

The Results Are In: Analyzing Your MCAT Diagnostic Exam

1) Which molecule is most likely to use a protein channel to cross the eukaryotic cell membrane?

- A. Aldosterone
- B. Vasopressin
- C. O₂
- D. CO₂

2) Modern MRI machines use electricity to generate their magnetic fields inside a circular chamber instead of permanent magnets. Which of the following would NOT increase the strength of the MRI field?

- A) Increased radius of the MRI chamber
- B) Increased power supplied to the MRI
- C) Decreased resistance of the MRI
- D) Increased current through the MRI

MCAT Test Passage 1

Antisocial personality disorder is a chronic mental condition in which a person's ways of thinking, perceiving situations and relating to their peers are dysfunctional and destructive. People with antisocial personality disorder typically have no regard for right and wrong and often disregard the rights, wishes and feelings of others. Several traits necessary to assess antisocial personality disorder have been identified.

- Superficial charm (smooth-talking, engaging and slick)
- Greatly inflated idea of one's abilities and self-esteem and a sense of superiority
- Pathological lying
- Manipulative (uses deceit to cheat others for personal gain)
- Lack of remorse or guilt
- Limited range or depth of feelings
- Callous/lack of empathy
- Failure to accept responsibility for own actions

Despite their antisocial behavior, many criminals do not fit the description of antisocial personality disorder. The disorder has both biological and psychological roots. No single gene codes for such complex behavior but some studies have detected early signs of antisocial behavior. Figure 1 below show the results of an experiment performed to measure levels of the hormone adrenaline in 2 groups of boys at age 15.

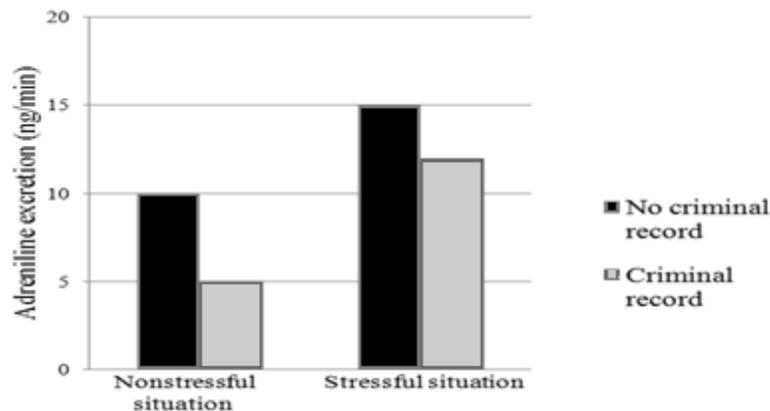


Figure 1 Levels of adrenaline measured in 2 groups of boys

In both stressful and non stressful situations, those who acquired a juvenile criminal record (as 12-15 year olds) showed comparatively low arousal. Genetics alone cannot tell the whole story. Relative to 1955, the average American in 2005 was twice as likely to be murdered, four times as likely to be robbed and five times more likely to be assaulted. Yet the human gene pool had hardly changed.

MCAT Passage 1 Questions

- 3) Which conclusion is supported by Figure 1?
- A) Boys with a criminal record have a no autonomic response to stress.
 - B) Boys with no criminal record have a smaller autonomic response to stress.
 - C) Boys with no criminal records have lower resting levels of adrenaline.
 - D) Boys with a criminal record have a smaller autonomic response to stress.
- 4) It is found that some people who suffer from antisocial personality disorder had trouble with speech a child. What brain area is likely the cause?
- A. Somatosensory cortex
 - B. Wernicke's area
 - C. Occipital lobe
 - D. Basal ganglia
- 5) A woman walking to work sees a group of people on the street staring at the sky. She stops to join them in staring up at the sky. Her behavior is an example of:
- A. The bystander effect.
 - B. De-individuation.
 - C. Conformity.
 - D. Groupthink.
- 6) Which organ is associated with the hormone response monitored in the experiment discussed in the passage?
- A. Kidneys
 - B. Adrenal glands
 - C. Thymus
 - D. Amygdala

