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
Metacognition\textsuperscript{1} is the awareness and regulation of thinking\textsuperscript{2} . . .

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

. . . and are salient features of effective learning.\textsuperscript{3}

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 constructs\(^5\) 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.


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.

![Diagram]

- **Conscientiousness**
- **Emotional Stability**

**Personality Predictors**

**Metacognition**

**Outcome**
Declarative Knowledge
What to Learn

Procedural Knowledge
How to Learn

Conditional Knowledge
When to Learn

Regulation of Cognition

Planning
- Planning, goal setting, allocating resources prior to learning

Info Management Strategies
- Strategies used to process information efficiently

Evaluation
- Analysis of performance and strategy effectiveness

Comprehension Monitoring
- Assessment of one's learning or strategy use

Debugging Strategies
- Strategies to correct comprehension and performance errors

Planning, goal setting, allocating resources prior to learning

Strategies used to process information efficiently

Analysis of performance and strategy effectiveness

Strategies to correct comprehension and performance errors

Assessment of one's learning or strategy use
Conscientiousness Structure

- Industriousness
- Orderliness
- Self-Efficacy
- Self-Discipline
- Achievement Striving
- Dutifulness
- Cautiousness
- Orderliness

Volutility

Emotional Stability Structure

Anxiety
Anger
Immoderation

Withdrawal

Depression
Self-Consciousness
Vulnerability

In 2019/20, an explanatory mixed methods study was initiated

41 students completed these online self-reported surveys

<table>
<thead>
<tr>
<th>Construct</th>
<th>Survey</th>
<th># Elements</th>
<th>Scale</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Factors</td>
<td>Facets</td>
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<tr>
<td>Metacognition</td>
<td>Metacognitive Awareness Inventory</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Personality</td>
<td>Five Factor Personality (IPIP-120)</td>
<td>5</td>
<td>30</td>
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</tbody>
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Methods: Analysis

- **Comparative Tests**
  - Single sample t-tests (sig of $\Delta$)

- **Relational Tests**
  - Pearson ($r$) correlations
  - Multivariate linear regressions

- **Psychometric Tests**
  - Inter-item reliability
    - Cronbach alpha ($\alpha$)

- **Software: Quantitative**
  - IBM® SPSS® 24 used for analysis

- **Human Research Protection**
  - This research approved by the school’s IRB.
Results: Mean Scores

Inter-Item reliability $\alpha = 0.8$

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<thead>
<tr>
<th>Knowledge of Cognition</th>
<th>Regulation of Cognition</th>
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<tbody>
<tr>
<td>Conditional Knowledge</td>
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<tr>
<td>Declarative Knowledge</td>
<td>7.6</td>
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<tr>
<td>Procedural Knowledge</td>
<td>7.3</td>
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<tr>
<td>Debugging Strategies</td>
<td>9.4</td>
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<tr>
<td>Information Management</td>
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<tr>
<td>Comprehension Monitoring</td>
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<tr>
<td>Planning</td>
<td>5.4</td>
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<tr>
<td>Evaluation</td>
<td>5.3</td>
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N=41

93% above midline
<table>
<thead>
<tr>
<th>Conscientiousness</th>
<th>Metacognition</th>
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<tr>
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<tr>
<td>Orderliness</td>
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<tr>
<td>Dutifulness</td>
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<tr>
<td>Cautiousness</td>
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<tr>
<td>Self-Efficacy</td>
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<tr>
<td>Achievement</td>
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<td>Self-Discipline</td>
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- Comprehension monitoring, declarative knowledge, planning, and cautiousness have multiple significant correlations (all $p \leq 0.050$)
<table>
<thead>
<tr>
<th>Emotional Stability</th>
<th>Metacognition</th>
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<tbody>
<tr>
<td></td>
<td>Comprehension Monitoring</td>
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<tr>
<td>Vulnerability</td>
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<td>Depression</td>
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<td>Immoderation</td>
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- 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.
Personality Predictors

- Cautiousness
  - Beta = 0.6

- Anger
  - Beta = 0.6

Metacognition Outcome

- Comprehension Monitoring
  - Goodness Of Fit: $R^2 = 0.60$, $p < 0.001$

- Being prudent and judicious in decision making (cautiousness)
- Getting annoyed and irritated (anger)
- Assessing learning and strategy use (comprehension monitoring)
Dutifulness

Anxiety

Declarative Knowledge

- Being responsible and committed (dutifulness)
- Uncertainty, doubt and apprehension (anxiety) neg relation
- What to learn and understanding expectations (declarative knowledge)

Beta = 0.6
Beta = -0.4

$R^2 = 0.59$  $p < 0.001$
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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https://tinyurl.com/y66xysv8


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.
48. I focus on overall meaning rather than specifics.

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.
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.