I ask myself how well I accomplish my goals once I'm finished.
38. I ask myself if I have considered all options after I solve a problem.
50. I ask myself if I learned as much as I could have once I finish a task.