MCAT Passage 2

If a drug company could take all of the positive effects of exercise and put them into a pill, they'd be the most successful company in history. It is, in fact, nearly impossible to overstate the positive effects that regular exercise has on nearly every facet of the body's physiological and the mind's psychological state. Exercise has been demonstrated to not just slow the progression of, but to reverse, many of the symptoms of type 2 diabetes, heart disease, high cholesterol, and hypertension. It can delay the onset of dementia, reduce symptoms of anxiety and depression disorders, and aid in smoking cessation programs.

And yet when patients meet with their physicians, the overwhelming majority of primary care doctors fail to discuss the importance of exercise with patients. To the extent that the topic is discussed at all, the doctor will make, at best, passing remarks about the importance of an exercise program. Even more perversely, there is a strong correlation between lower economic class and decreased likelihood of physician-recommended exercise programs, despite the even stronger correlation between lower economic class and many of the diseases that exercise would most directly benefit (most notably obesity and type 2 diabetes). That is to say, those patients who most need regular exercise are the ones least likely to have a doctor that strongly recommends such a program.

Why this connection exists is still somewhat unclear, although research is slowly shedding light on the topic. Fundamentally, public health scientists examine two different facets of the correlation: patient-sided factors and healthcare provider-sided factors. Thus, working and lower class patients may not have access to the kind of doctors that will recommend exercise, or doctors may change how they treat patients based on perceived economic class.

To date, research seems to suggest both of these factors work in concert. In a groundbreaking study at the University of Arizona College of Medicine, experimenters created audio recordings of over 5,000 patient-physician interactions for patients that were classified as obese. The patient population was categorized into three broad categories of economic class based on income. Researchers found that physicians were 22% more likely to discuss exercise regimens with the high-class patient group than the lowest, and that when exercise was discussed, doctors spent a staggering 420% more time in conversation about exercise with the high economic class group than either the middle or low class group. Despite these stark findings, the researchers' failure to control for factors of ethnicity and gender have created large enough concerns about methodological validity to lead some critics to dismiss the study entirely.

More promising are results obtained from examining the patient-sided factors, including frequency of patient-initiated discussions about exercise programs and patient access to high quality primary care. Here, surveys of both patients and healthcare workers have demonstrated a strong correlation between a patient's economic class and their likelihood of initiating a conversation about exercise with their healthcare provider. This correlation seems to exist regardless of the health status of the patient, and any similarities between the patient and provider in terms of demographic categories. The findings suggest, perhaps, that patients from higher economic classes are simply more comfortable initiating conversations with their healthcare professionals.

A final irony was revealed in the most recent major study published on the topic, which found no correlation between a patient's ability to start and stick with an exercise regimen and how frequently such programs were discussed with healthcare professionals.

7. In the study discussed in the fourth paragraph, the researchers created audio recordings of the doctor-patient interactions in order to:

- A) prove that physicians unconsciously discriminate against lower class patients by not discussing exercise with them.
- B) determine differences in doctor-patient interactions when the doctor and patient are of the same or of different ethnicities.
- C) ascertain whether doctors were more likely to discuss exercise regimens with obese male patients than with obese female patients.
- D) assess both how often exercise was discussed and for how much time it was discussed.

8. Which of the following studies would provide the best evaluation of the author's speculations at the end of the fifth paragraph?

- A) A study examining how frequently patients ask physicians about medications other than the ones initially recommended by the doctor
- B) A cross-sectional study that correlates ethnicity and gender with frequency of implementation of doctor-recommended exercise plans
- C) A survey asking patients how many members of their immediate family are healthcare workers that specialize in exercise-based fields such as physiatry or physical therapy
- D) A longitudinal study that follows three different groups who are given three different doctor-prescribed exercise regimens to determine whether they are able to stick with the plan and if not, why not

9. For which of the following statements does the passage provide the *least* explanation or support?

- A) A patient with type 2 diabetes who is trying to quit smoking may be able to improve both of these health factors with regular exercise.
- B) Patients who discuss exercise plans with their physician are unable to stick with the plan due to how infrequently they are able to get check-ups with their doctor.
- C) Even studies that include a very large amount of data may nonetheless lead to questionable conclusions.
- D) Patients' own behavior can influence the likelihood that their doctor will discuss exercise plans with them.

10. The passage author would be most likely to agree with which one of the following assertions?

- A) Patients in the lowest economic classes are just as likely to be able to stick with a doctor-recommended exercise plan than patients in the highest economic classes.
- B) A female doctor is more likely to discuss an exercise regimen with an obese female patient of lower economic class than a male obese patient from a higher economic class.
- C) The positive effects of exercise are overwhelming in the scope and profundity of effect on physiological conditions but are very limited on psychological ones.
- D) Had the study described in paragraph 4 been conducted at a different institution the researchers would have been more likely to use more robust controls.

11. Which of the following could serve as an appropriate title for the passage?

Physician-Recommended Exercise Plans: When and Why
The Benefits of Exercise in Addiction Recovery
Doctors and Patients Both Fail to Address Exercise

- A) I only
- B) III only
- C) I and II only
- D) I and III only

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Answers and Explanations

1) What molecule is most likely to use a protein channel to cross the eukaryotic cell membrane?

- A. Aldosterone
- B. Vasopressin**
- C. O₂
- D. CO₂

Explanation: The eukaryotic cell membrane is comprised of a phospholipid bilayer, cholesterol, and various trans-membrane protein pores, channels and gates. The lipid bilayer is impermeable to ions and polar molecules. The arrangement of hydrophilic heads and hydrophobic tails of the lipid bilayer prevent polar solutes from diffusing across the membrane, but allows for the free movement of hydrophobic molecules. Choice B, vasopressin is a peptide hormone built of amino acids, which renders the hormone polar. Choices C & D are also non-polar.

A: Aldosterone is a steroid hormone built from non-polar cholesterol which allows it to freely cross the membrane.

B: Is correct

C: Oxygen is a small, non-polar molecule which allows it to freely cross the membrane.

D: Carbon dioxide is a small, non-polar molecule which allows it to freely cross the membrane.

2) Modern MRI machines use electricity to generate their magnetic fields inside a circular chamber instead of permanent magnets. Which of the following would NOT increase the strength of the MRI field?

- A) Increased radius of the MRI chamber**
- B) Increased power supplied to the MRI
- C) Decreased resistance of the MRI
- D) Increased current through the MRI

Explanation: A is correct. The magnetic field strength generated at the center of a circuit loop is given by: $\beta = \mu_0 I / 2\pi r$ where β is the field strength, μ_0 is the permeability of space (a constant), I is the electrical current through the circuit and r is the radius of the loop. Field strength is directly proportional to current and inversely proportional to radius. Increasing radius of the chamber will lower the strength of the field at the center of the chamber.

A: Is correct.

B: Electrical Power = IV , increased power indicates an increased supply of current or energy to the device, which will raise field strength.

C: Ohm's law states that $V = IR$. Thus $I = V/R$. If resistance is lowered then current will increase. This leads to a stronger field.

D: Increased current leads to a stronger field.

Passage 1 Answers and Explanations

Antisocial personality disorder is a chronic mental condition in which a person's ways of thinking, perceiving situations and relating to their peers are dysfunctional and destructive. People with antisocial personality disorder have no regard for right and wrong and often disregard the rights, wishes and feelings of others. **Several traits necessary to assess** antisocial personality disorder have been identified.

Key terms: Antisocial personality disorder

Cause-and-Effect: The disease causes a loss of moral decision making and moral behavior.

- Superficial charm (smooth-talking, engaging and slick)
- Greatly inflated idea of one's abilities and self-esteem and a sense of superiority
- Pathological lying
- Manipulative (uses deceit to cheat others for personal gain)
- Lack of remorse or guilt
- Limited range or depth of feelings
- Callous/lack of empathy
- Failure to accept responsibility for own actions

Despite their antisocial behavior, many **criminals do not fit the description** of antisocial personality disorder. The disorder has both biological and psychological roots. No single gene codes for such complex behavior but some studies have **detected early signs** of antisocial behavior. Figure 1 below show the results of an **experiment performed to measure levels of the hormone adrenaline** in 2 groups of boys at age 15.

Key terms: early detection, experiment performed to measure adrenaline

Contrast: criminals do not fit typical ASP profile

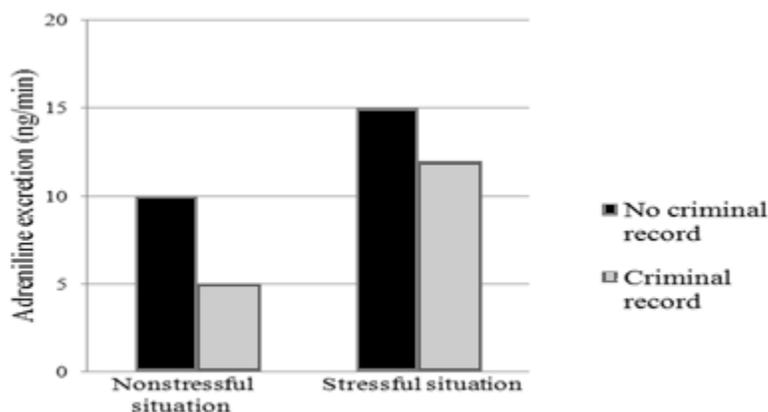


Figure 1 Levels of adrenaline measured in 2 groups of boys

Figure 1 shows us that people with a criminal record experience a lower level of adrenaline secretion. Both groups secrete more adrenaline in stressful situations but the % change is much bigger for those with criminal records.

In both stressful and non stressful situations, those who acquired a juvenile **criminal record** (as 12-15 year olds) showed **comparatively low arousal**. **Genetics** alone cannot tell the whole story. Relative to

1955, the average American in 2005 was twice as likely to be murdered, four times as likely to be robbed and five times more likely to be assaulted. Yet the human gene pool had hardly changed.

Key terms: low arousal, genetics, crime statistics

Contrast: genetics tells a part of story but are not definitive, crime rates are up

3) Which conclusion is supported by Figure 1?

- A. Boys with a criminal record have no autonomic response to stress.
- B. Boys with no criminal record have a smaller autonomic response to stress.
- C. Boys with no criminal records have lower resting levels of adrenaline.
- D. Boys with a criminal record have a smaller autonomic response to stress.**

Explanation: Choice D is correct. Figure 1 shows that in both stressful and non stressful situations, boys who have a criminal record have a smaller release of adrenaline, a common hormone released by the sympathetic branch of the autonomic nervous systems.

- A: Figure 1 shows subjects to have a release of adrenaline, which is an autonomic response.
- B: Figure 1 shows boys with no criminal record to have a higher release of adrenaline.
- C: Figure 1 shows no information about resting levels of adrenaline.
- D: Choice D is correct.

4) It is found that some people who suffer from antisocial personality disorder had trouble with speech as a child. What brain area is likely the cause?

- A. Somatosensory cortex
- B. Wernicke's area**
- C. Occipital lobe
- D. Basal ganglia

Explanation: Choice B is correct. Wernicke's area is involved in the understanding of written and spoken language. It is in the cerebral cortex and is located just posterior to the Sylvian fissure (part of the brain where the temporal lobe and parietal lobe meet).

- A: The somatosensory cortex is where afferent signals from the periphery are relayed into the brain.
- B: Choice B is the correct answer.
- C: The occipital lobe is associated with vision and is located on the posterior region of the brain.
- D: The Basal ganglia is closely associated with the control and regulation of the motor and premotor cortical areas so that voluntary movements can be performed smoothly and is located in the mid brain.

5) A woman walking to work sees a group of people on the street staring at the sky. She stops to join them in staring up at the sky. Her behavior is an example of:

- A. The Bystander effect.
- B. De-individuation.
- C. Conformity.**
- D. Groupthink.

Explanation: Choice C is correct. Conformity is defined as the adjusting of one's behavior or thinking to coincide with a group standard.

A: The bystander effect refers to cases in which individuals do not offer any means of help to a victim when other people are present.

B: De-individuation is when an individual loses self-awareness in groups.

C: Conformity is defined as the adjusting of one's behavior or thinking to coincide with a group standard

D: Groupthink is the case where the desire for harmony or conformity in the group results in an irrational or dysfunctional decision-making.

6) Which organ is associated with the hormone response monitored in the experiment discussed in the passage?

- A. Kidneys
- B. Adrenal glands**
- C. Thymus
- D. Amygdala

Explanation: Choice B is correct. The adrenal glands are responsible for releasing hormones in response to stress through the synthesis of corticosteroids such as cortisol and catecholamines such as adrenaline.

A: The kidneys main role is osmoregulation of the body. Maintaining the balance of fluids and solutes.

B: B is correct.

C: The thymus is a specialized organ of the immune system where T-cells mature.

D: The amygdalae are golf ball shaped groups of nuclei located within the temporal lobes of the brain. They serve to assist in the processing of memory, decision-making, and emotional reactions.

MCAT Passage 2 Answers and Explanations

If a drug company could take all of the positive effects of exercise and put them into a pill, they'd be the most successful company in history. It is, in fact, **nearly impossible to overstate the positive effects** that regular **exercise** has on nearly every facet of the **body's** physiological and the **mind's** psychological state. Exercise has been demonstrated to not just slow the progression of, but to reverse, many of the symptoms of type 2 diabetes, heart disease, high cholesterol, and hypertension. It can delay the onset of dementia, reduce symptoms of anxiety and depression disorders, and aid in smoking cessation programs.

Cause and effect: exercise has tons of benefits for body and mind

And yet when patients meet with their physicians, the overwhelming majority of **primary care doctors fail to discuss** the importance of **exercise** with patients. To the extent that the topic is discussed at all, the doctor will make, at best, passing remarks about the importance of an exercise program. Even more perversely, there is a strong correlation between lower economic class and decreased likelihood of physician-recommended exercise programs, despite the even stronger correlation between lower economic class and many of the diseases that exercise would most directly benefit (most notably obesity and type 2 diabetes). That is to say, **those patients who most need regular exercise** are the ones **least likely** to have a **doctor that strongly recommends** such a program.

Opinion: author thinks that doctors are failing to adequately discuss exercise with patients

Contrast: patients of lower economic class vs. patients of higher economic class – the lower economic class patients are more likely to need regular exercise but are less likely to have a doctor who pushes it

Why this connection exists is **still somewhat unclear**, although research is slowly shedding light on the topic. Fundamentally, public health scientists examine two different facets of the correlation: **patient-sided** factors and **healthcare provider-sided** factors. Thus, working and lower class patients may not have access to the kind of doctors that will recommend exercise, or doctors may change how they treat patients based on perceived economic class.

Cause and effect: factors relating to both patients and doctors influence the frequency of doctor-patient discussions about exercise

To date, research seems to suggest both of these factors work in concert. In a groundbreaking study at the University of Arizona College of Medicine, experimenters created audio recordings of over 5,000 patient-physician interactions for patients that were classified as obese. The **patient population was categorized** into three broad categories of economic class based on income. Researchers found that physicians were **22% more likely** to discuss exercise regimens with the **high-class patient group** than the lowest, and that when exercise was discussed, doctors spent a staggering **420% more time in conversation** about exercise with the high economic class group than either the middle or low class group. Despite these stark findings, the researchers' **failure to control** for factors of ethnicity and gender have created large enough concerns about methodological validity to lead **some critics to dismiss** the study entirely.

Contrast: doctors were more likely to discuss exercise with the rich patients and discussed exercise for much longer time with them

Opinion: critics dismiss the results because they think the design of the study was flawed

More promising are results obtained from examining the patient-sided factors, including frequency of patient-initiated discussions about exercise programs and patient access to high quality primary care. Here, surveys of both patients and healthcare workers have demonstrated a strong correlation between a patient's economic class and their likelihood of initiating a conversation about exercise with their healthcare provider. This correlation seems to exist regardless of the health status of the patient, and any similarities between the patient and provider in terms of demographic categories. The findings suggest, perhaps, that patients from higher economic classes are simply more comfortable initiating conversations with their healthcare professionals.

Cause and effect: patients from higher economic classes are much more likely to initiate conversations about exercise with their doctor

Opinion: author speculates that the richer patients are just more comfortable starting conversations with doctors in general

A final irony was revealed in the most recent major study published on the topic, which found no correlation between a patient's ability to start and stick with an exercise regimen and how frequently such programs were discussed with healthcare professionals.

Contrast: even when doctors discuss exercise more frequently with patients, that doesn't seem to have any effect on patients actually sticking with exercise plans

Main Idea: Exercise has huge benefits for both body and mind and yet doctors generally fail to address this important idea, and this failure is even more pronounced when looking at doctor-patient interactions for patients from lower economic classes.

7. In the study discussed in the fourth paragraph, the researchers created audio recordings of the doctor-patient interactions in order to:

- A) prove that physicians unconsciously discriminate against lower class patients by not discussing exercise with them.
- B) determine differences in doctor-patient interactions when the doctor and patient are of the same or of different ethnicities.
- C) ascertain whether doctors were more likely to discuss exercise regimens with obese male patients than with obese female patients.
- D) assess both how often exercise was discussed and for how much time it was discussed.

D is correct. The passage tells us information both about the frequency of discussions about exercise (22% more for high economic class patients) and about the duration of such conversations (420% longer conversations).

A: This goes far beyond the passage, both by saying that the researchers were setting out to "prove" a particular conclusion in advance, and that the physicians were unconsciously discriminating.

B, C: This is the opposite of what the passage says because we're specifically told the study failed to address these factors.

8. Which of the following studies would provide the best evaluation of the author's speculations at the end of the fifth paragraph?

- A) A study examining how frequently patients ask physicians about medications other than the ones initially recommended by the doctor
- B) A cross-sectional study that correlates ethnicity and gender with frequency of implementation of doctor-recommended exercise plans
- C) A survey asking patients how many members of their immediate family are healthcare workers that specialize in exercise-based fields such as psychiatry or physical therapy
- D) A longitudinal study that follows three different groups who are given three different doctor-prescribed exercise regimens to determine whether they are able to stick with the plan and if not, why not

A is correct. The author speculates that patients in higher economic classes are simply more comfortable initiating conversations with healthcare professionals. If this is the case, we should be able to study how often patients initiate conversations on topics other than exercise regimens. Specifically initiating a conversation about alternative medications would be one such example.

B: This study would be assessing factors discussed in paragraph four, not five.

C: While someone might be more likely to initiate a conversation about exercise if they are regularly exposed to family members who are focused on the topic, this study doesn't quite get at the issue of being comfortable initiating conversations with healthcare providers generally, as the author speculates.

D: This choice relates to the facts discussed in the sixth paragraph.

9. For which of the following statements does the passage provide the least explanation or support?

- A) A patient with type 2 diabetes who is trying to quit smoking may be able to improve both of these health factors with regular exercise.
- B) Patients who discuss exercise plans with their physician are unable to stick with the plan due to how infrequently they are able to get check-ups with their doctor.
- C) Even studies that include a very large amount of data may nonetheless lead to questionable conclusions.
- D) Patients' own behavior can influence the likelihood that their doctor will discuss exercise plans with them.

B is correct. The very end of the passage tells us that even when patients do discuss exercise regimens with their doctor, they don't seem to be able to start or stick with the plans. However, the passage doesn't tell us (or even suggest) why this is the case.

A: This is stated at the start of the passage.

C: The author tells us about a study in paragraph 4 that included tons of data (thousands of recorded doctor-patient interactions) but still had methodological flaws that made some question its conclusions.

D: The passage discusses a study that assess how frequently patients initiate conversations about exercise with their doctors.

10. The passage author would be most likely to agree with which one of the following assertions?

- A) Patients in the lowest economic classes are just as likely to be able to stick with a doctor-recommended exercise plan than patients in the highest economic classes.
- B) A female doctor is more likely to discuss an exercise regimen with an obese female patient of lower economic class than a male obese patient from a higher economic class.
- C) The positive effects of exercise are overwhelming in the scope and profundity of effect on physiological conditions but are very limited on psychological ones.
- D) Had the study described in paragraph 4 been conducted at a different institution the researchers would have been more likely to use more robust controls.

A is correct. At the very end of the passage, the author tells us that there seems to be no correlation between how frequently doctors discuss exercise plans and whether patients will stick to such plans. Since there's no correlation, we may guess that low economic class patients (few doctor conversations about exercise) and high economic class patients (many conversations about exercise) are equally likely to be able to stick to an exercise plan.

B: This contradicts the passage, which states that doctors are more likely to discuss exercise with higher class patients.

C: This contradicts the first paragraph, which tells us that exercise helps both mind and body.

D: Nowhere does the author state or suggest anything about the particular institutions that are carrying out the studies in the passage.

11. Which of the following could serve as an appropriate title for the passage?

Physician-Recommended Exercise Plans: When and Why
The Benefits of Exercise in Addiction Recovery
Doctors and Patients Both Fail to Address Exercise

- A) I only
- B) III only
- C) I and II only
- D) I and III only

D is correct. The passage is concerned with exercise plans recommended by doctors, and the various factors that influence when such discussions take place. The author discusses studies that address the behavior of both the patients and the healthcare professionals. Thus I and III both adequately sum up the general discussion in the text.

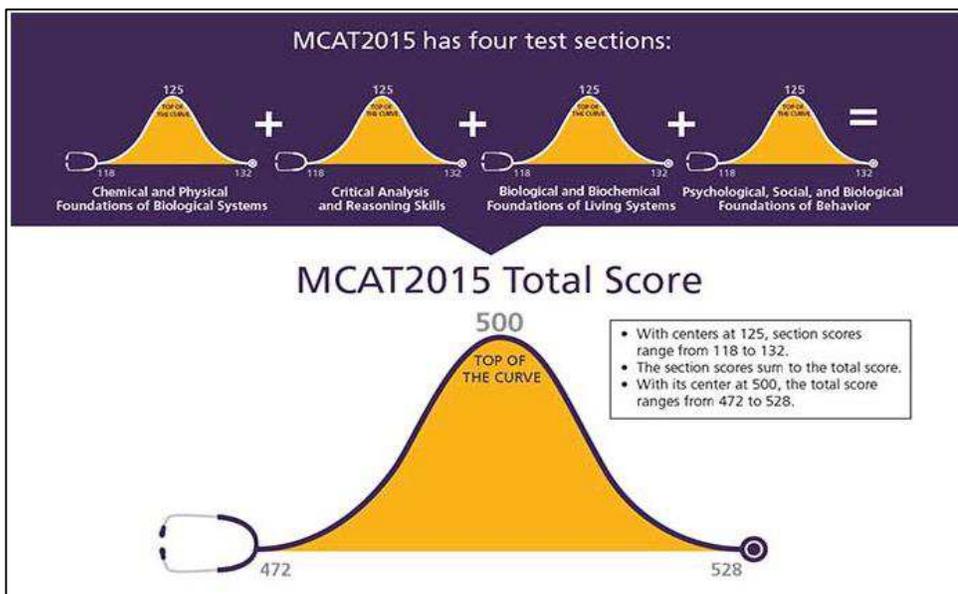
II: This is only mentioned briefly in the first paragraph and would serve as a good title summing up the whole passage.

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